

GENDER AND NUTRITION META-ANALYSIS TECHNICAL NOTE

INTRODUCTION

Action Against Hunger Canada strives to reduce gender inequality across its programs through evidence-based approaches. Understanding that social, political, and economic inequalities drive hunger –and that different needs, roles, and priorities of men, women, boys, and girls drive gender inequalities across these drivers or exacerbate their outcomes – is key to designing impactful programming. As a continued commitment to address these challenges, Action Against Hunger Canada is making efforts to increase the gender responsiveness of its operations and programs, which involves understanding how gender inequality relates to malnutrition.

In collaboration with the University of Toronto, Action Against Hunger Canada embarked on a multi-year meta-analysis project to gain a deeper understanding of the gendered nature of nutrition in humanitarian and emergency contexts. Sex differences in undernutrition were investigated, along with gender-specific contributing factors, among children under five years of age.

METHODS

The primary purpose of this project was to determine if the status of undernutrition differed between sexes using data from SMART surveys conducted in seven countries where humanitarian programming is conducted, followed by a comparison against identified gender metrics. Bayesian meta-regression models were used to determine the log odds ratios for undernutrition outcomes among boys versus girls under five years of age. Undernutrition outcomes included global acute malnutrition (GAM), severe acute malnutrition (SAM), and stunting. GAM and SAM were assessed by both weight-for-height/length z-scores, mid-upper-arm circumference, and edema. Stunting was assessed through height/length-for-age z-score. An index combining all children classified as acutely malnourished for GAM and SAM was also explored. Outcomes and their definitions are presented in Table 1.

Table 1. Undernutrition outcomes and their definitions explored through the meta-analysis.

Outcomes	Definitions
Global Acute Malnutrition (GAM)	<ul style="list-style-type: none"> ▪ Weight-for-height z-score (WHZ) <-2 and/or edema ▪ Mid-upper arm circumference (MUAC) <125 mm and/or edema ▪ Combined GAM (cGAM): WHZ <-2 plus MUAC <125 mm and/or edema as a combined index
Severe Acute Malnutrition (SAM)	<ul style="list-style-type: none"> ▪ WHZ <-3 and/or oedema ▪ MUAC <115 mm and/or oedema ▪ Combined SAM (cSAM): WHZ <-3 plus MUAC <115 mm and/or edema as a combined index
Stunting	<ul style="list-style-type: none"> ▪ Height-for-age z-score (HAZ) <-2

Nutrition data were obtained from representative sub-national SMART surveys conducted in Afghanistan, Bangladesh, the Democratic Republic of Congo (DRC), Ethiopia, Somalia, South Sudan, and Yemen (South). These surveys were cross-sectional, and each featured a two-stage cluster sampling design. In total, 93 surveys, spanning 2018 to 2022, were included in the quantitative analyses (Table 2). Most surveys were conducted in the DRC and the majority were from 2021. Both fixed and random effects meta-regression models were explored to understand the differences in undernutrition between sexes, with the unit of analysis being each individual survey, rather than the country. The difference in undernutrition was further explored by country groupings (African vs non-African). The total number of children under five included in the analysis is presented in Supplemental Table 1. Quantitative analyses were completed using R version R-4.0.2.

The Gender Transformative Framework for Nutrition (GTFN) was used as the main analytical framework for this project.¹ A secondary objective included determining which gender indicators and metrics, based on the GTFN, contextualize the differences in undernutrition between sexes. A landscaping exercise was conducted to develop a clear understanding of gender data availability. Data were mapped per GTFN domain of interest. Humanitarian Needs Overviews (HNOs) and Humanitarian Response Plans (HRPs) from the included humanitarian contexts were examined to ascertain the use of sex and age-disaggregated data (SADD). A qualitative component was introduced to the project to further explore the potential differences in undernutrition across sexes.

Table 2. The number of surveys included in the quantitative analysis by country and year (2018-2022).

Year	DRC	Ethiopia	Somalia	South Sudan	Afghanistan	Bangladesh	Yemen	Total
2018	9	1	5	5	3	-	-	23
2019	9	3	2	6	2	3	-	25
2020	8	-	2	1	-	-	-	11
2021	5	5	2	2	-	2	14	30
2022	-	-	1	3	-	-	-	4
Total	31	9	12	17	5	5	14	93

RESULTS

Overall, significant differences were found for all undernutrition indicators across sexes, but the odds differed depending on the indicator analyzed. Based on WHZ, boys had significantly higher odds of GAM and SAM as compared with girls (Table 3). However, when using MUAC, boys were observed to have significantly lower odds of GAM and SAM as compared with girls. Looking at a combined index of acute malnutrition, that considered both MUAC and WHZ, boys had *slightly* higher odds of both cGAM and cSAM than girls. The odds of stunting were also higher among boys than girls. Across country groupings, the gendered trends in malnutrition were the same by measurement method. However, the odds across country groupings were significantly different for two outcomes: GAM by MUAC and stunting. Girls across both country groups had significantly higher odds of GAM by MUAC than boys, however, girls in the non-African countries had significantly greater odds of GAM by MUAC than girls in African countries. For stunting, boys in both country contexts had higher odds of stunting than girls, but boys from African contexts had significantly greater odds of stunting than boys in non-African contexts.

The originally planned exploration of gender metrics via meta-regression was not possible due to inconsistency across gender metrics (identified based on the GTFN's domains), varying data availability, and a general lack of disaggregated data. Thus, key informant interviews were conducted to elucidate any underlying gender-specific factors that might explain why boys appeared to be more malnourished than girls. Here, respondents posited numerous factors that may contribute to the differences, including, but not limited to, differences in exposure to infection, variable care practices, and gendered societal norms.

Table 3. Sex differences in undernutrition outcomes among children under 5 years of age from Afghanistan, Bangladesh, the Democratic Republic of Congo, Ethiopia, Somalia, South Sudan, and Yemen (South) (2018-2022).¹

	Overall	Non-African Country Afghanistan, Bangladesh, Yemen	African Country DRC, Ethiopia, Somalia, SSD
GAM WHZ	1.30 (1.23, 1.38)	1.29 (1.15, 1.46)	1.30 (1.23, 1.39)
SAM WHZ	1.47 (1.33, 1.63)	1.56 (1.18, 2.05)	1.45 (1.30, 1.63)
GAM MUAC	0.82 (0.77, 0.87)	0.63 (0.54, 0.72)*	0.87 (0.82, 0.93)*
SAM MUAC	0.87 (0.78, 0.97)	0.73 (0.56, 0.95)	0.90 (0.80, 1.01)
Stunting	1.45 (1.37, 1.53)	1.29 (1.17, 1.41)*	1.52 (1.43, 1.61)*
cGAM	1.06 (1.01, 1.12)	1.04 (0.93, 1.16)	1.07 (1.01, 1.14)
cSAM	1.10 (1.01, 1.20)	1.00 (0.82, 1.23)	1.13 (1.03, 1.24)

¹Results are from the random effects meta-regression; values are odds ratio (95% Credible Interval).

*Significant differences across country groupings.

DISCUSSION

Our findings show that, based on WHZ and HAZ, boys have significantly higher odds of undernutrition than girls. These findings are in line with recent literature that states boys are more likely to experience growth faltering and undernutrition than girls.^{21,32} However, when children were assessed using MUAC, girls had significantly higher odds of both GAM and SAM. Again, this is mirrored by other findings, and unsurprising, as MUAC and WHZ tend to capture different populations of children – with MUAC capturing more girls and younger children.^{43–65} In examining sex differences across all children, regardless of measurement indices, it was found that boys had higher odds of both cGAM and cSAM as compared with girls. However, these odds were only *slightly* statistically significant and should be interpreted clinically with caution.

Altogether, these data reinforce the complementarity and additive nature of the two measurement methods and emphasize the need to use both for acute malnutrition assessment, especially as both indicators present similar risks of mortality for children with SAM.^{65–98} Moreover, it has been previously shown that despite boys being more likely to be malnourished than girls, mortality risk is similar between sexes; although, in absolute terms, a greater number of boys may die due to the increased number affected by undernutrition.¹⁰⁹

To date, availability of data to support understanding why these gender differences occur are limited and inconsistently collected; however, these differences are likely due to a complex array of social, environmental, and genetic factors.¹¹⁰ Our plan to contextualize these differences

through a meta-regression was not possible due to the lack of standardized gender indicators across the countries of interest. The landscaping exercise and qualitative interviews underscored this critical dearth of data. Not only was there a lack of data but also respondents noted that even if data were collected during program implementation, it was not always carried forward and aggregated within higher-level systems, such as global dashboards. This highlights that continued efforts are needed to address these gaps in gender data, which includes efforts to standardized data collection methods and gender metrics. Ultimately, the collection and analysis of gender and sex-disaggregated data must be prioritized by the humanitarian community to effectively understand and respond to the drivers of undernutrition.

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Supplemental Table 1. Number of children under five years of age included in the analysis (with totals), by country and undernutrition outcome.

	GAM (WHZ)		SAM (WHZ)		GAM (MUAC)		SAM (MUAC)		cGAM		cSAM		Stunting	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Afghanistan, <i>n total</i>	2302	2278	2302	2278	2329	2302	2329	2302	2330	2330	2330	2303	2275	2240
Cases	255	204	57	35	235	332	83	111	382	409	113	127	1116	946
Bangladesh, <i>n total</i>	964	926	802	757	971	928	569	531	971	928	631	574	958	922
Cases	134	97	12	5	21	32	0	3	136	104	12	5	314	263
DRC, <i>n total</i>	10868	10592	10868	10592	11071	10713	11071	11152	11075	10717	11075	10743	10881	10563
Cases	1656	1296	552	374	1449	1533	528	556	2275	2118	818	712	4799	3576
Ethiopia, <i>n total</i>	3219	3155	2021	2014	3248	3174	1747	1703	1747	1704	1747	1704	3199	3123
Cases	344	279	28	25	157	187	22	35	224	243	41	51	713	543
Somalia, <i>n total</i>	4545	4483	4545	4483	4627	4563	4627	4563	2169	2169	2169	2169	4031	3970
Cases	881	710	191	143	530	621	100	120	549	532	138	130	934	630
South Sudan, <i>n total</i>	3730	3809	3730	3809	3781	3881	3781	3881	3787	3874	3787	3874	2982	3017
Cases	745	588	146	96	364	429	51	66	848	757	176	142	506	462
Yemen, <i>n total</i>	3695	3529	3695	3529	3736	3568	3734	3561	3739	3750	3739	3570	3684	3532
Cases	515	394	81	53	169	253	43	53	572	514	108	95	1404	1176
Overall total	29323	28772	27963	27462	29763	29129	27858	27693	25818	25472	25478	24937	28010	27367
Total cases	4530	3568	1067	731	2925	3387	827	944	4986	4677	1406	1262	9786	7596