

I Introduction

The Sustainable Development Goals (SDGs) aim to eradicate stunting—defined as low height-for-age—which impairs optimal growth if not addressed within the first 1,000 days of life. However, progress has been slow in many developing countries^{1), 2), 3)}. In Malawi, stunting has posed a significant public health burden. Before and after the previous intervention periods in 2013 and 2016, children aged 6 months to 5 years were randomly selected from two sites: the intervention group (Manyamula) and the non-intervention group (Edingeni).

In response, the Mzimba South District Health Office, in collaboration with the Japanese NGO International Support and Partnership for Health (ISAPH), launched a nutrition project in 2018 with a focus on “the first 1,000 days”. A baseline survey revealed a high prevalence of stunting among children, as well as a skewed pattern of dietary diversity.⁴⁾ To address these issues, holistic interventions were implemented along with the Initiative for Food and Nutrition Security in Africa (IFNA), launched by the Japan International Cooperation Agency (JICA) in partnership with the African Union Development Agency (AUDA-NEPAD) during the Sixth Tokyo International Conference on African Development (TICAD VI) in 2016.

In Manyamula, the holistic interventions included:

- Farm coaching: Nutritious crops that were previously uncommon—such as carrots and orange-fleshed sweet potatoes—were introduced. Farmers received coaching from seeding to harvest, with an emphasis on the use of manure to improve yields.
- Cookery demonstrations: More than thirty new recipes were introduced. Beyond simply sharing recipes, the project organized cooking demonstrations in villages, inviting local residents. To promote sustainability, participants were asked to provide their own ingredients. The prepared dishes were shared

with children and their caregivers, including fathers, grandfathers, and grandmothers.

- Growth monitoring with Health Surveillance

Assistants (HSAs): Children in the villages were regularly monitored for height and weight.

Underweight children were followed up by government health service providers (HSAs).

After three years of interventions, nutritional status and dietary diversity were reassessed. There were no major famines or disasters during this period, apart from the COVID-19 pandemic.

II. Materials and Methods

Two sites were selected to compare the impact of the interventions. The intervention site was the catchment area of Manyamula Health Center, where the nutrition project was implemented. The control site was the catchment area of Edingeni Health Center, where a nutrition education project had been conducted between 2013 and 2016¹. Both catchment areas are adjacent and located near the border with Zambia. Surveys were conducted in 2018 and 2021, shortly after the harvest season, to assess and compare the nutritional status between the intervention and control groups. At baseline in Manyamula, 120 children aged 6 months to 5 years were randomly selected from the registration sheet. Children with congenital disorders were excluded. In Edingeni, 143 children were enrolled as the control group. At endline, 133 children in Manyamula and 78 children of the same age range in Edingeni were selected (Table 1).

	Number		
Manyamula	6 months - 2 y.o	2 y.o - 5 y.o.	total
<i>Base-line</i>	46	74	120
<i>End-line</i>	58	75	133
Edingeni			
<i>Base-line</i>	60	83	143
<i>End-line</i>	26	52	78

Table 1.

Participants at intervention site (Manyamula) and at the control site (Edingeni)

According to the previous survey cited as reference 4, Manyamula was originally a non-intervention area and Edingeni was an intervention area; however, after the intervention, the prevalence of stunting did not differ significantly between the intervention and non-intervention areas.

Caregivers of the selected children were interviewed using a semi-structured questionnaire administered by trained interviewers. The questionnaire collected data on Household Dietary Diversity Scores (HDDS) and socio-economic factors, following informed consent procedures. Minimum Dietary Diversity (MDD), based on established definitions (excluding breastfeeding), was calculated for each site.

Anthropometric measurements were conducted to assess nutritional status. All children were measured for height and weight, and Z-scores were calculated for height-for-age (stunting), weight-for-age (underweight), and weight-for-height (wasting). The risk factors of stunting were calculated with chi-square.

This study was approved by the Mzimba District Nutrition Coordinating Committee, an official body responsible for overseeing all nutrition-sensitive projects in the district and by the board of St Mary's hospital.

III. Results

The prevalence of malnutrition is presented in Table 2.

Intervention	Base-line			End-line		
	Stunting	Under Weight	Wasting	Stunting	Under Weight	Wasting
Manyamula						
6-23m	12/46 26.1%	6/46 13.0%	3/46 6.5%	12/58 20.7%	10/58 17.2%	4/58 6.9%
2-5yo	33/74 44.6%	11/74 15.1%	0/74 0.0%	23/75 30.7%	5/75 6.7%	1/75 0.7%
Sum	45/120 37.5%	17/120 14.3%	3/120 2.5%	35/133 26.3% p= 0.056	15/133 11.3%	6/133 3.8%
Control						
Edingeni						
6-23m	12/60 20.0%	6/60 10.0%	2/60 3.3%	46/2900.0% 26.9%	4613800.0% 15.4%	4604800.0% 3.8%
2-5yo	28/83 33.7%	6/83 7.2%	0/83 0.0%	19/52 36.5%	8/52 15.4%	0/52 0.0%
Sum	40/143 28.0%	12/143 8.4%	2/143 1.3%	26/78 33.3%	12/78 15.4%	2/78 1.4%

Table 2 Anthropometric change

At baseline, the prevalence of stunting among children was 37.5% in Manyamula and 28% in Edingeni. In

Manyamula, stunting decreased to 26.3% at endline, although the reduction was not statistically significant. In contrast, no improvement in stunting was observed in Edingeni. The number of underweight and wasted children remained low at both sites across both time points.

Characteristics of caregivers and study populations were compared between baseline and endline (Table 3).

		Manyamula			Edingeni		
		Base-line	End-line	p value	Base-line	End-line	p value
Sex ratio	Male /female	64/56 1.14	70/63 1.13	0.911	66/77 0.86	35/43 0.85	1.000
Birth Weight(g)	mean	3,000 87.5%	2,953 89.4%		3,330 90.1%	3,013 85.9%	
Biological Mother		105/120 87.5%	118/132 89.4%	0.638	127/141 90.1%	67/78 85.9%	0.352
Mother's age	mean	29.7	28.9		28.2	30	
Father		77/120 64.2%	85/132 64.4%	0.97	92/143 64.3%	52/78 66.7%	0.728
Grandfather		10/120 8.3%	3/132 2.3%	0.043	4/143 2.8%	5/78 6.4%	0.285
Income range	<20,000 Kw	78/120 65.0%	72/133 54.1%		88/143 61.5%	49/78 62.8%	
	20,000-50,000Kw	32/120 26.7%	36/133 27.1%		32/143 22.4%	9/78 11.5%	
	>50,000 Kw	10/120 8.3%	25/133 18.8%		23/143 16.1%	20/78 25.6%	
		2/120 1.7%	4/131 3.1%		3/143 2.1%	2/78 2.6%	
Education level	None	94/120 78.3%	103/131 78.6%		117/143 81.8%	57/78 73.1%	
	Primary	24/120 20.0%	24/131 18.3%		23/143 16.1%	19/78 24.4%	
	Secondary above						
		25/119 21.0%	69/133 51.9%	0.000	34/143 23.8%	29/78 37.2%	0.043
Smart phone		27/120 22.5%	62/133 46.6%	0.000	50/143 35.0%	28/78 35.9%	0.884
Solar panel		2/78 2.6%	2/8 2.5%		2/53 2.53	2/46 2.46	
Parity	mean	26/118 22.0%	29/132 22.0%	0.99	34/142 23.9%	18/78 23.1%	0.885

Table 3 Characters of children and their caregivers

The use of smartphones increased significantly over time. However, eating behaviors—such as plate sharing—remained unchanged. In Manyamula, baseline data showed that stunting was associated with factors such as child's gender, presence of the biological mother, and involvement of Grandfather. These associations were not observed at endline. Interestingly, at endline, stunted children aged 6 months to 2 years appeared to consume a more diverse diet than their non-stunted counterparts (Table 4).

	Gender (Male/Female)		Biological mother		Grand father		% Appropriate MDD	
	Stunting	WNL	Stunting	WNL	Stunting	WNL	Stunting	WNL
Baseline	32/13	32/43	9/45	6/75	7/45	3/75	20/44 -45.40%	31/75 -41.30%
p value	0.02		0.054		0.027		0.661	
End line	46/379	47/51	6/35	8/97	1/35	2/97	32/35 (91.4%)	58/98 (59.2%)
p value	0.071		0.143		0.787		0	

Table 4 Risk factors of stunting in Manyamula

Regarding Minimum Acceptable Diet Diversity (MDD) for children aged 6 months to 2 years—based

on the previous definition excluding breastmilk—the proportion meeting the criteria significantly increased from 33.3% to 62.1% in Manyamula. (Table 5).

Minimum Diet Diversity	Base-line	End-line	p value
Manyamula	15/45 33.3%	36/58 62.1%	0.05
Edingeni	33/60 55.0%	12/26 46.2%	0.488

Table 5 The ratio of appropriate MDD of 6 – 23 months

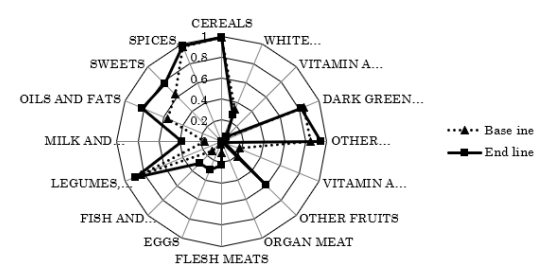
The target population was limited from 6 months to 2 years old children because of the definition of MDD. : WHO. Indicators for assessing infant and young child feeding practices: part 2: measurement. 2010 [cited 2016 Feb 22];

Although the overall HDDS distribution did not show dramatic changes, consumption of specific food items—such as oils, sweets, meat, eggs, fish, and milk—improved compared to baseline (Figure 1).

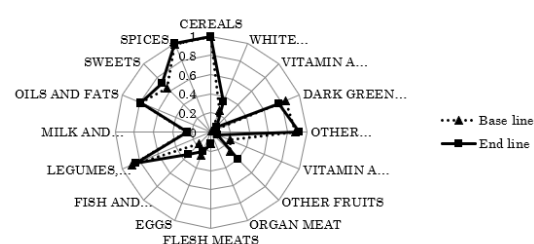
Figure 1

Food diversity in detail before aggregating HDDS, in 16 items

<Manyamula>



<Edingeni>



IV. Discussion

During the epidemic of COVID-19, the project continued without Japanese staff. Cooking Demonstrations were voluntarily continued by local staff, which was the crucial component. The potential indirect impact by COVID-19 is one of the limitations in interpreting the interventions. The number of samples at endline in Edingeni was unexpectedly low due to logistical constraints. To enhance statistical

reliability, children aged 2 to 5 years were included in the analysis to increase the sample size and credibility. Ultimately, the prevalence of stunting showed a tendency to improve, and dietary diversity generally increased at the intervention site, Manyamula.

The unexpected finding of higher Minimum Dietary Diversity (MDD) scores among stunted children compared to non-stunted children may be attributed to the Supplemental Feeding Program, which likely contributed to increased food variety that happened to be consumed within the previous 24 hours. However, since the MDD score in this study was based on the previous definition excluding breastmilk, the potential influence of breastfeeding practices should also be considered. It is possible that increased consumption of multiple food items may have been accompanied by a reduction in continued breastfeeding up to 2 years of age, which could have influenced the observed nutritional outcomes. The HDDS survey method to calculate MDD has the limitation to elucidate what children habitually consume.

On the other hand, the proportion meeting appropriate MDD increased. This may suggest that the intervention successfully reached the children most in need, taking into consideration the point that growth improvement often requires a long period of time. At endline, previously identified risk factors—such as gender and absence of the biological mother—were no longer statistically significant. This suggests that nutrition education targeting caregivers may have contributed to reduce stunting^{5),6),7)}

In Manyamula, stunting improved, whereas underweight and wasting did not show significant improvement. This pattern may suggest that the intervention primarily influenced dietary quality, micronutrient intake, and caregiving and living environments, thereby affecting chronic growth faltering, rather than providing high-calorie supplementation aimed at correcting acute energy

deficiency.

Five proven measures to reduce stunting have been identified by global initiatives <https://www.lift-fund.org/en/lift-voices/five-proven-measures-reduce-stunting>,

- 1.Community-engaged nutrition campaigns and sustained political commitment
- 2.Strong leadership
- 3.Enabling policy and legislation
- 4.Multi-sectoral, evidence-based interventions delivered at scale with robust monitoring
- 5.Maternity cash transfers, adequate and well-prioritized financing, and continued community engagement

According to the 2029 policy framework, our community-based approach in Manyamula addressed components 1, 2, and 3. The “first 1,000 days” theory emphasizes that interventions should not only target children but also support mothers and adolescent girls who will become future mothers.⁸⁾ Also, the market has been suggested to be a major issue in reducing stunting.⁹⁾

In this project, some fathers actively participated in cookery demonstrations and repeatedly prepared new recipes. Considering gender dynamics, the strategy adopted was culturally appropriate and well-received within the Malawian context. Therefore, cookery demonstrations in addition to farm coaching played an important role.

V. Conclusion

The nutrition project implemented in collaboration with IFNA demonstrated promising outcomes in improving dietary diversity and reducing stunting among children in Manyamula. These findings suggest that similar community-based, multi-sectoral interventions can be scaled across Malawi to sustainably improve child nutrition nationwide. Integrated strategies—centered on the first 1,000 days

and supported by community engagement—hold strong potential to achieve long-term nutritional security for Malawian children.

Acknowledgements

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