



MUAC screening reveals severe acute malnutrition (SAM) in this drought affected community, Somalia

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Casual factors of wasting in Africa: What can be gleaned from available data?

This article reviews available national data from Africa to examine to what extent wasting could be explained by the underlying causes of malnutrition and/or contextual factors



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AFRICA

Key messages:

- The national analysis inclusive of 42 countries in Africa found that, in locations where national wasting prevalence exceeds 10%, measures of drought risk and frequency are moderately correlated with wasting, suggesting a positive relationship between drought and wasting in countries with a higher wasting prevalence only.
- Findings from this analysis highlight the difficulties of identifying the risk factors of wasting and the limitations of using available data to inform policy and programme decision making.
- Given these limitations, policy makers and programme implementers must rely on context-specific approaches to analyse the drivers of wasting although these are likely to be variable in frequency and in the quality of implementation.

The burden of wasting

Wasting, the most visible form of undernutrition, affects an estimated 47 million children under five worldwide, with more than two thirds of all wasted children living in Asia and more than one quarter in Africa (UNICEF/WHO/WB, 2020). While wasting is apparent in non-crisis and crisis settings alike, high wasting prevalence rates are commonly observed in humanitarian settings where high rates of disease and acute food insecurity are triggered by conflict and/or climate shocks. The association between conflict and wasting has been demonstrated in locations such as Nigeria, Sudan, Ethiopia and Somalia (Howell et al 2018; Rowhani et al 2011). Other factors that increase wasting risk include diarrheal disease, excess rainfall, food price shocks and climate shocks (Brown et al 2020). Factors that mitigate wasting risk include birth in a health facility, higher levels of maternal education, household income/wealth, water and sanitation quality and higher per capita gross domestic product (GDP). However, a lack of

consistency across the studies highlights the need for further exploration of wasting predictors.

This paper reviews the available national data from Africa to examine to what extent wasting could be explained by the underlying causes of malnutrition and/or contextual factors. A sub-national analysis was also conducted, utilising data from Link Nutrition Casual Analysis (Link NCA) reports, to identify potential commonalities across locations where data was available for lower-level administrative areas. Link NCA is a structured approach developed by Action Against Hunger that combines quantitative surveys and participatory methods to analyse causes and mechanisms leading to undernutrition.

Methods

The analysis focused on Africa due to the relative availability of data on causal factors and the occurrence of conflicts and crises – both acute and protracted – which are likely to contribute to rapid changes in wasting prevalence.

Table 1 Included Link NCA reports from Africa (n=19)

Link NCA reports Africa (n=19) and sub-national data comparison sources

- Burkina Faso (Tapao region, 2013)
- Central African Republic (Mambéré-Kadeï/Sangha-Mambéré, 2016)
- Chad (Abdi district, Ouaddai, 2015; Kanem, 2012)
- DR Congo (Kasai Occidental, 2014)
- Ethiopia (Hararghe, 2014; Sidama, 2014; Borena, 2016)
- Kenya (Isiolo, 2013; West Pokot, 2015; Nairobi, 2016/17)
- Madagascar (Southern Region, 2018)
- Mali (Kaarta, 2016/17)
- Mauritania (Guindimakha, 2016)
- Mauritania/Senegal (Walo transborder Area, 2016/17)
- Niger (Maradi Region, 2016/17)
- Nigeria (Yobe State, 2017)
- South Sudan (Aweil East, 2011)
- Uganda (Karamoja, 2016)
- Zimbabwe (Masvingo, 2011)

National Level Analysis

The national analysis sought to identify the associations between wasting prevalence and national level data on contextual factors including the basic and underlying causes of undernutrition for 41 African countries with additional analysis for countries with wasting prevalence above 10% (n=13). National level estimates of wasting prevalence were obtained from the UNICEF/WHO/World Bank Group 2019 Joint Child Malnutrition Estimates. Countries where data collection was conducted more than a decade ago (n=1, Libya) were excluded. Data from other sources was matched to the year or closest available year of the malnutrition data. Some indicators for South Sudan were not available because malnutrition data was collected prior to independence in 2010. Indicators were sourced from the INFORM Risk Index which assesses risk for humanitarian crises and disasters (Joint Research Center of European Commission, 2019). Selection was based on previously identified relationships in the UNICEF conceptual framework (UNICEF, 2013). Measures of conflict included conflict intensity, uprooted people and conflict deaths reported by the Uppsala Conflict Data Program (2019). Measures of drought included drought risk and affected population from the INFORM Risk Index and drought affected populations as reported in the Emergency Events Database (Center for Research and Epidemiology in Disasters, 2019). Food security indicators were availability, access, utilisation and a summary level composite indicator reported by the INFORM Risk Index. Measures of governance included the Fragile States Index score and index category scores (Fund for Peace, 2019) and World Bank Country Policy and Institutional Assessment (CPIA) scores (African Development Bank, 2019). Development indicators that were assessed included per capita GDP, the Human Development Index (HDI), the multi-dimensional poverty index and the INFORM Risk Index development and deprivation score. Related inequality indicators that were included were the GINI index, the INFORM Risk Index inequality score and the INFORM Risk Index aid dependency score (Joint Research Center of European Commission, 2019; World Bank 2019). Analysis was conducted using Microsoft Excel 365 and Pearson's correlation coefficient was applied to

assess the strength of association between national indicators and wasting prevalence.

Link NCA Analysis

The Link NCA analysis examined sub-national data, typically from a single region within a country, to explore information on the underlying and immediate causes of undernutrition that were not available at a national level. Link NCA

combines quantitative child nutrition surveys with participatory methods to generate consensus on causality and major risk factors. There were 19 available Link NCA reports from Africa available online in late 2019 (inclusive of surveys between 2010 and 2018) including 16 from countries affected by conflict or recurrent climatic shocks (Table 1). One country was excluded from the analysis due to heterogeneity. This analysis builds off the approach used by Dodos et al (2017) to group causal factors for undernutrition with the aim of summarising Link NCA findings from African countries affected by conflict or recurrent climatic shock. The analysis explored if Link NCA findings produced similarities across multiple settings that could be grouped into 'typologies' and compared Link NCA findings to other commonly available sources of similar sub-national indicators including Multiple Indicator Cluster Surveys (MICS), Demographic and Health Surveys (DHS) and Standardised Expanded Nutrition Surveys (Table 1). This sub-national analysis involved data visualisation and categorisation to assess commonalities across locations and did not include statistical testing; all analysis was conducted using Microsoft Excel 365 and used publicly available data.

Table 2 Correlations of national indicators and national prevalence of wasting

	Wasting Prevalence			Wasting Prevalence ≥ 10%		
	(n=42 countries)			(n=12 countries)**		
	Correlation Coefficient	R-squared	p-value	Correlation Coefficient	R-squared	p-value
Development Indicators						
Per capita GDP	-0.14	0.020	0.37	0.262	0.068	0.41
LIC	-0.076	0.006	0.73	-0.09	0.080	0.85
LMIC	-0.234	0.055	0.34	-0.161	0.026	0.80
Human Development Index	0.324	0.105	0.04*	-0.179	0.032	0.58
Multi-Dimensional Poverty Index	0.153	0.023	0.39	-0.668	0.446	0.07
INFORM Index Inequality	-0.110	0.012	0.50	-0.341	0.116	0.33
Governance						
Fragile States Index	0.322	0.104	0.04*	-0.012	0.000	0.97
Warning	0.204	0.041	0.26	-0.330	0.109	0.43
Alert	0.744	0.544	0.01*	0.754	0.568	0.25
World Bank CPIA	-0.412	0.170	0.03*	-0.208	0.043	0.54
Not fragile	0.065	0.004	0.80	--	--	--
Fragile	-0.236	0.056	0.46	0.254	0.640	0.58
Crisis Situation						
INFORM Index	0.385	0.148	0.01*	-0.022	0.000	0.95
Medium or Low Risk	0.334	0.112	0.14	0.817	0.668	0.18
High/Very High Risk	0.492	0.242	0.02*	0.186	0.035	0.66
Coping Capacity	0.377	0.142	0.01*	0.146	0.021	0.65
Conflict						
INFORM Conflict Risk	0.093	0.009	0.56	-0.074	0.006	0.82
INFORM Conflict Intensity	0.292	0.085	0.06*	-0.092	0.008	0.78
Conflict Deaths (UCDP)	0.312	0.097	0.04*	-0.11	0.012	0.81
INFORM Uprooted People	0.376	0.142	0.01*	0.213	0.046	0.51
Drought						
INFORM Drought Risk	0.387	0.149	0.01*	0.682	0.465	0.01*
INFORM Drought Frequency	0.258	0.066	0.10	0.651	0.424	0.02*
INFORM Drought Affected	0.046	0.002	0.77	0.314	0.098	0.32
Food Security						
INFORM Food Access	0.309	0.095	0.10	0.527	0.278	0.28

*statistically significant correlation (p<0.05)

**includes Chad, Comoros, Djibouti, Eritrea, Ethiopia, Gambia, Mali, Mauritania, Niger, Nigeria, Somalia and Sudan

Findings

National level analysis

Findings for all African countries (n=42) and countries with wasting >10% (n=12) are presented in Table 2. When looking at all countries, no indicators were strongly correlated with wasting where the correlation was statistically significant. Indicators with statistically significant, weak correlations included the HDI, the Fragile States Index and the World Bank CPIA score as well as various crisis indicators such as the INFORM Risk Index, conflict mortality and displacement and drought risk. When examining only countries that were classified as fragile states, the only strong, statistically significant correlation was the Fragile States Index score (Coeff=0.744, p=0.01).

The analysis of a sub-set of 12 countries with wasting prevalence above 10% also yielded few significant correlations of national level indicators and wasting prevalence. However, two measures of drought – the INFORM Risk Index for drought (Coeff=0.682, p<0.01) and frequency scores (Coeff=0.651, p=0.02) – had strong correlations with wasting prevalence. This indicated that in contexts with elevated wasting prevalence, drought is associated with higher rates of wasting. There was a strong negative association between the multi-dimensional poverty index and wasting that was marginally statistically significant (Coeff=-0.668, p=0.07).

Link NCA analysis

Between six and 13 risk factors were identified in the 18 included Link NCA studies with an

average of 9.1 risk factors per study (Table 3). Risk factors were categorised into five areas: food security and livelihoods, maternal mental health and childcare practices, water and sanitation, health and other risks. Water and sanitation factors were the predominant concern in 28% of Link NCAs followed by maternal mental health and care practices (22%), food security and livelihoods (17%) and health (6%). In 28% of Link NCAs causal factors were spread equally across two or more categories. Seven Link NCAs observed high wasting prevalence, defined as ≥14.5%, and in three of these (Mauritania 2016, Nigeria and South Sudan) water and sanitation risk factors were the most frequently reported.

Comparison between the number of Link NCA causal factors in a particular category (e.g., health, water and sanitation) and the available indicators related to that category (e.g., under five mortality, vaccination coverage, breastfeeding, access to improved water and sanitation) yielded no strong correlations that were statistically significant. Statistically significant moderate correlations were observed between the number of Link NCA risk factors and access to improved water sources (Coeff=0.456, p=0.05) and the minimum acceptable diet among breastfed children (Coeff=0.481, p=0.04). There was a moderate statistically significant positive correlation between the Link NCA wasting rate and access to improved water (Coeff=0.565, p=0.012), surprisingly reflecting a rise in wasting prevalence as access to improved water sources increased. Negative, weak, yet statistically significant cor-

relations were found between the Link NCA wasting rate and the minimum acceptable diet among breastfed children (Coeff=-0.483, p=0.04) and measles vaccination coverage (Coeff=-0.484, p=0.04) indicating lower wasting prevalence in areas with higher vaccination coverage and better child feeding practices.

Discussion

The analysis of national level data showed no strong correlations between wasting prevalence and measures of governance, crises – including drought and conflict – and food security that were statistically significant. In the sub-set of countries with wasting prevalence >10%, both drought risk level and drought frequency has moderate, statistically significant associations with wasting prevalence. The national analysis indicates data at this level is not well correlated with wasting and therefore has significant limitations with respect to predictive value. This is likely as result of the resolution (i.e., reporting at higher level administrative units such as state/province) which may mask the relationships observed at lower levels, the immense number of confounding factors and the reporting differences including data collection frequency and timing. Of particular importance when considering wasting as an outcome is seasonal variations in prevalence which is a critical limitation for an analysis that seeks to incorporate multiple data sets where wasting prevalence was observed at different points of seasonal calendars. A lack of significant correlations was not unsurprising given the many limitations inherent to the analysis of

Table 3 Occurrence of risk factors rated as 'major' across Link NCA studies

Link NCA Location and Year		Food Security & Livelihoods	Maternal Mental Health & Children's Care Practices	Water & Sanitation	Health	Other Risks	Total	Wasting*
CAR	West CAR 2016	3	2	1	1	3	10	2.4%
Chad	Kanem 2012	1.5	2	1	1	1.5	7	19.0%
	Ouaddai 2015	1	1	2	3	0	7	15.9%
DR Congo	W Kasai 2014	0	2	2	2	0	6	8.2%
Ethiopia	Hararaghe 2014	1	3	1	1	0	6	12.0%
	Sidama 2014	5	3	3	0	1	12	5.6%
	Borena 2016	0	5	1	0	3	9	11.1%
	Gambella 2018	3	5	4	1	0	13	20.4%
Kenya	Isiolo 2013	5	2.5	3	1	0.5	12	11.5%
	W Pokot 2015	3	1	2	1	0	7	12.8%
	Nairobi 2017	1	3	5	1	1	11	5.6%
Mali	Kaarta 2017	3	3	3	2	1	12	12.1%
Mauritania	Guindimakha 2016	2	1	3	0	1	7	15.1%
	Senegal border 2017	2.5	2	1	1	1.5	8	14.6%
Niger	Maradi 2017	1	2	3	1	0	7	11.4%
Nigeria	Yobe 2017	2	1	4	2	1	10	14.6%
South Sudan	Aweil East 2011	1	2	3	1	1	8	18.3%
Uganda	Karamoja 2016	2	5	2	2	1	12	13.2%
Percent of Link NCAs w/risk factor		88.9%	100.0%	100.0%	83.3%	66.7%	100.0%	
Total risk factors (all Link NCAs)		34	43.5	43	20	13.5	154	
Average risk factors (per Link NCA)		2.1	2.5	2.4	1.2	0.9	9.1	

*Within the Link NCA analyses, the term wasting is defined as global acute malnutrition and/or the presence of oedema

Note: Orange shading denotes the category with the most risk factors; yellow shading denotes categories that had the next highest number of risk factors reported (and instances where there was no category with more risk factors reported). In some countries, risk factors were given a score of 0.5 if they were considered to be of lesser importance.

existing data from different sources and was the impetus for the Link NCA analysis. However, many indicators correlated with wasting came from the INFORM Risk Index suggesting that further analysis of various INFORM indicators and their components may be of value, in particular since they are updated annually and reflect higher-risk contexts where wasting rates are likely to fluctuate and may often exceed emergency thresholds. While findings from this analysis do call into question the value of attempting to use existing data to inform the understanding of the drivers of wasting, the regularity of INFORM Risk Index data collection and the planned expansion of sub-national INFORM Risk Index data may improve predictive values in future analyses.

In Link NCAs, water and sanitation and maternal mental health and children's care practices were the most frequently reported types of risk factors followed by those related to food security and nutrition. Water and sanitation risk factors were the most frequently reported type of risk factor in three of seven locations with elevated wasting prevalence. Interestingly, no Link NCA with high wasting prevalence found that food security and livelihoods-related casual factors were the most frequently reported casual factors of malnutrition (when assessed as counts of sub-factors per sector) which is somewhat surprising given that high levels of food insecurity are often associated with a rise in wasting prevalence in emergency settings. The lack of clear findings from the Link NCA analysis is likely the outcome of several limitations. First, temporal and geographic variation across the data sets being compared is a significant limitation and, as noted in the national level analysis, wasting prevalence varies seasonally and it is likely that the relative importance of drivers of wasting also vary by season. Second, the Link NCA analysis involved data categorisation and visualisation to assess commonalities across locations but statistical testing was not feasible. Third, the Link NCA approach does not rank casual factors or have an objective process for identifying which factors are of greatest importance in a particular context, making the interpretation of findings and the relative importance of certain types of risk factors or risk factor categories (e.g., food security, water and sanitation) challenging. In summary, there are numerous limitations to secondary data analysis, notably the lack of available data at lower-level administrative units and reporting periods or geographical units that do not align including seasonal variations in wasting that limit the conclusions that can be drawn from the available data.

The Link NCA methodology is a consensus building approach where factors are not ranked but instead categorised; consequently, risk factor identification is potentially biased by the types of technical experts involved (e.g., water and sanitation, food security and livelihoods) and group dynamics. While Link NCA employs strong data collection methodologies and uses a mixed-methods approach, it does not have



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A child being screened for malnutrition in Southern Tigray in Ethiopia

an objective process for identifying priorities or examining the strength of association between the various casual factors and wasting which is a significant limitation. While the Link NCA methodology employs a participatory approach to gain a nuanced understanding of the casual factors of undernutrition in a particular context, a more structured and systematic method for the characterisation of the relative importance of the casual factors identified could enhance the utility of findings for nutrition programme and humanitarian response decisions making.

Conclusions

The national analysis inclusive of 42 countries in Africa found that in locations where national wasting prevalence exceeds 10%, measures of drought risk and frequency are moderately correlated with wasting, suggesting a positive relationship between drought and wasting in countries with a higher wasting prevalence only. Comparison of Link NCA wasting prevalence to regional-level survey data found few low or moderate level associations between indicators indicating that, even at a sub-national level, available indicators such as MICS or DHS data may not be correlated with wasting prevalence;

this is not entirely unexpected given that wasting prevalence fluctuates and many indicators are infrequently collected. The only moderate or high correlation that was statistically significant was a positive correlation between wasting prevalence and access to improved water sources which was unexpected.

Findings from this analysis highlight the difficulties of identifying the risk factors of wasting and the limitations of using the available data to inform policy and programme decision making. Given these limitations, policy makers and programme implementers must rely on context-specific approaches to analyse the drivers of wasting although these are likely to be variable in frequency and in the quality of implementation. Further attention to strengthening the methodologies of context-specific assessments and the use of existing programme data could both inform programmes and policies at the local level and contribute more broadly to a regional and global understanding of the casual factors of wasting.

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