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Using the household hunger scale to improve analysis and classification of severe food insecurity in famine-risk conditions: Evidence from three countries

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ABSTRACT

The currently accepted means of categorizing household food insecurity and identifying famine or famine risk is through Integrated Food Security Phase Classification (IPC) analysis. IPC guidelines set criteria for the measurement and determination of famine, but recent analyses in famine-risk countries have faced several challenges. Commonly used indicators capture different aspects of food security and often produce very divergent estimates of the prevalence of food insecurity. This led to the usage of the Household Hunger Scale (HHS) as the presumed "anchor" indicator for IPC acute food insecurity analysis, with all other indicators of food consumption calibrated to the HHS. But because there was no gold standard, only an "anchor," this presumption had never been tested. Further, given that HHS was the only indicator that could specify the difference between the two most severe categories of IPC Phase Classification (Phase 4 "Emergency" and Phase 5 "Famine"), analysis of food insecurity at the extreme end of the IPC scale relies heavily on HHS, rather than the standard panoply of indicators used for acute food insecurity analysis at lesser levels of severity. This study sought to test how well HHS differentiates between IPC Phase 4 and Phase 5 and to investigate the validity of the usage of HHS as the "anchor" indicator across the spectrum of IPC analysis. Data was collected in seven different severely food-insecure areas of South Sudan, Kenya, and Somalia. The findings show that, overall, the HHS performs reasonably well as an "anchor indicator" across the IPC scale and is able to differentiate the majority of cases in Phases 4 and 5 but tends to over-classify (over-estimate the severity of food insecurity at the household level)—especially at the lower end of the IPC scale. At the high end of the scale, these results indicate that HHS is good at flagging highly food-insecure households but may require additional information to rigorously differentiate households in Phase 4 from those in Phase 5. The study identified ways to improve classification by HHS by some simple additional questions or observations to differentiate between Phase 4 and Phase 5. In an era of extreme scarcity of humanitarian funding, this has substantial implications for resource allocation and humanitarian prioritization.

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1. Introduction and problem statement

Acute food insecurity has worsened significantly in the past half decade. The number of people assessed to be in urgent need of external food assistance has jumped from a little over 100 million in 2016 to over 200 million in 2022, and the number of countries at risk of famine has jumped to six (FSIN 2022). The currently accepted means of categorizing household food insecurity and identifying famine or famine risk is through Integrated Food Security Phase Classification (IPC) analysis, which has been instituted in over fifty countries worldwide. This approach has led to significant improvements in the assessment and classification of food insecurity, malnutrition, and populations at risk of famine and has improved the impartial allocation of humanitarian resources. IPC guidelines set criteria for the measurement and determination of famine, but recent analyses in famine-risk countries have faced several challenges including insufficient or unreliable data and what to do when *some* of the famine thresholds are surpassed for a population, but not *all* the thresholds needed for a declaration.

IPC specifies three categories of indicators for famine including: "extreme food gaps," acute malnutrition, and mortality.[1] But actual declarations of famine are rare: famine has only been declared unambiguously once since 2011—as well as once when it was deemed "likely" and once when it was identified retrospectively.[2] Much more frequently, the analysis has identified "populations in IPC Phase 5" for acute food insecurity, when there was insufficient evidence to declare a famine, or when malnutrition or mortality indicators did not surpass the thresholds. Thus, differentiating between the most severe categories of food insecurity—Phase 4 and Phase 5 in IPC terms—or at the household level, between "acute humanitarian emergency" and "catastrophe" (IPC Global Partners 2021, p. 1), is a critical but often fraught distinction.

Given the increase in acute food insecurity, but the rarity of cases that meet the thresholds for outright famine, the identification of "population in Phase 5" for acute food insecurity (and the associated usage of language in the media of terms such as "near famine" or "famine-like conditions") has become a kind of shorthand way of referencing populations in deep distress—passing the food insecurity threshold for signaling "catastrophe" (i.e., in IPC Phase 5 according to the food security indicators but short of a famine declaration). In an era of increased competition for humanitarian funding,[3] the identification of "population in Phase 5" has become the common means of drawing attention—and especially funding—to severe humanitarian emergencies characterized by extreme food insecurity but which don't quite breach famine thresholds. As a result, this single indicator has significant influence on policy and funding decisions.

Measuring malnutrition and mortality is relatively straightforward. But identifying exactly what "extreme food gaps" means and determining an appropriate measure of food insecurity to identify such gaps has always been challenging. The declaration of famine in Somalia in 2011 was based on indirect judgments of the extent of food insecurity: loss of income, decline in agricultural output, increase in the price of food, loss of purchasing power, livestock deaths, and distress migration (Salama et al. 2012). Over the decade since that famine, efforts have been made to identify and make better use of food consumption indicators to classify household food insecurity, and four indicators have been selected to help make these determinations.[4] One of those four is the Household Hunger Scale (HHS), a simple, three-question indicator focused on the experience of extreme hunger (Deitchler et al. 2011). It is "the only indicator collected with a cut-off for Phase 5" (IPC Global Partners 2021, p. 86) or, in other words, the ability to distinguish between the two most severe phases in the analysis of famine or populations in "near famine" conditions. The construction of the HHS and the means of scoring it are in Annex 1.

Because each of the food consumption indicators used in IPC analysis captures a different aspect of a complex construct, they often produce very divergent estimates of the prevalence of food insecurity (Maxwell et al. 2014). For IPC analysis—which explicitly relies on a "convergence of evidence" approach—this has long been a problem. This lack of convergence of indicators led to the Household Food Consumption Indicator Study (HFCIS) which attempted to reconcile differences in the relationship between individual indicators and proposed a way to map food security outcome indicators to IPC Phase Classifications (Vaitla et al. 2015). There has never been a single "gold standard" indicator against which other food consumption indicators could be assessed, so the HFCIS study focused on demonstrating the correlation among the various indicators. Results from monitoring the response to the Somalia famine in 2011 had indicated that HHS was more sensitive to change in the most severe contexts than were other indicators of food consumption—and thus the most likely to be able to distinguish between Phase 4 and Phase 5 households (Hedlund et al. 2013).

However, linking divergent indicators to each other in a coherent way and then mapping them to the IPC scale required some kind of an "anchor" because there was no gold standard indicator against which others could be validated. Given the lack of a gold standard and based on the observation that HHS was likely to be the only indicator that could differentiate between Phases 4 and 5, the HFCIS study selected HHS as the "anchor." But that choice was based on a set of logical assumptions. This framework has been used to link thresholds in the main indicators of food consumption to the IPC analysis ever since (IPC Global Partners 2018; 2021). But this linkage meant that the validity of the mapping between indicator thresholds and the IPC scale was based on assumptions that had never been empirically verified.[5]

HHS was not developed to be a stand-alone indicator for famine or Phase 5 classification, but whereas corroborating food security indicators help classify households in the lower phases of IPC analysis, this mapping accepted HHS as the only means of differentiating households in Phase 5 from Phase 4 in the IPC Acute Food Insecurity Reference Table (IPC Global Partners 2018; 2021). The formal definitions or descriptions of household conditions by phase classification overlap so much that they don't really specify or help to differentiate these (see definitions in the methods section). This ambiguity has led to the inadvertent politicization of the use of HHS, the manipulation of figures for "population in Phase 5" for both political and budgetary reasons, and the questioning of the validity of HHS to determine Phase 5 (Maxwell and Hailey 2021).

[1] Specifically, a famine declaration requires: (a) more than 20 percent of households with extreme food gaps; (b) more than 30 percent of children acutely malnourished (global acute malnutrition or GAM); and (c) a crude death rate (CDR) of two or more persons per ten thousand population per day (IPC Global Partners 2021).

[2] After a number of analyses of suspected famine that lacked adequate evidence for a confirmed declaration, Version 3.1 of the IPC Technical Manual (IPC Global Partners 2021) adopted additional protocols for circumstances in which rigorous evidence was available for only two of the three categories of indicators required, enabling a new classification of "famine likely" for those circumstances.

[3] Over the past fifteen years, even as overall budgets have grown substantially, the *proportion* of assessed humanitarian needs actually receiving funding for response has shrunk from 72% in 2007 to less than 50% in 2022 (https://fts.unocha.org).

[4] These include, in addition to the Household Hunger Scale (HHS), the Food Consumption Score (FCS), the Household Dietary Diversity Scale, and the Reduced Coping Strategies Index (rCSI). See Annex 2 for a more in-depth explanation.

[5] Annex 2 depicts the mapping of these indicators to phase classifications eventually adopted by IPC in 2018 and reconfirmed in the latest edition of the IPC Technical Manual (IPC Global Partners 2018; 2021). An additional indicator (the Food Insecurity Experience Scale or FIES) has been added in the most recent update of the IPC Technical Manual (IPC Global Partners 2021), but it is also not helpful in classifying Phase 4 or 5.

The primary objective of this study was to test whether HHS is able to adequately distinguish between households in IPC Phases 4 and 5. However, as noted, there is no other quantitative indicator against which to assess the validity of the HHS in the differentiation of Phase 4 and Phase 5. Indeed, HHS *has been the indicator* against which all other food consumption indicators have been mapped to IPC phases for the past seven years but, as noted, that was based on a set of assumptions. The only way to assess the ability of HHS to differentiate between households in Phase 4 and Phase 5 was to identify those households by different means. This study was designed to do just that—to field-check the validity of the HHS classification against in-depth qualitative interviewing and observation that would enable a team of experienced food security and nutrition analysts to independently assess household food security status as matched against the definitions of the household conditions in different phases in the IPC Technical Manual V3.1 (IPC Global Partners 2021).

As the study proceeded however, two difficulties emerged: First, it proved very difficult to classify households by phase according to IPC definitions—even with extensive interviewing and observation—because of the degree to which these definitions overlap. In the analysis in the field, this resulted in "borderline" categories between IPC phases when a definitive judgment in the field was impossible, so the analysis also required a secondary objective of identifying the means to reclassify borderline cases to either IPC Phase 4 or IPC Phase 5 to permit the determination of how well the HHS identifies true positives and negatives. This need of reclassification—which had not been foreseen in advance of the study—had fortunate implications for the findings of the study and recommendations to strengthen the analysis differentiating the two phases.

Second, even with the methodology described below, it proved more difficult than expected to find households in Phases 4 and 5, and thus the sample included a substantial number of households in Phase 3 and even some in Phase 2. This enabled a secondary objective of being able to test more fully the assumption that HHS could serve as an "anchor" indicator across the IPC spectrum.

Overall, the study found that HHS performs reasonably well as an "anchor indicator" across the IPC scale and is able to differentiate the majority of cases in Phases 4 and 5 but tends to over-classify (over-estimate the severity of food insecurity at the household level)—especially at the lower (less severe) end of the IPC scale. At the higher (more severe) end of the scale, these results indicate that HHS is good at flagging highly food-insecure households but may require additional information to rigorously differentiate households in Phase 4 from those in Phase 5. The study provides practical recommendations to strengthen IPC classification at the most severe end of the scale. In an era of extreme scarcity of humanitarian funding, these results have substantial implications for resource allocation and humanitarian prioritization.

2. Methods

2.1. Sampling and household selection

To be able to differentiate between households in IPC Phase 4 and those in Phase 5, the team needed to find households that might fall within these two phases. This was done through the method of "active case finding" or active case identification (Isanaka et al. 2019), which seeks to recruit into a sample only cases that fit a certain criterion—in this case, only the most food insecure households in the most food insecure communities. This method of household identification was used for all the cases in the study.

All but one of the areas selected for the study were classified as having a population in IPC Phase 4 at the time of the research and while no figures were provided for Phase 5, the areas selected were the hardest hit but still accessible at the time. In the active case identification method, locations for the case studies were identified by early warning information, mass screening data, or other information as available in addition to the IPC classification for the whole area. This included REACH "Area of Knowledge" (AoK) data in South Sudan, early warning surveillance site data from the National Drought Management Authority (NDMA) in Kenya, and assessment data from the Food Security and Nutrition Analysis Unit (FSNAU) for Somalia. The team identified communities shown to be the hardest hit by current shocks and seasonal trends. Permission was then sought from the appropriate local authorities in those areas to conduct the household interviews. Local guides helped the team identify the hardest-hit households within those communities. These guides were community health volunteers in Kenya and knowledgeable local elders or other community representatives in Somalia and South Sudan.

Table 1
Case Study Locations and Interviews.

Location	Sites	Interviews	Valid
Aweil East (SS)	6	50	48
Turkana (KA)	6	67	63
Sanaag (SOM)	5	43	42
West Pokot (KA)	4	45	43
Marsabit (KA)	6	48	47
Baidoa (SOM)	5	38	38
Yirol East (SS)	3	50	50
Total	**35**	**341**	**331**

SS = South Sudan, KA = Kenya, SOM = Somalia

In the end, a total of 341 households were interviewed in 35 sites in 7 field locations in 3 countries. Out of the overall sample, ten households were dropped from the sample: three were dropped because a respondent was not able to continue with an interview; five because the respondent was clearly not answering the HHS questions correctly and was clearly exaggerating their vulnerability, despite having been repeatedly informed that this study was not a needs assessment and was not attached to food aid or any other assistance; and two because the local guides mistook well-off households for vulnerable ones (i.e., households that would have an IPC classification of Phase 1). In total, 331 interview results were available for analysis (Table 1).

2.2. Context

Six of the seven areas in which the study was conducted were reported as being in Phase 4 (at least locally) at the time of the study. West Pokot County in Kenya was in Phase 3 but served as a useful training exercise. The two locations in South Sudan were both in Phase 4—Aweil East is a chronically vulnerable area, with malnutrition prevalence frequently surpassing emergency levels. Though not directly affected by conflict, Aweil East had seen heavy recruitment into the army or various militias and had very high levels of single-person, female-, or widow-headed households. Yirol East on the other hand, had seen high levels of violence and internal displacement, with high tensions between host and displaced communities in the period before the study. In Kenya, Turkana and Marsabit Counties had populations in Phase 4 in localized areas. Both were subject to very late rains the year of the study, even though some areas had suffered flooding in the previous rainy season, providing for a combination of climate-related shocks. West Pokot was classified in Phase 3. A chronic, low-grade level of raiding and violence between West Pokot and Turkana has simmered for years, resulting in a high number of widow-headed households. The two areas in Somalia both had large-scale IDP populations, resulting from a variety of shocks, both climatic and conflict related. In other words, the overall sample deliberately included populations that were in different degrees of food and livelihood distress—some chronically distressed and some more acutely, were subject to different shocks including conflict and climatic shocks and were both displaced and non-displaced. All areas selected were at the more severe end of the IPC scale so more likely to have populations in Phases 4 and 5.

2.3. Procedures

All household respondents were read a voluntary consent statement to which they agreed before the interview proceeded. The voluntary consent and the research protocol were reviewed by the Social, Behavioral and Education Research Internal Review Board of Tufts University, and the Ethics and Scientific Review Committee of AMREF, which provided ethical clearance in Kenya. For South Sudan, clearance was granted to REACH by the South Sudan Relief and Rehabilitation Commission (SSRRC). For Somalia clearance was granted by local authorities in Somaliland and Southwest State.

Households identified by these means were interviewed according to the interview and observation guide in Annex 3—with lengthy probing around the minimum list of questions suggested there. The categories for in-depth interviewing and observation of the selected households included demographics, livelihoods, food access, water access, coping, malnutrition, mortality, health, and resilience—as well as evidence of assets, food stores, cooking, conditions of shelter and physical appearance of children. Children under the age of five years and pregnant and lactating mothers were measured for nutritional status by mid-upper arm circumference (MUAC). The questions from the HHS module were asked at the end of the food-access questions but posed similarly as qualitative interview questions and answers recorded directly. Later, an actual HHS score was calculated for each household. The preferred household respondent was the senior female member responsible for making food consumption decisions, but in practice, this person was not always available, and in some cases both men and women in the same household were interviewed.

2.4. IPC definitions for household classification

The definitions of classifications for IPC Phases from the IPC Manual, Version 3.1 (IPC Global Partners 2021, p.37) are below. Phases 3, 4 and 5 are considered "populations in need" in IPC analyses.

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.".
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."

These definitions formed the basis of the classification analysis undertaken by the team on a daily basis, but as will be noted from the above, there is some overlap in the definitions—especially between Phases 4 and 5.

2.5. Classification analysis

At the end of each day of fieldwork, the full team (consisting of two to four senior food security and nutrition analysts, all of whom were experienced interviewers, and each with a translator) met to review the results of the interviews conducted that day, analyzing each household in detail to determine the IPC phase classification for that household according to the definitions above. The answers to the HHS questions were reviewed separately, and an HHS score for each household was calculated. After the classification discussions were complete, a comparison between the assessed IPC phase classification (as judged by the research team according to the definitions in the IPC guidelines) and the HHS score for each household was noted and recorded.

Given the overlapping nature of the phase classification definitions, however, the team sometimes found that even with in-depth interview data, determining whether a given household was in Phase 4 or Phase 5 was not immediately possible under field research conditions.[6] If all the characteristics of Phase 5 were clearly present, the household was judged accordingly. If most characteristics were clearly missing, the household would be classified accordingly. But sometimes the judgement was impossible to make, and thus in many cases, a "borderline" category had to be used to make the classification in the field. (As described below, a subsequent attempt was made to reclassify households that were classified in the Phase 4/Phase 5 borderline category.).

2.6. Statistical analysis

A chi-square test and Spearman Correlation Coefficient were used to test the statistical relationship between the HHS and the IPC ordinal categorical variables. To further help assess the accuracy of the HHS categories to differentiate households in the two highest IPC phases, the team used four different approaches to calculate true positives and negatives[7] aligned with standard calculations for sensitivity, specificity, and precision. First, the proportion of all the households classified by the team as IPC Phase 5 with an HHS score of 5 or 6 was calculated. This is the "true positives out of all IPC Phase 5 households" in all further discussion. Second, the proportion of all households classified by the team as IPC non-Phase 5 that had an HHS score of <5 (whole sample) and specifically with an HHS score of 4 (restricted sample) was calculated. This is the "true negatives out of all IPC Phase less than 5 households" in all further discussion. The third and fourth metric consider the true positives (IPC phase equals 5) and true negatives (IPC phase equals <5), but now as a proportion of all households having an HHS score of 5 or 6. In the following discussion, the third metric is referred to as "true positives out of all HHS 5/6 households" and "true negatives out of all HHS < 5 or HHS $= 4$ households." The differences in the calculations between the first and the last two metrics is relevant. For example, the proportion of "true positives out of IPC Phase 5 households" calculates the proportion of all the households assigned by the team as food insecure households/IPC Phase 5, that HHS accurately identifies; while the proportion of "true positives out of all HHS 5/6 households" identifies the proportion of all the households scored 5 or 6 by HHS that were judged to be in IPC Phase 5. In all four cases, a higher value (ranging from 0 to 100 percent) indicates better performance of the HHS in predicting the IPC phase.

2.7. Reclassification approaches

Because a number of cases were considered "borderline"—meaning that the team could not decide in the field whether the household should be classified in IPC Phase 4 or Phase 5—standard analysis of true positives and true negatives was impossible. Thus, the borderline cases were reclassified in several different ways. The first was a simple "rounding

[6] For instance, if a household has two children under the age of five and one is severely malnourished, is that "very high acute malnutrition" or is it "extremely critical acute malnutrition"? What is the difference between "excess mortality" and "death"? It was often not possible to address these questions under field conditions.

[7] "True" positives and negatives in this case refer to the judgment of the field team as described above.

Table 2
HHS by IPC Phase Classification: Whole Study Field Classification.

HHS Score	IPC Phase (as judged by team)							Total
	2	2 or 3	3	3 or 4	4	4 or 5	5	
6	0	0	0	0	3	1	4	**8**
5	0	0	1	1	9	10	4	**25**
4	0	1	20	16	20	7	0	**64**
3	13	19	98	14	9	3	0	**156**
2	18	14	24	2	1	0	0	**59**
1	14	3	0	0	0	0	0	**17**
0	2	0	0	0	0	0	0	**2**
Dropped								**10**
Total	**47**	**37**	**143**	**33**	**42**	**21**	**8**	**341 (331)**

Key	
164 (49.5%)	True positive
83 (25.1%)	Borderline true positive
65 (19.6%)	Over-classified by one phase (HHS scored one phase higher than team judgment)
1 (0.3%)	Over-classified by two phases
13 (3.9%)	Under-classified by one phase (HHS scored one phase lower than team judgment)
5 (1.5%)	Under-classified by two phases
0	Off by more than two phases
HHS Score-IPC Phase	HHS 0 = IPC P1; HHS 1 = IPC P2; HHS 2-3 = IPC P3; HHS 4 = IPC P4; HHS 5-6 = IPC P5

up" or "rounding down" approach. Using a more "conservative" approach, all P4/P5 borderline cases (identified by the team) were rounded down to P4. And in a more "no regrets" approach, all P4/P5 borderline cases were rounded up to P5. This analysis was conducted for the whole dataset (n = 331 households) as well as for a restricted sample of households with HHS of 4 or greater (n = 97 households). The reclassification was done after all fieldwork was completed. Then the proportion of true positives and true negatives of both approaches were compared using the method described above.

In addition to simply rounding up or down, the team attempted to reclassify all the cases in the "borderline" Phase 4/Phase 5 category by a deeper analysis of the qualitative interview results. All households that were classified as Phases 4, "borderline" 4/5, or 5 were selected and coded qualitatively according to a coding tree developed both deductively from the interview guide and inductively from the contents of the interviews. Coded interviews for Phase 4 and Phase 5 were used to determine all the characteristics that differentiated between these two phases. Then the interviews that were classified as borderline Phase 4/5 in the field were re-analyzed according to the criteria resulting from the coding of the interviews from households that were clearly classified as Phase 4 or Phase 5. The factors identified as classifying households in Phases 4 and 5 and the algorithm by which the reclassification was done are presented in detail in Annex 4. This qualitative reclassification exercise had significant implications for improving future field identification of households in Phase 5.

3. Results

3.1. Classification

The definitions in the IPC Manual are somewhat overlapping, and there was not a clear dividing line between them, as would be implied by different "phases." As a result, classifying households into precise and exclusive categories was difficult. In about a quarter of the cases (92 out of 331) it was not possible under field circumstances to determine on which side of a dividing line between two IPC phases a household belonged—even on the basis of in-depth interviewing and observation. Such "borderline" cases were equally frequent between Phases 2 and 3, Phases 3 and 4, and Phases 4 and 5. In all these cases, many of the characteristics of a given phase were evident, but some were not. Rather than spend additional time debating, the team simply created a borderline category, as depicted in Table 2. Hence the team agreed on a "borderline true-positive" if the HHS score placed the household in one of the two categories between which they were judged to be borderline.

3.2. Comparison of HHS scores with Team-Assessed IPC classifications

Table 2 shows the results of the full study, with HHS scores in the rows and IPC phase as classified by the team in the field using the methods described above in the columns—and including the "borderline" cases where a field judgment of classification proved difficult. (A reminder of the relationship between HHS scores and IPC classifications is provided at the bottom of Table 2.).

Of the 331 valid household interviews, 164 were true positives and 83 were "borderline" true positives. This means that in 74.6 percent of the sample, HHS correctly classified households according to observed IPC phase. In the initial classification, 83 households had HHS scores that mis-classified IPC phase by one phase, or 25.3 percent of the cases. Eighteen households (5.4 percent) were under-classified by HHS (HHS predicted a lower, or *less severe*, phase classification than the observed category). Sixty-five households (19.6 percent) were over-classified by HHS (HHS predicted a higher, or *more severe*, phase classification than the observed category). Only five households were misclassified by two IPC phases—higher in this case (1.5 percent) and only at the very lowest end of the IPC scale. None were misclassified by more than two phases.

Fig. 1 depicts the distribution of households by IPC phase (including the "borderline" cases) and HHS. It will be noted that, despite the active case identification approach, the majority of households were determined to be in IPC Phase 3—as classified *both* by the HHS score and the judgment of the research team.

Table 2 and Fig. 1 show visually that HHS tends to slightly over-classify—that is, it tends to classify households in the next most severe phase classification—compared to the classification by the field team based on in-depth interview results and observations. But this mostly occurs at the *lower* end of the IPC scale. Out of 84 errors, 57 (68 percent) were in the range of HHS less than or equal to 3, corresponding to IPC

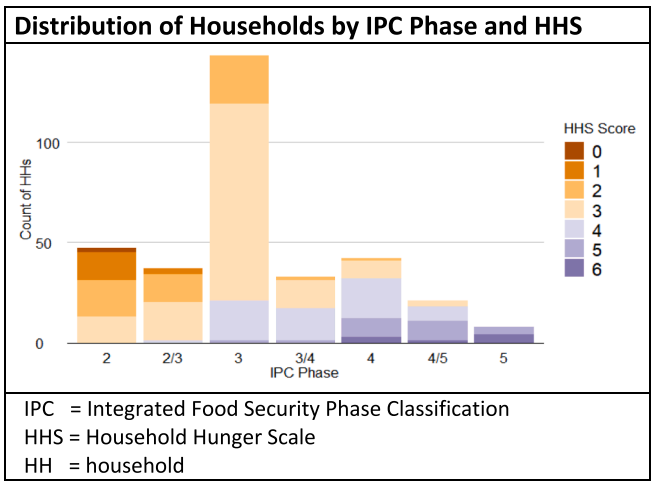

Fig. 1. Distribution of Households by IPC Phase and HHS. IPC = Integrated Food Security Phase Classification. HHS = Household Hunger Scale, HH = household.

Phase 3 or lower. This analysis matches the assumptions behind the use of HHS as the anchor for IPC analysis and the note that other indicators in Annex 2 are better placed to classify acute food insecurity at the lower end of the IPC scale. The objective here was to determine the extent to which HHS correctly differentiates households at the more severe end of the IPC scale. Of 97 households with an HHS score of 4 or higher, including the borderline cases (i.e., those that HHS alone would classify as IPC Phases 4 or 5), 34 were errors (35 percent). However, when considered from the perspective of the households that the team classified as in Phases 4 or 5 (including the borderline cases), HHS scored 76 households (76 percent) out of 104 correctly, over-classified households in 13 cases (13 percent), and under-classified them in 13 cases (13 percent). So, at the upper end of the IPC scale, the errors were equally distributed between over-classifying and under-classifying households.

A simple chi-square test clearly rejects the null hypothesis ($p < 0.001$) of no association between HHS and IPC categories (i.e., indicating a highly statistically significant association) and confirming the relationship visually evident in Table 2. The Spearman Correlation Coefficient between the HHS and IPC was also calculated, and the correlation was found to be reasonably high at 0.725 (with a possible range of 0–1) and statistically significant ($p < 0.001$). These tests broadly confirm the assumption behind selecting HHS as the "anchor" indicator for IPC acute food insecurity analysis.

Table 3
Reclassification by Qualitative Analysis.

HHS	**IPC Phase** (as reclassified)		
	P4	P5	**Total**
6	3	5	**8**
5	12	11	**23**
4	22	5	**27**
3	11	1	**12**
2	1	0	**1**
Total	**49**	**22**	**71**
38 (53.5 %)	True positive		
15 (21.1 %)	Over-classified by one phase		
16 (22.5 %)	Under-classified by one phase		
2 (2.8 %)	Under-classified by two phases		
0	Off by more than two phases		

3.3. Reclassification analysis

To enable better testing of the ability of HHS to differentiate between IPC Phases 4 and 5, the "borderline" category between Phases 4 and 5 had to be reclassified into one of the two phases as described in Annex 4. The comparison of IPC phases and the reclassified "borderline" cases are depicted in Table 3.

3.4. Statistical analysis

To determine how well the HHS identifies IPC Phase 5 households, the proportion of true positives and true negatives was calculated using the four metrics described in the methods section (Table 4).

Post-reclassification contingency tables presenting the proportion of IPC Phase 5 households are identified as food insecure by HHS indicate that HHS is a fairly reliable predictor of IPC phase. The proportion of true positives (proportion of all IPC Phase 5 households also identified by HHS as having a value of 5 or 6) ranges from 66 to 100 percent, meaning if the households is in IPC Phase 5, there is a 66 to 100 percent probability that the household is also identified by HHS as being in Phase 5, with better performance if borderline IPC categories are rounded down (i.e., conservative approach). The proportion of true negatives (proportion of all IPC Phase < 5 households also identified by HHS < 5) ranges from 72 to 95 percent, indicating that if a household is in an IPC phase lower than 5, there is a 72 to 95 percent probability that the household will have an HHS value <5, with better performance if borderline IPC categories are rounded up (i.e., no regrets approach).

The proportion of true positives calculated as the proportion of IPC Phase 5 households out of all households identified to have an HHS score

Table 4
Accuracy of HHS by Different Reclassification Methods and Samples.

Type of reclassification	*Sample size*	*HHS score*	*Raw data*		*Statistical test*			
			IPC = 5	*IPC < 5*	**true positives** out of IPC Phase 5 hh	**true negatives** out of IPC phase < 5 hh	**true positives** out of HHS = 5/6 hh	**true negatives** out of HHS < 5 hh
"No Regrets" (rounding up)	Whole	HHS < 5	10	288	66 %	95 %	58 %	97 %
	(n = 331)	HHS = 5/6	19	14				
	Restricted	HHS = 4	7	57	73 %	80 %	58 %	89 %
	(n = 97)	HHS = 5/6	19	14				
"Conservative" (rounding down)	Whole	HHS < 5	0	298	100 %	92 %	24 %	100 %
	(n = 331)	HHS = 5/6	8	25				
	Restricted	HHS = 4	0	64	100 %	72 %	24 %	100 %
	(n = 97)	HHS = 5/6	8	25				
Qualitative reclassification	Restricted	HHS = 4	5	35	75 %	69 %	48 %	88 %
	(n = 71)	HHS = 5/6	15	16				

Notes: "hh" stands for household
The restricted sample for "no regrets" and "conservative" reclassification is all households appearing in rows 1 and 2 in Table 1 (i.e., those with an HHS score of 5 or 6). The restricted sample for the qualitatively reclassification is all households appearing in columns 5, 6, and 7 in Table 1 (i.e., those the team identified as in IPC Phase 4, Phase 5, and "borderline 4/5").

of 5 or 6 was fairly low (24 to 58 percent). In other words, if a household is identified by HHS as being in the most severe food insecurity category, there is a 24–58 percent chance of misclassification. The more frequent tendency is for HHS to over-classify at the highest scores, but under-classification also occurs. The probability of over-classification is highest if borderline IPC categories are rounded down.[8] The proportion of true negatives calculated as the number of households in an IPC phase <5 out of all households identified to have an HHS score <5 is high (88–100 percent). The high percentage indicates that once a household is identified by HHS as being in a category <5, the probability that the assessment is correct is 88 to 100 percent. Note however, that "rounding up" or "rounding down" is not a possibility in normal IPC assessments since it requires having another measure to differentiate between Phases 4 and 5. Qualitatively reclassifying cases provided similar results to the conservative and no-regrets approach across all tested metrics—and does offer some suggestions for normal IPC assessments.

4. Discussion and conclusions

Several conclusions can be drawn from this study. First, overall, HHS does a good job of flagging households at the high end of the scale and does a reasonably good—albeit imperfect—job of differentiating between households in Phase 4 and Phase 5. Second, these results show a strong association between HHS scores and IPC classifications—again, as judged by the field team—across the IPC scale. So broadly speaking, the use of HHS as the "anchor" indicator for IPC acute food insecurity is empirically valid. These are the major findings of the study and broadly confirm that HHS is a reasonable measure for identifying "population in Phase 5"—and that meddling with survey results for "population in Phase 5" requires very strong evidence and should not be changed just for the sake of political or budgetary considerations. Given that HHS is one of five indicators of acute food insecurity used in the surveys on which IPC analyses depend—and the only one that distinguishes Phase 5—these are both important findings.

Third, HHS tends to overclassify results at the middle and lower end of the scale. This is more than compensated for by the fact that IPC uses four other indicators in a "convergence of evidence" analysis up to and including Phase 4. The over-classification and under-classification errors at the Phase 4/Phase 5 level were fairly evenly split in this study but the qualitative reclassification showed that accuracy at this end of the IPC scale could be improved. However, since this study developed the means to objectively separate "borderline" cases into one or the other of the highest phases, the study identified additional measures to help correct classification errors at the high end of the IPC scale.

With regard to improving the classification of households in Phase 5, two concerns arise and several means of addressing these concerns emerge out of this research:

- *Over-classification errors.* From both Table 2 and Fig. 1, the over-classification of households is a concern: of 97 households scoring HHS >= 4, only 62 are classified correctly by HHS. Of the 35 households misclassified, all are over-classified, meaning HHS classifies them at least one phase *higher* than the team judged them to be on the basis of in-depth interviewing. Note that considering only households that HHS scores in the highest categories, *under-classifying* such households is impossible.
- *Under-classification errors.* Considering only the 71 households found by the team to be in Phase 4 or 5 (including the "borderline" Phase 4/Phase 5 category), in Table 2, 13 were under-classified and 12 were over-classified. After reclassifying all "borderline" cases (Table 3), 18 were under-classified (HHS scored them in a lower IPC phase than the team found) whereas 15 were over-classified. Most of the households that were under-classified had a score of 3 in the HHS, meaning HHS would classify them in IPC Phase 3. This would imply that to reduce both over- and under-classification errors, households with HHS score of equal to or greater than 3 should be subjected to some further checks.

However, there are several important caveats to these general conclusions. First, the definitions of IPC phases are fuzzy: there is no clear dividing line in the definitions—particularly between Phase 4 and Phase 5. If a team of experienced food security and nutrition analysts with in-depth interviewing and observation at the household level cannot use these definitions to distinguish between households in IPC Phases 4 and 5, it is unlikely that a single indicator based on three simple questions will be able to either. Changing the definitions of IPC phase classifications that have been in use for over a decade is unlikely, but the caveat resulting from this study is simply to be aware that the border between Phases 4 and 5 is not clearly defined, and for accurate measurement purposes, these results suggest some additional measures may be needed.

Second, reviewing the IPC phase classification definitions reminds the analyst that the descriptions in the definitions for households in both Phases 4 and 5 include malnutrition and mortality, even though the indicators used to classify households in Phases 4 and 5 are entirely in the food consumption and livelihoods change reference table. The results of this study cannot address that discrepancy, but it remains an issue in IPC analysis that needs to be addressed.

Third, while the intent of the research was to test the validity of HHS at the high end of the IPC scale, the number of households found in Phases 4 and 5, even with an "active case identification" method turned out to be smaller than anticipated. Additional testing along similar lines to our analysis, but with larger sample sizes, will help to reconfirm the relationship between HHS and IPC and allow for more detailed quantitative and qualitative analysis, but it should be noted that this kind of in-depth interviewing and observation is time consuming and expensive. But the low numbers of households identified in Phases 4 and 5 also suggest that some areas selected for study may have been over-classified prior to the study.

5. Recommendations: Improving measurement and IPC classification

In terms of improving policy and practice, several recommendations grow out of this study to advance IPC analysis generally, and especially to focus on both the definition of "populations in Phase 5" and the classification of famine itself. First, given the fuzzy definitions for IPC phases some tightening of these should be considered, and it should be noted that relying on HHS by itself can result in classification errors.

Second, the results depicted in Tables 2 and 4, as well as the chi-squared and Spearman's correlation tests confirm that HHS is a reasonably accurate indicator, but not a perfect one. As noted, there is still room for improvement in the ability to distinguish between households in IPC Phases 4 and 5. Up to and including IPC Phase 4, other corroborating food security indicators can be relied on to validate household classifications through the process of "convergence of evidence" (IPC Global Partners 2021; Vaitla et al. 2015). The amount of work involved in qualitative interviewing combined with the reclassification methods described here is far beyond what data collection teams in the field could do during a "normal" SMART or FSNMS survey. However, the study itself suggests that existing data collection instruments and field procedures could be improved to reduce the frequency of both over-classification and under-classification of households as the most severe end of the IPC scale.

Over-classification errors may tend to allocate scarce resources to people who do not need them as urgently. Overall, the possibility of classifying a household in the next higher IPC phase seems to be greater than the possibility of classifying a household in the next lower phase. Up to IPC Phase 4, other indicators can be used in a "convergence of

[8] Probability statements here refer only to "in-sample" probability.

evidence" approach to help classify households, meaning again that this is a problem only at the Phase 4/5 divide. The FEWS NET Food Consumption Indicator Matrix (FEWS NET 2021) extends this logic to include households in Phase 5. The matrix only classifies Phase 5 when other indicators—the Food Consumption Score or FCS (WFP 2008) and the Reduced Coping Strategies Index or rCSI (IPC Global Partners 2021)—classify a household in the highest phase for which those indicators are able—following the guidance in the IPC Manual (IPC Global Partners 2021). Thus, using the FEWS NET matrix could help to reduce over-classification errors, because it places tighter restrictions on Phase 5 classification. Note, however, that the FEWS NET matrix would not help to prevent under-classification errors.[9]

Under-classification errors are more serious since it might mean humanitarian assistance does not reach those who need it most. Avoiding this kind of error requires a measure that could obtain additional information. The results of this study suggest that specific points used to reclassify households in Phases 4 and 5 (found in Annex 4) could easily be adapted to a "pop-up" module in SMART or FSNMS surveys where HHS scores 4 or above (meaning that HHS would classify the household as in either Phase 4 or 5). These factors could then be incorporated into the analysis so that a more reliable figure for "population in Phase 5"—and less subject to manipulation or politicization—would result. The factors identified in Annex 4 and the algorithm developed to differentiate between Phases 4 and 5 focus on factors that would already be included in a survey (demographics, mortality, and malnutrition) but would include further questions or observations about consumption and, especially, livelihood coping strategies, paralleling recent work by other initiatives to improve the understanding of coping and livelihood exhaustion (ICF 2022). The only caveat here would be that the factors identified in this study may be somewhat context specific, even though the "context" for this study included crises driven by both climatic and conflict factors and also included both displaced and non-displaced populations. Still, they were all in Eastern Africa, and different factors may determine the classification in a Yemen case or a Nigeria case.

Further testing, with a greater number of observations, will be necessary to fully assess the capability of the HHS. It would also be useful to test the HHS at the lower end of the scale (there were ample observations here to test it in the mid-ranges).[10]

Finally, it is worth reiterating that with the increased risk of famine noted in the past half decade, improving the analysis and early warning of famine should remain a high priority to the humanitarian community. This study indicates that the HHS is a critical and reasonably accurate tool in that urgent imperative. However, the results provided by the HHS could be bolstered at the high end of the IPC scale for even greater accuracy in the classification of famine and "populations in Phase 5." The search for additional valid, reliable, and universally applicable indicators of acute food insecurity at the severe end of the analytical spectrum remains an unfinished task.

CRediT authorship contribution statement

Daniel Maxwell: Conceptualization, Methodology, Investigation, Validation, Data curation, Writing – original draft, Supervision, Project administration, Funding acquisition. **Guhad Adan:** Investigation, Data curation, Supervision, Project administration. **Peter Hailey:** Conceptualization, Methodology, Investigation, Validation, Data curation, Supervision, Project administration, Funding acquisition. **Matthew Day:** Conceptualization, Methodology, Investigation, Validation, Data curation. **Stephen B.J. Odhiambo:** Investigation, Data curation. **Lilian Kaindi:** Investigation, Supervision, Project administration. **James Njiru:** Investigation, Data curation. **Aishwarya Venkat:** Validation, Formal analysis, Data curation. **Anastasia Marshak:** Validation, Formal analysis, Data curation, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Annex 1:. Construction of the household hunger scale (HHS)

HHS consists of three simple questions about the experience of extreme hunger with a yes/no answer and if the answer is yes, there is a follow up question about the frequency. The recall period is the previous 30 days (Deitchler et al. 2011).

[9] Some observers have objected to this methodology because it suggests "pre-designated" phase classifications, rather than the "convergence of evidence" approach of IPC. Without commenting on the relative merits of that debate, the point here is that the use of the matrix would help to reduce over-classification errors in differentiating between households in Phases 4 and 5.

[10] To fully test the ideas suggested here, conducting one further field test would be necessary, preferably in conjunction with a SMART survey that included all the food security indicators as well as health, WASH, and some livelihood indicators. It would have to be carried out in an area already identified as having a high prevalence of Phase 4 households and at least 10 percent of households in Phase 5 and would require a pre-trained team of interviewers to accompany the SMART team. While perhaps an expensive undertaking, not having accurate information about populations in Phase 5 conditions is more costly in the long run.

Question	Response
1. Was there **ever no food to eat of any kind in your house because of lack of resources to get food?**	Yes/No
1a. (If yes) How often did this happen in the past 30 days?	Rarely (1–2)Sometimes (3–10)Often (>10)
2. Did you or any household member **go to sleep at night hungry** because there was not enough food?	Yes/No
2a. (If yes) How often did this happen in the past 30 days?	Rarely (1–2)Sometimes (3–10)Often (>10)
3. Did you or any household member **go a whole day and night without eating anything** because there was not enough food?	Yes/No
3a. (If yes) How often did this happen in the past 30 days?	Rarely (1–2)Sometimes (3–10)Often (>10)

Note that the answers are combined into categories so that "rarely" and "sometimes" are categorized together and given a score of 1; "often" is given a score of 2. Thus, the range of answers is from zero (the answer of "no" to all questions) to six (the answer of "often" to all the questions).

The relationship specified of HHS scoring to IPC phase is:

HHS Score	IPC Phase
0	1
1	2
2–3	3
4	4
5–6	5

Annex 2:. Household food consumption indicators used by IPC

The main household food consumption indicators used in the IPC acute food insecurity (AFI) reference table include:

1. The Food Consumption Score (FCS) (WFP, 2008).
2. The Household Dietary Diversity Score (HDDS) (Swindale and Bilinsky 2006).
3. The Reduced Coping Strategies Index (rCSI) (Maxwell and Caldwell 2008).
4. The Household Hunger Scale (HHS) (Deitchler et al. 2011)

IPC acute food insecurity analysis can also use Household Economy Analysis, but this is a different method altogether—it is not a survey instrument indicator. Dietary energy intake is listed in the reference table but never measured due the time requirements for data collection and processing. Note that HHS is the only indicator with a clear scoring for Phase 5. There are no livelihood coping strategies for Phase 5.

IPC Acute Food Insecurity (First Level Outcomes) Reference Table

Phase name and description		Phase 1 None/Minimal	Phase 2 Stressed	Phase 3 Crisis	Phase 4 Emergency	Phase 5 Catastrophe/ Famine
Food security first-level level outcomes (household level)	**First-level outcomes** refer to characteristics of food consumption and livelihood change. Thresholds that correspond as closely as possible to the Phase description are included for each indicator. Although cut-offs are based on applied research and presented as a global reference, correlation between indicators is often somewhat limited and findings need to be contextualized. The area is classified in the most severe Phase that affects at least 20% of the population.					
	Food consumption (focus on energy intake)	**Quantity**: **Adequate energy intake** **Dietary energy intake:**[2] Adequate (avg. 2,350 Kilocalories (kcal) pp/day) and stable	**Quantity: Minimally adequate** **Dietary energy intake**: Minimally adequate (avg. 2,100 kcal pp/day)	**Quantity: Moderately inadequate** – Moderate deficits **Dietary energy intake**: Food gap (below avg. 2,100 kcal pp/day)	**Quantity: Very inadequate** – Large deficits **Dietary energy intake**: Large food gap (well below 2,100 kcal pp/day)	**Quantity: Extremely inadequate** – Very large deficits **Dietary Energy Intake**: Extreme food gap
		Household Dietary Diversity Score (HDDS):[3] 5–12 food groups and stable	**HDDS**: 5 FG but deterioration ≥1 FG from typical	**HDDS**: 3-4 FG	**HDDS:** 0-2 FG (NDC to differentiate P4 and 5)	**HDDS** 0–2 FG (NDC)
		Food Consumption Score (FCS):[4] Acceptable and stable	**FCS:** Acceptable but deterioration from typical	**FCS**: Borderline	**FCS**: Poor (NDC to differentiate P4 and 5)	**FCS**: Poor (NDC to differentiate P4 and 5)
		Household Hunger Scale (HHS):[5] 0 (none)	**HHS**: 1 (slight)	**HHS:** 2-3 (moderate)	**HHS:** 4 (severe)	**HHS**: 5-6 (severe)
		Reduced Coping Strategies Index (rCSI):[6] 0–3	**rCSI**: 4–18	**rCSI**: ≥ 19 (non-defining characteristics—NDC—to differentiate P3, 4 and 5)	**rCSI**: ≥ 19 (NDC to differentiate P3, 4 and 5)	**rCSI**: ≥ 19 (NDC to differentiate P3, 4 and 5)
		Household Economy Analysis (HEA):[7] No livelihood protection deficit.	**HEA**: Small or moderate livelihood protection deficit <80%	**HEA**: Livelihood protection deficit ≥80%; or survival deficit <20%	**HEA**: Survival Deficit ≥20% but <50%	**HEA**: Survival deficit ≥50%
		Food Insecurity Experience Scale (FIES 30 days recall): < -0.58	**FIES:** Between -0.58 and 0.36	**FIES:** > 0.36 (NDC to differentiate between Phases 3, 4 and 5)	**FIES:** > 0.36 (NDC to differentiate between Phases 3, 4 and 5)	**FIES:** > 0.36 (NDC)
	Livelihood change (assets and strategies)	**Livelihood change:** Sustainable livelihood strategies and assets **Livelihood coping strategies (LCSs):**[8] No stress, crisis or emergency coping observed.	**Livelihood change:** Stressed strategies and/or assets; reduced ability to invest in livelihoods **LCS**: Stress strategies are the most severe strategies used by the household in the past 30 days.	**Livelihood change:** Accelerated depletion/erosion of strategies and/or assets **LCSs**: Crisis strategies are the most severe strategies used by the household in the past 30 days.	**Livelihood change:** Extreme depletion/ liquidation of strategies and assets **LCSs:** Emergency strategies are the most severe strategies used by the household in the past 30 days.	**Livelihood change:** Near complete collapse of strategies and assets **LCSs:** Near exhaustion of coping capacity.

Source: IPC Global Partners (2021) p. 37.

Appendix 3:. Household interview guide and observation checklist

Questions

Household

1. Tell us about your household. Who lives here?
a. Get sex and age of members.
2. How has membership in the household changed over the past year?

Livelihoods

3. What activities do you do to earn a living?
4. What constraints do you face in those activities?
5. Note which member of the household does what.
6. If only one working member (especially if a woman), find out how much time she allocates to income earning activities and other requirements like getting water or childcare.

Food access

7. What food are you able to eat with the income you earn? When was the last time you had enough to eat?
8. When was the last time you had "good" or preferred food to eat? What do you have to eat now?
9. Household Hunger Scale questions.
a. Was there ever no food whatsoever to eat of any kind in your house because of lack of resources to get food? (Y/N). If yes, how often in past 30 days? Rarely (1–2 times), Sometimes (3–10 times), Often (>10 times) [Keep close track of these answers].
b. Did you or any household member go to sleep at night hungry because there was not enough food? (Y/N). If yes, how often in past 30 days? Rarely (1–2 times), Sometimes (3–10 times), Often (>10 times) [Keep track of answers].
c. Did you or any household member go a whole day and night without eating anything because there was not enough food? (Y/N). If yes, how often in past 30 days? Rarely (1–2 times), Sometimes (3–10 times), Often (>10 times) [Keep track of answers].
10. Probe on these.
a. Probe around "what having no food in the house" means? What does "going all day without eating" mean?
b. What actions did the household take in the face of increasing hunger? How were they aided or constrained?
c. Is every-one in the household affected equally? If not, who bears the brunt of the hunger? Who does the household try to protect? Why?
d. Probe here for gender, age, working and non-working members, able-bodied members, etc.

Coping

11. What has your household done to cope with extreme circumstances?
a. Probe for things like splitting up the household, increasing livelihood activities, selling valuable assets, distress migration, extreme food consumption indicators like going all day without eating. NOTE TRADE-OFFS MADE.
b. But probe for other things—things we might not be familiar with.
c. Do you have relatives who help you? Do you have to help relatives of other households?
d. Are there other sources of assistance (chief? HFA? Etc.).
e. Probe for who this person(s) is/are, what they do, how they help, how often, etc.
f. If no one, probe for other forms of social exclusion—why doesn't anyone help?

Malnutrition

12. Is there a malnourished child in the household (use MUAC to measure)?
a. Ask about the circumstances of the child: How did s/he come to be malnourished? How long ago?
b. What were household members able to do for the child? Has s/he been referred for therapeutic or supplementary feeding?
c. Were there constraints to be able to reach this kind of assistance? Is this the first time this child has been malnourished this year?
d. Is this the first child to be malnourished in the family in the last year?

Mortality

13. Has there been a recent death in the household, who was the person? How did s/he die? What were his/her symptoms? Did the causes affect only that particular person or did those factors affect every-one in the household?

Water

14. What is the current status and history of your access to water for drinking, for other household uses, for animals?

Health

15. Is any member of the household sick? Have any members had a major illness or injury in the past year?
16. If so, what were you able to do for that person?

Resilience

17. How does this year compare with previous years?
18. See if the household can narrate the story of how they came to be in these conditions: What caused this? Over what period of time? Who helped them? What went wrong? What are the consequences—for different members of the household? What are they doing now? (Get at the issue of agency, not just "affectedness.").

Observations

1. Are there any indications of food in the household? What are they (bags of grain, food aid, cooking pots that have been recently used, other)?
2. What is the condition of the members of the household (just by observation, not by anthropometric measurement—that has already been done)?
a. What does their health status appear to be (clothing, cleanliness, symptoms of respiratory or other illness, etc.)?
b. What do the other members of the household who were not anthropometrically measured look like (very thin? Etc.)?
3. Are any members of the household included in programs?
a. OTP
b. SFP
c. School feeding
d. PLW
e. Safety nets (differ depending on country)
4. What is the condition of their shelter and compound?
5. What is the water storage and access situation? What is the sanitation approach used?
6. Is there any indication of household assets (livestock, tools, anything salable)?
7. Were the questions in the HHS asked correctly? Did the household member interviewed by the SMART team understand the questions?
8. Other observations.

Annex 4:. Qualitative reclassification and results

The following factors were identified as classifying households in Phases 4 and 5, and some combination of these were the confusing factor in the borderline classification of P4/P5. So, *in addition to an HHS score of 4–6*, these factors were used to re-classify households. The same factors could be used in an actual survey but would require some slight modifications. Note that some of these factors would have *already been identified* in a SMART or FSNMS survey instrument (there are identified with an asterisk *), while others require additional information that could be added in a "pop-up" window on a tablet for data collection when HHS scores 4 or higher (these are identified with a hashtag #).

1. High dependency ratio. Less than or equal to 1 household member with an active livelihood activity for every 5 members of a household appeared to be the cut-off.*
2. Woman-headed household that was recently widowed or abandoned. This often coincides with high dependency ratio.*
3. Household split up. Members leave the household or are sent away in search of food or income, or children are sent to relatives so they can eat, etc. #
4. Zero-sum coping. Whatever choice a caregiver/income earner makes means that something else equally urgent and critical to survival gets ignored. For example, the caregiver is constantly forced to choose between core survival activities on a daily basis because there is not the time or resources to do them all.[11] This could include:#
   - having to choose between an income producing activity like collecting firewood or burning charcoal, and selling stock s/he has already collected (can't do both on the same day); and/or
   - having to choose between fetching water and caring for children, or taking a sick child to the clinic or a malnourished child to the clinic; and/or
   - livelihood activities that take a mother away from home for many hours and where she must leave a baby in another's care; and/or
   - any combination of the above that pits the urgency of livelihood activities against the necessity for caregiving activities.

Having to make these choices also often coincides with #1 and #2 above and can occur with or without a specific shock, but when associated with shocks, they are often idiosyncratic—hence a standard "shock module" may have to be altered to capture these.

5. Literal hand-to-mouth existence or no livelihoods/assistance. People are relying on daily activity to obtain food for the current day (i.e., if member doesn't sell tea that day, the household doesn't eat) or are relying entirely on begging and receive no other assistance (including kinship support). In this case, "livelihood" would include social connections that enable people to receive some food or other help (or even to beg). So, the combination of the lack of an active livelihood, no formal assistance, and poor or limited social connections would be an additional marker.#
6. Signs of extreme weakness or hunger. Beyond the experiences of hunger and food insecurity captured by HHS, if the caregiver is physically weak (lying down and isn't getting up or is unable to stand) or is clearly exhibiting some other means of coping with extreme hunger, this would be confirmation of Phase 5. (Other means include things like tying a rope or piece of cloth around her waist to stop hunger pangs, extreme reliance on wild foods, or extreme reliance on over-stretched social networks. These may be context-specific).#
7. Malnutrition. The presence or absence of acute malnutrition on its own is not a marker for any particular phase classification at the household level. Thus, malnourished kids in the absence of a high HHS score are not necessarily a marker for a household classification of Phase 5 or even 4. Presence of severe acute malnutrition, combined with severe livelihood constraints (as outlined above) and/or food access constraints (i.e., a high HHS score) is a likely confirmation of Phase 5, but malnourished members in the absence of these factors might be caused by something else.

[11] For more on the notion of "zero-sum coping" see (REACH 2018).

Multiple malnourished kids would be further confirmation. Multiple malnourished kids *and* a malnourished caregiver (combined with high HHS) is a marker of Phase 5.*

8. Mortality. Mortality can be due to many factors, but if resulting from hunger/malnutrition, and in the recent past (past three months), would be a confirmation of Phase 5.*

The resulting "algorithm" for qualitative reclassification of households that were initially classified as borderline Phase 4/Phase 5 is below. The resulting qualitative reclassification of households appears in Table 3 in the main text.

1. If HHS >= 4, and #1 or #2 or #3 above were observed, and at least one of any of #5–8 was observed, household was reclassified P5.
2. If HHS >= 4, and *both* #7 and #8 were observed, household was reclassified P5.
3. If HHS >= 4, and #4 or #5 or #6, *and* #7 or #8 were observed, household was reclassified P5.
4. Otherwise, households were reclassified Phase 4 (even if HHS was 5 or 6).

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