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Factors associated with acute malnutrition among children 6-59 months in rural Mozambique

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Abstract

Factors associated with acute malnutrition are complex and wide-ranging particularly in developing countries. In Mozambique, contextual factors associated to children acute malnutrition are yet to be fully investigated and the evidences used to better inform prevention programme. The objective of this study is to identify key factors associated with acute malnutrition among 6- to 59-month-old children living in nine districts in rural Mozambique assessed in the 2018 seasonal nutrition assessment. We analysed Standardized Monitoring and Assessment for Relief and Transition (SMART) nutrition survey data of 1,116 children from three districts and rapid nutrition assessment (RNA) data of 3,884 children from six districts of Mozambique. We used a multiple logistic regression analysis to respond to the research question. Experiencing diarrhoea [odds ratio (OR) = 4.54; P = 0.001] was the only variable associated with acute malnutrition from the SMART survey dataset, whereas in the RNA, fever (OR = 3.0; P = 0.000) access to sanitation (OR = 0.118; P = 0.037), experiencing shock in the household (OR = 0.5; P = 0.020), diarrhoea (OR = 2.41; P = 0.001) and cough (OR = 1.75; P = 0.030) were the variables with significant association to acute malnutrition. We believe that the findings were influenced by the proportion of acute malnutrition in each survey type. Study findings confirm the association between acute malnutrition and child's health outcomes that are generally linked to poor living conditions and independent effects of shocks. This highlights the need for policy and programme to implement integrated, cross-sectoral approaches to tackling child acute malnutrition, particularly addressing community level conditions such as water and sanitation.

KEYWORDS
acute malnutrition, children, district-level, evidence-based policy, factors, Mozambique

1 | INTRODUCTION

Childhood acute malnutrition is a global health problem and life-threatening condition. Acute malnutrition is caused by complex and intertwined factors with large, time and geographic variability (Marshak, Young, Bontrager, & Boyd, 2017). Globally, acute malnutrition still affects 50.5 million children under 5 years old and those 'who are moderately or severely wasted have higher risk of mortality' and 'more likely to become stunted' (Development Initiatives, 2018). Wasted children are more likely to be living in low- and middle-income countries, such as Mozambique, with many health inequalities (Peters et al., 2008).

Factors associated with acute malnutrition have been studied and documented in many researches across the globe, and those studies have identified the potential factors that are consistent with those described in the UNICEF conceptual framework that identifies the causes of malnutrition and categorizes them in immediate causes (affecting at individual level), underlying causes (affecting at household level) and basic causes (affecting at overall society—structure) (UNICEF, 2013). The UNICEF conceptual framework is a reference guide (Young & Marshak, 2017), and given the fact that factors that drive acute malnutrition are geographically diverse, it is important to understand, wherever possible, what drive it at local level.

Little is known and documented in Mozambique about the factors related to acute malnutrition, despite the availability of large datasets that have previously been used to capture the correlations or associations of malnutrition and other factors (Schneider, Hommel, & Blettner, 2010; Sperandei, 2014). In 2017, in the context of the drought assessment in Mozambique, the Technical Secretariat for Food Security and Nutrition (SETSAN) with support from development partners undertook high quality and district level resolution surveys (a first of its kind in the recent years) to inform the nutrition emergency response. These assessments have fed into an approach called Integrated Food Security and Nutrition Phase Classification on Acute Malnutrition (IPC AMN) that was introduced in Mozambique in 2016 and repeated in 2017 and 2018. Through its nonstatistical methods, the IPC AMN identified a range of factors, in varied geographical settings, as being either major or minor contributor to the observed level of acute malnutrition (IPC Global Partners, 2019). Those factors were diarrhoea, cough, fever and dysentery and other indicators under the underlying, and basic causes as per UNICEF conceptual framework classification (IPC TWG, 2016, 2017).

This study was designed to close a knowledge gap about the factors that are associated with acute malnutrition and their contribution to acute malnutrition based on high quality nutrition data (anthropometric in particular) at district level. This makes the study of notable importance as it brings fresh insights to the acute malnutrition situation and key risk factors to child survival and development in the current context of Mozambique. This study is therefore expected to provide information to influence the policy planning and design of effective interventions to address acute malnutrition effectively.

Key messages

- In the surveyed districts, diarrhoea, cough and fever were the individual level factors associated with acute malnutrition, with increased likelihood.
- Children in households who have experienced an unusual event of shock and those living in households that have not had access to sanitation facilities were associated with acute malnutrition.
- Further analysis should the carried out using health facility and community level data from the Nutrition Rehabilitation Programme in order to understand the factors associated with acute malnutrition including other variables not collected in nutrition surveys.

2 | METHODS

The study tested the association between the levels of acute malnutrition defined as <−2 *z*-score weight-for-height (WFH) and/or oedema and mid-upper arm circumference (MUAC) < 125 mm, as described further below, and childhood diseases such as fever, cough, diarrhoea and dysentery in the past 2 weeks prior the survey data collection and food consumption score categories and with socio-demographic variables of the household.

2.1 | Data

The study analysed data from the March and April 2018 Government of Mozambique (SETSAN) nutrition surveys that used the Standardized Monitoring and Assessment for Relief and Transition (SMART) and the Rapid Nutrition Assessment (RNA). SMART surveys were conducted in three districts, namely, Namuno district (in Cabo Delgado province), Milange district (in Zambézia province) and Mutarara districts (in Tete Province). These districts had been forecasted to be the most vulnerable to acute malnutrition at the time. Rapid nutrition assessments were conducted in Balama, Chiúre, Ancuabe and Macomia districts (Cabo Delgado), Marara district (Tete) and Macossa district (Manica province). These six districts had considerable 'moderate' risk based on an analysis done by the nutrition assessment working group. Considering that RNA had a larger sample size than SMART surveys, we expected that the strength of the factors associated with acute malnutrition would be higher in the RNA.

2.2 | Sampling

Anthropometric measurements and childhood diseases were measured at individual level (children), whereas other variables were measured at household level (the basic sampling unit). Surveys used twostage sampling with clusters selected using probability proportion to size of population, an exercise done by the National Institute of Statistics. In the field, selected clusters were located using a Global Positioning System (GPS) device version 78s, and households were randomly selected using a random table that was updated from the list of households in the selected cluster. In the SMART surveys, households were selected regardless of the presence of children under 5 years old; however, in RNA, household were selected only if they met the inclusion criteria of having at least one child under 5 years old.

The assessment team was made up of enumerators who had previously undergone and passed a rigorous one-week training process on standardization and field-testing procedures. Throughout the survey, daily quality checks were performed to all the districts as well as close field level supervision.

2.3 | Outcome variables and predictors

Acute malnutrition was the outcome of interest for this study and the classification used the standard World Health Organization (WHO) 2006 Child Growth Standard and WHO classification, that is, WFH < −2 standard deviation and/or bilateral oedema in SMART survey data sets and MUAC < 125 mm and/or bilateral oedema in RNA datasets. Other variables pertaining to the socio economic, food security, feeding practices, illness and environmental profile of the selected household were collected concurrently.

All children aged from 6- to 59-month-old living in the selected household were measured for anthropometry using SECA mother–child electronic scales for weight and portable measurement boards for height: all children aged <2 years were measured lying down and >2 year standing. MUAC tapes were used in RNA. Bilateral oedema was checked in both SMART surveys and RNA. Local event calendars were developed for all the districts to estimate the age (in months) of children with no official birth date record. Other variables were collected using a semi-structured questionnaire conducted by local trained enumerators. The questionnaire was field tested prior to the survey.

2.3.1 | Variables in the analysis

The study analysed all the variables collected during the surveys, namely, (a) demographic variables: sex of the head of household (male or female), education of the head of household (educated or not educated), age of the head of household and household size; (b) household level variables: food consumption score (inadequate, moderate and adequate) as per the World Food Programme (2008), availability of sanitation facility (yes or no), type of sanitation facility (improved or not improved) as per the UNICEF and WHO (2008) and treatment of drinking water (yes or no); (c) individual variables (for children): diarrhoea, cough, fever and dysentery in the past 2 weeks prior the survey (yes and no and do not know).

Key variables were selected based on global evidence supporting the association of the aforementioned with acute malnutrition as proposed by Marshak et al. (2017) and IPC AMN analysis carried out in Mozambique between 2016 to 2018 that has identified in several instance these variables as being association with of acute malnutrition (IPC TWG, 2016, 2017, 2018) nevertheless with no statistical and analytical perspective.

2.3.2 | Analytical strategy

To measure the association between the aforementioned variables and acute malnutrition, two multiple logistic regression analyses were conducted, one for RNA data sets and another for SMART data sets both using the Enter method. As a measure of increasing the power of the analysis (and reducing potential confounders), the model was limited to the variables of interest only (Berne, Cook, Rowe, & Norwood, 2010; Sperandei, 2014), there was no variable reduction done and there were selected purposively as recommended by Bursac, Gauss, Williams, and Hosmer (2008) and Zhang (2016). All assumptions were checked and met. In the analysis, acute malnutrition was included as the dependent (dichotomous) variable, and other variables were included into the analysis as independent using the following classification: sex of head of household (male or female—used male as reference); education of the head of household (yes = any education level achieved, no = not completed primary education); food consumption score (categorized in 'inadequate', 'moderate' and 'adequate', using 'adequate' as reference); access to sanitation facilities (yes or no, used 'yes') as reference; type of sanitation facilities (recoded into 'improved' and 'not improved' and used 'improved' as reference); shocks in the household ('yes' or 'no' and used 'no' as reference); childhood diseases were recoded into 'do not know', 'yes' and 'no', where applicable.

For the analysis, we used IBM SPSS software version 24 (IBM Corp, 2016), and the existence of an association was assumed if *P* value < 0.05 and, highly significant if *P* value < 0.01 (Lwanga, Tye, & Ayeni, 1999). Exponential of beta (*Exp*(B)) was used to assess the likelihood [odds ratio (OR)] of experiencing an event of acute malnutrition in comparison with the reference category with 95% of confidence interval (CI) reported.

3 | RESULTS

A total of 1,116 children within 1,573 households were surveyed in the SMART survey, and 3,884 children and households surveyed in RNA. Overall prevalence of acute malnutrition was 5.11% (*n* = 57), (3.81–6.40, 95% CI) in SMART survey data set and 3.58% (*n* = 139), (2.99–4.16, 95% CI) in RNA.

Most of the households were headed by men (85.3%), and 67.4% these had some level of education. With regards to food consumption score, more than half of households had an adequate consumption score (69.6%). On the three water, sanitation and hygiene (WASH) variables, 51.5% of the household did not have access to sanitation facilities, 85.3% no improved sanitation facilities and 93.3% no treating water to drink. With regards to childhood diseases, 93.1% of children did not have dysentery followed of diarrhoea with 93.1%. A total of 54.3% of children reported fever, whereas 49.5% reported cough within the 2 weeks prior to the survey (see Table 1).

TABLE 1 Distribution of the characteristics of households and children in Standardized Monitoring and Assessment for Relief and Transition (SMART) survey (sample size: 1,573 households and 1,116 children)

Variable	Category	*n* (%)
Demographic		
Sex of head of household	Male	1,342 (85.3)
	Female	231 (14.7)
Age groups of the head of household	<18 years	5 (0.3)
	18–27	354 (22.5)
	28–37	498 (31.7)
	38–47	406 (25.8)
	>48	310 (19.7)
Education	Educated	1,060 (67.4)
	Not educated	513 (32.6)
Food security		
Food consumption	Adequate	1,170 (69.6)
	Moderate	338 (20.1)
	Inadequate	174 (10.3)
Unusual chock in the household	Yes	727 (46.2)
	No	846 (53.8)
WASH		
Sanitation facilities	Yes	761 (48.4)
	No	812 (51.6)
Type of sanitation facilities	Improved	147 (14.7)
	Not improved	856 (85.3)
Treatment of water	Yes	106 (6.7)
	No	1,467 (93.3)
Childhood diseases		
Diarrhoea	Yes	277 (24.8)
	No	839 (75.2)
Dysentery	Yes	76 (6.8)
	No	1,039 (93.2)
Fever	Do not know	2 (0.2)
	Yes	606 (54.3)
	No	508 (45.5)
Cough	Yes	552 (49.5)
	No	564 (50.5)

Note. Distribution of the characteristics of households and children in SMART survey. This table provides an overview of the demographic, food security, WASH and child health characteristics of the surveyed subjects, that is, households and respective children.

3.1 | SMART survey

3.1.1 | Multiple logistic regression analysis

Although our chi-square was large, but no significant enough (χ^2 = 25.063, *P* = 0.049), the model was able to explain 12.2% (Nagelkerke R^2) of the variance in acute malnutrition and was able to classify 95% of the cases. The results from the multiple logistic regression model showed that only children who had diarrhoea from the past 2 weeks prior the survey date were associated with acute malnutrition, and the difference was highly significant (*P* = 0.001). Moreover, the OR (*Exp (B)*) was 4.54, showing that children suffering from diarrhoea were five times more likely to experience an event of acute malnutrition compared with the reference category (children who did not have diarrhoea).

Table 3 shows the response's distribution for each variable used for the regression model. In the RNA, 3,884 households were assessed with similar number of children aged 6–59 months measured for MUAC. Similar to what was presented in SMART survey, majority of respondents were male (73.5%), educated (65.8%), with adequate food consumption score (67.0%) and with access to unimproved sanitation facilities (75.1%). With regards to childhood diseases, minor proportion of children had diarrhoea (17.9%) and dysentery (3.1%). On the other hand, for fever and cough, a considerable number of children reported episode of fever (44.5%) and cough (34.8%) within the 2 weeks prior to the assessment.

3.2 | Rapid nutrition assessment

3.2.1 | Multiple logistic regression analysis

The logistic regression model was statistically significant, χ^2 = 102.721, $P < 0.0001$ and the model explained 14.8% (Nagelkerke R^2) of the variance in acute malnutrition and was able to classify 96% of the cases. As per the results in the below table, access to sanitation facilities, experience of shock in the household in the past 12 months prior survey date and cough in the past 2 weeks were significantly associated to acute malnutrition ($P < 0.05$). On the other hand, the model has showed highly significant association for the variables of diarrhoea in children, fever in children (*P* = 0.000). As per the model, looking at likelihood (*Exp (B)*) it can be interpreted that children with cough were 1.75 more likely to experience an event of acute malnutrition, children with fever were three times more likely and 2.4 times more likely for diarrhoea.

4 | DISCUSSION

Studies investigating the association of an observed level of acute malnutrition and different relevant factors of interest for Mozambique were not found; nonetheless, evidence from countries with relatively similar rural characteristics as Mozambique were used for the discussion. This

TABLE 2 Multiple logistic regression for Standardized Monitoring and Assessment for Relief and Transition (SMART) survey data (sample size: 1,573 households and 1,116 children)

Variable in the equation		*B*	Sig.	Exp (B)	95% CI for Exp (B)	
					Lower	Upper
Step 1	Sex of the head of HH (1)	−0.180	0.788	0.835	0.224	3.109
	Age of the head of HH	0.009	0.680	1.010	0.965	1.056
	Education of the head of HH (1)	−0.277	0.556	0.758	0.302	1.904
	HH size	0.075	0.360	1.077	0.918	1.264
	Number of children in the HH	0.018	0.948	1.019	0.588	1.763
	FCS categories		0.876			
	FCS categories (1)	−18.435	0.998	0.000	0.000	
	FCS categories (2)	-0.268	0.607	0.765	0.275	2.127
	Access to sanitation (1)	0.175	0.714	1.191	0.467	3.039
	Type of sanitation (1)	−0.490	0.309	0.612	0.238	1.576
	Drinking water treatment (1)	0.211	0.795	1.235	0.250	6.089
	Any chock in the HH (1)	−0.512	0.262	0.599	0.245	1.468
	Diarrhoea in children (1)	1.513	**0.001**	4.541	1.789	11.528
	Dysentery in children (1)	−0.049	0.932	0.952	0.310	2.930
	Fever in children		0.998			
	Fever in children (1)	−17.099	1.000	0.000	0.000	
	Fever in children (2)	0.034	0.949	1.034	0.370	2.892
	Cough in children (1)	0.450	0.318	1.569	0.648	3.798
	Constant	−4.085	0.004	0.017		

Note. Binary logistic regression for SMART survey data. In this table, it provides the results of the multivariate logistic regression model produced for the data sets gathered in the SMART nutrition survey. Under the column of 'variable in the equation' are listed all the variables, their categories and the reference category used in the regression. More to the right, 'Sig' is the significance level of the association between the category and the dependant variable, and 'Exp (B)' is the likelihood read in number of times more likely to experience the outcome if a relative case is observed, and finally, the last two columns as the confidence intervals of the likelihood.
Abbreviations: CI, confidence interval; FCS, food consumption score; HH, household.
Bold emphasis refers to variables with significant *p*-value.

study used high-quality anthropometric data with high level resolution (district level estimates) for the first time in Mozambique, and these data were collected during the lean season when it is believed to be the highest occurrence of seasonal risk factors. This provided an important insight into the association between acute malnutrition and risk factors. We also acknowledge the fact that because we used two different sources of data sets, and each source used different method to classify acute malnutrition, we believe our results might be influenced by the proportions of the dependant variable obtained in each source of data.

The observed prevalence of acute malnutrition from the SMART survey districts (GAM by WFH *z*-score) was 5.1% (3.81–6.40, 95% CI) and 3.6%, (2.99–4.16, 95% CI) for the RNA (GAM by MUAC). These levels of acute malnutrition were similar to those observed in other districts of Mozambique (IPC TWG, 2017). Overall, in the SMART survey data sets, acute malnutrition in children was associated (highly significant) with occurrence of diarrhoea only, whereas in RNA, beside of diarrhoea, there was also an association (albeit with limited strength) with shocks in the household over the past 12 months, access to sanitation, fever and cough in children over the past 2 weeks prior the survey date (Tables 2 and 4). There is extensive documentation from similar studies in other countries where association between acute malnutrition and diarrhoea has been observed. In South Sudan for instance, similar SMART survey has identified diarrhoea as being highly significantly associated with acute malnutrition (Woldetsadik, 2011). A study in rural population in Bangladeshi, although from a facility-based surveillance system, using a binary analysis, found that 'childhood malnutrition was associated with (…) dehydrating diarrhoea' (Ferdous et al., 2013) and Poda, Hsu, and Chao (2017) using Demographic and Health Surveys (DHS) data in Burkina Faso identified that children who have experienced diarrhoea had an OR of 1.25, $P < 0.05$ and fever 1.20, $P < 0.05$).

Our study's OR for diarrhoea in both sources has shown an increase in the likelihood of experiencing an event of acute malnutrition (4.5 times more likely in SMART survey and 2.4 times more likely in RNA). Evidences supports that 'diarrhoeal illness account for 10%–80%' of cases of acute malnutrition in the first few years of life globally (Baqui & Ahmed, 2006). It should be noted that the different results on the association in RNA compared with SMART may be related to difference in sample size as the pool of data sets encompassed six districts with a total of 3,884 children and 139 cases of acute malnutrition and three districts with 1,116 children and 57 cases of acute malnutrition, respectively.

TABLE 3 Distribution of the characteristics of households and children in rapid nutrition assessment (RNA) (sample size: 3,884 household and children)

Variable	Category	*n* (%)
Demographic		
Sex of head of household	Male	2,811 (73.5)
	Female	1,015 (26.5)
Age groups of the head of household	<18 years	18 (0.5)
	18–27	896 (23.6)
	28–37	1,493 (39.4)
	38–47	831 (21.9)
	>48	556 (14.7)
Education	Educated	2,517 (65.8)
	Not educated	1,309 (34.2)
Food security		
Food consumption	Adequate	2,644 (67.0)
	Moderate	932 (23.6)
	Inadequate	370 (9.4)
WASH		
Sanitation facilities	Yes	2,363 (61.8)
	No	1,463 (38.2)
Type of sanitation facilities	Improved	620 (24.9)
	Not improved	1,868 (75.1)
Treatment of water	Yes	301 (7.9)
	No	3,525 (92.1)
	Do not know	180 (4.7)
Unusual chock in the household	Yes	1,091 (28.5)
	No	2,555 (66.8)
Childhood diseases		
Diarrhoea	Yes	696 (17.9)
	No	3,184 (82.1)
Dysentery	Yes	121 (3.1)
	No	3,744 (96.8)
Fever	Yes	1,730 (44.6)
	No	2,145 (55.4)
Cough	Yes	1,351 (34.8)
	No	2,525 (65.2)

Note. Distribution of the variables of the total respondents in RNA. This table provides an overview of the demographic, food security, WASH and child health characteristics of the surveyed subjects, that is, households and respective children.

With regards to association observed between acute malnutrition and sanitation, our study found a significant but modest effect between latrine ownership and acute malnutrition with an OR of OR = 0.118 (P = 0.037) (Table 4). Some studies have reported large positive association between latrine ownership and acute malnutrition (Gizaw, Woldu, & Bitew, 2018). It is, however, known, that not having access to sanitation facilities promotes open defecation and thus, increasing the risks of diarrhoeal diseases in the community (UNICEF & WHO, 2008; Wasihun et al., 2018). Indeed sanitation in Mozambique, mostly in small town and rural setting are still an issue with less than one in four Mozambicans who has access to improved sanitation and two of every five Mozambicans practicing open defecation (UNICEF, 2014).

This study also observed that households who ever experienced any kind of shock event in the past 12 months prior the surveys were associated with the occurrence of acute malnutrition among children (see Table 4). Mozambique is highly dependent on rain fed agriculture, where 65.0% of population live in rural areas and rely on agriculture [Instituto Nacional Electoral (INE), 2015] and over 80% consume their own production. Any kind of shock destabilizes the livelihoods of the household, affecting malnutrition (Food and Agriculture Organization (FAO), 2008). This finding was consistent with a study conducted in Burkina Faso one (in Nouna) using MUAC data and household crop from routine surveillance system that identified an association between acute malnutrition and shock on household crop production (Belesova, Gasparrini, Sié, Sauerborn, & Wilkinson, 2017). It should be noted that the study presented by Belesova et al. (2017) was conducted in areas with same characteristics as these in Mozambique where households relied more on rain-fed crop production, calling the attention of public health nutrition practitioners for continued monitoring.

As for the association observed between acute malnutrition and fever (as a proxy for malaria), it is known that malaria and acute malnutrition are the ‘major causes of morbidity and mortality in under 5-year-old children in developing countries’ (Kielmann, Uberoi, Chandra, & Mehra, 1976; Shikur, Deressa, & Lindtjørn, 2016). The finding from this study was similar to the one observed from evidences gathered in a study conducted by Woldetsadik (2011) in South Sudan where the association between fever and acute malnutrition was highly significant. According to the Mozambican Ministry of Health and the National Institute of Statistics (MISAU, INE malaria report 2015) malaria is still high, affecting 46.4% of children living in rural area. Given this finding, integrated nutrition and malaria prevention activities should be strongly encouraged, and further analysis on the relationship of these two variables (fever and acute malnutrition) should continue to be investigated in Mozambique.

The RNA found association, unlike the SMART survey, between acute respiratory infection (ARI) and malnutrition through a significant association between acute malnutrition and cough (Table 4). This finding is supported by findings from some similar studies such as a ‘secondary data analysis from a cross-sectional population-based data’ from Burkina-Faso where the odds ratio for ARI from a binary analysis was of 1.19 (1.07–1.84, 95% CI) (Poda et al., 2017).

4.1 | Limitations

The study is not representative of the whole country; hence, we are not able to generalize findings for the whole population; however, the findings are still informative for programming. The study

TABLE 4 Multiple logistic regression for rapid nutrition assessment (RNA) survey data (sample size: 3,884 household and children)

Variable in the equation		B	Sig.	Exp (B)	95% CI for Exp (B)	
					Lower	Upper
Step 1	Sex of the head of HH (1)	−0.455	0.107	0.634	0.634	1.104
	Age of the head of HH	−0.018	0.127	0.982	0.960	1.005
	Education of the head of HH (1)	0.281	0.249	1.325	0.821	2.139
	HH size	−0.051	0.411	0.951	0.843	1.072
	Number of <5-year-old children in the HH	−0.169	0.414	0.845	0.564	1.266
	FCS categories		0.753			
	FCS categories (1)	−0.054	0.920	0.947	0.328	2.737
	FCS categories (2)	0.193	0.468	1.213	0.720	2.041
	Access to Sanitation facilities in the HH (1)	−2.136	**0.037**	0.118	0.016	0.876
	Type of Sanitation (1)	0.172	0.516	1.188	0.707	1.995
	Drinking water treatment (1)	0.847	0.101	2.333	0.833	6.536
	Any shock in the HH past 12 months		0.014			
	Any shock in the HH past 12 months (1)	0.659	0.155	1.933	0.780	4.794
	Any shock in the HH past 12 months (2)	−0.645	**0.020**	0.524	0.304	0.904
	Diarrhoea in children (1)	.879	**0.001**	2.409	1.466	3.959
	Dysentery in children (1)	.414	0.310	1.513	0.680	3.367
	Fever in children (1)	1.105	**0.000**	3.018	1.720	5.295
	Cough in children (1)	.559	**0.030**	1.749	1.054	2.900
	Constant	−3.966	0.000	0.019		

Note. Binary logistic regression for RNA survey data. In this table, it provides the results of the multivariate logistic regression model produced for the data sets gathered in the SMART nutrition survey. Under the column of 'variable in the equation' are listed all the variables, their categories and the reference category used in the regression. More to the right, 'Sig' is the significance level of the association between the category and the dependant variable, and 'Exp (B)' is the likelihood read in number of times more likely to experience the outcome if a relative case is observed, and finally, the last two columns as the confidence intervals of the likelihood.
Abbreviations: CI, confidence interval; FCS, food consumption score; HH, household.
Bold emphasis refers to variables with significant *p*-value.

has not included into its analysis the variables about infant and young children feeding practices as some errors in the original databases were found that did not allow to compute indicators. Also, human immunodeficiency virus (HIV) was not included in the analysis because this was not collected and more independent variables such as community level, environmental factors, media and others relevant factors that were not included in this analysis because they were not available in the databases. On the other hand, the authors believe that the analysis would be informative if district level analysis (for each district where data were collected) was made; however, despite considerable number of children measured by district, number of those with the condition (acutely malnourished) was relatively low, which would reduce the power analysis of the study.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest. The opinions in this commentary are those of the authors and do not necessarily reflect the views of their institutions, UNICEF or the United Nations.

CONTRIBUTIONS

TZ and MJ designed the project of this study. EF and DB supported on the operationalization of the study. TZ performed the analysis and wrote the manuscript with input from all the authors. All authors discussed the results and commented on the manuscript.

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