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Mozambique Nutrition Intervention Package Evaluation of the Intervention Model

Baseline Survey Report

March 2020

I. Introduction

Mozambique has achieved significant improvements in health outcomes in the last two decades, but results have been uneven, particularly for people in rural areas and the poorest quintiles. For example, the country met Millennium Development Goal (MDG) 4 on reducing under-5 mortality but did not meet MDGs 1, 5, and 6 on nutrition, maternal health, and human immunodeficiency virus, acquired immunodeficiency syndrome, and other infectious diseases. Child undernutrition is alarmingly high and has remained particularly stagnant; 43 percent of all children under five are stunted in Mozambique, and this indicator has improved little in the past 20 to 30 years, with higher concentrations in the northern and central regions (MISAU, INE, and ICF International 2011). Micronutrient deficiencies are also high, with 63 percent of Mozambican children under five years affected (MISAU, 2006; MISAU, INE & IFCI, 2015). Anemia is particularly high, with 80% of children affected (MIS, 2018). Stunting is an important driver of the low Human Capital Index value of 0.36, which means that a child born in Mozambique will be 36% as productive as he/she would be had they enjoyed complete education and full health (World Bank Human Capital Project, 2020). The high burden of communicable diseases (malaria contributes to 35 percent of child mortality) and widespread lack of access to clean water and sanitation compounded children's nutritional deficiencies. In 2014, 45 percent of all deaths of children under five years old in Mozambique were linked to malnutrition, and the country lost an estimated $1.7 billion in 2015 because of child malnutrition (NMC 2015).

In 2017, the government of Mozambique developed a 5-year investment case for reproductive, maternal, newborn, child, and adolescent health and nutrition, which focuses on geographical areas that are lagging and aims to channel financing to demand- and supply-side interventions**.** To operationalize and finance the investment case, the government and health care partners developed the Primary Health Care Strengthening Program-for-Results (P163541), which became active in 2018. The Program aims to increase focus on and achievement of results through the use of 11 disbursement-linked indicators, one of which is specific to nutrition. As part of the Program, the Nutrition Intervention Package (NIP) was redesigned to address the problems of stunting and micronutrient deficiencies by increasing the capacity of health service systems and staff at the central, provincial, district, and community levels to deliver appropriate counseling and resources to children under five and their mothers or other caretakers.

The NIP targets children in the first 1,000 days of life in 8 of the country's 11 provinces with a stunting prevalence of over 35%, and builds on the experience of the three northern provinces where nongovernmental organizations acted as third-party providers of community-based nutrition intervention under the Bank-financed Health Service Delivery Project. This mode of delivery indicates an important shift to expand access to nutrition services for vulnerable populations in high-burden regions of the country. It is the first time that the Ministry of Health will manage this

set of activities in collaboration with other providers and APEs. Except for growth monitoring and promotion (GMP), interventions selected and presented in Table 1 include those listed in the "Effective interventions to address maternal and child malnutrition: an update of the evidence" in the 2021 Lancet Series on Maternal and Child Undernutrition. Although evidence about the effectiveness of GMP is mixed, the NIP includes significant efforts to improve the quality of GMP, which is expected to contribute to improvements in nutritional outcomes among children.

Table 1. *Nutrition Intervention Package Theory of Change*

Level of care	Interventions	Outputs	Outcomes	Impact
Community-based activities	Regular growth monitoring and promotion	Increased referrals to health facilities for children at risk of malnutrition	Increased integrated approach to healthcare as an essential action for investing in early childhood development	Improved micronutrient status Reduction in growth faltering Improvements in growth patterns that promote reductions in stunting, wasting, and underweight
	Counseling on exclusive breastfeeding 0-6 months	Expanded nutrition services (counseling and delivery using community-based platforms)	Improved knowledge, attitudes and self-efficacy on infant and young child feeding and health Improved infant and young child feeding and hygiene practices	
	Counseling on optimal complementary feeding practices, including timely and continued intake of micronutrient powders from 6-24 months			
	Counseling on safe water and sanitation practices	Skilled providers for quality nutrition services at community level	Reduced child morbidity from common childhood illnesses (fever, diarrhea, acute respiratory infection, other infections)	
	Deworming of children from 12-24 months	Integrated and coordinated nutrition service delivery		
	Vitamin A supplementation for children 12-24 months			
	Blanket distribution of micronutrient powders from 6-24 months			

Under the analytical portfolio that accompanies the Primary Health Care Strengthening Program-for-Results is the Intensifying Health Policy Dialogue for Reforms and Donor Coordination advisory services and analytics, which consists of a combination of knowledge generation (reports and studies), policy dialogue, technical assistance, capacity development, and knowledge exchange with peers in other countries, with a focus on facilitating the implementation phase of the investment case. The advisory services and analytics program includes four thematic lines of work, the fourth of which is an operational and effectiveness evaluation of the NIP, the baseline survey results of which are presented in this report.

II. Objective of the evaluation

The objective of this evaluation is to examine the impact, implementation, and cost-effectiveness of the scale-up of the NIP's new delivery mechanism. Impact refers to the extent to which the implementation of the NIP contributed to improvements in child feeding, hygiene, and caring practices, and subsequently, child nutritional status, as measured by the prevalence of stunting, wasting, and micronutrient deficiencies. The evaluation also aims to measure the extent to which the intervention was implemented using methodologies grounded in process evaluation. The evaluation intends to include a final survey to measure program impact during a similar period after 4 to 5 years of implementation, complemented by a continuous review implementation and

coverage data collected through routine monitoring mechanisms to inform the process and implementation measures.

The combined outputs from the proposed research activities are critical for informing the expansion of the NIP to the remaining districts in the country, which is an eventual goal of the government. This report presents findings from the baseline evaluation, which was the first of the two surveys conducted to respond to the above-stated objectives.

III. Methodology

The baseline survey was conducted from September 18 to October 24, 2019. Three questionnaires were used to collect data on household socioeconomic and living conditions, health and nutrition status and practices for children younger than 36 months, and community information, such as availability of and distance to the nearest health clinic and other public services. The household questionnairewas administered to heads of the household and child questionnaire to children's primary caregivers. The community questionnaire was completed based on a discussion with the community leader. Each of eight field teams, one per province, had a supervisor and four enumerators. The lead researcher and lead field coordinator managed the field teams. Three trainings for the data collection team were conducted in three provinces (Nampula, Tete, Inhambane) using the same trainers, each lasting for five days: four days of in-class training and one day in the field for a pilot exercise. The survey firm recruited field team members in the selected provinces.

The Mozambique Institutional Review Board (*Comité Nacional de Bioética para a Saúde*), approved the survey protocol on September 18, 2019 (Ref:437/CNBS/19), and informed written consent was obtained from all respondents.

Sampling

The methodology used for this study was a nonequivalent group design, which is structured like a traditional pre-test and post-test randomized design, but the random assignment feature is replaced using intact groups whose existence typically predates the intervention. The Ministry of Health provided the list of communities based on the planning intervention areas defined for the implementation of the NIP in 2019 and 2020.

The sample was a multistage sample stratified according to province and, within each province, stratified into two types of area: control and intervention. Each province was considered to be a domain of analysis. Data are representative according to province with 95% confidence intervals and acceptable coefficients of variation (below 20%) for the key variables and indicators among children 0-36 months. Data were collected from 1,583 of 1,590 households[1] in the eight provinces of Nampula, Cabo Delgado, Zambezia, Tete, Niassa, Sofala, Manica, and Inhambane.

Because there were no lists of families at the community level, the field teams listed all households in the enumeration or community area, with the support of the community leader. Within each community, up to 20 households that met the eligibility criteria (had a child younger than 36 months) were randomly selected. The child questionnaire was administered to all eligible children in households with more than one eligible child.

Table 2: Number of Households and Children Included in Sample

[1] In some communities, there were fewer households with children younger than 36 months than previewed.

Province	Households	Children
Nampula	210	228
Cabo Delgado	168	173
Niassa	209	234
Zambezia	240	241
Tete	180	191
Manica	228	257
Sofala	190	208
Inhambane	158	184
All	**1,583**	**1,716**

Data analysis

Data were collected using CSPro (United States' Census Bureau, Washington, DC), compiled in Excel (Microsoft, Redmond, WA), and analyzed in Stata 16 (Stata Corp., College Station, TX). Variables were created to measure key outcomes of interest, the definitions of which are provided in detail in appendix A. Briefly, child age was calculated in months using the child's recorded date of birth and interview date. Child age, the median of three length measurements, and weight measurement were used to calculate standardized z-scores using the World Health Organization Growth Reference Standards and proportions of stunted and wasted children as defined in appendix A. Children aged 36 months and older (n=16) or with invalid dates of birth that led to an age of 0 months (n=55) were excluded from the anthropometric analysis.

Infant and young child feeding outcome variables of dietary diversity score, minimum meal frequency, minimum dietary diversity, and minimum acceptable diet were constructed from 24-hour food frequency data using World Health Organization definitions and guidelines outlined in the *Indicators for Assessing Infant and Young Child Feeding Practices* guidebook (WHO, 2008). Other variables calculated and analyzed included handwashing practices, child morbidity, household food insecurity, and knowledge of infant and young child feeding practices (appendix A).

Variables pertaining to household-level food security were produced using the Household Food Insecurity Access Scale methodology, as the United States' Agency for International Development and Food and Nutrition Technical Assistance project have defined and described. This methodology is based on nine questions about experiences associated with food insecurity in the last 30 days. If a respondent confirmed having experienced food insecurity in the last 30 days, a follow-up question was asked about the frequency with which it occurred.

IV. Findings

- ***Child anthropometry***

The mean height-for-age z-score for children younger than 36 months is low in Mozambique, confirming that the distribution of nutrition indicators is shifted to the left (as compared to the standard normal distribution), indicating a high proportion of undernourishment amongst children. The provinces with the highest prevalence of stunting were the northern provinces of Cabo Delgado, Nampula, Zambezia, and Niassa (>40%), the prevalence in the central provinces was

lower but still high (30–39%), and the southern province of Inhambane had the lowest prevalence (<30%).

The prevalence of wasting presents a different picture, with the provinces of Zambezia, Cabo Delgado, Manica, and Tete the most heavily affected (>9%). Patterns of severe acute malnutrition follow those for moderate acute malnutrition, with an alarming situation in Zambezia.

Table 3: Key Anthropometric Indicators for Children Younger than 36 Months According to Province

Province	Height for age z-score		Weight for height z-score		
	Mean ± SD	% stunted	Mean ± SD	% wasted	% severely wasted
Cabo Delgado	-2.00±1.73	53.8	-0.05±1.74	12.3	4.9
Inhambane	-1.34±1.74	29.3	0.72±1.11	0.6	0.0
Manica	-1.25±1.66	33.7	-0.06±1.50	11.2	4.5
Nampula	-1.76±1.76	47.5	-0.12±1.37	7.6	2.7
Niassa	-1.91±1.77	48.8	0.07±1.43	6.9	3.8
Sofala	-1.40±1.75	35.6	0.21±1.60	4.2	2.1
Tete	-1.35±1.77	39.6	-0.02±1.59	9.2	3.8
Zambezia*	-1.32±2.57	46.4	-0.08±2.55	17.5	10.1
All	**-1.53±1.87**	**41.6**	**0.07±1.64**	**8.5**	**4.1**

*Weight for height for children younger than 6 months in Zambezia province was excluded from the analysis because of data quality problems that continue to be investigated.
SD, standard deviation.
Stunting defined as height-for-age z-score<-2 standard deviations below the reference median; wasting defined as weight-for-height z-score <-2 standard deviations below the reference median; severe wasting defined as weight-for-height z-score <-3 standard deviations below the reference median.

The distribution of stunting and wasting was also assessed for the intervention and control areas (table 4). In most provinces, children in control areas had lower levels of stunting and wasting than in intervention areas, likely due to the selection criteria for intervention areas that favored high poverty, nutritional need, and burden. Exceptions include Niassa and Sofala for stunting and Cabo Delgado for wasting, where the prevalence was higher in control than intervention areas.

Table 4: Distribution of Stunting and Wasting in Intervention and Control Areas

Province	Stunted[a]		Wasted[b]	
	Intervention	Control	Intervention	Control
	%			
Cabo Delgado	59.5	35.1	10.4	18.4
Inhambane	36.5	24.0	1.4	0.0
Manica	37.5	27.5	11.3	11.1
Nampula	48.2	46.5	9.5	4.6
Niassa	43.2	58.4	8.5	3.9
Sofala	33.6	38.7	4.3	4.0
Tete	46.9	22.2	11.1	5.2
Zambezia*	48.9	39.6	18.6	14.6
All	**44.6**	**36.4**	**9.8**	**6.4**

*Weight for height for children younger than6 months in Zambezia province was excluded from the analysis because of data quality problems that continue to be investigated.

[a]Height for age z-score more than 2 standard deviations below the reference median.

[b]Weight for height z-score more than 2 standard deviations below the reference median.

The pattern of height-for-age distributions deteriorated with age (figure 1; table 5). This is what we would expect to see based on global trends for nutrition, but what was surprising was the large proportion of very young children (<1 month) who were stunted and wasted. This points to maternal factors that are causing children to be born small, stunted or wasted.

Figure 1: Distribution of Height-for-Age Z-Score (HAZ) According to Age

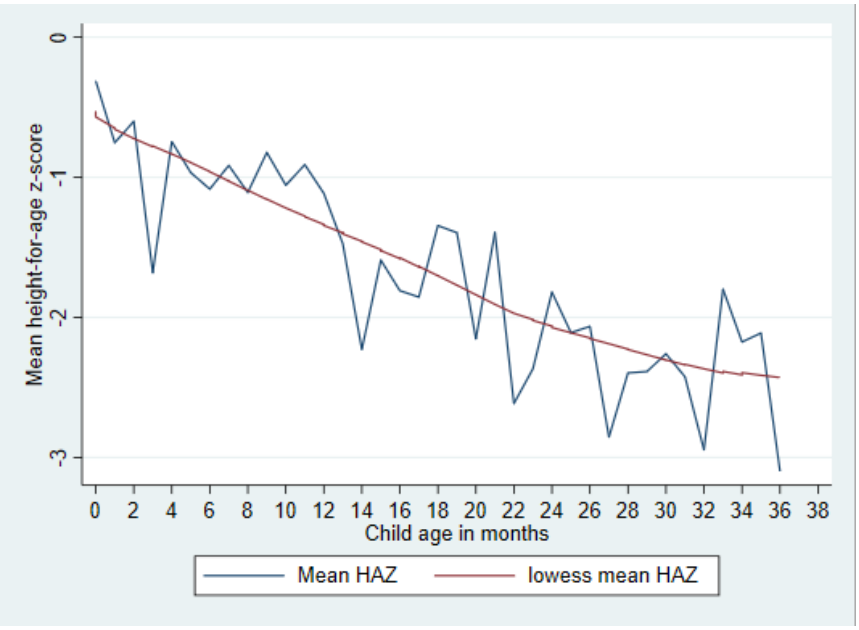


Table 5: Prevalence of Stunting and Wasting According to Age and Sex

Age, months	Prevalence of stunting[a]			Prevalence of global acute malnutrition[b,c]			Prevalence of severe acute malnutrition[c,d]		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
	%								
0–1	28.1	36.8	18.3	14.0	10.5	18.0	3.8	1.4	6.9
2–3	31.7	50.0	18.3	6.7	9.8	4.1	2.8	4.2	1.6
4–5	21.1	29.4	10.3	7.6	7.0	8.3	4.3	3.9	4.8
6–11	32.5	52.4	12.1	7.9	8.2	7.6	4.6	4.6	4.7
12–17	41.6	59.2	26.6	10.7	13.7	8.2	6.0	7.2	4.9
18–23	49.8	60.5	38.5	7.4	9.8	5.0	3.6	4.0	3.3
24–36	54.8	66.8	41.4	7.2	9.3	4.9	2.5	3.9	1.1

[a]Height for age z-score more than 2 standard deviations below the reference median.

[b]Weight for height z-score more than 2 standard deviations below the reference median.

[c]Children in Zambezia younger than 6 months were excluded from the acute malnutrition analysis.

[d]Weight for height z-score more than 3 standard deviations below the reference median.

- ***Child morbidity***

Diarrhea was highly prevalent in the population, with 25.0 percent of children having experienced diarrhea in the 30 days preceding the survey. Symptoms of acute respiratory infection were less common, with 5.7 percent of children having experienced any symptom (cough, wheezing or rapid breathing, fever). Maternal report of malaria was also very high, with 19.8 percent of mothers reporting that the child had had malaria in the last 30 days. Data is presented in Appendix B.

- ***Handwashing practices and environment***

Mean handwashing scores were low, with mothers mentioning washing their hands with water and soap on fewer than two of the possible occasions: before cooking, before eating, before feeding the child, after cleaning the child's feces, after using the toilet or latrine. As presented in the breakdown of the score (Table 6 and Appendix C), more than half of mothers did not mention washing their hands on any of the five possible occasions, and fewer than 15 percent of mothers said that they washed their hands or four or five of these occasions. Disaggregation of the handwashing score according to province revealed that Zambezia, Tete, and Cabo Delgado had the highest proportions of caretakers with poor handwashing practices, whereas caretakers in Inhambane had better handwashing practices (table 6, Appendix C).

Table 6: Handwashing Practices of Mothers of Children Younger than 36 Months at Five Critical Time Points, According to Province

Province	**Number of Critical Time Points for Washing Hands with Soap and Water**					
	0	**1**	**2**	**3**	**4**	**5**
Nampula	46.1	13.6	17.5	6.1	4.8	11.8
Cabo Delgado	57.8	20.8	11.6	1.2	0.6	8.1
Niassa	49.6	26.5	15.8	5.9	1.3	0.9
Zambézia	80.1	13.3	6.6	0.00	0.00	0.00
Tete	59.2	14.1	6.8	0.5	1.57	17.8
Manica	44.4	8.6	14.8	13.6	11.3	7.4
Sofala	52.4	6.7	15.9	8.7	7.2	9.1
Inhambane	30.4	17.4	20.7	15.2	8.7	7.6
Total	**52.8**	**14.9**	**13.7**	**6.5**	**4.6**	**7.5**

Note: Critical time points: before cooking, before eating, before feeding the child, after cleaning the child's feces, after using the toilet or latrine

Direct observations of the household-level environment as it relates to hygiene (Table 7, Appendix E) demonstrate that fewer than half of households had improved latrines, one-third had a space for handwashing, and one-quarter had soap available for handwashing, which helps explain the low handwashing scores. The presence of insects, rubbish, and animal feces in or around the toilet or household compound was relatively low, but 31 percent of households had

animal feces within the household compound, which presents a substantial risk for an unhygienic environment that may be contributing to the high morbidity in children due to diarrhea.

Table 7: Observed Household-Level Hygiene Environment

Hygiene Environment		n (%)
Latrine has cover (improved latrines)?	No	592 (51.5)
	Yes	522 (45.4)
	Not observed	36 (3.1)
Flies or cockroaches in toilet?	No	599 (51.2)
	Yes	511 (43.6)
	Not observed	61 (5.2)
Space for handwashing?	No	693 (59.7)
	Yes	423 (36.4)
	Not observed	45 (3.9)
Soap for handwashing?	No	814 (69.3)
	Yes	303 (25.8)
	Not observed	57 (4.9)
Animal feces in house or compound or right outside?	No	893 (67.2)
	Yes	414 (31.2)
	Not observed	22 (1.7)
Rubbish in house or compound?	No	982 (69.2)
	Yes	426 (30.0)
	Not observed	11 (0.8)
Distance between toilet and water source	<25 footsteps	128 (19.8)
	25-30 footsteps	82 (12.7)
	>30 steps	283 (43.9)
	Not observed	152 (23.6)
Animals near cooking space?	No	910 (67.1)
	Yes	430 (31.7)
	Not observed	17 (1.3)

Infant and Young Child Feeding Practices and Knowledge

- ***Breastfeeding practices*:** exclusive breastfeeding for children younger than 6 months, continued breastfeeding for children aged 12 to 15 months

Close to 60 percent of mothers with a child younger than 6 months reported that they were exclusively breastfeeding their child (Appendix D). This practice was highest in Sofala and lowest in Inhambane. Continued breastfeeding of children aged 12 to 15 months was very high in all provinces except Zambezia.

- ***Complementary feeding practices:*** dietary diversity score, minimum dietary diversity, minimum meal frequency, minimum acceptable diet

Dietary diversity of children aged 6 to 36 months was very low in the surveyed areas. The mean dietary diversity score was less than two food groups per day, which contributed to a very low proportion of children achieving a minimum dietary diversity (consumption of four4 or more

food groups per day). Meal frequency was also surprisingly low, with only 19 percent of children achieving a minimum meal frequency. It is likely that this was because 81.5 percent of all children surveyed consumed fewer than three meals per day.

The combination of low dietary diversity and meal frequency led to extremely low proportions of children achieving minimum meal diversity.

Table 8: Key Infant and Young Child Feeding Practices According to Province

Province	**Exclusive breastfeeding <6 months**	**Continued breastfeeding aged 12-15 months**	**Minimum dietary diversity**	**Minimum meal frequency**	**Minimum acceptable diet**
	%				
Cabo Delgado	60.0	90.9	13.9	16.8	0.6
Inhambane	29.4	90.0	20.7	16.9	3.8
Manica	60.0	92.9	13.7	17.1	3.5
Nampula	62.3	90.9	16.2	23.7	4.8
Niassa	50.0	100.0	30.6	22.2	7.7
Sofala	82.9	92.0	12.0	16.4	2.4
Tete	59.6	92.3	15.7	20.4	4.7
Zambezia	55.1	72.5	15.4	18.3	2.1
All	57.7	88.8	17.3	19.1	3.8

Despite poor infant and young child feeding practices, knowledge of infant and young child feeding practices was high, with a mean score of 5.7 out of 8. This is not uncommon in these contexts and is important to consider for programmatic purposes. In other words, more may be needed to be done to stimulate changes in behavior than just informing people about adequate nutrition.

- ***Household-level food security***

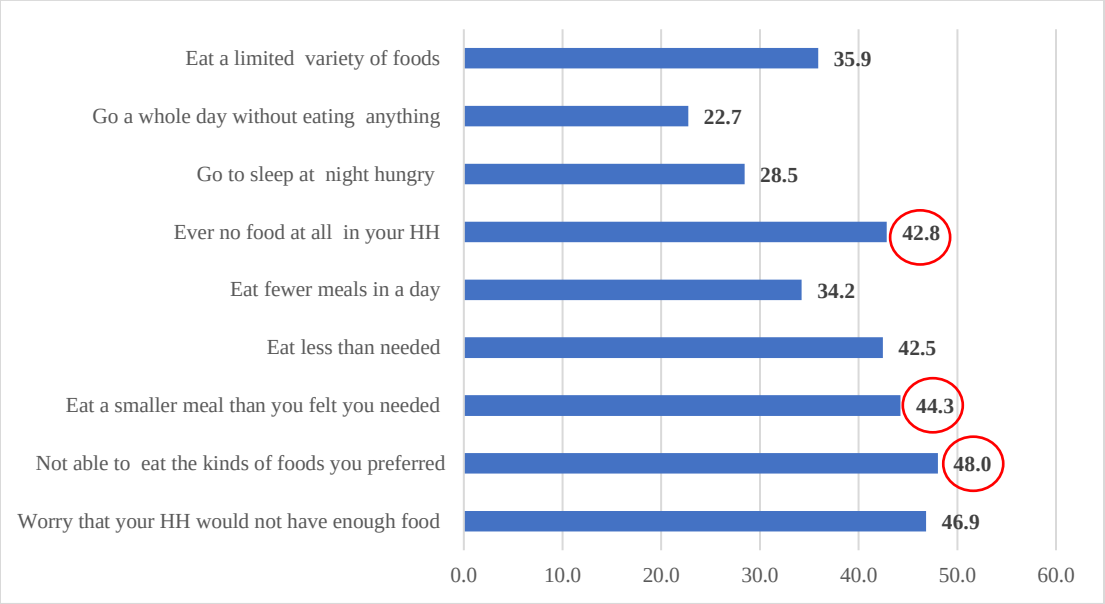
Approximately 60 percent of households were experiencing food insecurity, with 34 percent experiencing severe food insecurity. Provinces with the lowest percentages of food security also have the lowest level of stunting and acute malnutrition, except Inhambane Province. Although a large majority (97 percent) of households owned land and 45 percent of them had livestock, the diversity of agricultural production is very low. On average, households cultivate three crops, with the majority having maize, beans, and tubers (85 percent maize, 56 percent beans, 52 percent tubers, 14 percent vegetables, and 7 percent fruits).

Table 9: Prevalence of Food Insecurity According to Province

Province	Food secure (%)	Mild food insecurity	Moderate food insecurity	Severe food insecurity
		%		
Nampula	37.6	19.0	4.8	38.6
Cabo Delgado	19.6	24.4	7.7	48.2
Niassa	64.1	14.8	6.2	14.8
Zambézia	42.9	23.8	2.1	31.3
Tete	38.3	11.7	11.7	38.3
Manica	56.6	18.9	5.7	18.9
Sofala	40.5	14.2	3.2	42.1
Inhambane	14.6	23.4	13.3	48.7
Total	40.9	18.8	6.4	33.9

Although most of the provinces faced an emergency situation in 2019 (cyclones, flooding, drought, armed attacks), only 27 percent of households reported calamitous events with negative effects on their lives, which is contradictory to the food insecurity conditions experienced; 43 percent of households reported running out of food, which forced them to cut on meal size or frequency, and 36 percent reduced the quality of food provided to children because of lack of resources (figure 2).

Figure 2: Household (HH) Food Insecurity



V. Conclusions and considerations for the way forward

This study was conducted to serve as a baseline assessment of the nutritional status of young children in Mozambique, including underlying determinants of nutritional status such as infant and young child feeding practices and hygiene. This baseline survey was conducted before the NIP was introduced, which represented a significant change in how nutrition services are delivered in Mozambique, shifting service delivery from the health care facility to the

community in an effort to better reach the populations most vulnerable to malnutrition and its consequences.

The nutritional status of young children in Mozambique continues to be a significant public health challenge. Almost half of all children included in this sample's intervention areas were stunted, with the northern region of Cabo Delgado have rates upward of 60 percent. The prevalence of wasting was also high, with a number of provinces exhibiting levels that would signal a public health emergency. The combination of high stunting and wasting rates in certain geographic areas of the country points to an unavoidable truth that some proportion of these children are in fact both stunted and wasted, which has dire consequences for their survival given the multiplicative effect on mortality that children who are both stunted and wasted face. The determinants of malnutrition are multifaceted and multilayered, but widespread food insecurity, poor handwashing practices, high levels of child morbidity, and suboptimal infant and young child feeding practices are undoubtedly hampering progress on key nutrition indicators. Lastly, the low z-scores and prevalence of stunting and wasting observed among very young children in this sample (<6 months, for example), highlights the need to intervene from the time of conception, as opposed to after the child is born.

The results of this baseline survey are particularly troubling in the face of the COVID-19 crisis, with numerous projections warning of the potential devastation the health crisis may have on food security and food access globally. This presents a bleak picture given the fragile state in which vulnerable children are entering this crisis. Under such circumstances, it is critical that the Mozambican government focus its efforts on implementing the NIP, which includes evidence-based interventions that have been associated with improvements in stunting and wasting, while that ensuring quality and coverage targets are met.

The findings from this baseline survey bring forth key considerations for the way forward:

- Nutrition interventions in Mozambique should target pregnant women, given the high levels of malnutrition in utero, as evidenced by the high prevalence of stunting and wasting among young infants (first six months of life). The NIP does not include a strong focus on pregnant women, but in a future iteration should be strengthened to implement evidence-based interventions that more effectively aim to break the intergenerational cycle of malnutrition.
- Consider the integration of study design features that could go beyond the measurement of the implementation of the NIP to include impacts or effects of the COVID-19 pandemic on implementation. These two are likely to have opposite effects but may elucidate important lessons regarding the resilience of the NIP in times of crisis and external shocks.

Conduct additional analyses to identify the percentage of children who are simultaneously stunted and wasted, as well as the determinants that may be associated with this highly vulnerable situation to inform programming and targeting for this population at the highest risk of mortality.

References

MISAU (Ministerio da Saude), INE (Instituto Nacional de Estatística), and ICF International. *Mozambique Demographic and Health Survey 2011*. Calverton, MD: MISAU, INE, and ICF International.

Ministerio da Saúde [MISAU] (2006). *National survey on Vitamin A deficiency, anemia and malaria in children 6–59 months and their mothers (December 2001–February 2002)*. Maputo, Mozambique: MISAU Nutrition Division & Instituto Nacional de Estadística.

MISAU, INE, & ICFI (2015). *Mozambique immunization, malaria, and HIV/AIDS indicators survey 2015*. Maputo, Mozambique & Rockville, MD: National Institute of Health (Mozambique), INE, & ICFI

NMC (Nutrition Modeling Consortium). 2015. *The Cost of Hunger in Africa: Mozambique Case Study.* https://www.nyas.org/media/21001/case-study3-mozambique-pages.pdf

World Health Organization. (2008) *Indicators for Assessing Infant and Young Child Feeding Practices: Part 1, Definitions.* Geneva, Switzerland: WHO.

Appendix A: Variable definitions

Variable	Definition
height-for-age z score, weight-for-height z-score	Standardized length or height and weight measurement materials were used to measure anthropometry. Length was measured for children under 24 months and height for those aged 24 to 36 months, both using a stadiometer. Weight was measured on an electronic scale with the child standing alone or, if the child could not stand alone, by subtracting the weight of the mother from the mother-plus-child measurement. Standardized z-scores were calculated using the zscore06 program in STATA.
Stunting, wasting	Measured as length or height for age and weight for-height more than 2 standard deviations below the reference median for that measure.
Child morbidity (diarrhea, acute respiratory infection, malaria)	Measured according to maternal report of child having symptoms of diarrhea, acute respiratory infection, or malaria in the last 30 days. Diarrhea was defined as four or more loose or watery stools over a 24-hour period. Acute respiratory infections symptoms included cough, wheezing or difficulty breathing, and fever.
Handwashing practices	Measured according to maternal report of handwashing practices with the use of soap at five time points: before cooking, before eating, before feeding the child, after cleaning the child's feces, after using the toilet or latrine. Only instances in which the mother mentioned the occasion and then mentioned the use of soap and water were included in the handwashing score.
Household Food Security	Household Food Security was measured using the Household Food Insecurity Access Scale (HFIAS). The HFIAS includes nine occurrence questions that relate to three domains of food insecurity: (1) anxiety and uncertainty about the household food supply; (2) insufficient quality of food; and (3) insufficient food intake and its physical consequences. The standardized questionnaire consists of nine occurrence questions representing an increasing level of severity of food insecurity, and nine "frequency of occurrence" questions that are asked as a follow-up to each occurrence question to determine how often the condition occurred. The frequency of occurrence question is skipped if the respondent reports that the condition described in the corresponding occurrence question was not experienced in the previous 30 days. Questions ask about respondents' perceptions of food vulnerability or stress, while others ask about behavioral responses to insecurity. The questions address the situation of all household members and do not distinguish adults from children or adolescents.

Exclusive breastfeeding from 0-5 months	Measured according to maternal report of giving the child breastmilk in the last 24 hours and not having fed the child any other liquid (water, tea, milk, infant formula, powdered milk) in the first 6 months of the child's life.
Continued breastfeeding from 12-15 months	Measured according to maternal report of having breastfed the child in the last 24 hours.
Dietary diversity score	Measured according to maternal report of foods that the child consumed in the 24 hours preceding the survey. A food group score (range 0-7) was then calculated based on consumption of foods from the following food groups: grains, roots, and tubers; legumes and nuts; dairy products (milk, yogurt, cheese); flesh foods (meat, fish, poultry, organ meats); eggs; vitamin A-rich fruits and vegetables; other fruits and vegetables. 1 point was assigned for each food group consumed.
Minimum dietary diversity	Defined as consumption of four or more food groups in the previous 24 hours
Minimum meal frequency	Defined as consumption of two meals for breastfed children 6-8 months; three meals for breastfed children 9-23 months; four meals for non-breastfed children 6-23 months.
Minimum acceptable diet	Defined as children who achieve minimum dietary diversity and minimum meal frequency.
Infant and young child feeding knowledge	Calculation of a score that assigns 1 point for each correct answer to eight questions on infant and young child feeding: how soon after birth a child should be put to the breast, whether children 0–6 months should be given anything other than breastmilk, feeding frequency for a 6- to 8-month-old child, feeding frequency for a 9- to 11-month-old child, feeding frequency for a 12- to 24-month-old child, types of nutritious foods that can be given to young children, feeding frequency and content during illness, feeding frequency and content after illness.

Appendix B: Child Morbidity in the 30 Days Preceding the Survey According to Cause of Illness

Province	Diarrhea	≥1 symptoms of acute respiratory infection	Malaria
Cabo Delgado	20.8	2.9	6.4
Inhambane	29.4	8.2	17.4
Manica	20.2	2.7	21.0
Nampula	20.2	1.8	25.4
Niassa	29.5	10.3	28.2
Sofala	34.1	10.1	26.4
Tete	28.3	11.0	19.4
Zambézia	19.5	0.4	11.2
Total	**25.0**	**5.8**	**19.8**

Appendix C: Handwashing with soap at five critical occasions (%), by Province

Province	Before cooking, %	Before eating, %	After feeding child, %	After cleaning child's feces, %	After using the latrine, %
Cabo Delgado	10.4	9.3	11.6	26.6	32.4
Inhambane	47.8	43.5	20.7	19.6	45.7
Manica	32.7	23.0	15.2	44.0	46.3
Nampula	22.4	21.5	21.9	37.3	42.5
Niassa	26.9	6.8	5.1	16.2	30.3
Sofala	26.4	12.0	19.7	40.4	40.4
Tete	20.9	20.9	19.9	26.2	36.7
Zambézia	0.4	0.4	0.0	19.1	6.6
Total	**23.3**	**16.7**	**13.9**	**29.0**	**34.8**

Appendix D: Child breastfeeding practices in the last 24 hours, by age

Child age (months)	Child received breastmilk in last 24 hours, %
0 a 1 mes	100.0
2 a 3 meses	99.1
4 a 5 meses	100.0
6 a 11 meses	99.7
12 a 17 meses	99.3
18 a 23 meses	97.9
24 a 35 meses	88.9

Appendix E: Observations of household hygienic environment, by Province

Province		Improved latrine?	Insects in and around the latrine?	Presence of handwashing station?	Soap or ash for handwashing available?	Animal feces in and around household?	Trash in and around household?	Animal presence near household cooking areas?
Nampula	Não	31.2	58.5	65.9	60.0	78.5	72.2	76.6
	Sim	55.6	91.2	25.9	34.2	19.5	26.8	17.6
Cabo Delgado	Não	62.5	61.3	42.3	61.9	73.2	71.4	72.6
	Sim	31.6	33.3	54.8	35.1	20.8	26.8	20.8
Niassa	Não	35.4	48.3	26.3	59.8	76.1	78.5	75.6
	Sim	60.3	47.4	68.4	35.9	21.1	20.1	16.8
Zambezia	Não	26.8	22.3	24.6	31.4	39.1	44.1	44.6
	Sim	20.5	17.7	14.6	6.4	14.1	21.8	25.9
Tete	Não	26.1	28.9	50.6	52.8	45.6	52.8	47.2
	Sim	40.0	41.1	18.3	16.1	37.2	35.0	35.0
Manica	Não	29.8	42.1	50.0	50.9	65.4	79.8	61.0
	Sim	35.5	21.1	12.7	11.4	19.3	15.8	22.4
Sofala	Não	41.1	16.3	42.1	44.2	31.6	53.7	40.0
	Sim	11.1	39.0	12.6	11.6	45.8	34.2	45.3
Inhambane	Não	62.2	30.1	59.6	62.8	46.8	47.4	48.1
	Sim	6.4	34.6	10.9	5.1	42.3	46.2	43.0