ZAMBIA SCALING UP NUTRITION (SUN) / FIRST 1000 MOST CRITICAL DAYS PROGRAMME (MCDP) II

2022 MIDLINE SURVEY REPORT

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MIDLINE SURVEY REPORT

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ACKNOWLEDGEMENTS

The Government of Zambia, through the National Food and Nutrition Commission (NFNC), acknowledges the support rendered by partners during the 2022 Midline Survey of Zambia's Scaling Up Nutrition / First 1000 Most Critical Days Phase 2 (SUN/MCDP II) programme. Gratitude is extended to the Ministry of Health, NFNC's parent ministry, for providing technical and logistical support during the survey.

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Finally, the Commission also appreciates the participation of field workers who worked tirelessly during the data collection phase. The survey would not have been possible without the concerted effort and dedication of the field workers. We are grateful to the communities and respondents, without whose cooperation this survey would not have been possible.

ACRONYMS

BMI	Body Mass Index
CDD	Child Dietary Diversity
COVID	Coronavirus Disease of 2019
CSI	Coping Strategy Index
DHS	Demographic Health Survey
CLTS	Community-Led Total Sanitation
EA	Enumeration Area
ENA	Essential Nutrition Actions
FAO	Food and Agricultural Organization
GIZ	German Agency for International Cooperation
GRZ	Government of the Republic of Zambia
HAZ	Height for Age Z-score
HH	Household
HDD	Household Dietary Diversity
HFIAS	Household Food Insecurity Access Scale
IAPRI	Indaba Agricultural Policy and Research Institute
IFA	Iron and Folic Acid
IYCF	Infant and Young Child Feeding
LBMI	Low Body Mass Index
LCL	Lower Confidence Limit
MAD	Minimum Acceptable Diet
MCDP	Most Critical Days Programme
MER	Monitoring, Evaluation & Research
MDD-H	Minimum Dietary Diversity for Households
MDD-W	Minimum Dietary Diversity for Women
NFNC	National Food and Nutrition Commission
NGO	Nongovernmental Organisation
OR	Odds Ratio
ORS	Oral Rehydration Solution
QC	Quality Controller
QCA	Qualitative Comparative Analysis
RPA	Readiness and Performance Assessment
SBCC	Social Behaviour Change Communication
SD	Standard Deviation
SUN	Scaling Up Nutrition
SUN LE	Scaling Up Nutrition Learning and Evaluation
SUN TA	Scaling Up Nutrition Technical Assistance
TDRC	Tropical Diseases Research Centre
TWG	Technical Working Group
UCL	Upper Confidence Limit
UNC	University of North Carolina at Chapel Hill
UNICEF	United Nations Children's Fund

USAID	United States Agency for International Development
WASH	Water, Sanitation, and Hygiene
WAZ	Weight for Age Z-score
WHZ	Weight for Height Z-score
WRA	Women of Reproductive Age
WHO	World Health Organization
ZDHS	Zambia Demographic and Health Survey

EXECUTIVE SUMMARY

The 2019 baseline and 2022 midline surveys were designed to measure progress in implementing the Scaling Up Nutrition / First 1000 Most Critical Days Phase 2 (SUN/MCDP II) programme. The goal of the programme is to reduce the prevalence of stunting among children 0-23 months through high-impact multi-sectoral nutrition-specific and nutrition-sensitive interventions. The midline survey was conducted between June and August 2022, three years after the baseline survey, and assessed changes in 27 key indicators overall and at the district level. Both surveys used a cluster sampling approach, targeting 8,000 households with children aged 0-23 months (250 households in each of the target 32 districts).

Key Findings

The 2022 midline survey showed significant improvements in household access to water and basic sanitation from the baseline. Access to drinking water increased from 36.9% to 52.4%, representing a significant 15.5%-point improvement in 3 years. Access to drinking water improved in 26 out of the 32 SUN/MCDP II target districts. Similarly, access to basic sanitation significantly improved from 14.2% to 21.1%, representing a 6.9% increase in 3 years. Both rural and urban households reported comparable improvement levels in 23 out of the 32 districts. However, households' practice of essential hygiene actions remained low at midline (6.6%), although it improved slightly from the baseline (5.5%).

The midline survey observed a decline in most food security indicators, such as food production and consumption. The proportion of households producing crops declined significantly from 71.6% at baseline to 65.2% ($p<0.001$) at midline. Likewise, those that owned livestock significantly declined from 58.8% to 53.0% ($p<0.001$) in 3 years. Crop production declined in 22 of 32 districts, and livestock ownership declined in 23 of 32 SUN/MCDP II districts. While food production declined in many districts, there was a significant increase in households selling and bartering crops and livestock from their own production – from 62.5% at baseline to 66.8% at midline, representing a 4.3%-point increase in 3 years. Selling of nutritious crops and livestock that household produced or owned increased in 23 out of the 32 SUN/MCDP II districts. Further, households' experience of severe hunger rose from 43.4% at baseline to 46.7% at midline.

The survey showed inconsistent adherence to infant and young child feeding (IYCF) standards at household level. A slight increase in exclusive breastfeeding of children under 6 months old was observed, from 68.4% at baseline to 69.6% at midline, representing a 1.2% increase in 3 years. Exclusive breastfeeding improved in 18 of the 32 SUN/MCDP II districts. However, minimum acceptable diet (MAD) for children 6-23-month-old deteriorated from 18.9% at baseline to 14.6% at midline, representing a 4.3%-point drop in 3 years. MAD deteriorated in 23 out of the 32 SUN/MCDP II districts. In addition, a decline in children reached with at least 90% of nutrition-specific interventions was observed from 18.5% to 11.1% between baseline and midline. Only 5 out of 32 districts noted improvements in the proportion of children that accessed at least 90% of the nutrition-specific interventions for children, either directly or through the mother.

The nutrition status of children 0-23 months of age generally deteriorated over the 3 years. Overall, the stunting prevalence of children 0-23 months old significantly increased from 30.1% at baseline to 33.7% at midline ($p<0.001$), the proportion of underweight children increased from 10.0% to 11.1% ($p<0.001$), while wasting barely declined from 3.4% to 3.3%. Stunting prevalence declined in only 10 out of the 32 districts, underweight prevalence declined in 10 districts, while wasting declined in 15 of the 32 SUN/MCDP II districts. Additionally, anaemia assessment at midline showed that 62.3% of children 0-23 months old were anaemic, with more males (64.3%) being anaemic than females (60.9%) ($p<0.001$). Anaemia was more prevalent among rural children (63.2%) than among urban children (61.3%).

Further analysis of the factors associated with stunting showed that the likelihood of stunting was higher among children where the household head was older (OR= 1.403; p>0.1), but less likely among children in households where the head was on salaried employment (OR=0.732; p>0. 1) or where the child was born to a mother aged 20-24 (OR=0.582; p<0.01) compared to teenage mothers. Older children aged 18-23 months and those aged 12-17 months were more likely to be stunted compared to children younger than 12 months (OR=2.03; p>0.1 and OR=3.055, p>0.1, respectively). In contrast, the likelihood of stunting was lower among children whose mothers used any form of modern family planning method compared to those whose mothers did not (OR=0.855; p>0.1).

An assessment of the relationship between child stunting and SUN/MCDP II service delivery to households showed that improvements in at least four of five key indicators resulted in stunting reduction at district level, i.e., (1) minimum dietary diversity for women, (2) minimum meal frequency for children, (3) child dietary diversity, (4) access to basic water, and (5) access to basic sanitation.

The midline analysis shows that improvements in certain indicators – minimum dietary diversity for women and child dietary diversity (particularly minimum meal frequency) – combined with improved access to basic drinking water and basic sanitation were necessary conditions for stunting reduction at district level.

Although not assessed in the survey, it is likely that the effect of the COVID-19 pandemic, a general economic downturn in Zambia, and reduced agricultural production during and preceding the midline survey period could have contributed to the lack of progress in stunting reduction and other indicators.

In conclusion, the 2022 midline survey observed notable achievements in access to basic drinking water and improved sanitation facilities at the household level, while deterioration was observed in food security indicators. Similarly, poor adherence to IYCF practices was noted, coupled with low coverage of nutrition interventions at the household level. The combination of the above factors could have contributed to the deterioration in nutrition status, especially stunting among children 0-23 months old, over the 3 years since the 2019 baseline. Our further analysis shows that a combination of household-level factors, service delivery, and adherence to IYCF practices are critical to reducing stunting at the district level, underscoring the importance of convergence of interventions at the household level.

We recommend greater emphasis in scaling up high-impact nutrition interventions as a package delivered using a multi-sectoral approach. Effective strategies to catalyse social behaviour change among households, including interventions that target young mothers, are recommended to improve adherence to recommended practices. Further, fast-tracking targeted iron fortification of complementary foods or major foods consumed by women and children to address nutrient gaps is crucial in addressing malnutrition, including incidence of anaemia. Further, increased investments in climate change mitigation measures, pest control, and other measures to contain environmental shocks are required to improve food security and household resilience.

Table 1. Summary of SUN/MCDP II Key Indicators

Indicator	Baseline			Midline			Change	p-value
	%	LCL	UCL	%	LCL	UCL		
GOAL: Reduced stunting among children under 2 years of age								
Percent of children under age 2 who are stunted	30.1	29.1	31.2	33.7	32.6	34.7	3.6	0.000**
Percent of women with low BMI (by age)	7.4	6.8	8.0	7.0	6.4	7.6	-0.4	0.330
Percent of children under age 2 who are underweight	10.0	9.3	10.6	11.1	10.5	11.9	1.1	0.016**

Indicator	Baseline			Midline			Change	p-value
	%	LCL	UCL	%	LCL	UCL		
Percent of children under age 2 reached with community-level nutrition-specific interventions	18.5	17.7	19.4	11.1	10.4	11.8	-7.4	0.000***
Objective 1: Adequate quantity and quality of dietary intake among target groups								
Percent of HHs with moderate or severe hunger	76.3	75.4	77.2	74.1	73.1	75.1	-2.2	0.001**
Intermediate Result 1: Increased reliable access to safe, nutritious foods								
Prevalence of HHs practising safe food processing/preparation /improved storage practice	7.6	7.0	8.2	10.8	10.1	11.5	3.2	0.000***
Prevalence of women of reproductive age who consume targeted nutrient-rich value chain commodities	33.8	32.7	34.9	35.0	33.9	36.0	1.1	0.136
Women's dietary diversity: Mean number of food groups consumed by women of reproductive age	4.6	4.6	4.7	4.7	4.6	4.7	0.1	0.005
Percent of HHs selling or bartering nutritious crops that they grew	62.5	61.3	63.7	66.8	65.5	68.0	4.3	0.000***
Percent of HHs producing safe and nutritious foods (crops and livestock) for consumption	47.3	46.2	48.4	30.8	29.8	31.9	-16.5	0.000***
Percent of HHs with a recommended diet diversity	19.3	18.4	20.2	18.2	17.4	19.1	-1.1	0.076
Percent of HHs reporting stronger resilience to lean season and environmental shocks	39.5	38.4	40.7	42.3	41.1	43.5	2.8	0.002***
Intermediate Result 2: Adoption of better child feeding and household hygiene practices								
Percent of HHs practising essential hygiene actions	5.5	5.0	6.0	6.6	6.0	7.1	1.1	0.004***
Percent of HHs practising essential nutrition actions	18.6	17.8	19.5	26.5	25.6	27.5	7.9	0.000***
Percent of children exclusively breastfed to 6 months	68.4	66.4	70.5	69.6	67.5	71.5	1.2	0.440
Percent of children less than age 2 meeting minimal standards for IYCF	28.3	27.3	29.3	29.0	28.0	30.0	0.7	0.343
Objective 2: Adequate health conditions for biological utilisation of nutrients								
Percent of children less than age 2 who had diarrhoea in the preceding 2 weeks.	35.1	34.0	36.1	27.4	26.4	28.4	-7.7	0.000***
Intermediate Result 3: Improved delivery of effective, sustainable health and nutrition services								
% of women using modern family planning methods	53.5	52.4	54.6	73.7	72.7	74.6	20.2	0.000***

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval. *** statistically significant change (p<0.05)*

	Improved
	Worsened

1 INTRODUCTION

1.1 Background

Malnutrition among women of childbearing age and children under five years is a major public health problem worldwide. Malnutrition manifests as stunting, underweight, wasting, overweight, and other micronutrient deficiencies such as anaemia. Globally, it is estimated that in 2022, 148.1 million children under five years (22.3%) were stunted, 45 million were too thin for their height (6.8%) (wasting), and 37.0 million (5.6%) were too heavy for their height (overweight)[1]. Africa and Asia bear the highest burden of malnutrition and stunting. In 2022, nearly all children under 5 affected by stunting lived in Asia (52%) and Africa (43%).

Stunting, or being too short for one's age, is a form of undernutrition defined as height greater than two standard deviations below the World Health Organization (WHO) child growth standards median. Evidence shows that stunting has serious negative consequences on the individual and the broader population of a country. Early childhood stunting is associated with an increased risk of short-term morbidity and mortality, non-communicable diseases later in life, and reduced learning capacity and productivity[2]. Stunting can begin in utero and continue through the first two years of life, with rates peaking between 18-24 months of age.

Stunting has declined steadily since 2000 – but faster progress is needed to reach the World Health Assembly target of reducing stunting prevalence by 40% by 2025[3]. Zambia has persistently high proportions of under-nourished children despite improvements from 2013 to 2018 in key nutrition indices (stunting, wasting, and underweight)[4]. During this period, stunting among children under 5 years decreased from 40% to 35%, wasting decreased from 6% to 4%, and the proportion of underweight children decreased from 15% to 12%. However, Zambia's stunting level is still too high if it is to achieve the goal of reducing the prevalence to 25%, in line with the World Assembly target. To this end, the country has set up frameworks and programmes targeting child undernutrition.

Recognising the importance of better nutrition in human and national development, the Government Republic of Zambia (GRZ), through the Scaling Up Nutrition (SUN) initiative, initiated the First 1000 Most Critical Days Programme (MCDP) implemented through six key line ministries (Box 1) with support from

SUN/MCDP II Goals and Strategic Objectives

Goals:

1. Reduce stunting among children < 2 years from 40% to 25%
2. Contribute to the achievement of the SDGs Goals

Strategic Objectives:

1. Improve Policy, Coordination, Financing and Partnerships
2. Improve the Coverage and Quality of Priority Nutrition Interventions for Stunting Reduction
3. Strengthen Capacity of Institutions, Systems and Management
4. Improve Advocacy for Stunting Reduction
5. Improve Monitoring, Evaluation, Research, Learning and Adaptive Management

[1] Joint child malnutrition estimates 2023 — levels and trends | UNICEF TransMonEE

[2] Black, R.E. et al. 2013. Maternal and Child Undernutrition and Overweight in Low-Income and Middle-Income Countries. The Lancet. Vol. 382, pp. 427–451. https://doi.org/10.1016/S0140-6736(13)60937-X

[3] https://www.who.int/teams/nutrition-and-food-safety/global-targets-2025

[4] Central Statistical Office (CSO) [Zambia], Ministry of Health (MOH) [Zambia], and ICF International. 2018. Zambia Demographic and Health Survey. Rockville, Maryland, USA: Central Statistical Office, Ministry of Health, and ICF International. https://dhsprogram.com/pubs/pdf/FR361/FR361.pdf

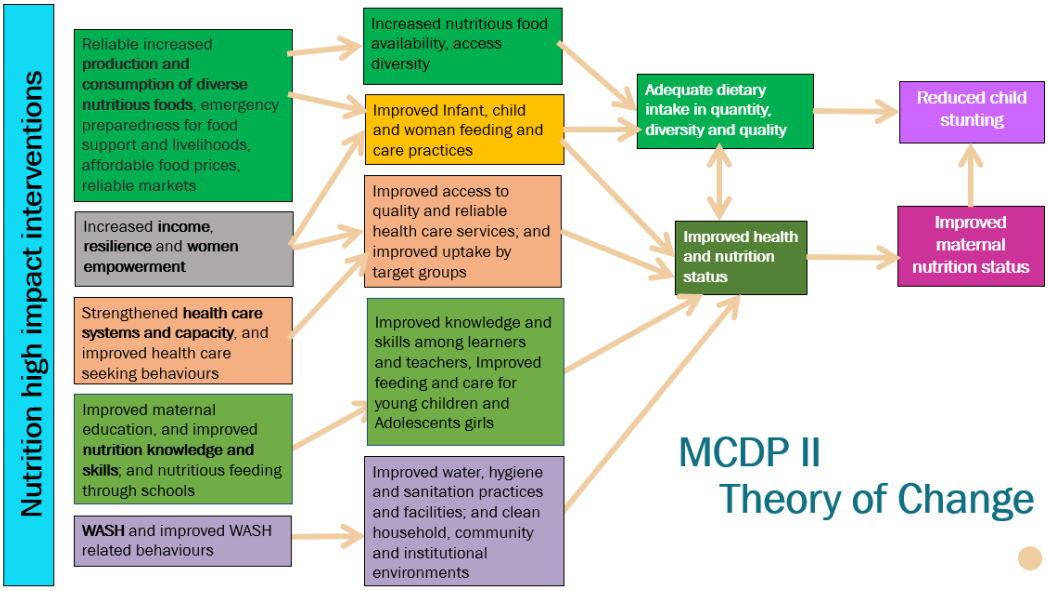
partners since 2013[5]. SUN/MCDP focuses on delivering a range of multi-sectoral high-impact nutrition interventions to decrease Zambia's high rates of stunting among children less than 2 years.

Box 1. Key Line Ministries implementing SUN/MCDP II

1. Health
2. Agriculture
3. Livestock and Fisheries
4. Education
5. Water Development and Sanitation, and
6. Community Development and Social Services

SUN/MCDP's first phase, implemented in 15 districts, concluded in 2017. The second phase of MCDP commenced in 2018 with 30 districts (15 districts from the first phase plus 15 new ones). However, the programme has since expanded to a total of 42 districts by 2022 (Table 2), with plans to scale up nationwide (Figure 3). The impact pathways in the SUN/MCDP II Theory of Change (Figure 1**)** illustrates how high-impact nutrition interventions will interact to achieve improved child and maternal nutrition status.

Figure 1. SUN/MCDP II Theory of Change

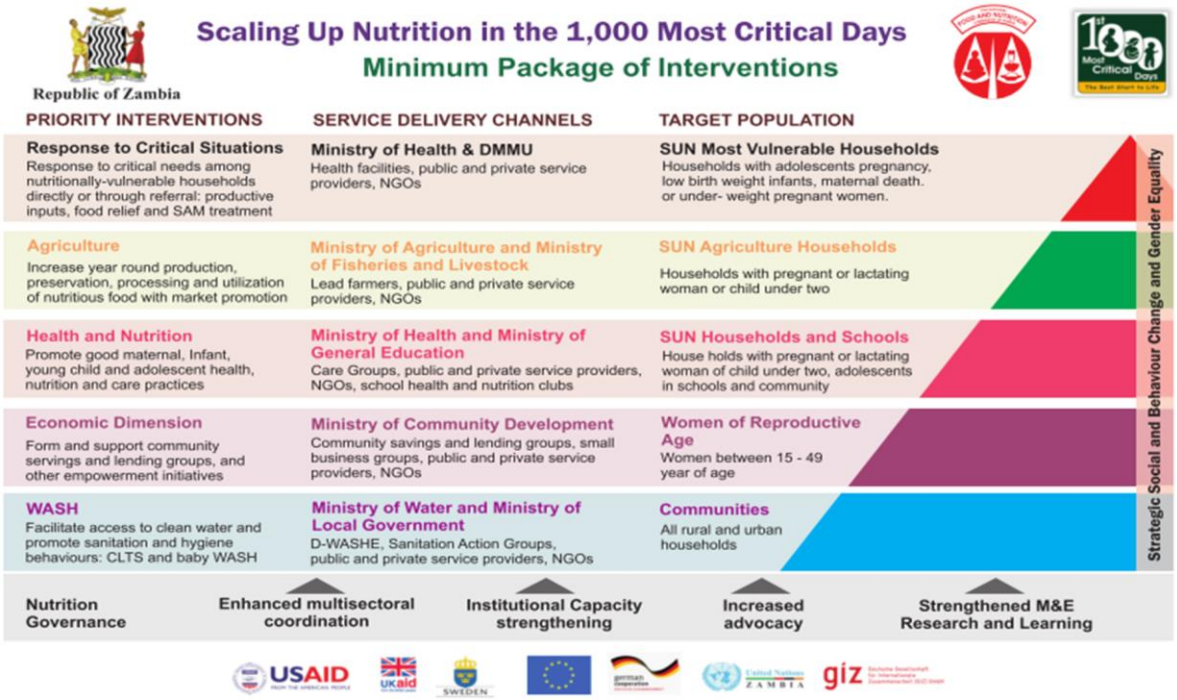


SUN/MCDP II aims to reduce stunting by 14 percentage points over 7 years (approximately 2% reduction per year) between baseline (2019) and endline (2026). Specific target groups for priority interventions, and service delivery channels, are summarised in the SUN/MCDP II Pyramid of Interventions (Figure 2).

The USAID-funded Scaling Up Nutrition Learning and Evaluation (SUN LE) project is mandated to track the progress of SUN/MCDP II by conducting baseline, midline, and endline surveys in the SUN/MCDP II target districts. Under the leadership of the NFNC, a baseline survey was conducted in June-July 2019 to assess the status of 26 key indicators, which are the focus of SUN/MCDP II. The 2019 Baseline Survey established benchmarks for the SUN/MCDP II indicators to be tracked at midline and endline surveys.

[5] The First 1000 Most Critical Days Programme (MCDP) II. "Zambia's Five-Year Flagship Stunting Reduction Programme me". 2018-2022. DRAFT. http://www.nfnc.org.zm/download/file/fid/536

Figure 2. Pyramid of SUN/MCDP II interventions by line ministries and funding agencies



The 2022 SUN/MCDP II midline survey, as well as the 2019 baseline survey, were carried out in 32 districts of Zambia, as listed in Table 2**.**

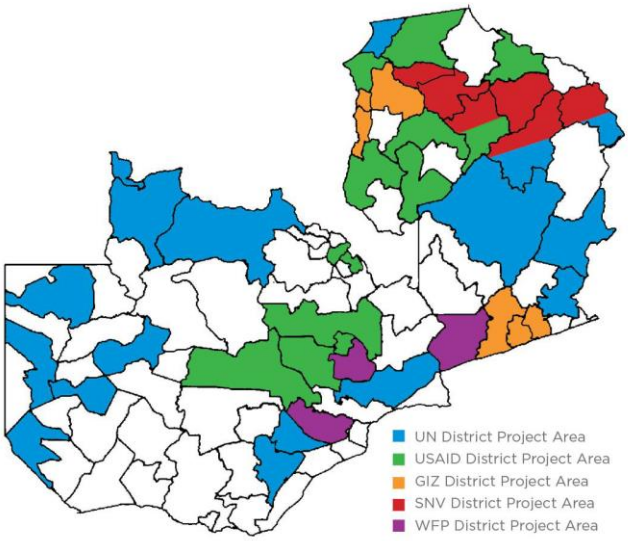
Table 2. SUN/MCDP II districts

Province	Baseline and midline districts (n=32)	Additional SUN/MCDP II districts (n=12)*
Central	Chibombo, Kabwe, Kapiri Mposhi, Mumbwa	Chisamba
Copperbelt	Ndola, Kitwe	
Eastern	Chipata, Lundazi, Petauke, Katete	Sinda, Nyimba
Luapula	Mansa, Samfya, Nchelenge, #Mwense, #Kawambwa	Chiengi, Mwansabombwe
Lusaka	Lusaka	Chongwe
Muchinga	Chinsali, Isoka, Mpika	
Northern	Kaputa, Kasama, Mbala, Luwingu,	Mporokoso, Lunte, Mungwi
North-western	Solwezi, Mwinilunga, Zambezi	
Southern	Choma, Monze	Mazabuka
Western	Kaoma, Mongu, Shang'ombo, Kalabo	

* The SUN/MCDP II program has been rolled out in these districts through the support of implementing partners, but they were not part of the baseline or midline surveys.

#Data collection and analysis in these districts were supported by the German Agency for International Cooperation. Data were collected around the same time as other districts and the same tools and approaches were used.

Figure 3. SUN/MCDP II implementing districts by supporting partners/donors



1.2 Midline Survey Objectives

The Midline Survey's purpose was to track the performance of key SUN/MCDP II indicators over the 3 years of programme implementation since the baseline survey conducted in 2019.

Specifically, the survey aimed to:

1. Track the performance of child and maternal nutrition status – stunting, wasting, underweight, maternal BMI, and anaemia
2. Track the performance of other determinants of maternal and child nutritional status, such as household food security, access to water and sanitation, coverage and reach of nutrition interventions, and
3. Provide recommendations on areas that need improvement

2 METHODS

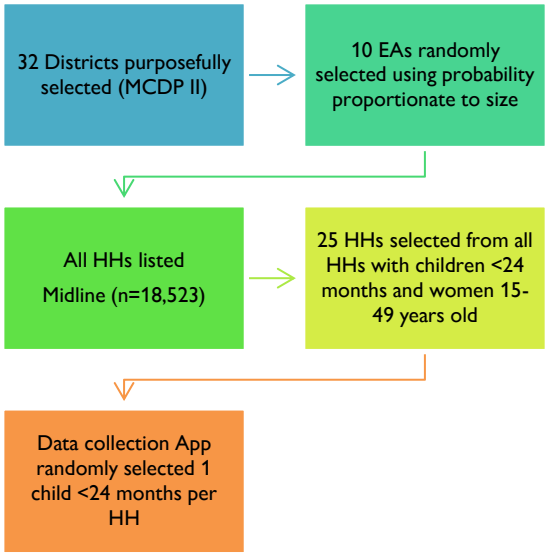
2.1 Midline Survey Sampling Design

The household surveys (baseline, midline, and endline) are designed as repeated cross-sectional surveys.

***Sample calculation*:** The 2022 midline survey used the same sample size as drawn at the 2019 baseline. The sample size was calculated based on the 2018 ZDHS prevalence of stunting at 35%, and an anticipated 14% reduction in stunting over a period of 7 years. The design effect of 1.305 was used to adjust for the sample size (as used in ZDHS 2018). Taking into account these parameters, a sample of 8,000 was determined. To ensure that each of the 32 SUN/MCDP II districts had representation in the sample, an equal distribution of the sample across all districts was made. Therefore, each district had a sample of 250 households[5].

Sample Selection: The survey targeted 32 districts across the 10 provinces (Table 2). In each district, 10 enumeration areas (EAs), with 25 households in each EA, were surveyed, yielding a sample of 250 households per district (Figure 4). The 10 EAs in each district were systematically selected using probability proportional to size (PPS) from the ordered list of EAs on the census 2010/2020 sampling frame. The "size" of each EA was based on the number of households in the EA, such that the more households in an EA, the higher the chance of that EA being selected.

Figure 4. Sampling process



To ensure representation from the whole district, the sampling frame was sorted by district, constituency, ward, rural/urban, Census Supervisory Area, and EA. This is a form of implicit stratification since these variables in the frame follow geographical ordering. An SPSS© software syntax was programmed for the selection process. This sample size was determined to ensure sufficient power to detect a 14% reduction in the primary outcome of the SUN/MCDP II programme (reduction in stunting) from baseline to endline, in keeping with the SUN/MCDP II objective of reducing stunting by 14 percentage points in 7 years (or 2% per year).

Note that the results presented in this report are not weighted. Sample weights were not obtained during baseline survey but were obtained in the midline survey. We compared weighted and unweighted results at midline and found minimal differences. This is because the PPS sampling approach already accounts for the population size.

***Household Selection*:** In each EA, all households with children less than 2 years were listed. The household lists were entered into an excel spreadsheet programmed to randomly select 25 households. Five (5) additional households were also randomly selected, per EA, as potential replacements for instances of non-response. In cases where a selected EA had fewer than 25 eligible households, or when the sample could not be met due to non-availability of residents, an adjacent EA with a similar socio-economic profile was randomly selected, and all households in that EA were listed. Household lists from both EAs were combined, and a sample of 25 households was randomly selected from the new list as described above. A total sample of 7,999 households were surveyed at midline (and 7,986 at baseline) from a targeted 8,000 in each survey.

In each sampled household, only one child (age 0-23 months) was selected as the focus of the survey. Where a household had more than one eligible child, one child was randomly selected as programmed in the data collection software (Survey Solutions). The child's biological mother/caregiver was then purposively selected for the interview for the mother and child sections of the questionnaire. If the biological mother did not live in the household, the child's adult caretaker (preferably a female aged 15-49 years old) was selected. Where more than one woman met the eligibility criteria, the child's primary caregiver was selected. The biological mother or the primary caregiver of the child was interviewed, and anthropometric measurements (height/length and weight) of both the child and biological mother were taken. Anaemia testing for the mother and the selected child was also conducted.

We conducted an ex-post power analysis of the midline survey results and found that at national level, our minimum detectable effect size (MDES) for stunting is 3% (using the baseline mean of 30.1%), and at district level it is 10%. This implies that although we have more statistical power than anticipated at district level, we can only report changes of 10% and above as statistically significant changes.

2.2 Ethical Approval

The survey protocol was submitted to the University of Zambia Biomedical Research Ethics Committee for ethical review and approval. Approval for the baseline survey was granted on 2 April 2019 and renewed for the midline survey on 28 March 2022 (ref No. 017-03-19). The midline survey protocol was also approved by the National Health Research Authority on 3 February 2022 (ref No: NHRA 000018/03/2022).

2.3 Data Collection Tool

The household questionnaire for the midline was designed in a participatory manner involving all SUN/MCDP II stakeholders through the national monitoring and evaluation technical working group (M&ER TWG) on nutrition. The baseline questionnaire was circulated to all stakeholders to review and provide input, followed by a review workshop with all stakeholders to obtain consensus on indicators and questions to be assessed. The workshop decided to not change baseline questions but rather suggested additional questions.

In addition, various national-level review meetings for design, survey planning, analysis plan development, and enumerator training were held with six key line ministries involved in SUN/MCDP II (see Box 1), donors, and implementing partners (IPs). The meetings provided opportunities for stakeholders to provide input at different stages of the survey. These national-level meetings resulted in the inclusion of additional indicators and questions (while maintaining the baseline questions) into the questionnaire and the revision of the analysis plan.

The household questionnaire was designed to assess issues concerning the nutrition of women aged 15 to 49 years and children less than 2 years old. The questionnaire included questions on household identifiers; household demographic characteristics; socio-economic characteristics; access to financial services; social protection; household food security; water and sanitation; social behavioural change communication; dietary diversity; mother and child health; and nutrition.

The questionnaire was pre-tested by members of the MER TWG soon after design in Chingola District from 21-26 February 2022. This included field tests in Kalilo and Kabundi wards on 22 and 25 February 2022, respectively. Simulations in the local language (Bemba) were undertaken of different scenarios and different possible personalities of respondents. The pre-test involved physical interviews while taking into consideration the COVID-19 regulations.

Pre-test data was collected using tablets with the questionnaire programmed on the Survey Solutions software. Each team (consisting of two individuals) was allocated two households in each pre-testing area. After each field day, a meeting was held to provide feedback and discuss experiences regarding the time taken for interviews, household concerns, and any programming issues. Also discussed were the flow of questions and possible revisions to sections in the questionnaire to ensure better logical flow.

Experience from the field pre-test was used to update the questionnaire in readiness for stakeholders' validation. A final stakeholder meeting was held to review the pre-tested questionnaires and the analysis plan with the members of the M&ER TWG, who provided valuable inputs into the household questionnaire and the data analysis plan. The questionnaire was refined and finalised for training during this meeting. The analysis plan was also updated.

2.4 Fieldwork

2.4.1 Community Sensitisation – Midline Survey

One month before the survey, a sensitisation programme was conducted at national, provincial, and district levels and all communities in the 30 districts (not including Kawambwa and Mwense) to systematically maximise understanding, buy-in, and participation from all local authorities and communities selected for the survey. A national team from NFNC, with representatives from key line ministries, were oriented and supported to conduct the provincial- and district-level sensitisation and to facilitate the districts' plans for conducting community sensitisation meetings at community level through the district coordinating committees (DNCCs). Community sensitisation was necessary at midline survey to address any potential misunderstanding associated with blood draws for anaemia testing in children and women of reproductive age (WRA).

Community Sensitisation in Kapiri-Mposhi district- May 2022

DNCC representatives sensitised the community leaders and community members in the selected EAs about the survey. During these meetings, the purpose of the survey was explained, as were the procedures, the risks, benefits, and rights of the community regarding participation in the survey. Community members were allowed to seek clarification on the survey. The DNCCs further nominated a community volunteer in each of the selected EAs to work with the field teams during the field data collection period.

2.4.2 Recruitment and Training of Enumerators

A recruitment advert for field workers was shared on various online platforms from 15-31 March 2022. A total of nine thousand one hundred and fifty-six (9,156) applications were received by close of the advert. Using a programming code in Stata, all those that did not meet the minimum requirements for the survey were filtered out, and 144 qualified applicants selected for training. Among these were 15 nurses recruited to conduct anthropometric measurements and anaemia testing. For Mwense and Kawambwa, enumerators were selected from a pool of the Indaba Agricultural Policy Research Institute's (IAPRI's) database of enumerators. These enumerators were selected based on previous experience in conducting fieldwork with IAPRI in nutrition surveys.

Enumerator training was conducted at the Mika Convention Centre in Chongwe District from 9-18 May 2022 and Mika Hotel Kabulonga from 30 May- 6 June 2022 (for Mwense and Kawambwa teams). A total

of 78 data collectors, 15 supervisors, and 14 quality controllers participated in the 10-day training. The training was facilitated by 17 trainers from Khulisa, the Tropical Diseases Research Centre (TDRC), NFNC, the line ministries, and IAPRI. For Mwense and Kawambwa teams, a total of 10 data collectors, 2 supervisors and 2 quality controllers participated in the 7 days training which was facilitated by IAPRI and NFNC.

For the household questionnaire, training was facilitated by various subject matter specialists from the six-line ministries (see Box 1) who facilitated their respective sections of the questionnaire. Trainers led enumerators through each section of the midline survey questionnaire, with time devoted to role plays. Participation in the role plays was mandatory, and any identified issues were addressed. Role plays included simulations in various languages of different scenarios and different possible personalities of respondents. The participants were also given written and oral assessments to determine their level of understanding of the data collection instrument. For Mwense and Kawambwa, the training was conducted by IAPRI staff. The trainers led the enumerators through the questionnaire section by section, with time devoted to role plays as well. Participation during this process was mandatory and any identified issues were addressed.

Anthropometric measurement training was conducted over 5 days by the MOH and NFNC. This was segmented into one day of theory, one day of classroom role plays using models, a day of practice on children and women and a standardisation test, one day of community field testing, and one day of feedback. On the field practice day, trainees measured the height of the same child 10 times. A standardisation test was conducted among all the nurses. The standard measurement was conducted by the trainers (MOH and NFNC), and measurements taken by the enumerators were compared against this standard. Two enumerators, whose measurements varied from the standard by ±0.3 cm, were excluded from conducting anthropometric measurements in the field. For Mwense and Kawambwa, NFNC staff conducted both the theory and practical training with participants on how to conduct various anthropometrics (height and weight) and Mid Upper Arm Circumference (MUAC).

Anthropometric training in Lusaka – May 2022

Training for anaemia testing was led by the TDRC and was held over one day using the standard Ministry of Health anaemia testing protocol.

A final field test in Chongwe District on 16 May 2022, following the classroom theory sessions, was conducted by the data collectors and supervised by the training facilitators. Teams were sent to Chainda, Chalimbana, Kasenga, and Kapete communities in Chongwe District to conduct interviews. This represented a second pre-test of the survey instrument and took place from 09:00 to 17:00 to allow all trainees to have a broad experience administering the questionnaire. As with the first pre-test conducted by the M&ER TWG, anthropometric measurements were also taken, as were anaemia tests.

Feedback from the second pre-test was collected and used to improve the data collection tool, determine the competencies of the data collection teams and inform field work logistics. At the end of the training, a total of 5 enumerators were withdrawn from the data collection team because they did not perform to expectations during the classroom sessions, the role plays, or the pre-test. For Mwense and Kawambwa, the pretest of the survey instrument was done on 5 June 2022. The pretest ran from 09:00 to 17:00 to allow all the data collectors to have an extensive feel of the questionnaire. After the

pretest, the team spent some time discussing and collecting feedback from the pretest experiences. There were minor edits recommended for the survey instrument, and these were escalated to the instrument programmer. The final training day ended with an orientation for the quality controllers and supervisors. The orientation entailed introducing the team to the survey solutions platform for quality checks. The training was then concluded by addressing logistical issues.

2.4.3 Data Collection

Data were collected in 30 districts between 23 May and 7 August 2022 using a structured household questionnaire. For the two additional districts (Mwense and Kawambwa), the data collection period ran from 9 June to 10 July 2022.

As per the survey protocol, only households that voluntarily consented to provide information to the survey team were interviewed. The following processes were used for collecting each type of data:

1. Household information, nutrition practices, and access to services

   Information on household demographics and practices were collected through a mix of interviews and observations using the standard questionnaire. The target respondent for these sections were the head of the household or spouse. Specific questions related to child and women nutrition were targeted to the women or caregivers of the selected child.

2. Anthropometric data

   Anthropometric data was collected by measuring the weight, length, and mid-upper arm circumference. Weight was measured using SECA 874 digital scales and recorded to the nearest 0.1 kg. Length was measured using a wooden measuring board (at baseline) and SECA 417 Mobile Length Board (at midline) and recorded to the nearest 0.1 cm (or 1 mm). Age was determined by recording the child's date of birth as recorded in the child's under-five card into the survey software and calculating the age in months using the date of the interview. When a child's under-five card was unavailable, the mother or primary caregiver was assisted in recalling the date of birth as accurately as possible using major/memorable events.

   MUAC measurements were done on the mother and the under 24-month-old child using MUAC tapes supplied by the Ministry of Health and NFNC.

3. Biomarkers

   The survey collected anaemia data from mothers and children. Consent was requested from the woman for her anaemia test before conducting the test. Similarly, consent for testing the child for anaemia was obtained from the mother. Anaemia data were collected by first pricking the cleaned right finger of the child and the woman (with methylated spirit and clean cotton) then collecting the blood sample using a Hemocue machine. The first drop of blood was wiped off, and the test was based on the second drop of blood.

Fieldwork was undertaken by 17 teams, each with a supervisor, five enumerators (except for three teams with only four enumerators), and one nurse, except for Kawambwa and Mwense, because anaemia tests were not conducted in these two districts.

Local language proficiency was the basis of team and geographic assignments. Quality Controllers (QCs) assigned to teams provided remote data quality checks on completed questionnaires supervisors had already reviewed (except for Kawambwa and Mwense districts, where these checks happened in the field).

The survey was administered through one-on-one in-person interviews. Per COVID-19 regulations, enumerators were provided with disposable masks and hand sanitisers. Data was collected using tablets loaded with the questionnaire programmed in Survey Solutions. Each team was allocated 20 enumeration areas (EAs), except for Kawambwa and Mwense teams, which were allocated 10 EAs. Completed questionnaires were uploaded daily or as soon as network connectivity was available in cases where enumerated areas were outside internet coverage.

2.4.4 Data Quality Control

A four-tier data quality control mechanism was used to ensure high-quality data. At the first stage of quality control, each supervisor deployed in the field would check completed questionnaires immediately after enumerators finished their interviews. Call backs to households were made for any problems identified, such as incorrect or missing data.

At the second level of quality control, the QCs reviewed data electronically through the Survey Solutions platform before the data collection teams left a particular EA. Any identified problems were sent back to the supervisors for prompt call-backs to the households or for clarifications by the enumerators.

Household listing in Chipata district - 2022

Another level of quality control checks involved two rounds of high-level supervision visits. The first round of high-level supervision was conducted between 24 May to 7 June 2022, while the second took place from 2-17 July 2022. Supervision teams were mandated to observe the orientation of the EAs by the data collection teams, the listing and sampling of households, and the enumeration and collection of anthropometric measurements.

Lastly, the Survey Manager and Senior Researcher were also available throughout the survey period to provide supervisors and enumerators assistance with various survey situations, thus providing an additional layer of quality assurance.

2.5 Data Cleaning and Analysis[6]

Data cleaning was conducted using Stata v16, via a standardised syntax. Potential data errors were identified by running frequencies/cross tabs, and data was cleaned based on follow-ups and verification with concerned households, data collectors, and supervisors. Data cleaning also included the recoding of the 'other specified' responses.

Data were also analysed using Stata v16. Analysis mainly involved establishing descriptive values (percentages, mean, median, and standard deviations [SD]) for the indicators, disaggregated by district, region (urban/rural), and sex, where applicable. Z-scores for anthropometric data were generated using WHO's AnthroPlus software and the outputs were merged with household data in Stata. Changes in key indicators were evaluated utilising Chi-squared tests (for categorical variables) and t-tests (for continuous variables) to determine if statistically significant differences existed between the results in the baseline and midline surveys. Further, we conducted regression analysis to examine the effects of

[6] The full cleaned and analysed datasets will be uploaded onto USAID's Data Development Library (https://data.usaid.gov/) upon clearance of the final report.

background variables on selected outcome variables and the changes observed.

In early 2023, the midline survey's data analysis and data cleaning were reviewed and validated by the data science team at ICF (a SUN LE consortium partner) and involved reviews of preliminary tables, with a focus on large changes, sample characteristics, anthropometric measurements, and associated calculations of outcomes. Any identified error on data related to the analytic outputs or analysis syntax were corrected. Additional anthropometric data quality verifications were conducted by the Nutrition Department of the University of North Carolina (another SUN LE Consortium partner), an independent subject matter expert, and USAID. Combined, these reviews established that the anthropometric data was of good quality and could be used to assess the nutritional status of children. A summary of findings from these reviews are presented in Appendix 1.0.

In addition to the customary parametric analysis described above, the survey team also conducted Qualitative Comparative Analysis (QCA) [7,8] to identify a set of factors that could be associated with the changes in stunting prevalence at district level. QCA is an analytical technique developed in the 1980s for use in the qualitative study of macrosocial phenomena. QCA draws on both variable-oriented and case-oriented methodologies as a "means of bridging quantitative and qualitative analysis"[9]. It combines the use of quantitative techniques to identify patterns within the data with in-depth qualitative understanding of the cases and subject matter being studied. QCA is based on two primary assumptions: change is often the result of different combinations of factors, rather than on any one individual factor; and different combinations of factors can produce similar changes. QCA is a useful methodology for analysing multiple cases in complex situations to identify causal links and explain conditions under which changes happen[10]

The midline survey's QCA analysis involved five steps: 1) coding of district-level indicators associated with child nutrition status 2) identification of key factors/conditions associated with child stunting from the programme's theory of change (in this case the UNICEF conceptual framework), 3) Boolean analysis to identified important factors/ conditions, 4) running the QCA model with key factors/ conditions to identify stronger models to apply to the midline data analysis, and 5) analysing district data using an identified stronger model as critical for stunting reduction.

2.6 Survey Limitations and Challenges

The surveys faced a few challenges that could have impacted the results. Firstly, because the maps used were old (2010 census – which were the latest maps available at the time), the profiles of some EAs had changed in the intervening years. For instance, some EAs had changed from residential areas to commercial ones, making it difficult to obtain the required sample of 25 households with children less than 2 years old per EA. In cases where few households (<25) were listed in the selected EA, the fieldwork teams were assigned a randomly selected EA from the surrounding comparable EAs to

[7] QCA is an analytical technique that combines the use of quantitative techniques to identify patterns within one's data with in-depth qualitative understanding of the cases and subject matter being studied. The QCA methodology uses Boolean algebra to generate a set of inferences based on underlying data across multiple qualitative cases.

[8] Hanckel, B., Petticrew, M., Thomas, J. *et al.* The use of Qualitative Comparative Analysis (QCA) to address causality in complex systems: a systematic review of research on public health interventions. *BMC Public Health* 21, 877 (2021). https://doi.org/10.1186/s12889-021-10926-2.

[9] Cragun, Deborah, et al. "Qualitative comparative analysis: a hybrid method for identifying factors associated with program effectiveness." Journal of Mixed Methods Research 10.3 (2016): 251-272.

[10] Rubinson, Claude, Migara Jayawardena, Ryan Watkins, Joy Butscher, and Noureddine Berrah. 2022. Qualitative Comparative Analysis: Exploring Causal Links for Scaling Up Investments in Renewable Energy. IEG Methods and Evaluation Capacity Development Working Paper Series. Independent Evaluation Group. Washington, DC: World

complete the sample size, as described in Section 2.3.

Secondly, the midline survey followed the Covid-19 pandemic, which in addition to the direct consequences on health and morbidity, also affected different facets of life. The effect of COVID-19 on the sample is unknown. Since questions about Covid-19 were not included in the survey, the impact of the pandemic on the outcomes cannot be directly inferred.

Thirdly, as stated under the design section above, the district samples are powered to detect changes in stunting that are 10% or more from baseline to endline. Therefore, changes less than 10% in stunting reported at district level at the midline survey should be understood as trends and not interpreted as precise magnitudes of change.

Lastly, as with all cross-sectional surveys, causal relationships between outcomes of interest and underlaying factors cannot be determined directly. Nevertheless, the study team has conducted regression analysis and QCA as described earlier to identify factors that may be associated with child stunting and changes in the prevalence of stunting in the districts.

3 FINDINGS

3.1 Sample Description

The midline survey listed 18,523 households across all the selected EAs in the 32 districts, from which 10,577 eligible households were identified. Of these, 8,007 were randomly selected for interviews, as described above. Sixteen (16) interviews were incomplete (8 did not have exact date of birth for the child and 8 lacked vital information for merging household data sets with the rest of the data sets). These 16 cases were removed from the anthropometric analysis. However, the total sample was 7,999 households for the remaining analysis.

Household characteristics in the baseline and midline surveys were comparable across most variables, including distribution of children aged less than two years and sex of the household head (Table 3).

Table 3. Characteristics of the survey population at baseline and midline

Characteristic	Baseline	Midline
Household size		
≤ 5	45.9%	48.9%
10-Jun	49.1%	47.04%
11+	4.9%	4.1%
Age of HH head		
15-24	8.5%	9.4%
25-34	34.1%	33.8%
35-44	29.9%	29.3%
45-54	14.8%	15.4%
55-64	8.2%	7.1%
65+	4.6%	4.9%
Economic activity of HH head		
None	7.4%	4.7%
Farmer	50.2%	45.9%
Salaried	15.4%	12.3%
Self-employed	15.2%	19.4%
Businesswoman	5.3%	4.3%
Charcoal burning	1.7%	1.5%
Casual labour	6.4%	11.0%
Students	0.2%	0.2%
Other	1.5%	0.7%
Mother economic status		
Farmer	46.7%	42.2%
Formal employment (salaried)	3.6%	2.7%
Informal employment (self-employed)	8.1%	13.1%
Businessman/woman (commercial)	4.9%	4.1%
Charcoal burning	0.5%	0.4%
Casual labour	2.3%	5.0%
Student	2.1%	3.6%
None	31.1%	28.5%
Others specify	0.7%	0.4%

Characteristic	Baseline	Midline
Region		
Urban	31.7%	35.6%
Rural	68.3%	64.4%
Children < 2 years		
<6 months	25.9%	26.6%
6-8 months	13.7%	13.1%
9-11 months	13.8%	13.8%
12-17 months	24.0%	24.1%
18-24 months	22.7%	22.4%
Education level of HH head		
None	7.4%	7.1%
Preschool	1.4%	0.1%
Primary	39.7%	39.8%
Jr Secondary	24.3%	25.0%
Sr secondary	17.1%	20.4%
Higher	10.1%	7.6%
Gender of HH head		
Male	81.5%	79.1%
Female	18.5%	20.9%
Mother age group		
15-19	12.9%	14.0%
20-24	28.6%	29.1%
25-29	23.1%	23.8%
30-34	16.8%	15.7%
35-39	12.5%	11.9%
40-44	5.1%	4.8%
45-49	1.0%	0.7%

Characteristic	Baseline	Midline
Mother Marital Status		
Never married or lived together with a man or woman	16.7%	18.4%
Married (Monogamous)	67.9%	67.0%
Married (Polygamous)	5.9%	4.7%
Divorced	5.0%	5.5%
Widow / widower	1.3%	1.1%
Separated	3.1%	2.4%
Living with a man or woman but not married (Cohabiting)	0.1%	0.8%

Characteristic	Baseline	Midline
Mother highest education level		
None	9.0%	7.9%
Preschool	1.7%	0.1%
Primary	46.8%	45.8%
Jr Secondary	23.4%	25.3%
Sr Secondary	13.9%	17.0%
Higher	5.3%	3.9%

3.2 Household Food Security

Household food security indicators assessed at baseline and midline included:

- crop and livestock production
- production and consumption of crops and livestock from own production
- households bartering and selling of nutritious crops
- household food processing and preservation
- household dietary diversity
- household hunger experience, and
- household resilience to environmental shocks.

Results on each of these are described below.

3.2.1 Household Production

Production of Crops and Livestock

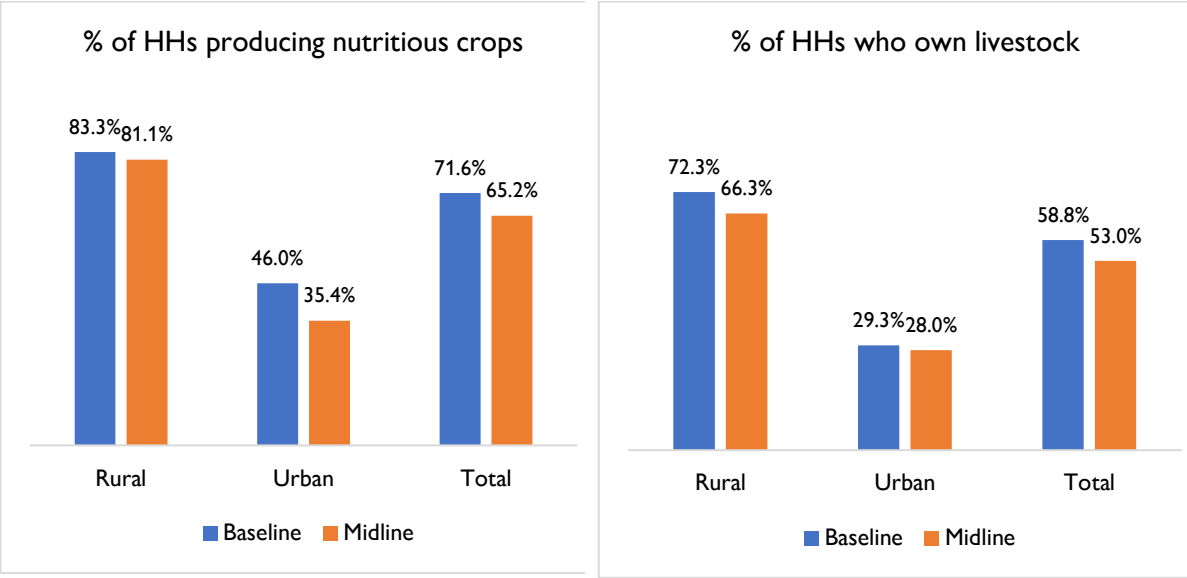
Agricultural interventions and food-based approaches have been noted to contribute to poverty reduction and improved nutritional status. Increased availability and consumption of nutrient rich foods through a household's own production is considered a sustainable approach because it empowers households to take ultimate responsibility for the quality of their diet through their own production.

The baseline and midline surveys assessed households' engagement in crop and livestock production. The proportion of households producing nutritious crops[11] declined from 71.6% at baseline to 65.2% ($p<0.001$) at midline. Likewise, those that owned livestock declined from 58.8% to 53.0% ($p<0.001$) (Figure 5).

Crop production declined in 22 out of 32 districts. Samfya, Chipata, and Nchelenge reported the highest decline in % of HHs producing crops, from 78.4% to 45.2; 82.6% to 53.6% and 86.3% to 65.7%, respectively. Chibombo, Mbala, and Shang'ombo reported an increase in households producing crops: 58.2 to 76, 65.6 to 84.8 and 66.0 to 75.2, respectively.

Livestock ownership declined in even more (23) districts. Again, Samfya, Chipata, and Lundazi reported declines in households producing/rearing livestock from 57.6% to 18.8 %, 68.8 % to 39.6 %, and 82.3 % to 60.4 %, respectively. Mwense, Kawambwa and Choma reported increased proportions of households producing/rearing livestock from 61.2% to 79.2%, 60.8% to 73.6%, and 55.1% to 70.0%, respectively.

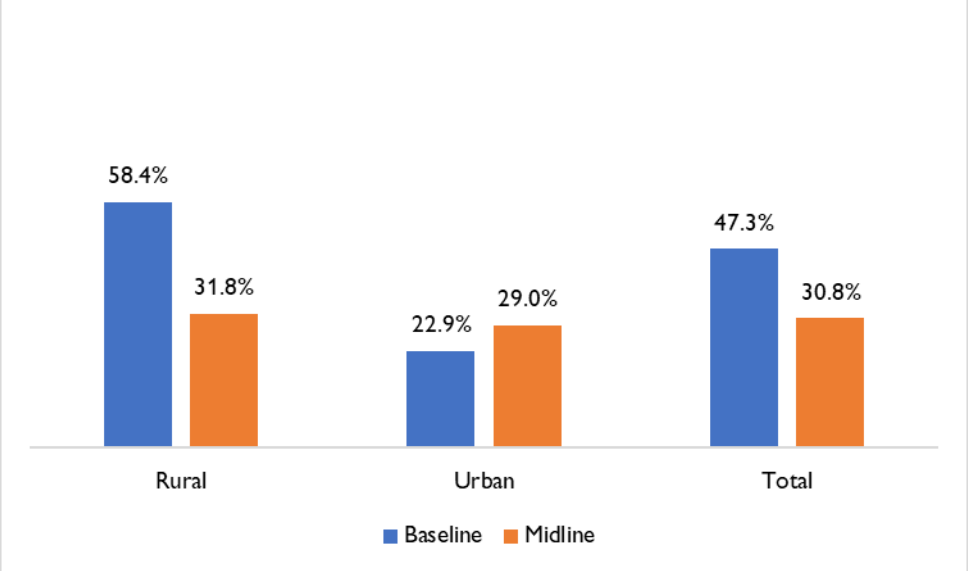
Figure 5. Percent of households that produced crops and livestock



Production and consumption of crops and livestock from own production

The overall proportion of households producing and consuming nutritious crops[11]/livestock significantly reduced from 47.3% ([CI 46.2-48.4]) at baseline to midline 30.8% ([CI 29.8-31.9]) p<0.000 (Figure 6), although there was an increase in urban areas from 22.9% CI [21.3-24.6] to 29.0% CI [27.3-30.7]. Except for a few, all districts experienced a decline in the proportion of households consuming the crops and livestock that they grew/produced (Table 4).

Figure 6. Percent of households that consumed nutritious crops (and/or livestock) that they grew/produced



[11] Nutritious crops include crops rich in micronutrients i.e., vitamin A rich crops, dark green leafy vegetables, and fruits; as well as protein rich crops i.e., legumes.

Table 4. Percent of HHs that consumed nutritious crops/livestock that they grew/produced by district

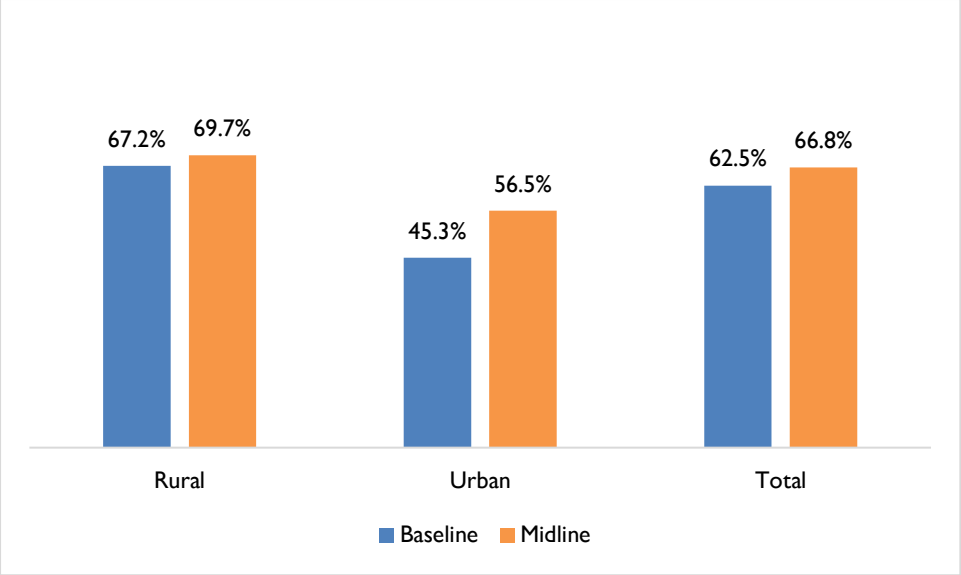
Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	249	35.7	0.030	29.8	42.0	250	46.4	0.032	40.1	52.8	0.016***
	Kabwe	250	12.4	0.021	8.6	17.1	250	29.2	0.029	23.6	35.3	0.000***
	Kapiri Mposhi	249	40.2	0.031	34.0	46.5	250	45.6	0.032	39.3	52.0	0.220
	Mumbwa	250	64.0	0.030	57.7	70.0	250	26.4	0.028	21.0	32.3	0.000***
Copperbelt	Kitwe	250	21.6	0.026	16.7	27.2	250	46.0	0.032	39.7	52.4	0.000***
	Ndola	250	22.0	0.026	17.0	27.7	250	50.4	0.032	44.0	56.8	0.000***
Eastern	Chipata	247	70.4	0.029	64.3	76.1	250	34.8	0.030	28.9	41.1	0.000***
	Katete	250	74.8	0.027	68.9	80.1	248	30.2	0.029	24.6	36.4	0.000***
	Lundazi	249	84.3	0.023	79.2	88.6	250	46.4	0.032	40.1	52.8	0.000***
	Petauke	249	76.7	0.027	71.0	81.8	250	18.4	0.025	13.8	23.8	0.000***
Luapula	Kawambwa	250	62.8	0.031	56.5	68.8	250	10.8	0.020	7.2	15.3	0.000***
	Mansa	250	48.4	0.032	42.1	54.8	249	20.5	0.026	15.6	26.0	0.000***
	Mwense	250	69.2	0.029	63.1	74.9	250	7.6	0.017	4.6	11.6	0.000***
	Nchelenge	249	57.8	0.031	51.4	64.0	248	19.4	0.025	14.6	24.8	0.000***
	Samfya	250	47.6	0.032	41.3	54.0	250	15.2	0.023	11.0	20.3	0.000***
Lusaka	Lusaka	250	1.2	0.007	0.2	3.5	250	18.0	0.024	13.4	23.3	0.000***
Muchinga	Chinsali	250	52.0	0.032	45.6	58.3	250	31.6	0.029	25.9	37.8	0.000***
	Isoka	250	40.0	0.031	33.9	46.4	250	34.8	0.030	28.9	41.1	0.230
	Mpika	250	53.6	0.032	47.2	59.9	249	37.8	0.031	31.7	44.1	0.000***
Northern	Kaputa	250	55.6	0.031	49.2	61.9	250	32.0	0.030	26.3	38.2	0.000***
	Kasama	250	52.8	0.032	46.4	59.1	249	28.1	0.028	22.6	34.1	0.000***
	Luwingu	250	62.8	0.031	56.5	68.8	250	35.6	0.030	29.7	41.9	0.000***
	Mbala	250	40.0	0.031	33.9	46.4	250	45.2	0.031	38.9	51.6	0.240
North-western	Mwinilunga	249	64.3	0.030	58.0	70.2	250	26.4	0.028	21.0	32.3	0.000***
	Solwezi	250	30.8	0.029	25.1	36.9	249	22.5	0.026	17.5	28.2	0.036***
	Zambezi	250	51.2	0.032	44.8	57.5	250	24.4	0.027	19.2	30.2	0.000***
Southern	Choma	247	37.2	0.031	31.2	43.6	250	57.6	0.031	51.2	63.8	0.000***
	Monze	250	53.6	0.032	47.2	59.9	250	54.8	0.031	48.4	61.1	0.788
Western	Kalabo	249	26.1	0.028	20.8	32.0	250	17.2	0.024	12.7	22.5	0.016***
	Kaoma	250	52.8	0.032	46.4	59.1	249	25.7	0.028	20.4	31.6	0.000***
	Mongu	249	24.1	0.027	18.9	29.9	249	32.9	0.030	27.1	39.1	0.029***
	Shang'ombo	250	28.8	0.029	23.3	34.8	250	14.4	0.022	10.3	19.4	0.000***

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

Households producing nutritious crops/livestock for sale

Overall, there was a significant (p=0.000) increase in households that sold or bartered nutritious crops/livestock) that they grew from 62.5%; CI [61.3-63.7] at baseline to 66.8%; CI [65.5-68.0] at midline. (Figure 7). Despite rural households recording a higher percentage of households selling nutritious crops/livestock in both surveys, urban areas had a higher increase, from 45.3% CI [42.6-48.0]) at baseline to 56.5% CI [53.7-59.3]) at midline.

Figure 7. Percent of households that sold nutritious crops/livestock that they grew/produced



At the district level, Mbala district reported the highest percentage of households that sold or bartered nutritious crops/livestock at midline (85.5%; CI [80.2-89.9]), while Shang'ombo district had the least 32.7%; CI [26.3-39.6] (Table 5)

Table 5. Percent of households that sold or bartered nutritious crops /livestock) that they grew by district

Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	194	64.4	0.034	57.3	71.2	210	80.5	0.027	74.5	85.6	0.000***
	Kabwe	121	33.1	0.043	24.8	42.2	81	44.4	0.055	33.4	55.9	0.102
	Kapiri Mposhi	187	72.7	0.033	65.7	79.0	178	67.4	0.035	60.0	74.2	0.268
	Mumbwa	223	77.6	0.028	71.5	82.9	212	77.8	0.029	71.6	83.2	0.950
Copperbelt	Kitwe	116	46.6	0.046	37.2	56.0	100	49.0	0.050	38.9	59.2	0.719
	Ndola	137	40.9	0.042	32.6	49.6	126	51.6	0.045	42.5	60.6	0.082
Eastern	Chipata	215	69.3	0.031	62.7	75.4	144	74.3	0.036	66.4	81.2	0.304
	Katete	237	65.0	0.031	58.5	71.0	233	80.7	0.026	75.0	85.6	0.000***
	Lundazi	234	81.2	0.026	75.6	86.0	201	82.6	0.027	76.6	87.6	0.708
	Petauke	235	71.1	0.030	64.8	76.8	216	63.9	0.033	57.1	70.3	0.104
Luapula	Kawambwa	220	61.8	0.033	55.0	68.3	228	72.4	0.030	66.1	78.1	0.017***
	Mansa	205	60.5	0.034	53.4	67.2	150	62.7	0.039	54.4	70.4	0.677
	Mwense	234	53.0	0.033	46.4	59.5	234	59.4	0.032	52.8	65.8	0.162
	Nchelenge	227	54.2	0.033	47.5	60.8	184	58.2	0.036	50.7	65.4	0.420
	Samfya	216	50.9	0.034	44.1	57.8	98	35.7	0.048	26.3	46.0	0.012***
Lusaka	Lusaka	31	32.3	0.084	16.7	51.4	47	44.7	0.073	30.2	59.9	0.273
Muchinga	Chinsali	213	62.9	0.033	56.0	69.4	193	72.0	0.032	65.1	78.2	0.051
	Isoka	198	59.1	0.035	51.9	66.0	191	81.2	0.028	74.9	86.4	0.000***
	Mpika	209	72.7	0.031	66.2	78.6	171	69.0	0.035	61.5	75.8	0.426
Northern	Kaputa	228	55.7	0.033	49.0	62.3	213	65.3	0.033	58.5	71.6	0.040***
	Kasama	217	66.8	0.032	60.1	73.0	180	75.0	0.032	68.0	81.1	0.075
	Luwingu	232	65.9	0.031	59.5	72.0	213	82.6	0.026	76.9	87.5	0.000***
	Mbala	208	63.0	0.033	56.0	69.6	221	85.5	0.024	80.2	89.9	0.000***
North-western	Mwinilunga	231	66.7	0.031	60.2	72.7	206	67.0	0.033	60.1	73.4	0.943

Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
	Solwezi	156	56.4	0.040	48.2	64.3	118	69.5	0.042	60.3	77.6	0.027***
	Zambezi	230	54.3	0.033	47.7	60.9	220	56.4	0.033	49.5	63.0	0.667
Southern	Choma	187	81.3	0.029	74.9	86.6	190	69.5	0.033	62.4	75.9	0.008***
	Monze	229	84.3	0.024	78.9	88.7	220	84.5	0.024	79.1	89.1	0.938
Western	Kalabo	189	39.7	0.036	32.7	47.0	170	34.7	0.037	27.6	42.4	0.330
	Kaoma	217	69.6	0.031	63.0	75.6	188	68.1	0.034	60.9	74.7	0.745
	Mongu	171	53.2	0.038	45.4	60.9	135	43.7	0.043	35.2	52.5	0.098
	Shang'ombo	181	54.1	0.037	46.6	61.6	205	32.7	0.033	26.3	39.6	0.000***

LCL= Lower Confidence Interval: UCL= Upper confidence Interval; SE= Standard Error. *** *statistically significant change (p<0.05)*

3.2.2 Safe Food Processing, Preparation, and Storage

A household was counted as having practiced safe food processing, preparation, and storage if it practiced all six recommended actions for safe food practices (Box 2).

Box 2. Safe food practices

Food Handling/Preparation

1. Washing hands when handling food
2. Keeping food vessels clean
3. Handling left over food (re-heat stored food before eating)

Food processing

4. Duration of cooking (until tender)
5. Extent of cooking (for meat products)

Food Storage

6. Time food is kept before preservation (i.e., refrigeration)

Although there was a significant improvement in the proportion of households that reported practising all six food safety actions (from 7.6 % CI [7.0- 8.21] to 10.8 % [10.1-11.5], p<0.0.0001 at midline), safe food preparation and storage practices were still very low. A higher proportion of urban households than rural households practised all three safety actions.

Disaggregation by district (Table 6) shows that Monze District had the largest decrease in the proportion of households implementing safe food processing, preparation, and storage.

Figure 8. Percent of households practising safe food preparation, processing, and storage

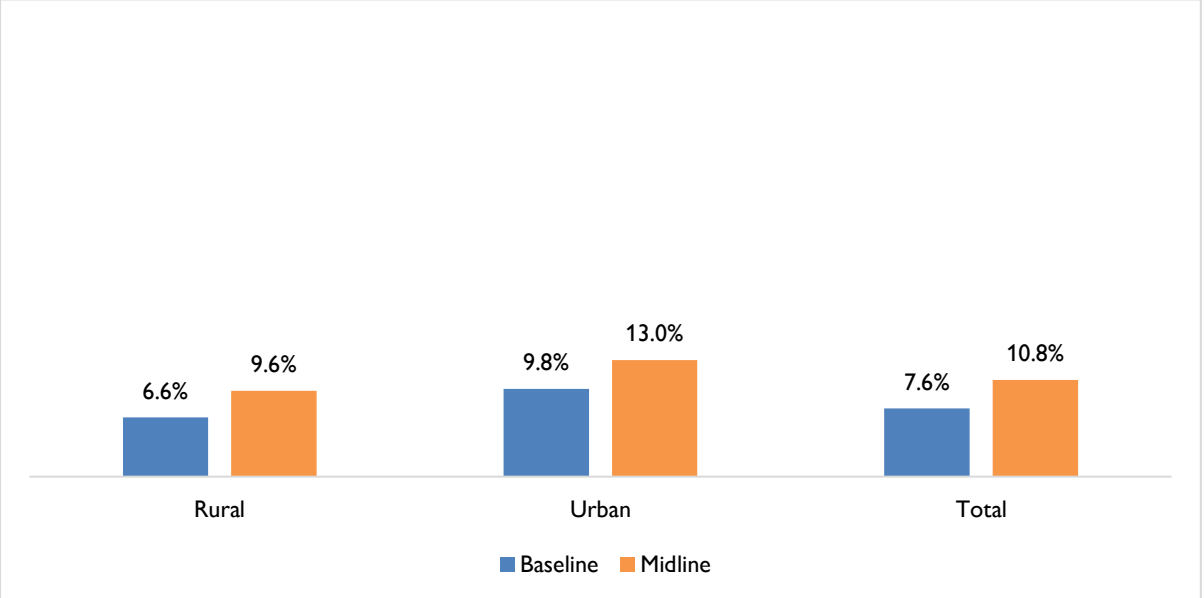


Table 6. Percent of households practising safe food preparation, processing, and storage by district

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	249	10.0	1.9	6.3	13.8	244	9.4	1.8	5.6	12.8	0.938
	Kabwe	250	8.0	1.7	4.6	11.4	224	24.6	2.7	16.9	27.1	0.000***
	Kapiri Mposhi	249	8.8	1.8	5.3	12.4	200	23.0	2.7	13.6	23.2	0.000***
	Mumbwa	250	1.2	0.7	0.0	2.5	243	9.5	1.9	5.6	12.8	0.000***
Copperbelt	Kitwe	250	7.6	1.7	4.3	10.9	250	2.0	0.9	0.3	3.7	0.007***
	Ndola	250	12.4	2.1	8.3	16.5	247	2.4	1.0	0.5	4.3	0.000***
Eastern	Chipata	247	11.7	2.0	7.7	15.8	234	11.1	2.0	6.6	14.2	0.941
	Katete	250	7.6	1.7	4.3	10.9	239	8.8	1.8	5.0	11.9	0.754
	Lundazi	249	5.2	1.4	2.5	8.0	224	8.5	1.8	4.3	10.9	0.220
	Petauke	249	6.4	1.6	3.4	9.5	246	6.9	1.6	3.7	9.9	0.971
Luapula	Mansa	250	8.0	1.7	4.6	11.4	227	20.3	2.5	13.7	23.3	0.000***
	Kawambwa	250	9.6	1.9	5.9	13.3	250	6.0	1.5	3.1	8.9	0.182
	Nchelenge	249	4.8	1.4	2.2	7.5	230	9.1	1.8	5.0	11.9	0.093
	Samfya	250	9.6	1.9	5.9	13.3	223	19.3	2.5	12.5	21.9	0.004***
	Mwense	250	9.2	1.8	5.6	12.8	217	14.7	2.2	8.7	16.9	0.087*
Lusaka	Lusaka	250	3.2	1.1	1.0	5.4	241	21.6	2.6	15.8	25.8	0.000***
Muchinga	Chinsali	250	5.2	1.4	2.4	8.0	249	1.2	0.7	0.0	2.5	0.023**
	Isoka	250	8.4	1.8	5.0	11.8	247	6.9	1.6	3.7	9.9	0.640
	Mpika	250	3.2	1.1	1.0	5.4	242	11.6	2.0	7.3	15.2	0.001**
Northern	Kaputa	250	1.2	0.7	0.0	2.5	228	11.4	2.0	6.6	14.2	0.000***
	Kasama	250	5.6	1.5	2.7	8.5	223	14.8	2.3	9.0	17.5	0.001**
	Luwingu	250	3.6	1.2	1.3	5.9	229	24.5	2.7	17.2	27.6	0.000***
	Mbala	250	11.2	2.0	7.3	15.1	242	7.0	1.6	3.7	9.9	0.147
North-western	Mwinilunga	249	3.6	1.2	1.3	5.9	249	4.0	1.2	1.6	6.4	1.000
	Solwezi	250	5.2	1.4	2.4	8.0	205	11.2	2.0	5.6	12.8	0.028**
	Zambezi	250	3.2	1.1	1.0	5.4	248	4.8	1.4	2.2	7.4	0.482
Southern	Choma	247	20.6	2.6	15.6	25.7	233	14.2	2.2	9.0	17.4	0.080
	Monze	250	37.2	3.1	31.2	43.2	211	14.2	2.2	8.0	16.0	0.000***
Western	Kalabo	249	2.4	1.0	0.5	4.3	248	7.7	1.7	4.3	10.9	0.013*
	Kaoma	250	6.8	1.6	3.7	9.9	235	6.8	1.6	3.4	9.5	1.000
	Mongu	249	0.4	0.4	0.0	1.2	245	9.4	1.8	5.6	12.8	0.000***
	Shang'ombo	250	1.2	0.7	0.0	2.5	249	6.0	1.5	3.1	8.9	0.008**

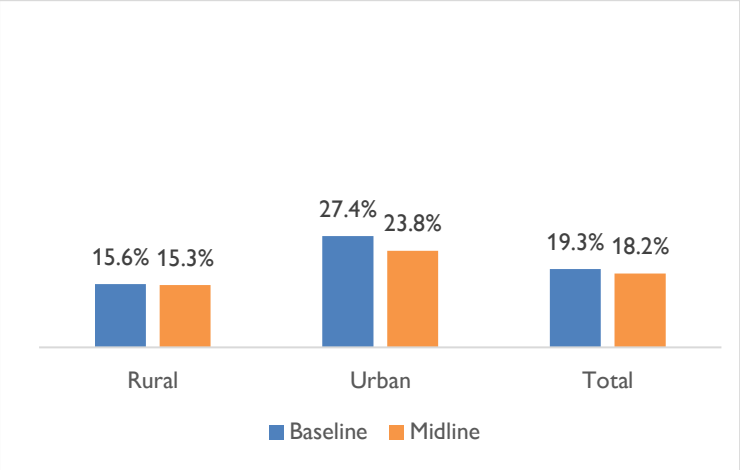
*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

3.2.3 Household Dietary Diversity (HDD)

Household dietary diversity at baseline was calculated using a proxy measure that combined the women's minimum dietary diversity and the child's minimum dietary diversity. Therefore, for comparability, the same was done for the midline analysis. Foods were categorised into 10 food groups based on the Food and Agriculture Organization's (FAO's) recommendation for minimum dietary

diversity at the household level (HDD). A variable was created for each food group and a household was given a score of "1" for each food group consumed by mother or child in the previous 24 hours. A household was counted towards this indicator if they consumed food from 5 or more food groups, as per FAO's recommendation.

Figure 9. Household dietary diversity by region



Overall, only 18.2% of households; CI [17.4-19.1] reached HDD at midline, slightly lower than the 19.3%; CI [18.4-20.2] reported in the baseline survey; (p=0.080) (Figure 9). More households in urban areas (23.8%); CI [22.2-25.4] met HDD standards than in rural areas (14.3%); CI [14.3-16.3], a pattern similar to that observed in the baseline survey but with lower levels.

At district level (Table 7), Kaoma District in Western Province registered the highest jump in HDD to 30.5% at midline from 7.6% at baseline) and Ndola District in Copperbelt Province had the sharpest drop (from 33.6% at baseline to 15.2% at midline). Shang'ombo District continues to have the lowest DHH of all SUN/MCDP II districts. DHH levels differed slightly by stunting status, with the lowest levels recorded for households with severely stunted children.

Table 7. Percent of households meeting household dietary diversity by district

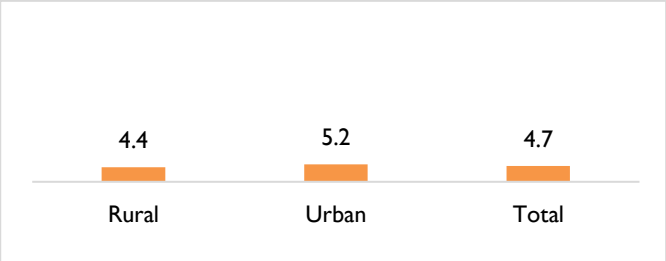
Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	249	18.9	2.5	14.2	24.3	250	18.4	2.5	13.8	23.8	0.892
	Kabwe	250	36.8	3.1	30.8	43.1	250	26.0	2.8	20.7	31.9	0.009***
	Kapiri Mposhi	249	24.1	2.7	18.9	29.9	250	18.0	2.4	13.4	23.3	0.095
	Mumbwa	250	31.6	2.9	25.9	37.8	250	16.4	2.3	12.0	21.6	0.000***
Copperbelt	Kitwe	250	29.2	2.9	23.6	35.3	250	24.4	2.7	19.2	30.2	0.226
	Ndola	250	33.6	3.0	27.8	39.8	250	15.2	2.3	11.0	20.3	0.000***
Eastern	Chipata	247	29.6	2.9	23.9	35.7	250	30.8	2.9	25.1	36.9	0.762
	Katete	250	27.2	2.8	21.8	33.2	248	22.6	2.7	17.5	28.3	0.233
	Lundazi	249	28.9	2.9	23.4	35.0	250	22.0	2.6	17.0	27.7	0.076
	Petauke	249	17.3	2.4	12.8	22.5	250	16.8	2.4	12.4	22.0	0.889
Luapula	Mansa	250	24.8	2.7	19.6	30.6	249	17.3	2.4	12.8	22.5	0.039***
	Kawambwa	250	18.0	2.4	13.2	22.8	250	22.4	2.6	17.2	27.6	0.265
	Nchelenge	248	13.7	2.2	9.7	18.6	248	19.0	2.5	14.3	24.4	0.114
	Samfya	249	15.7	2.3	11.4	20.8	250	7.6	1.7	4.6	11.6	0.005**
	Mwense	250	17.6	2.4	12.9	22.3	250	18.8	2.5	14.0	23.6	0.817
Lusaka	Lusaka	250	25.6	2.8	20.3	31.5	250	22.8	2.7	17.7	28.5	0.465
Muchinga	Chinsali	249	11.2	2.0	7.6	15.8	250	9.6	1.9	6.2	13.9	0.548
	Isoka	250	21.2	2.6	16.3	26.8	250	18.8	2.5	14.2	24.2	0.502
	Mpika	248	10.9	2.0	7.3	15.4	249	16.9	2.4	12.4	22.1	0.054
Northern	Kaputa	249	6.4	1.6	3.7	10.2	250	17.6	2.4	13.1	22.9	0.000***
	Kasama	250	16.8	2.4	12.4	22.0	249	16.5	2.4	12.1	21.7	0.920

Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
	Luwingu	250	16.0	2.3	11.7	21.1	250	10.4	1.9	6.9	14.9	0.064
	Mbala	250	24.4	2.7	19.2	30.2	250	20.8	2.6	15.9	26.4	0.336
North-western	Mwinilunga	249	17.7	2.4	13.1	23.0	250	10.0	1.9	6.6	14.4	0.013***
	Solwezi	249	22.1	2.6	17.1	27.8	249	38.6	3.1	32.5	44.9	0.000***
	Zambezi	249	11.6	2.0	7.9	16.3	250	13.2	2.1	9.3	18.0	0.599
Southern	Choma	247	23.1	2.7	18.0	28.8	250	24.0	2.7	18.8	29.8	0.808
	Monze	250	20.4	2.5	15.6	25.9	250	28.4	2.9	22.9	34.4	0.037***
Western	Kalabo	249	6.0	1.5	3.4	9.7	250	2.8	1.0	1.1	5.7	0.079
	Kaoma	250	7.6	1.7	4.6	11.6	249	30.5	2.9	24.9	36.7	0.000***
	Mongu	249	8.0	1.7	5.0	12.1	249	5.2	1.4	2.8	8.8	0.207
	Shang'ombo	250	1.6	0.8	0.4	4.0	250	1.6	0.8	0.4	4.0	1.000

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

As per FAO recommendations, the additional analysis of HDD shows that overall, households consumed an average of only 4.7 food groups at midline: CI [4.6-4.7]. Urban households had slightly more diverse diets (average of 5.2 food groups); CI [5.1-5.2] compared to rural households (4.4); CI [4.3-4.4] (Figure 10).

Figure 10. Mean number of food groups



At district level (Table 8), higher levels of household dietary diversity are seen in Chipata District (5.8 food groups) at midline, CI [5.6-6.0]. On the other hand, the lowest levels of household dietary diversity are seen in Kalabo district (average of 2.5 food groups) CI [2.3-2.6].

Table 8. Mean number of food groups consumed by households by district.

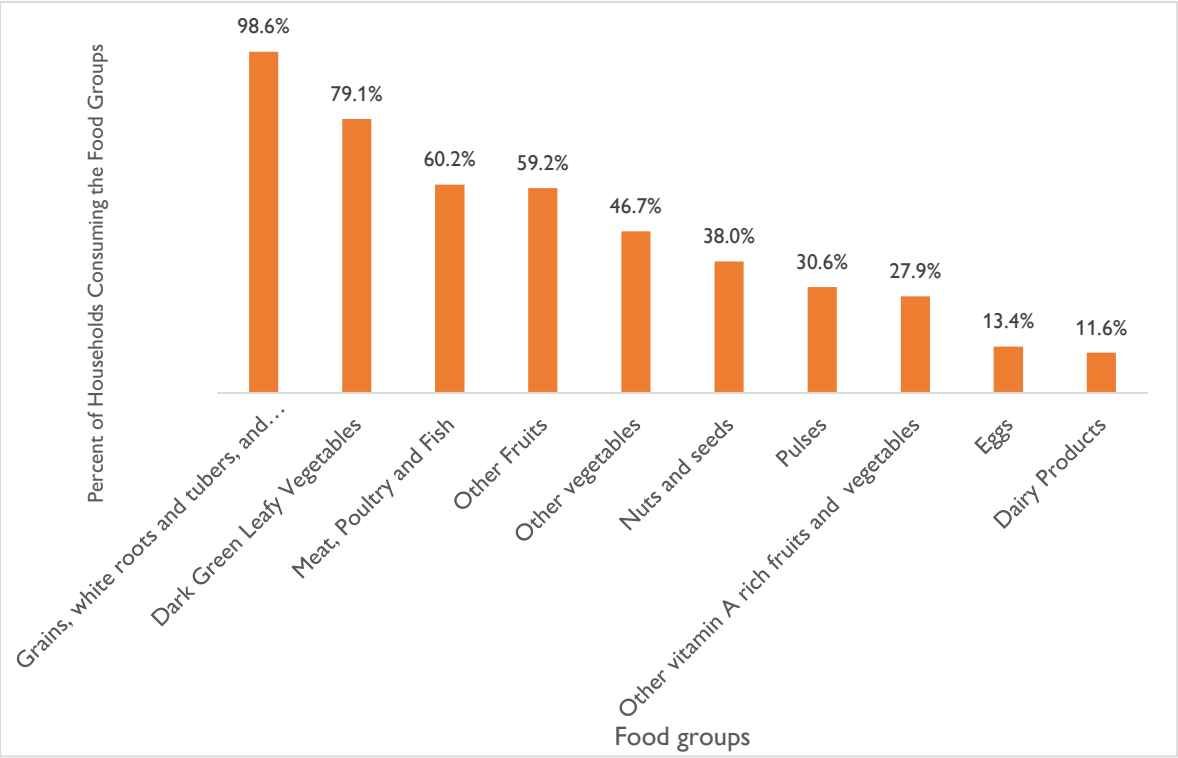
Province	District	n	Mean	SE	LCL	UCL
Central	Chibombo	250	5.1	0.10	4.9	5.3
	Kabwe	250	5.1	0.09	4.9	5.2
	Kapiri Mposhi	250	4.9	0.09	4.7	5.1
	Mumbwa	250	4.5	0.12	4.3	4.7
Copperbelt	Ndola	250	5.0	0.10	4.8	5.2
	Kitwe	250	4.9	0.10	4.7	5.0
Eastern	Chipata	250	5.8	0.10	5.6	6.0
	Katete	248	5.1	0.10	4.9	5.3
	Lundazi	250	5.4	0.10	5.2	5.6
	Petauke	250	4.7	0.10	4.5	4.9
Luapula	Mansa	249	5.0	0.13	4.8	5.3
	Kawambwa	250	4.7	0.101	4.5	4.9
	Nchelenge	248	5.1	0.10	4.9	5.3
	Samfya	250	3.6	0.09	3.4	3.8
	Mwense	250	4.8	0.100	4.6	5.0
Lusaka	Lusaka	250	5.7	0.09	5.5	5.8

Province	District	n	Mean	SE	LCL	UCL
Muchinga	Isoka	250	4.5	0.09	4.3	4.6
	Chinsali	250	3.8	0.10	3.6	4.0
	Mpika	249	4.6	0.09	4.4	4.8
Northern	Kaputa	250	4.5	0.10	4.3	4.7
	Kasama	249	4.9	0.09	4.7	5.0
	Luwingu	250	4.5	0.11	4.3	4.7
	Mbala	250	5.2	0.12	4.9	5.4
Southern	Choma	250	5.1	0.11	4.9	5.3
	Monze	250	5.4	0.09	5.2	5.6
North-western	Mwinilunga	250	3.8	0.10	3.6	4.0
	Solwezi	249	5.7	0.10	5.5	5.9
	Zambezi	250	4.0	0.11	3.8	4.2
Western	Kalabo	250	2.5	0.08	2.3	2.6
	Kaoma	249	4.9	0.11	4.7	5.2
	Mongu	249	3.5	0.10	3.3	3.7
	Shang'ombo	250	2.8	0.06	2.7	3.0

LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error

Households most commonly consumed grains, white roots and tubers, and plantains (98.6%); dark green leafy vegetables (79.1%); and meat, poultry, and fish (60.2%), with fewer households consuming eggs (13.4%) and dairy (11.6%) (Figure 11).

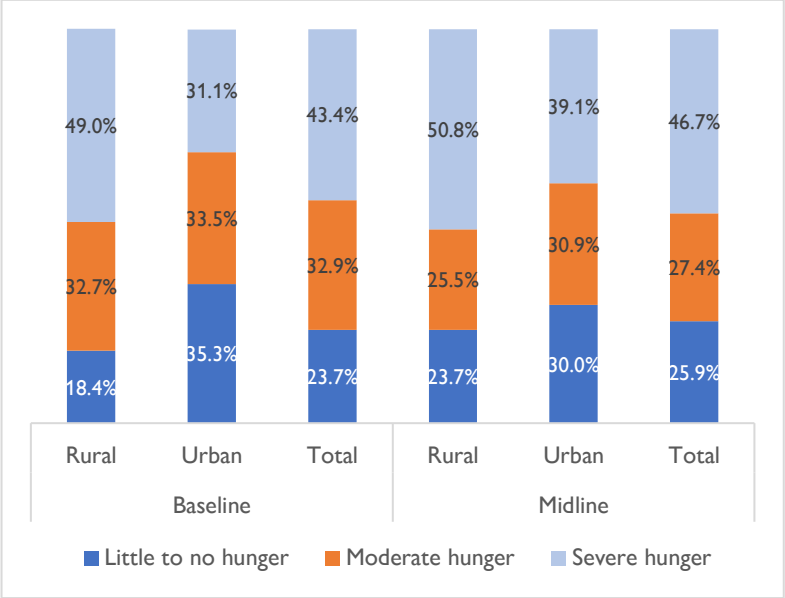
Figure 11. Percent of households consuming specific food groups



3.2.4 Household Hunger Experience

Household hunger was measured according to the Household Food Insecurity Access Scale (HFIAS)[12] that asks if households experienced any of 9 specific hunger situations in the 4 weeks preceding the survey. If the respondent answered "yes" to any of the situations, they were then asked how often they experienced the situation, with responses ranging from 1-2 times ("rarely") to 3-10 times ("sometimes") to more than 10 times ("often"). The prevalence of household food insecurity (access) was then calculated as indicated in the HFIAS guidelines.

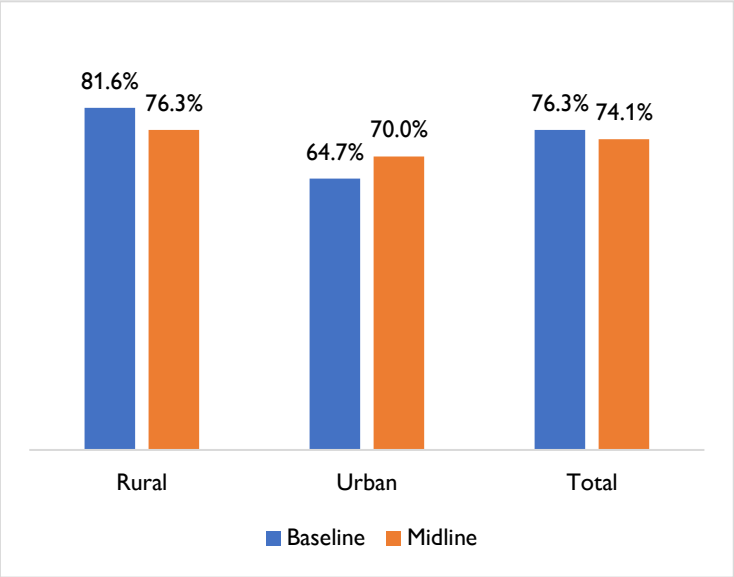
Figure 12. Percent of households experiencing hunger by severity of hunger



Overall, the proportion of households experiencing severe hunger increased from baseline. 46.7% of households experienced severe hunger at midline compared to 43.4% at baseline (Figure 12). But there was also a slight increase in the proportion of households that reported little to no hunger – 25.9% of households experienced little or no hunger at midline compared to 23.7% at baseline.

The combined prevalence of moderate and severe hunger dropped slightly from 76.3%; CI [75.4-77.2] at baseline to 74.1%; CI [73.1-75.1] at midline, with households in urban areas reporting less hunger prevalence than rural areas (Figure 13) in both surveys. This reduction, albeit slight, is statistically significant (p=0.001).

Figure 13. Percent of households experiencing hunger (moderate or severe combined)



Similar to the baseline survey, the prevalence of hunger in rural areas (75.1%) was higher than in urban areas (68.3%) in the midline survey. However, the prevalence of hunger in urban areas increased from 64.7% (CI [62.7-66.5]) at baseline to 70.0% (CI [68.3-71.7]) at midline, while the prevalence of hunger in rural areas decreased from 81. 6% (CI

[12] Food and Nutrition Technical Assistance Project (FANTA). HFAIS scale (2007). https://www.fantaproject.org/sites/default/files/resources/HFIAS_ENG_v3_Aug07.pdf

[80.6-82.6]) at baseline to 76.3% (CI [75.1-77.4]) at midline. Changes in hunger experience between the midline and baseline surveys in both urban and rural areas were significant (p=0.000). Moderate and severe hunger varied by household size, with the lowest rates reported in households with fewer than 5 members (71.0%) and highest in those with more than 10 members (76.7%).

There were substantial variations in moderate and severe hunger rates across districts (Table 9). At district level, the rates ranged from a low of 31.2% in Chipata District (Eastern Province) to a high of 98.8% in Shang'ombo District (Western Province). Several districts experienced substantial increases in the rates of moderate and severe hunger, with Lusaka district experiencing the highest jump, from 54.0% in the baseline (the lowest rate at the time) to 86.8% in the midline survey (an increase of 32.8%). In contrast, Monze District (Southern Province) had the largest decrease (a drop of 39.6%) (Table 9).

Table 9. Percent of households experiencing hunger by district

Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	249	75.9	2.7	70.6	81.2	250	86.8	2.1	82.6	91.0	0.003***
	Kabwe	250	67.6	3.0	61.8	73.4	250	69.6	2.9	63.9	75.3	0.700
	Kapiri Mposhi	249	74.3	2.8	68.9	79.7	250	66.8	3.0	61.0	72.6	0.082
	Mumbwa	250	56.4	3.1	50.3	62.5	250	57.2	3.1	51.1	63.3	0.928
Copperbelt	Kitwe	250	62.4	3.1	56.4	68.4	250	72.8	2.8	67.3	78.3	0.017***
	Ndola	250	56.0	3.1	49.8	62.2	250	67.2	3.0	61.4	73.0	0.013***
Eastern	Chipata	247	64.0	3.1	58.0	70.0	250	31.2	2.9	25.5	36.9	0.000***
	Katete	250	57.6	3.1	51.5	63.7	248	48.4	3.2	42.2	54.6	0.049***
	Lundazi	249	59.0	3.1	52.9	65.1	250	32.4	3.0	26.6	38.2	0.000***
	Petauke	249	57.8	3.1	51.7	64.0	250	56.0	3.1	49.8	62.2	0.747
Luapula	Mansa	250	76.0	2.7	70.7	81.3	249	79.9	2.5	74.9	84.9	0.343
	Kawambwa	250	81.2	2.5	76.4	86.0	250	83.2	2.4	78.6	87.8	0.640
	Nchelenge	249	90.0	1.9	86.2	93.7	248	86.3	2.2	82.0	90.6	0.260
	Samfya	250	80.0	2.5	75.0	85.0	250	89.6	1.9	85.8	93.4	0.004***
	Mwense	250	91.6	1.8	88.2	95.0	250	84.0	2.3	79.5	88.5	0.014
Lusaka	Lusaka	250	54.0	3.2	47.8	60.2	250	86.8	2.1	82.6	91.0	0.000***
Muchinga	Chinsali	250	76.0	2.7	70.7	81.3	250	87.6	2.1	83.5	91.7	0.001***
	Isoka	250	71.6	2.9	66.0	77.2	250	84.8	2.3	80.3	89.3	0.001***
	Mpika	250	79.2	2.6	74.2	84.2	249	73.5	2.8	68.0	79.0	0.163
Northern	Kaputa	250	95.6	1.3	93.1	98.1	250	85.2	2.2	80.8	89.6	0.000***
	Kasama	250	74.4	2.8	69.0	79.8	249	72.3	2.8	66.7	77.8	0.666
	Luwingu	249	85.1	2.2	80.3	89.3	250	83.6	2.3	79.0	88.2	0.726
	Mbala	250	74.0	2.8	68.6	79.4	250	68.8	2.9	63.1	74.5	0.235
North-western	Mwinilunga	249	88.8	2.0	84.8	92.7	250	88.8	2.0	84.9	92.7	1.000
	Solwezi	250	67.2	3.0	61.4	73.0	249	70.7	2.9	65.0	76.3	0.457
	Zambezi	250	90.0	1.9	86.3	93.7	250	83.2	2.4	78.6	87.8	0.036***
Southern	Choma	247	83.8	2.3	79.2	88.4	250	58.8	3.1	52.7	64.9	0.000***
	Monze	250	90.8	1.8	87.2	94.4	250	51.2	3.2	45.0	57.4	0.000***
Western	Kalabo	249	94.8	1.4	92.0	97.5	250	96.0	1.2	93.6	98.4	0.662
	Kaoma	250	82.4	2.4	77.7	87.1	249	80.3	2.5	75.4	85.3	0.630
	Mongu	249	86.7	2.1	82.5	91.0	249	89.6	1.9	85.8	93.4	0.405
	Shang'ombo	250	97.6	1.0	95.7	99.5	250	98.8	0.7	97.5	100.0	0.501

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

3.2.5 Household Resilience to Environmental Shocks

Households were considered to have stronger resilience to lean seasons and environmental shocks if they did not report having to undertake certain coping strategies to mitigate hunger experiences within the 12 months preceding the survey. The FAO's Household Coping Strategy Index (CSI) was used as a proxy for resilience to environmental shocks experienced in the 12-month preceding the survey[13]. Responses to questions were weighted for certain coping strategies, and a total score calculated for the household.

Overall, the proportion of households reporting stronger resilience to environmental shocks increased slightly from 39.5% at baseline to 42.3% at midline, but the increase was negligible in urban areas (Figure 14). Mumbwa district had the highest increase in the proportion of households reporting resilience to lean seasons and environmental shocks from 45.7% to 73.4%, followed by Monze (from 48.9% to 69.3%). Most districts had a decrease in the proportion of households reporting stronger resilience to environmental shocks – with the biggest declines observed in Kabwe District (from 69.4% to 53.4%) (Table 10).

Figure 14. Households Coping Strategy Index

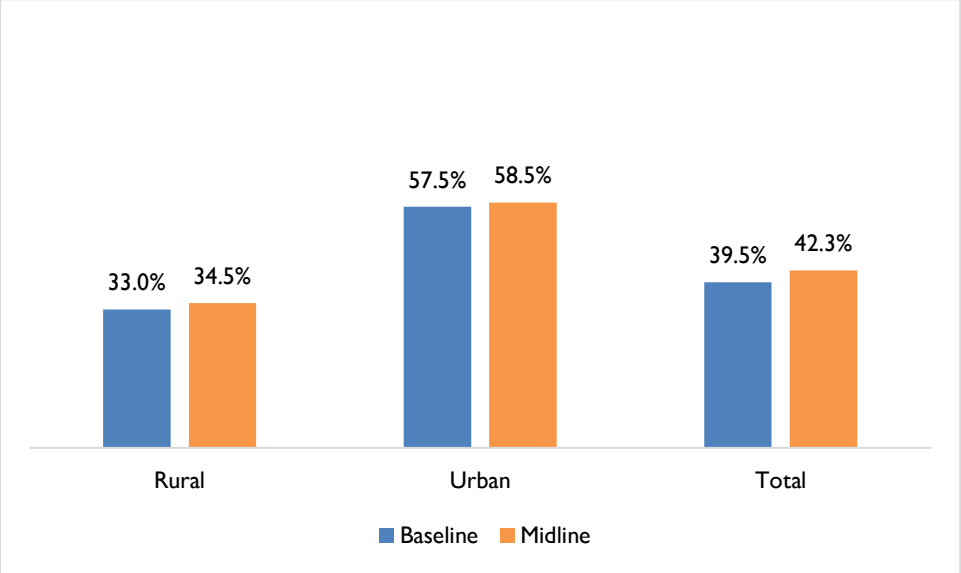


Table 10. Households reporting stronger resilience to environmental shocks by district

Province	District	Baseline					Midline					p-values
		n	%	se	LCL	UCL	n	%	se	LCL	UCL	
Central	Chibombo	222	55.4	3.2	43.2	55.6	201	39.8	3.1	26.2	37.8	0.002***
	Kabwe	216	69.4	2.9	53.9	66.1	189	53.4	3.2	34.3	46.5	0.001
	Kapiri Mposhi	199	54.8	3.2	37.6	49.9	169	58.0	3.1	33.1	45.3	0.607
	Mumbwa	186	45.7	3.2	28.1	39.9	184	73.4	2.8	47.8	60.2	0.000***
Copperbelt	Kitwe	137	56.2	3.1	25.1	36.5	193	74.6	2.8	51.5	63.7	0.001***
	Ndola	152	71.1	2.9	37.1	49.3	168	66.1	3.0	38.2	50.6	0.403
Eastern	Chipata	200	39.0	3.1	25.8	37.4	129	54.3	3.2	22.4	33.6	0.009
	Katete	220	44.1	3.1	32.8	44.8	139	33.8	3.0	14.1	23.8	0.068

[13] FAO. Coping Strategy Index. (2003) http://www.fao.org/3/a-ae513e.pdf

Province	District	Baseline					Midline					p-values
		n	%	se	LCL	UCL	n	%	se	LCL	UCL	
	Lundazi	219	40.6	3.1	29.8	41.7	134	59.0	3.1	25.8	37.4	0.001***
	Petauke	178	36.5	3.1	20.6	31.6	168	33.3	3.0	17.2	27.6	0.612
Luapula	Mansa	193	38.3	3.1	23.9	35.3	193	44.6	3.1	28.6	40.4	0.256
	Kawambwa	215	40.0	3.1	28.5	40.3	217	34.1	3.0	23.9	35.3	0.242
	Nchelenge	222	21.2	2.6	14.0	23.7	212	26.9	2.8	17.7	28.2	0.200
	Samfya	220	35.0	3.0	25.1	36.5	222	48.6	3.2	37.1	49.3	0.005***
	Mwense	239	46.0	3.2	37.8	50.2	229	41.0	3.1	31.6	43.6	0.321
Lusaka	Lusaka	165	66.1	3.0	37.5	49.7	212	57.1	3.1	42.2	54.6	0.095
Muchinga	Chinsali	210	23.8	2.7	15.0	25.0	220	24.1	2.7	16.1	26.3	1.000
	Isoka	217	47.5	3.2	35.1	47.3	217	42.9	3.1	31.2	43.2	0.385
	Mpika	198	34.3	3.0	21.7	32.7	187	47.1	3.2	29.4	41.3	0.015***
Northern	Kaputa	230	18.7	2.5	12.5	21.9	224	18.8	2.5	12.2	21.4	1.000
	Kasama	190	52.6	3.2	33.9	46.1	187	41.2	3.1	25.2	36.7	0.034***
	Luwingu	219	25.1	2.7	16.9	27.1	225	28.4	2.9	20.2	31.0	0.493
	Mbala	221	44.8	3.1	33.5	45.7	164	30.5	2.9	15.0	25.0	0.006***
North-western	Mwinilunga	207	27.5	2.8	17.7	28.1	235	27.7	2.8	20.6	31.4	1.000
	Solwezi	170	58.2	3.1	33.5	45.7	191	66.0	3.0	44.4	56.8	0.160
	Zambezi	213	17.4	2.4	10.4	19.2	237	21.9	2.6	15.8	25.8	0.273
Southern	Choma	219	55.3	3.2	42.8	55.2	160	56.9	3.1	30.4	42.4	0.834
	Monze	227	48.9	3.2	38.2	50.6	153	69.3	2.9	36.3	48.5	0.000***
Western	Kalabo	235	10.6	2.0	6.3	13.8	239	20.9	2.6	15.0	25.0	0.003***
	Kaoma	207	34.3	3.0	22.8	34.0	201	37.8	3.1	24.8	36.2	0.525
	Mongu	207	29.5	2.9	19.2	29.8	226	42.5	3.1	32.5	44.6	0.007***
	Shang'ombo	239	9.6	1.9	5.6	12.8	241	25.7	2.8	19.4	30.2	0.000***

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

3.3 Household Water, Sanitation, and Hygiene (WASH)

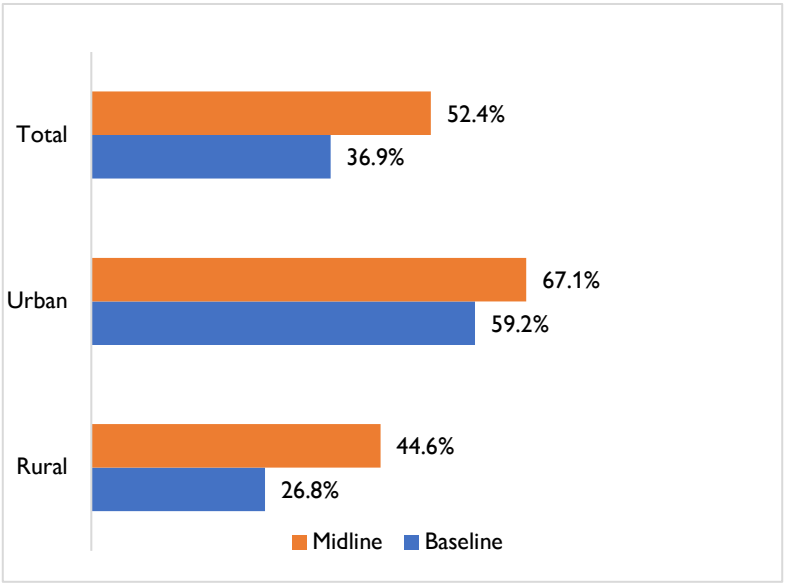
The water, sanitation and hygiene section indicators assessed included household access to drinking water, basic sanitation, and hygiene.

3.3.1 Drinking Water

Access to drinking water

A household's access to basic drinking water was determined by whether a household got water from a safe water source that was usually accessible, and they could reach in 30 minutes or less.

Figure 15. Percent of households with access to basic/improved source of drinking water



Slightly more than half of households had access to basic drinking water at midline (52.40%; CI [51.3-53.5], a 16% increase from baseline (36.9%; CI [35.9-38.] (p=0.0001) (Figure 15). Two-thirds of households in urban areas (67.1%) had access to basic drinking water compared to less than half in rural areas (44.6%) (Figure 15). Chipata and Kabwe districts recorded the highest percentage of households (82.0%) with access to basic drinking water, while Zambezi District had the lowest (19.6%). While Lusaka District remained static in the proportion of households with access to drinking water across the two surveys, Samfya District recorded a 48% increase to 56.4% at the midline (Table 11).

Table 11. Percent of households with access to basic drinking water

Province	District	Baseline					Midline					p-values
		n	%	se	LCL	UCL	n	%	se	LCL	UCL	
Central	Chibombo	249	67.9	3.0	62.1	73.7	250	48	3.2	41.8	54.2	0.000***
	Kabwe	250	75.2	2.7	69.8	80.6	250	82	2.4	77.2	86.8	0.081
	Kapiri Mposhi	249	49.4	3.2	43.2	55.6	250	54.4	3.2	48.2	60.6	0.304
	Mumbwa	250	58.8	3.1	52.7	64.9	250	55.2	3.1	49	61.4	0.470
Copperbelt	Kitwe	250	74.8	2.7	69.4	80.2	250	66.0	3.0	60.1	71.9	0.040***
	Ndola	250	76.8	2.7	71.6	82.0	250	67.6	3.0	61.8	73.4	0.028***
Eastern	Chipata	247	43.3	3.2	37.1	49.5	250	82.4	2.4	77.7	87.1	0.000***
	Katete	250	44.0	3.1	37.8	50.2	248	64.1	3.0	58.1	70.1	0.000***
	Lundazi	249	30.5	2.9	24.8	36.2	250	62.8	3.1	56.8	68.8	0.000***
	Petauke	249	46.6	3.2	40.4	52.8	250	55.6	3.1	49.4	61.8	0.054
Luapula	Mansa	250	18.4	2.5	13.6	23.2	249	46.2	3.2	40.0	52.4	0.000***
	Kawambwa	250	25.6	2.8	20.2	31.0	250	40.0	3.1	33.9	46.1	0.001***
	Nchelenge	249	30.1	2.9	24.4	35.8	248	60.5	3.1	54.4	66.6	0.000***
	Samfya	250	8.4	1.8	5.0	11.8	250	56.4	3.1	50.3	62.5	0.000***
	Mwense	250	24.8	2.7	19.4	30.2	250	46.0	3.2	39.8	52.2	0.000***

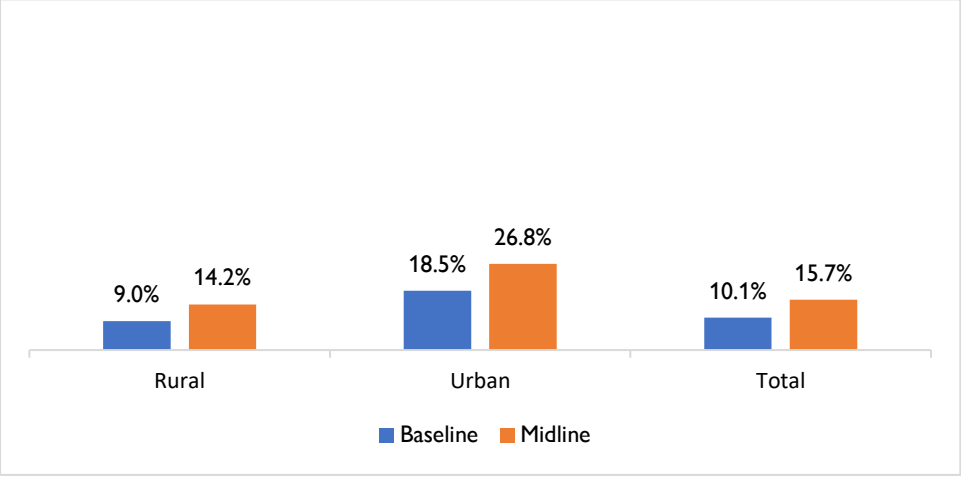
Province	District	Baseline					Midline					p-values
		n	%	se	LCL	UCL	n	%	se	LCL	UCL	
Lusaka	Lusaka	250	80.4	2.5	75.5	85.3	250	80.4	2.5	75.5	85.3	1.000
Muchinga	Chinsali	250	17.6	2.4	12.9	22.3	250	47.6	3.2	41.4	53.8	0.000***
	Isoka	250	27.6	2.8	22.1	33.1	250	50.8	3.2	44.6	57	0.000***
	Mpika	250	18.0	2.4	13.2	22.8	249	41.8	3.1	35.6	47.9	0.000***
Northern	Kaputa	250	18.0	2.4	13.2	22.8	250	61.2	3.1	55.2	67.2	0.000***
	Kasama	250	28.8	2.9	23.2	34.4	249	60.2	3.1	54.2	66.3	0.000***
	Luwingu	250	18.8	2.5	14.0	23.6	250	28.8	2.9	23.2	34.4	0.012***
	Mbala	250	26.0	2.8	20.6	31.4	250	38.8	3.1	32.8	44.8	0.003***
North-western	Mwinilunga	249	25.3	2.8	19.9	30.7	250	24.0	2.7	18.7	29.3	0.815
	Solwezi	250	46.0	3.2	39.8	52.2	249	63.5	3.1	57.5	69.4	0.000***
	Zambezi	250	15.2	2.3	10.7	19.7	250	19.6	2.5	14.7	24.5	0.238
Southern	Choma	247	51.8	3.2	45.6	58.1	250	58.4	3.1	52.3	64.5	0.166
	Monze	250	44.4	3.1	38.2	50.6	250	54.8	3.1	48.6	61	0.025***
Western	Kalabo	249	16.5	2.4	11.9	21.1	250	32.8	3.0	27	38.6	0.000***
	Kaoma	250	24.4	2.7	19.1	29.7	249	55.0	3.2	48.8	61.2	0.000***
	Mongu	249	32.5	3.0	26.7	38.3	249	50.6	3.2	44.4	56.8	0.000***
	Shang'ombo	250	16.4	2.3	11.8	21.0	250	22.0	2.6	16.9	27.1	0.140

Water Treatment

A household was counted as practising correct water treatment if it reported access to unsafe water source as its primary or alternative source of drinking water and reported treating it, including demonstrating the treatment materials and correct processes.

The correct use of recommended water treatment technologies increased by 5% from 10.1% (CI [9.2-11.2]) of households at baseline to 15.7% (CI [14.3-17.1]) at midline (p=0.000). At midline, urban households reported higher use of recommended water treatment technologies (from 18.5% to 26.8%) than rural households (from 9.0% to 14.2%), representing an increase of over f 8.3% for urban and 5.2% for rural households, respectively (Figure 16).

Figure 16. Percent of households practising correct treatment of water



At district level, the proportion of households using recommended water treatment technologies increased in most districts compared to baseline, with increases ranging from 1% to as high as 24%. But some districts reported a decrease of as much as approximately 14% from baseline, as was the case for Mumbwa district. Similar to the baseline findings, the most commonly used water treatment practices at midline were boiling (51.5%) and use of bleach or chlorine (40.6%) with disinfectant powder and solar disinfection less frequently used.

Table 12. Percent of households practising correct treatment of water

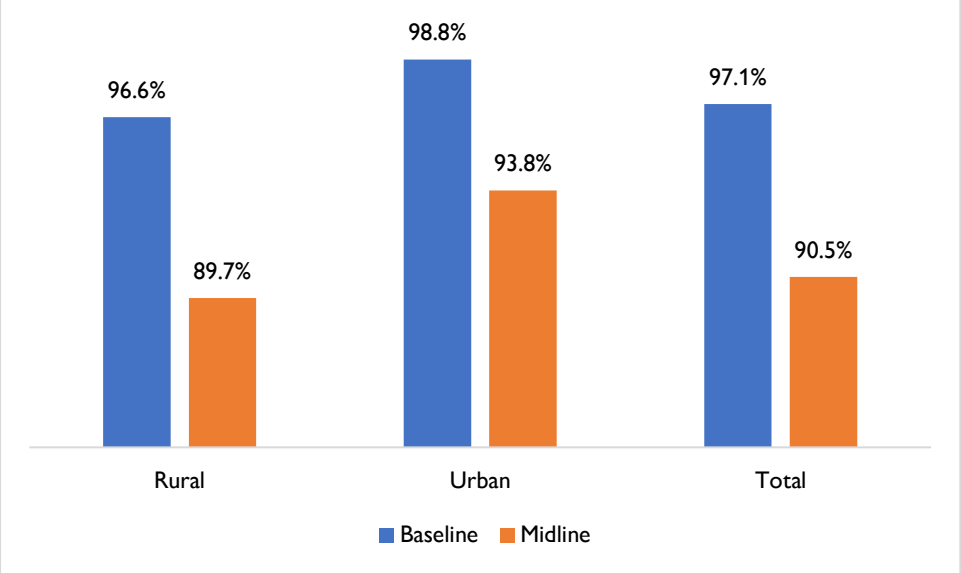
Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	43	9.3	0.044	2.6	22.1	94	22.3	0.043	14.4	32.1	0.067
	Kabwe	7	14.3	0.132	0.4	57.9	8	37.5	0.171	8.5	75.5	0.310
	Kapiri Mposhi	96	16.7	0.038	9.8	25.6	94	34.0	0.049	24.6	44.5	0.006***
	Mumbwa	16	18.8	0.098	4.0	45.6	60	5.0	0.028	1.0	13.9	0.070
Copperbelt	Kitwe	11	18.2	0.116	2.3	51.8	59	42.4	0.064	29.6	55.9	0.130
	Ndola	18	55.6	0.117	30.8	78.5	13	46.2	0.138	19.2	74.9	0.605
Eastern	Chipata	104	6.7	0.025	2.7	13.4	25	20.0	0.080	6.8	40.7	0.040***
	Katete	113	9.7	0.028	5.0	16.8	50	22.0	0.059	11.5	36.0	0.035***
	Lundazi	146	10.3	0.025	5.9	16.4	71	16.9	0.044	9.0	27.7	0.165
	Petauke	103	12.6	0.033	6.9	20.6	46	15.2	0.053	6.3	28.9	0.668
Luapula	Kawambwa	172	23.3	0.032	17.2	30.3	134	35.8	0.041	27.7	44.6	0.016***
	Mansa	192	13.5	0.025	9.0	19.2	101	11.9	0.032	6.3	19.8	0.688
	Mwense	99	10.1	0.030	5.0	17.8	84	23.8	0.046	15.2	34.3	0.013***
	Nchelenge	59	6.8	0.033	1.9	16.5	51	9.8	0.042	3.3	21.4	0.564
	Samfya	229	7.4	0.017	4.4	11.6	95	5.3	0.023	1.7	11.9	0.482
Lusaka	Lusaka	2	0.0	0.000	0.0	84.2	6	0.0	0.000	0.0	45.9	
Muchinga	Chinsali	195	12.3	0.024	8.0	17.8	111	15.3	0.034	9.2	23.4	0.458
	Isoka	153	7.8	0.022	4.1	13.3	108	18.5	0.037	11.7	27.1	0.010***
	Mpika	166	16.9	0.029	11.5	23.4	99	25.3	0.044	17.1	35.0	0.099
Northern	Kaputa	111	4.5	0.020	1.5	10.2	62	6.5	0.031	1.8	15.7	0.580
	Kasama	117	17.1	0.035	10.8	25.2	53	26.4	0.061	15.3	40.3	0.159
	Luwingu	189	12.2	0.024	7.9	17.7	167	19.8	0.031	14.0	26.6	0.050
	Mbala	158	22.2	0.033	15.9	29.4	125	28.8	0.041	21.1	37.6	0.200
North-western	Mwinilunga	151	6.0	0.019	2.8	11.0	168	6.0	0.018	2.9	10.7	0.998
	Solwezi	106	14.2	0.034	8.1	22.3	52	26.9	0.062	15.6	41.0	0.051
	Zambezi	200	1.5	0.009	0.3	4.3	173	4.0	0.015	1.6	8.2	0.129
Southern	Choma	51	3.9	0.027	0.5	13.5	54	18.5	0.053	9.3	31.4	0.019***
	Monze	35	5.7	0.039	0.7	19.2	63	27.0	0.056	16.6	39.7	0.011***
Western	Kalabo	193	2.6	0.011	0.8	5.9	157	4.5	0.016	1.8	9.0	0.340
	Kaoma	157	3.8	0.015	1.4	8.1	78	10.3	0.034	4.5	19.2	0.050
	Mongu	125	4.0	0.018	1.3	9.1	80	5.0	0.024	1.4	12.3	0.733
	Shangombo	192	1.6	0.009	0.3	4.5	183	1.6	0.009	0.3	4.7	0.953

Safe storage of treated water

This indicator was used to assess the proportion of households storing treated drinking water in a way that protects its quality and prevents contamination. A household was counted if: correct treatment was followed (per the discussion above), the containers used to store treated water were clean (no visible dirt as inspected by interviewers), water containers with treated water had narrow necks/protecting covers and water containers had a tap or narrow mouth for drawing the water.

Correct water storage practices were reported by most households (90.5%) who treated water, even though this was 7% lower than observed at baseline (97.1%) (Figure 17).

Figure 17. Percent of households practising safe storage of treated water



3.3.2 Sanitation

Household sanitation facilities

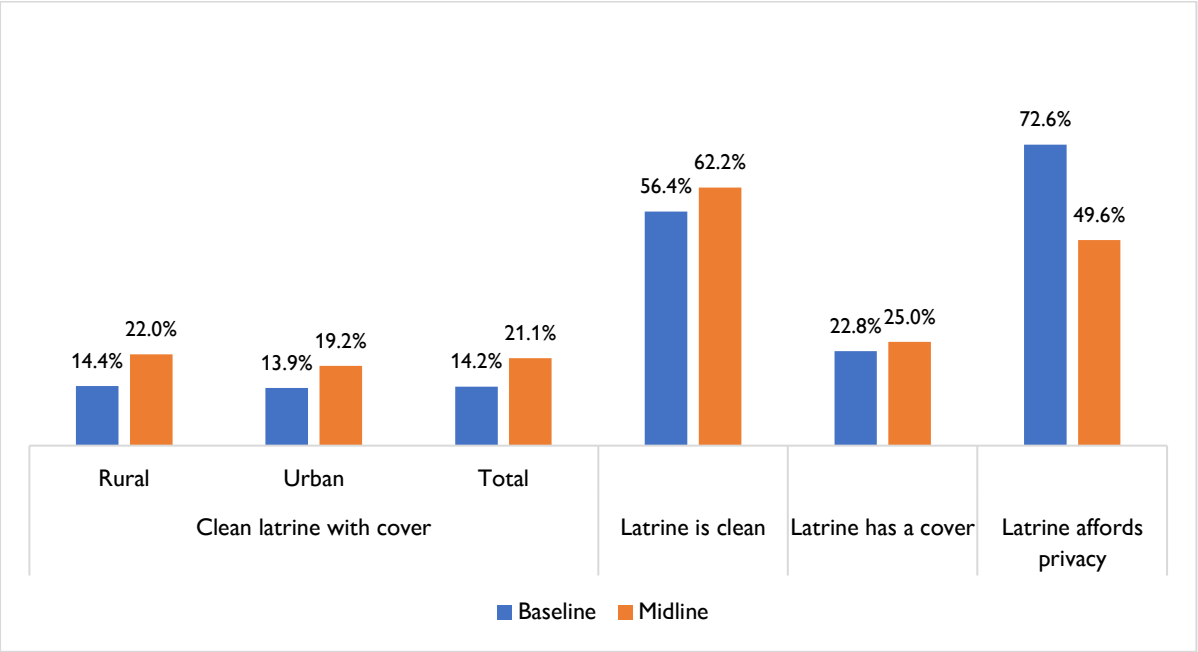
A household was considered to have improved sanitation if it used either a ventilated improved pit latrine, a flush or pour toilet connected to a sewer system or septic tank, or a composting toilet, and the latrine/toilet was shown to the enumerator and had visible signs of being used.

About a third (31.7%) of households had access to sanitation facilities, but this masks a sizeable difference between urban and rural households. Almost two-thirds of urban households (62.2%) had access to sanitation facilities, representing a 20% increase from baseline. In contrast, less than a fifth (15.2%) of rural households had access to sanitation facilities.

Households with clean and covered latrines

Of the households that used pit latrines, only one out of every 5 had a clean latrine (including cover) at midline, representing a 7% increase from baseline (p=0.000). More rural households (22.0%) had clean latrines at midline compared to urban households (19.2%), though an increase was recorded in both regions from baseline to midline (Figure 18).

Figure 18. Percent of households with access to basic sanitation



Access to improved sanitation improved from baseline across most districts, except for districts in Southern province and Western province. Major improvements were observed in Chipata (32.2%), Mansa (28.5%), Samfya (26.1%) and Mbala (20.1%) with all of them recording percentage increases of over 20% between baseline and midline (Table 13).

Table 13. Households with clean and covered latrines

Province	District	Baseline					Midline					P-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	203	21.7	2.6	12.9	22.4	193	13.5	2.2	6.6	14.2	0.045***
	Kabwe	167	21.6	2.6	10.0	18.8	166	22.9	2.7	10.7	19.7	0.872
	Kapiri Mposhi	189	11.6	2.0	5.3	12.4	160	18.8	2.5	8.0	16.0	0.088
	Mumbwa	226	4.4	1.3	1.6	6.4	195	20	2.5	11.1	20.1	0.000***
Copperbelt	Kitwe	97	11.3	2.0	1.9	6.9	150	14	2.2	5.0	11.8	0.679
	Ndola	96	8.3	1.7	1.0	5.4	117	11.1	2	2.4	8.0	0.656
Eastern	Chipata	205	17.6	2.4	10.2	19.0	219	49.8	3.2	37.5	49.7	0.000***
	Katete	207	25.6	2.8	16.1	26.3	196	19.4	2.5	10.8	19.8	0.170
	Lundazi	200	20.5	2.6	11.9	21.1	167	40.1	3.1	21.3	32.3	0.000***
	Petauke	200	12.0	2.1	6.0	13.3	167	16.2	2.3	7.0	14.6	0.318
Luapula	Mansa	211	12.8	2.1	7.0	14.6	213	41.3	3.1	29.4	41.3	0.000***
	Kawambwa	223	18.8	2.5	12.2	21.4	242	20.2	2.5	14.7	24.5	0.790
	Nchelenge	197	4.6	1.3	1.3	5.9	229	13.5	2.2	8.4	16.6	0.003***
	Samfya	222	15.8	2.3	9.7	18.3	217	41.9	3.1	30.4	42.4	0.000***
	Mwense	235	22.1	2.6	15.8	25.8	230	29.6	2.9	21.7	32.7	0.084
Lusaka	Lusaka	145	6.9	1.6	1.6	6.4	142	12.7	2.1	4.0	10.4	0.147
Muchinga	Chinsali	192	5.7	1.5	1.9	6.9	198	7.6	1.7	3.1	8.9	0.598
	Isoka	196	15.3	2.3	8.0	16.0	212	8.0	1.7	3.7	9.9	0.032***
	Mpika	222	3.6	1.2	1.0	5.4	213	12.2	2.1	6.6	14.2	0.002**
Northern	Kaputa	240	27.5	2.8	20.9	31.9	247	40.5	3.1	33.9	46.1	0.003**
	Kasama	215	5.6	1.5	2.2	7.4	189	21.7	2.6	11.9	21.1	0.000***
	Luwingu	220	10.9	2.0	5.9	13.3	229	31.9	2.9	23.6	34.8	0.000***
	Mbala	202	10.9	2.0	5.3	12.3	197	31.0	2.9	19.1	29.7	0.000***
North-western	Mwinilunga	222	2.3	0.9	0.3	3.8	213	7.0	1.6	3.1	8.9	0.031***
	Solwezi	189	4.8	1.3	1.3	5.9	122	7.4	1.7	1.3	5.9	0.474
	Zambezi	195	10.8	2.0	5.0	11.8	189	3.7	1.2	0.8	4.8	0.014***

Province	District	Baseline					Midline					P-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Southern	Choma	172	24.4	2.7	12.3	21.7	180	15.0	2.3	7.0	14.6	0.037***
	Monze	161	24.2	2.7	11.1	20.1	154	20.8	2.6	8.7	16.9	0.551
Western	Kalabo	54	25.9	2.8	2.8	8.5	94	16.0	2.3	3.1	8.9	0.209
	Kaoma	188	26.1	2.8	14.7	24.5	202	9.4	1.8	4.3	10.9	0.000***
	Mongu	114	15.8	2.3	4.0	10.4	155	10.3	1.9	3.4	9.5	0.251
	Shang'ombo	67	9.0	1.8	0.5	4.3	19	10.5	1.9	0.0	1.9	1.000

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

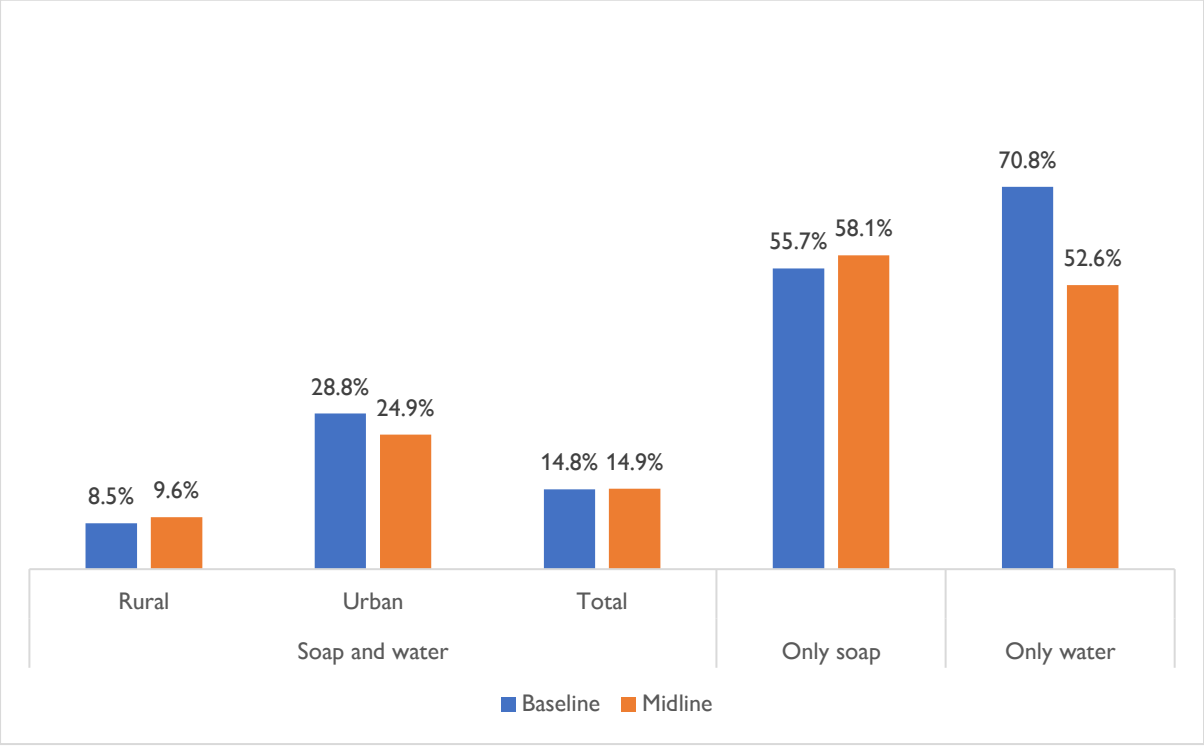
3.3.3 Hygiene

Availability of soap and water at handwashing station

A household was considered as having access to soap and water at a handwashing station if the enumerator was shown a place where household members usually wash their hands after using the toilet, and there was soap and water within one minute of reach.

Slightly more households had access to water and soap at a handwashing station used by family members at midline 14.9%; CI [14.1-15.7]) compared to baseline (14.8%; CI [14.1-15.6]). (p=0.916). Similarly, a slight decline in the proportion of households with both water and soap in urban households between baseline and midline was observed (28.8% vs 24.9%) (Figure 19).

Figure 19. Percent of households with water and soap at a handwashing station



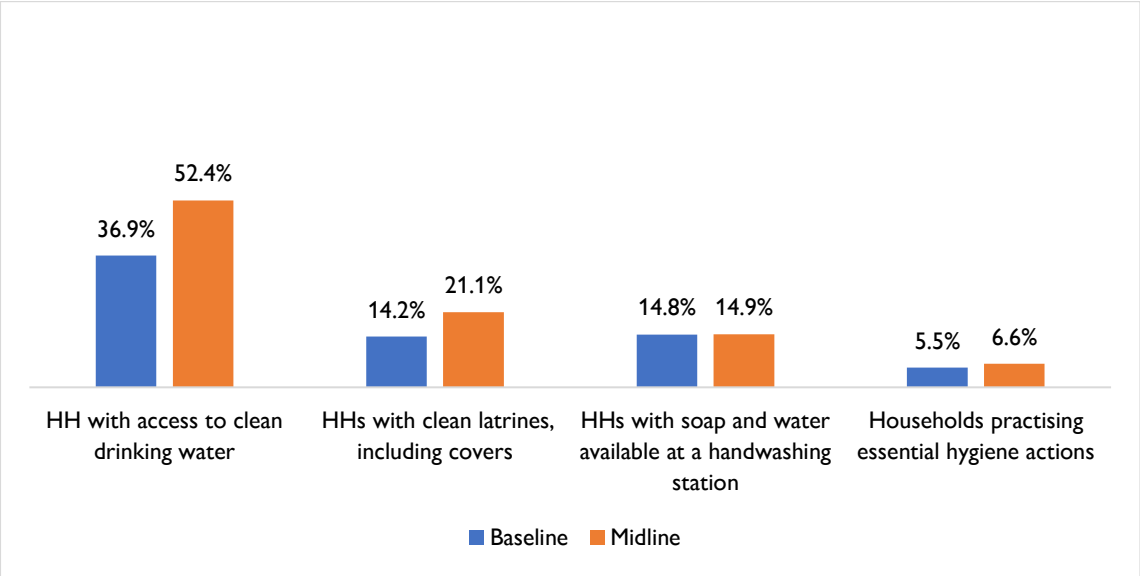
3.3.4 Household Essential Hygiene Practices

Essential hygiene actions are critical at household level to ensure a healthy environment, enabling essential nutrition actions to bring benefits to children. Clean water and sanitation facilities and good hygiene contributes to improved nutritional outcomes. In contrast, unsanitary environments and poor

household hygiene practices lead to the consumption of contaminated water and food resulting in increased diarrhoeal episodes, poor absorption of nutrients, environmental enteric dysfunction, and chronic undernutrition.[14] Essential Hygiene practices is a composite indicator derived from a combination of wash indicators i.e., clean drinking water, availability of soap and water at a handwashing facility, and access to basic sanitation facilities.

A household was counted as practising essential hygiene actions if it had access to clean drinking water, had soap and water available at a handwashing facility, had access to clean latrines. Essential hygiene practices remained low at 6.6% CI [6.0-7.1]] at midline, compared to 5.5% (CI [5.0-6.0] at baseline (Figure 20).

Figure 20. Percent of households practising Essential Hygiene Actions



Child Exposure to Environmental Waste

There is mounting evidence that children exposed to environmental animal waste, along with poor sanitation and hygiene, are at high risk for increased diarrhoea incidence and environmental enteric disorders, leading to malabsorption of nutrients, poor growth, and childhood stunting and wasting[15][16]. Interventions that reduce a child's exposure to environmental waste have a greater impact if the entire community is engaged-[17].

Child exposure to environmental waste was assessed by inquiring about the area where the child plays, observing for signs of animal presence, including faeces and feathers in the child's play area, and asking how many days a week an animal comes into the child's play area. A child was considered to be exposed to environmental animal waste if evidence of animal presence was observed in the play areas or if the respondent indicated that a domestic animal comes into the play area at least once a week. Note that

[14] Water and Development Strategy and Implementation Brief. USAID. 2015. WASH and its link to nutrition. Technical Brief 3. USAID Water and Development Technical Series. https://www.usaid.gov/sites/default/files/documents/1864/wash-nutrition-508.pdf; and https://www.globalwaters.org/sites/default/files/usaid_wash_nutrition_tech_brief_3.pdf

[15] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8401185/

[16] Vilcins, D., Sly, P.D., and Jagals, P. (2018) Environmental Risk Factors associated with Child Stunting: A Systematic Review of the Literature. Annals of global health. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6748290/; WASH and it's link to nutrition.

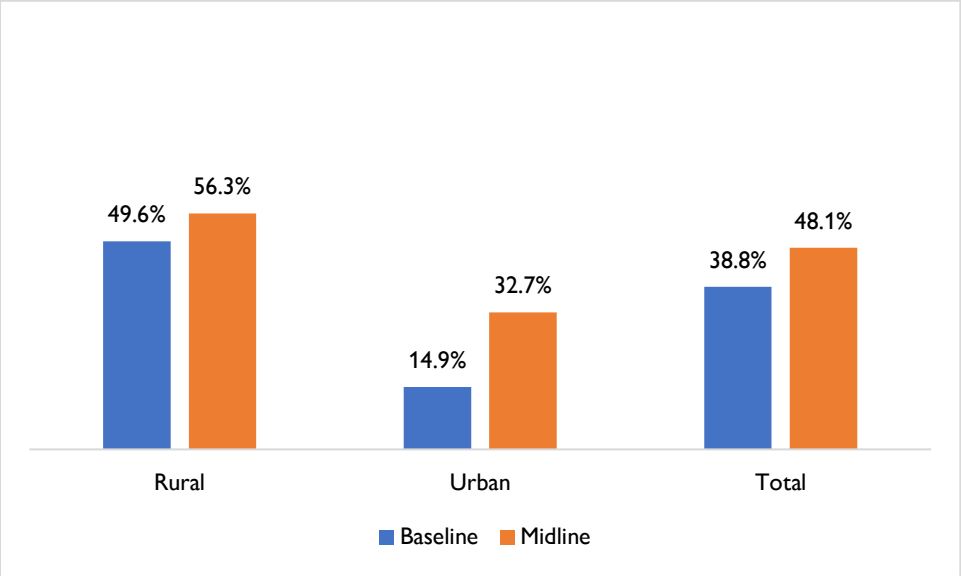
[17] Ibid.

there were some differences in the assessment of this indicator at baseline and midline[18].

Almost half of the children (48.1%; CI [47.0-49.3]) at midline were exposed to environmental animal waste in their play areas (Figure 21). Children living in rural areas have almost double exposure at 56.3% compared to children in urban areas (32.8%).

A significant proportion of children (74.4%) at midline and 53.7% at baseline with diarrhoea were exposed to environmental animal waste in play areas.

Figure 21. Percent of children exposed to environmental waste in play area by region.



3.4 Reach of Nutrition Interventions

The GRZ implements a wide range of community-level nutrition interventions to address undernutrition among children and women during critical life cycle stages. Current evidence shows that the convergence of nutrition-specific and nutrition-sensitive interventions can highly impact stunting reduction[19]. Therefore, the coverage and reach of MCDP interventions at household level were assessed by asking women about their access to nutrition services for themselves and their children in both the baseline and midline surveys.

3.4.1 Nutrition-Specific Interventions

Eleven GRZ nutrition-specific interventions are provided to either the mother or the child (Table 14).

[18] For the question about seeing the child play area, 1374 households were marked 'not applicable' at midline whereas no households were marked as not applicable at baseline. This potentially explains the large difference observed between baseline and midline.

[19] Amy Guo1, J. Michael Bowling2, Jamie Bartram1, Georgia Kayser. Water, Sanitation, and Hygiene in Rural Health-Care Facilities: A Cross-Sectional Study in Ethiopia, Kenya, Mozambique, Rwanda, Uganda, and Zambia. The American journal of tropical medicine and hygiene, 97(4), 1033-1042. http://www.ajtmh.org/content/journals/10.4269/ajtmh.17-0208;jsessionid=BCXSGZRKYsKgbQG7XeMowtm5.ip-10-241-1-122

Table 14. GRZ nutrition-specific interventions to reduce stunting

Child age group	Channel of delivery	Nutrition-Specific Interventions
0-5 months (8 interventions)	Delivered directly to the child	1. Growth monitoring every 6 months
	Delivered through the mother	2. Iron supplementation
		3. Folic acid supplementation
		4. SBCC: exclusive breastfeeding
		5. SBCC: feeding the sick child
		6. SBCC: diet during pregnancy
		7. SBCC: breastfeeding
		8. SBCC complementary feeding
6-11 months (9 interventions)	Delivered directly to the child	1. Growth monitoring every 6 months
		2. Vitamin A supplementation
	Delivered through the mother	3. Iron supplementation
		4. Folic Acid supplementation
		5. SBCC: complementary feeding
		6. SBCC: diet during breastfeeding
		7. SBCC: feeding the sick child
		8. SBCC: diet during pregnancy
		9. SBCC: exclusive breastfeeding
12-23 months (10 interventions)	Delivered directly to the child	1. Growth monitoring every 6 months
		2. Vitamin A supplementation
		3. Deworming
	Delivered through the mother	4. Iron supplementation
		5. Folic Acid supplementation
		6. SBCC: complementary feeding
		7. SBCC: diet during breastfeeding
		8. SBCC: feeding the sick child
		9. SBCC: diet during pregnancy
		10. SBCC: exclusive breastfeeding

Nutrition-specific Interventions targeting the Child

Figure 22 present the coverage of nutrition-specific interventions to the child (growth monitoring, deworming, and Vitamin A supplementation) during the baseline and midline surveys.

The proportion of children receiving vitamin A supplementation increased slightly from 67.5% to 69.2%. The increase was observed in both rural (66.3% to 68.1%) and urban (70.0% to 71.1%) areas. Likewise, the proportion of children who received deworming also increased slightly from 55.5% to 59.8%; and again, the increase was in both rural (from 54.3% to 58.0%) and urban (from 58.1% to 63.3%) areas. Figure 23 shows that children receiving Vitamin A supplementation increased across all age groups.

Figure 22. Percent of children reached with nutrition-specific services overall

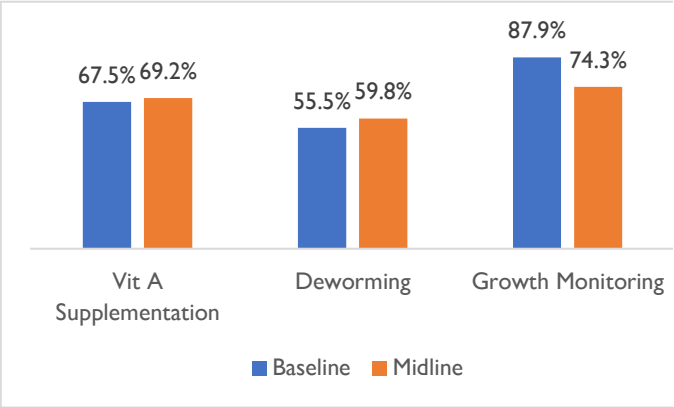
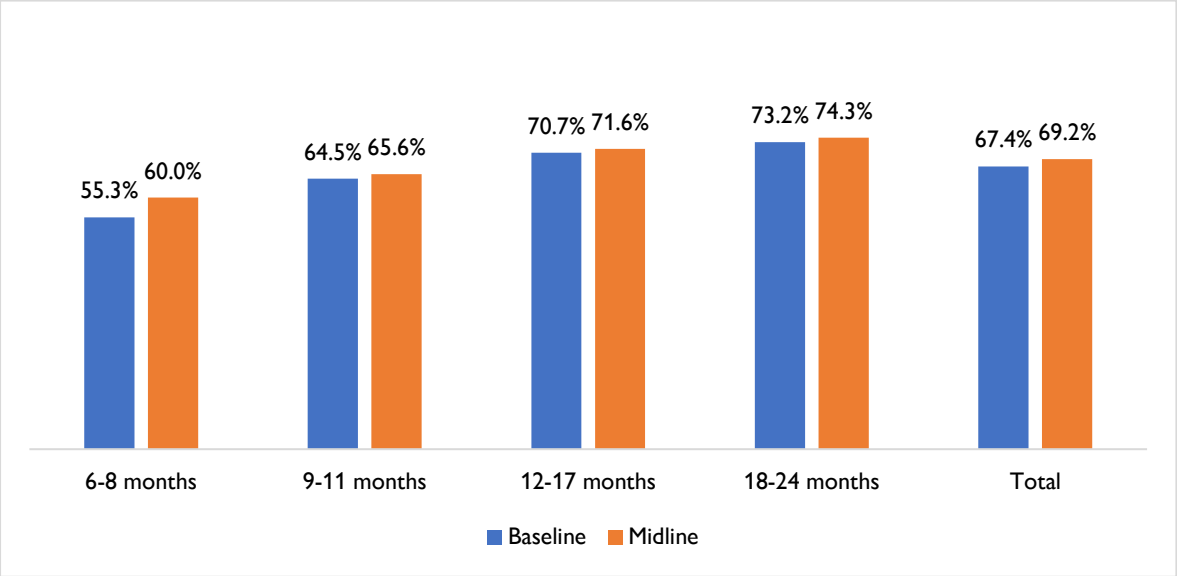


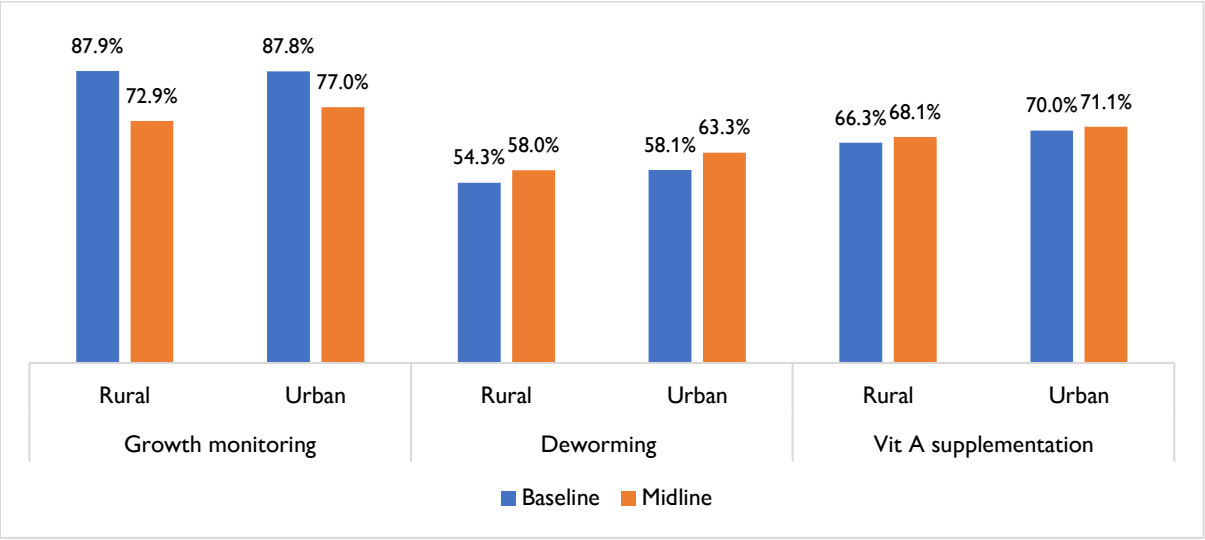
Figure 23. Vitamin A coverage by age



The proportion of children receiving growth monitoring services decreased substantially between the two surveys, from 87.9% to 74.3%, with a more pronounced decline in rural areas (from 87.9% to 72.9%) compared to urban areas (from 87.8% to 77.0%). The decrease affected children of all age groups. In both surveys, children less than six months were less likely to receive growth monitoring services.

There was no difference in access to services between male and female children, but the gap in access to services – especially deworming and growth monitoring – widened between children in rural areas and those in urban areas, with those in rural areas being less likely to receive the services.

Figure 24. Percent of children reached with nutrition-specific services by region



Nutrition-specific Interventions Targeting the Mother

The proportion of women who reported receiving micronutrient and SBCC on nutrition-specific interventions declined in all cases, except among those who received SBCC messages on "women's diet during pregnancy" and "feeding the sick child" (Figure 25). In terms of micronutrient supplements targeting the mothers, most women received folic acid and iron supplementation (albeit with a slight decline in the midline survey), with minimal rural-urban differential. However, the mean number of days for which the women reported consuming the supplement was low (folic acid: 102 days; iron: 103 days) out of the 280 days of gestation. SBCC, especially about diet during pregnancy, remained high – both in urban and rural areas – but SBCC on complementary feeding dropped by more than 40% in urban and rural areas. Notably, SBCC on exclusive breastfeeding, which was low in the baseline, significantly improved in urban areas but remained low in rural areas (Figure 26).

Figure 25. Percent of pregnant and lactating women who received nutrition-specific interventions

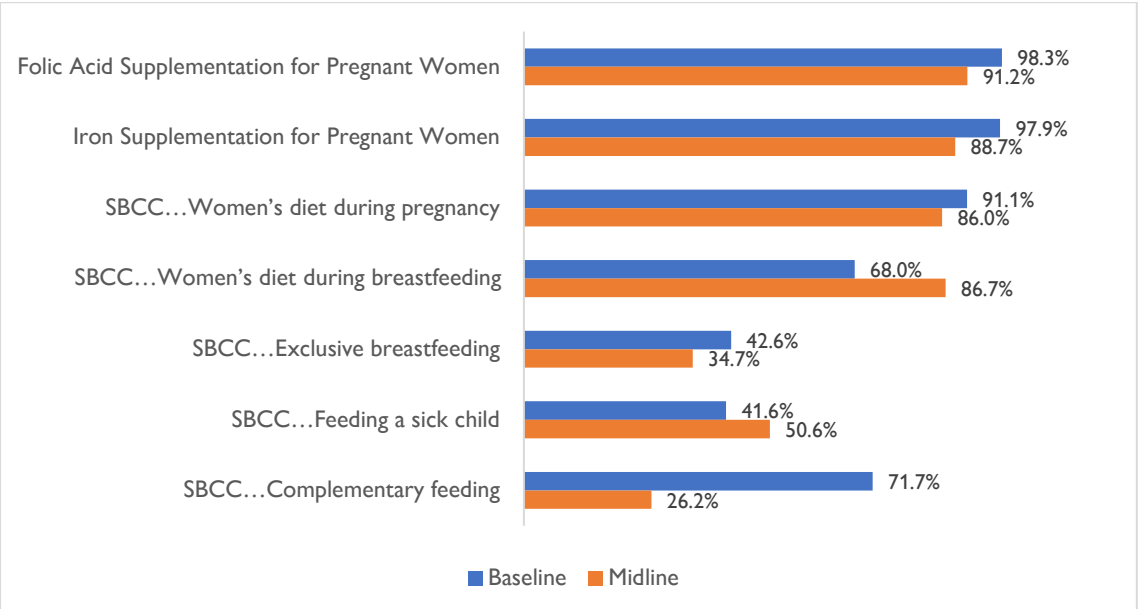
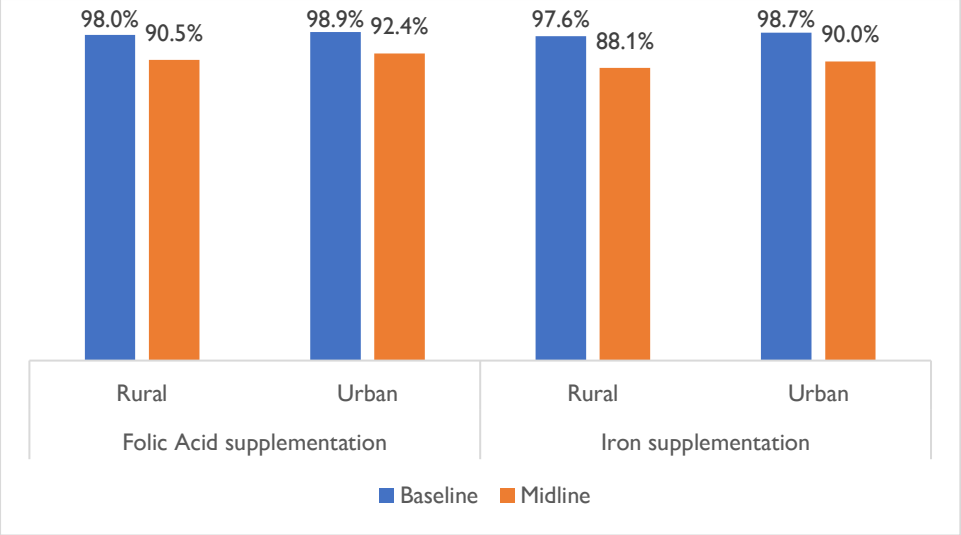


Figure 26. Percent of pregnant and lactating women who received nutrition-specific interventions by region

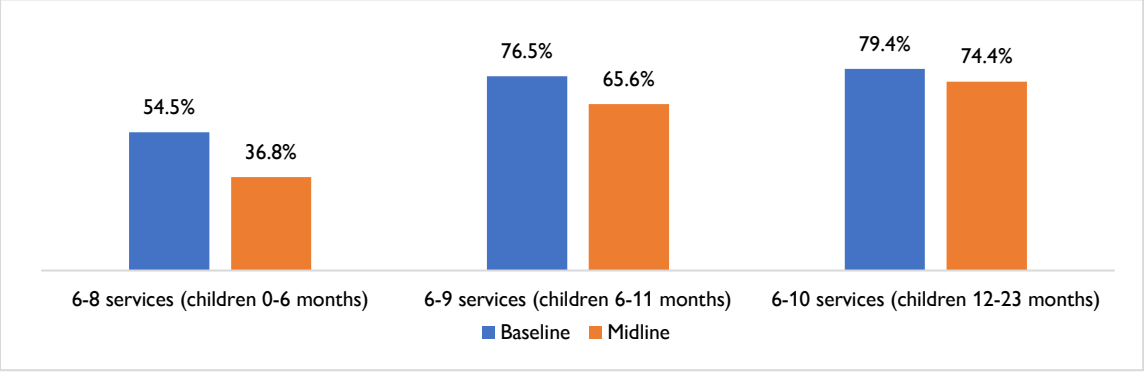


Convergence of Nutrition-Specific Services

The convergence of nutrition-specific interventions was computed for each child age group (aged 0-5, 6-11 and 12-23 months) as a separate indictor by calculating the proportion of children reached with at least 90% of the interventions either directly (i.e. vitamin A supplementation, deworming, and growth monitoring) or indirectly through their mothers (micronutrient supplementation and SBCC). This is based on the two studies published in the Lancet Series on Maternal and Child Undernutrition which found that widespread implementation of a wide range of evidence-based interventions with either 90 or 99% coverage would decrease stunting by 33-36 percent[20,21].

At midline, there was a decline in the proportion of children reached with at least 90% of nutrition-specific interventions (Figure 27); and the decline was observed across all child age groups – especially in children less than 6 months, among whom the proportion reached with 6-8 interventions (of 8 interventions) declined by nearly 20% from baseline.

Figure 27. Percent of children receiving at least 90% of nutrition-specific interventions (either directly or indirectly) in the baseline and midline surveys



[20] Bhutta et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? Lancet 2013; 382: 452–77

[21] Bhutta et al. What works? Interventions for maternal and child undernutrition and survival. Lancet 2008;371 (9610):417-40

The decline in access to nutrition-specific interventions could be attributed in part to the COVID-19 pandemic and restrictions imposed to curb its spread. Consistent with our findings, the 2017-2021 Ministry of Health Annual Statistical Report, indicates a per capita drop of under 5 clinic attendance in most nutrition specific interventions such as under-five clinics from 2019 to 2020 and a further drop from 2020 to 2022. Specifically, weight taking, which had been consistently above 90% in the pre-covid period dropped to 80.9% in 2021[22]. It is worth noting that the Ministry of Health conducted a Child Health Week campaign between 20-25 June 2022 which, among other services, provided vitamin A supplementation and deworming. However, this campaign did not increase the uptake of services usually provided within health facilities – such as growth monitoring of children, iron and folic acid supplementation, and counselling/SBCC on maternal and child health.

Table 15. Percent of children receiving at least 90% of nutrition-specific interventions (directly or indirectly) by district

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	249	13.7	2.2	9.4	17.9	250	8.4	1.8	5.0	11.8	0.0447***
	Kabwe	250	24.0	2.7	18.7	29.3	250	9.6	1.9	5.9	13.3	0.8720
	Kapiri Mposhi	249	10.0	1.9	6.3	13.8	250	10.0	1.9	6.3	13.7	0.0877
	Mumbwa	250	10.4	1.9	6.6	14.2	250	5.6	1.5	2.7	8.5	0.0000***
Copperbelt	Kitwe	250	26.0	2.8	20.6	31.4	250	3.2	1.1	1.0	5.4	0.6789
	Ndola	250	30.0	2.9	24.3	35.7	250	8.0	1.7	4.6	11.4	0.6558
Eastern	Chipata	247	20.6	2.6	15.6	25.7	250	10.0	1.9	6.3	13.7	0.0000***
	Katete	250	20.4	2.5	15.4	25.4	248	13.7	2.2	9.4	18.0	0.1699
	Lundazi	249	31.3	2.9	25.6	37.1	250	8.8	1.8	5.3	12.3	0.0001***
	Petauke	249	23.3	2.7	18.0	28.5	250	8.4	1.8	5.0	11.8	0.3183
Luapula	Mansa	250	19.2	2.5	14.3	24.1	249	26.1	2.8	20.6	31.6	0.0000***
	Kawambwa	250	18.4	2.5	13.6	23.2	250	3.2	1.1	1.0	5.4	0.000***
	Nchelenge	249	15.7	2.3	11.1	20.2	248	10.1	1.9	6.3	13.8	0.0027***
	Samfya	250	20.8	2.6	15.8	25.8	250	34.4	3.0	28.5	40.3	0.0000***
	Mwense	250	30.4	2.9	24.7	36.1	250	16.0	2.3	11.5	20.5	0.000***
Lusaka	Lusaka	250	13.6	2.2	9.4	17.8	250	10.0	1.9	6.3	13.7	0.1468
Muchinga	Chinsali	250	15.2	2.3	10.7	19.7	250	8.8	1.8	5.3	12.3	0.5976
	Isoka	250	10.4	1.9	6.6	14.2	250	5.2	1.4	2.4	8.0	0.0317***
	Mpika	250	17.6	2.4	12.9	22.3	249	12.4	2.1	8.3	16.6	0.0016***
Northern	Kaputa	250	12.0	2.1	8.0	16.0	250	18.0	2.4	13.2	22.8	0.0034**
	Kasama	250	11.6	2.0	7.6	15.6	249	16.5	2.4	11.9	21.1	0.0000***
	Luwingu	250	12.0	2.1	8.0	16.0	250	36.8	3.1	30.8	42.8	0.0000***
	Mbala	250	42.0	3.1	35.9	48.1	250	17.6	2.4	12.9	22.3	0.0000***
North - western	Mwinilunga	249	14.9	2.3	10.4	19.3	250	5.2	1.4	2.4	8.0	0.0311***
	Solwezi	250	14.0	2.2	9.7	18.3	249	6.8	1.6	3.7	10.0	0.4742
	Zambezi	250	16.0	2.3	11.5	20.5	250	7.2	1.6	4.0	10.4	0.0137***
Southern	Choma	247	15.8	2.3	11.2	20.3	250	9.2	1.8	5.6	12.8	0.0366***
	Monze	250	30.4	2.9	24.7	36.1	250	16.4	2.3	11.8	21.0	0.5509
Western	Kalabo	249	13.3	2.1	9.0	17.5	250	2.4	1.0	0.5	4.3	0.2092
	Kaoma	250	14.0	2.2	9.7	18.3	249	4.4	1.3	1.9	7.0	0.0000***
	Mongu	249	17.3	2.4	12.6	22.0	249	2.4	1.0	0.5	4.3	0.2511
	Shang'ombo	250	8.8	1.8	5.3	12.3	250	0.8	0.6	0.0	1.9	1.0000

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

[22] Annual Health Statistics Report 2017-2021, Ministry of Health, Zambia. October 2022

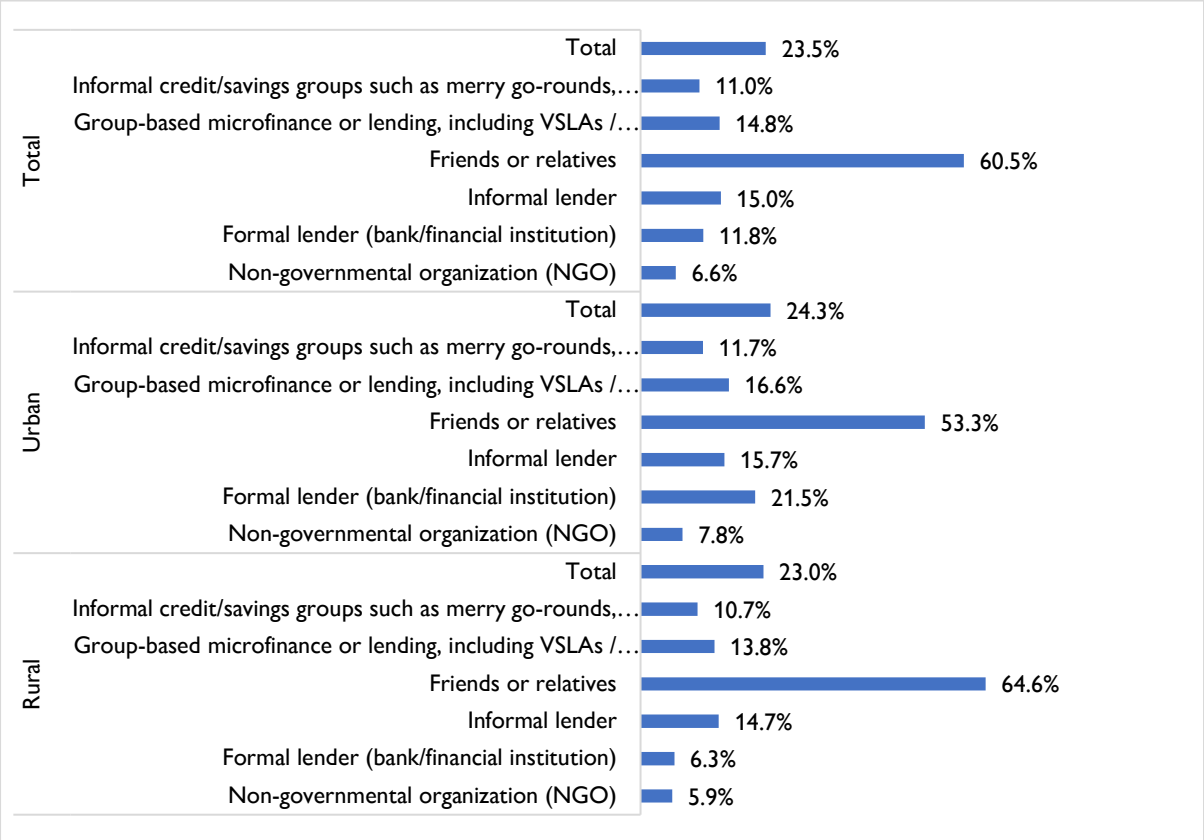
3.4.2 Nutrition-Sensitive Interventions

Nutrition-sensitive indicators were only assessed in the midline survey. Interventions assessed include access to social protection services during emergency, access to financial credits in the past 12 months, households reached with social, and behaviour change communication on livestock management, animal husbandry, food processing, fish management, improved harvesting technics, improved land management and improved crop management. Result for each of these interventions are discussed below.

Access to Financial Credit

Access to financial credit was determined using the proportion of households with members who accessed a loan in the 12 months preceding the survey (Figure 28). Only 23.5% (n=1,877 for each response) of households had obtained credit; slightly more urban households obtained credit (24.3%) compared to rural households (23.0%). The primary source of credit was friends and relatives both in rural (64.6%) and urban (53.3%) areas. Access to credit from NGOs was low (6.6%). However again, more urban households (7.8%) accessed credit from NGOs than rural households (6.3%). Similarly, access to credit through formal lending institutions was 3 times lower in rural households (6.3%) than in urban households (21.4%). These results suggest that rural households have less access to credit compared to urban households.

Figure 28. Percent of households where any member got any loan or borrowed cash/in kind in the 12 months preceding the survey



Access to Social Protection services during Emergency

Households were asked if they (a) were aware of social protection assistance programme (i.e., social cash transfer, COVID-19 assistance, pass on programmes, and other emergency funds), (b) experienced any shocks in the previous 12 months, and (c) received any assistance of social protection assistance from any sources in their areas. Overall, 89.3% (n=7,997) of households were aware of the social protection programmes, 48.3% (n=7,997) of households experienced shocks in 12 months preceding the survey, and 17.6% of those that experienced shocks received assistance. Among those that received assistance, 51.2% indicated receiving the assistance early enough to enable them to use it to address the emergency.

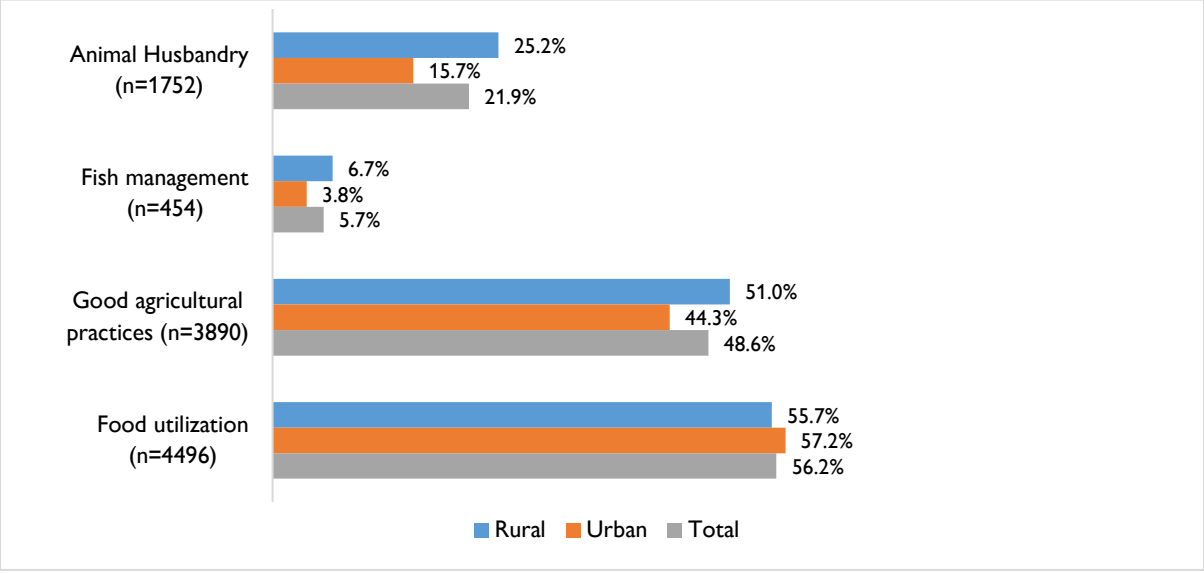
The results indicate a lower response towards addressing emergencies in the community which could contribute to worsening the situation among vulnerable populations. However, the response is prompt enough to provide the needed assistance.

Social and Behaviour Change Communication (SBCC)

Exposure to nutrition-sensitive messages

Exposure to nutrition-sensitive information (see the four main areas in Figure 29) was low for animal husbandry and fish management. More households (56.2%) were exposed to food utilisation messages than any other, with similar exposures in rural and urban areas. In contrast, exposure to SBCC on fish management was very low, with only 5.7% of households exposed, mostly in rural areas (6.7%) than in urban areas (3.8%).

Figure 29. Percent of households exposed to nutrition-sensitive SBCC by region

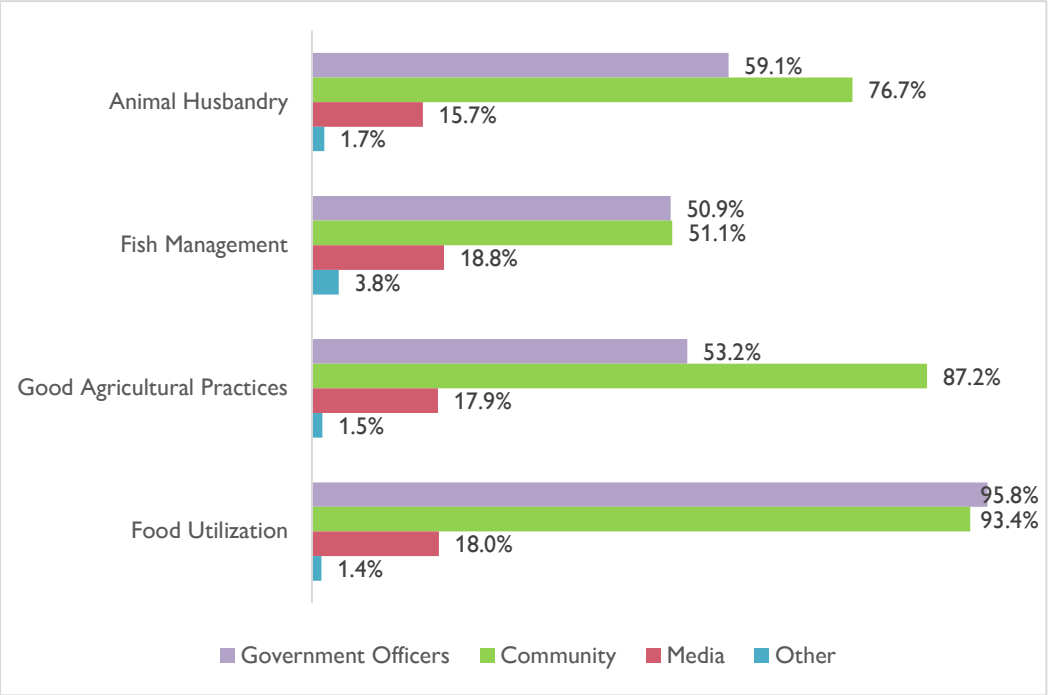


Households were exposed to nutrition-sensitive SBCC messages through various government officers or experts such as i) health workers, agricultural workers, community development workers, and project staff; ii) NGOs working in the area and any other events where experts provided information to the community; iii) Community members, including lead farmers, community health volunteers, and other community champions in health and nutrition interventions delivery; and iv) the media, including print sources, radio, posters, television, phone, etc.

The primary sources of messages for households were government officers and community members for

all topics (Figure 30).

Figure 30. Percent of sources of information for nutrition-sensitive intervention



The main source of nutrition sensitive information was from the community (which include community workers, lead farmers, neighbours) and government officers.

Self-reported use of nutrition-sensitive information obtained

The respondents were asked if they were able to use the nutrition-specific and nutrition-sensitive information they had obtained. Almost all households (95.8%) reported using information on nutrition-specific messages received from health facilities. Among those that did not use the information, time was mentioned as the main challenge hindering application of recommendations obtained. For nutrition-sensitive interventions, a higher usage of information was reported for food processing SBCC (94.4%), followed by good agricultural practices (78.5%), and the least was fish and livestock management (36,1%). The main challenges highlighted for not implementing nutrition-sensitive messages was the lack of resources, e.g., equipment and finances, to use when applying the knowledge.

3.5 Household Food and Nutrition Practices

3.5.1 Household Essential Nutrition Action Practices

The World Health Organization (WHO) has identified nine essential nutrition actions (ENA) in relation to the mother and the child that, if adhered to, are likely to reduce malnutrition. A household was counted as implementing ENA if it reported practising all nine actions (Box 3), based on the dietary intake and micronutrient supplementation data collected in both surveys for mothers and children.

A significant increase in households practising ENA was observed from baseline and midline. Overall, 18.6% CI [17.8-19.5] of households practiced ENA at baseline compared to 26.5% CI 25.6-27.5], at midline ($p<0.001$). This shows a positive trend around behaviour change in nutrition practices at household level. ENA increased in both rural and urban from baseline – from 18.3% to 26.2% in rural

Box 3. Essential nutrition actions

Mother

1. Adequate diet during pregnancy and lactation
2. Iron supplementation during pregnancy
3. Vitamin A supplementation during pregnancy

Child

4. Early initiation of breastfeeding
5. Exclusive breastfeeding for 6 months
6. Continued breastfeeding from 1 year
7. Adequate complementary foods through diversified diet for children 6-23 months of age
8. Correct feeding of the sick child during and after sickness (i.e., feeding through fluids and foods)
9. Vitamin A supplementation in children above 6 months of age

areas and from 19.3% to 23.6% in urban areas. In terms of geographical variations, ENA increased in 24 of 32 districts from the baseline. Districts with highest improvements included Monze, Kitwe, Katete, Kalabo, Luwingu, Petauke, Lusaka, Mbala, Mwinilunga, Zambezi and Chibombo ($p<0.001$) (Table 16).

Table 16. Percent of households practising Essential Nutrition Actions (ENA)

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	249	18.1	2.4	13.3	22.9	250	32.8	3.0	27.0	38.6	0.000***
	Kabwe	250	19.6	2.5	14.7	24.5	250	24.0	2.7	18.7	29.3	0.279
	Kapiri Mposhi	249	21.3	2.6	16.2	26.4	250	21.6	2.6	16.5	26.7	1.000
	Mumbwa	250	10.0	1.9	6.3	13.7	250	11.2	2.0	7.3	15.1	0.771
Copperbelt	Kitwe	250	17.2	2.4	12.5	21.9	250	19.6	2.5	14.7	24.5	0.564
	Ndola	250	17.2	2.4	12.5	21.9	250	18.4	2.5	13.6	23.2	0.815
Eastern	Chipata	247	29.6	2.9	23.9	35.2	250	27.6	2.8	22.1	33.1	0.702
	Katete	250	16.0	2.3	11.5	20.5	248	44.0	3.2	37.8	50.1	0.000***
	Lundazi	249	24.1	2.7	18.8	29.4	250	31.2	2.9	25.5	36.9	0.094
	Petauke	249	19.3	2.5	14.4	24.2	250	40.0	3.1	33.9	46.1	0.000***
Luapula	Mansa	250	20.0	2.5	15.0	25.0	249	19.7	2.5	14.7	24.6	1.000
	Kawambwa	250	23.6	2.7	18.3	28.9	250	26.8	2.8	21.3	32.3	0.471
	Nchelenge	249	22.1	2.6	16.9	27.2	248	26.2	2.8	20.7	31.7	0.333
	Samfya	250	23.2	2.7	18.0	28.4	250	24.4	2.7	19.1	29.7	0.834
	Mwense	250	20.8	2.6	15.8	25.8	250	34.0	3.0	28.1	39.9	0.001
Lusaka	Lusaka	250	12.0	2.1	8.0	16.0	250	35.2	3.0	29.3	41.1	0.000***
Muchinga	Chinsali	250	18.0	2.4	13.2	22.8	250	29.6	2.9	23.9	35.3	0.003***
	Isoka	250	24.0	2.7	18.7	29.3	250	36.8	3.1	30.8	42.8	0.003***
	Mpika	250	17.6	2.4	12.9	22.3	249	23.7	2.7	18.4	29.0	0.116
Northern	Kaputa	250	14.0	2.2	9.7	18.3	250	27.6	2.8	22.1	33.1	0.000***
	Kasama	250	16.0	2.3	11.5	20.5	249	26.1	2.8	20.6	31.6	0.008***
	Luwingu	250	13.2	2.1	9.0	17.4	250	39.6	3.1	33.5	45.7	0.000***
	Mbala	250	26.4	2.8	20.9	31.9	250	44.4	3.1	38.2	50.6	0.000***
North-western	Mwinilunga	249	14.9	2.3	10.4	19.3	250	38.8	3.1	32.8	44.8	0.000***
	Solwezi	250	17.6	2.4	12.9	22.3	249	23.3	2.7	18.0	28.5	0.143
	Zambezi	250	12.4	2.1	8.3	16.5	250	32.4	3.0	26.6	38.2	0.000***
Southern	Choma	247	20.6	2.6	15.6	25.7	250	17.2	2.4	12.5	21.9	0.386
	Monze	250	21.6	2.6	16.5	26.7	250	16.4	2.3	11.8	21.0	0.171
Western	Kalabo	249	20.5	2.6	15.5	25.5	250	16.0	2.3	11.5	20.5	0.238

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
	Kaoma	250	20.4	2.5	15.4	25.4	249	18.5	2.5	13.7	23.3	0.667
	Mongu	249	9.2	1.8	5.6	12.8	249	16.1	2.3	11.5	20.6	0.031
	Shang'ombo	250	16.0	2.3	11.5	20.5	250	6.4	1.5	3.4	9.4	0.001

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

3.6 Maternal and Young Child Feeding

3.6.1 Infant and Young Child Feeding (IYCF)

Children Meeting IYCF Minimum Standards

Children were counted to have met WHO/UNICEF IYCF minimal standards if they were given all the nutrition minimum requirements for their age, i.e., children less than 6 months are exclusively breastfed; children 6-8 months and those aged 9 to 23 months are fed according to WHO/UNICEF recommended feeding practices for their age (Box 4)[23], [24].

A total of 7,976 children at baseline and 7,941 at midline were assessed on IYCF practices. The proportion of children meeting IYCF standards remained the same from baseline (28.3%); CI [27.3-29.3] to midline (29.0%); CI [28.0-30.0]; (p=0.326). However, children less than 6 months showed improvement in meeting IYCF standards for their age requirement from 55.7% at baseline to 69.6% at midline, reflecting an increase in exclusive breastfeeding. For children over 6 months of age, IYCF indicators declined especially among those aged 18 to 23 months old (Figure 31).

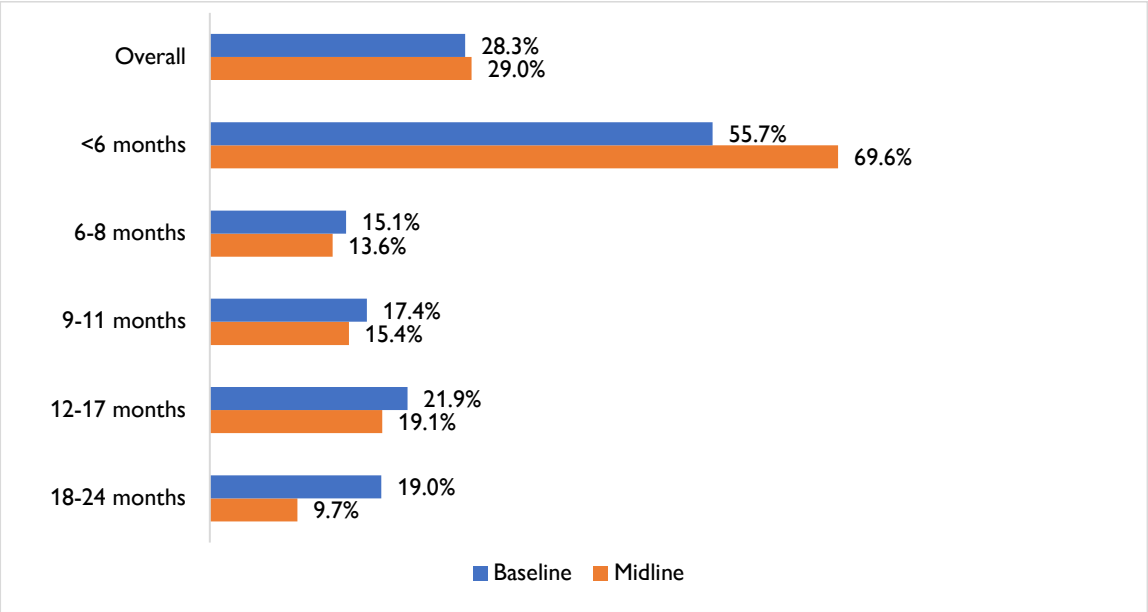
Box 4. Minimum IYCF standards for children 0-23 months of age

1. Early initiation of breastfeeding within one hour of birth
2. Exclusive breastfeeding from birth until 6 months of age
3. Timely introduction of soft, semi-soft and solid foods at 6 months of age
4. Dietary diversity – foods from at least five food groups (including breastmilk) between the ages of 6–23 months
5. Adequate meal frequency – feeding the minimum number of recommended times in a day between the ages of 6–23 months
6. Continued breastfeeding from the age of 6 months to 2 years and beyond
7. Safe preparation, storage and handling of complementary foods

[23] UNICEF. Guidelines and Minimum Standards for the Protection, Promotion and Support of Breastfeeding and Complementary Feeding (2022). https://www.unicef.org/eap/media/10676/file/Guidelines%20and%20Minimum%20Standards%20for%20the%20Protection,%20Promotion%20and%20Support%20of%20Breastfeeding%20and%20Complementary%20Feeding.pdf

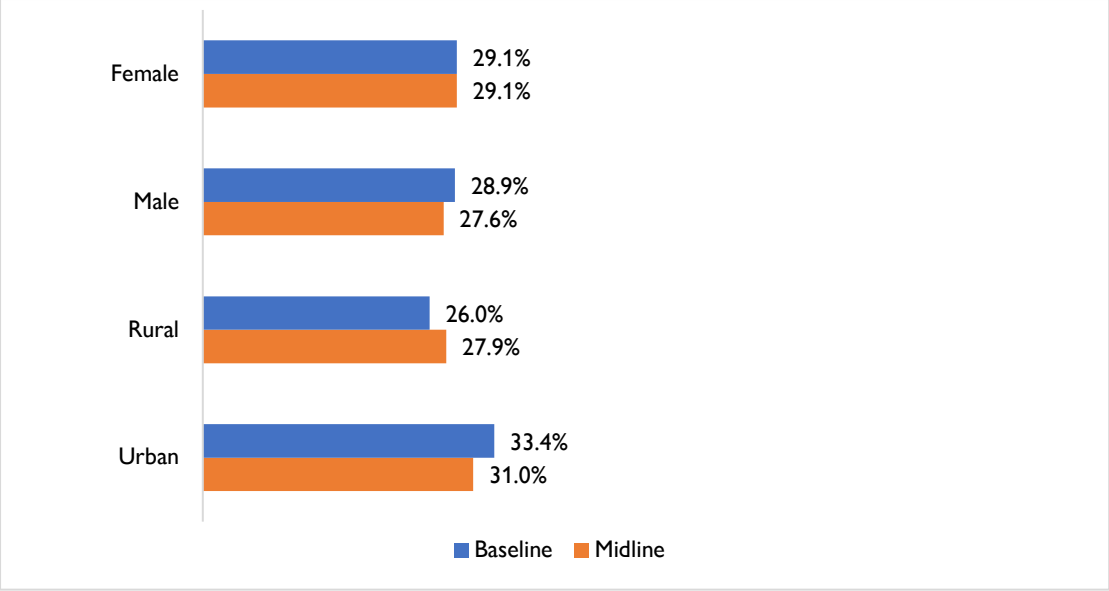
[24] Indicators for assessing infant and young child feeding practices: definitions and measurement methods. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2021. Licence: CC BYNC-SA 3.0 IGO; https://creativecommons.org/licenses/by-nc-sa/3.0/igo .

Figure 31. Percent of children meeting IYCF standards by age group.



No major differences were observed in children meeting IYCF standards by sex of the child (Figure 32). From baseline to midline, the overall proportion of children meeting IYCF standards slightly increased in rural areas (from 26.0% to 27.9%) and slightly decreased in urban areas (from 33.4% to 31.0%) (Figure 32).

Figure 32. Percent of children meeting IYCF standards by sex of child and region



Children Meeting IYCF minimum standards by District

The proportion of children fed according to IYCF standard[25] increased in 17 out of the 32 districts. However, significant declines were observed in Ndola ($p<0.0001$), Kabwe ($p=0.017$), Mumbwa ($p=0.005$), Luwingu ($p=0.045$), and Solwezi ($p=0.001$) districts. In contrast, significant improvements were observed in Mpika ($p=0.015$), Kaputa ($P<0.0001$), and Kaoma ($p<0.0001$) districts (Table 17).

Table 17. Percent of children meeting IYCF minimum standards for their age by district.

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	249	26.1	2.8	20.6	31.6	247	27.1	2.8	21.3	32.3	0.876
	Kabwe	250	44.0	3.1	37.8	50.2	247	33.2	3.0	27.0	38.6	0.017***
	Kapiri Mposhi	249	34.1	3.0	28.2	40.0	248	28.2	2.8	22.4	33.6	0.185
	Mumbwa	250	41.6	3.1	35.5	47.7	247	29.1	2.9	23.2	34.4	0.005***
Copperbelt	Kitwe	250	36.4	3.0	30.4	42.4	249	33.3	3.0	27.4	39.0	0.532
	Ndola	250	36.4	3.0	30.4	42.4	250	20.8	2.6	15.8	25.8	0.000***
Eastern	Chipata	247	34.8	3.0	28.9	40.8	248	34.7	3.0	28.5	40.3	1.000
	Katete	250	31.2	2.9	25.5	36.9	246	32.5	3.0	26.4	38.1	0.827
	Lundazi	249	34.1	3.0	28.2	40.0	246	27.2	2.8	21.3	32.3	0.117
	Petauke	249	24.1	2.7	18.8	29.4	247	27.5	2.8	21.7	32.7	0.441
Luapula	Mansa	250	33.6	3.0	27.7	39.5	248	25.8	2.8	20.3	31.1	0.071
	Kawambwa	249	25.3	2.7	19.8	30.6	250	35.2	3.0	29.3	41.1	0.021
	Nchelenge	248	21.4	2.6	16.2	26.4	248	27.8	2.8	22.2	33.4	0.118
	Samfya	249	25.7	2.8	20.2	31.0	245	28.2	2.8	22.1	33.1	0.607
	Mwense	250	24.0	2.7	18.7	29.3	249	26.9	2.8	21.3	32.3	0.520
Lusaka	Lusaka	250	30.8	2.9	25.1	36.5	249	26.9	2.8	21.3	32.3	0.389
Muchinga	Chinsali	249	21.7	2.6	16.5	26.7	250	23.2	2.7	18.0	28.4	0.766
	Isoka	250	28.8	2.9	23.2	34.4	247	30.8	2.9	24.7	36.1	0.703
	Mpika	248	16.9	2.4	12.2	21.4	247	26.3	2.8	20.6	31.6	0.015***
Northern	Kaputa	249	15.7	2.3	11.1	20.1	249	30.1	2.9	24.3	35.7	0.000***
	Kasama	250	24.0	2.7	18.7	29.3	246	24.0	2.7	18.4	29.0	1.000
	Luwingu	250	29.6	2.9	23.9	35.3	248	21.4	2.6	16.1	26.3	0.045
	Mbala	250	29.2	2.9	23.6	34.8	247	30.4	2.9	24.3	35.7	0.853
North - western	Mwinilunga	249	26.9	2.8	21.4	32.4	250	26.0	2.8	20.6	31.4	0.898
	Solwezi	249	26.1	2.8	20.6	31.4	249	40.6	3.1	34.5	46.7	0.001***
	Zambezi	249	23.7	2.7	18.3	28.9	250	32.0	3.0	26.2	37.8	0.049
Southern	Choma	247	37.7	3.1	31.6	43.7	250	37.6	3.1	31.6	43.6	1.000
	Monze	250	36.8	3.1	30.8	42.8	250	35.2	3.0	29.3	41.1	0.780
Western	Kalabo	249	21.7	2.6	16.6	26.8	246	21.1	2.6	15.8	25.8	0.969
	Kaoma	250	21.6	2.6	16.5	26.7	249	39.0	3.1	32.9	45.0	0.000***
	Mongu	248	23.0	2.7	17.7	28.1	249	21.3	2.6	16.2	26.4	0.728
	Shang'ombo	250	18.4	2.5	13.6	23.2	250	24.4	2.7	19.1	29.7	0.127

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

Children Meeting Selected IYCF Standards

The selected standards for IYCF assessment included early initiation of breastfeeding, exclusive breastfeeding, introduction to semi-solid foods, children meeting minimum meal frequency (MMF), children meeting child dietary diversity (CDD), and children's minimum acceptable diets (MAD). The proportion of children who met different IYCF standards varied by the standards as discussed below.

Early initiation of breastfeeding (at birth)

Early initiation of breastfeeding is crucial for a child's development as it stimulates breast milk production and promotes consumption of colostrum (the first yellowish milk produced after the mother gives birth). Colostrum supplies high levels of nutrients and antibodies that support a child's immunity in early life. Therefore, WHO recommends that new-borns receive breast milk within the first hour of birth.

Overall, the proportion of children initiated on breast milk within one hour of birth increased from 73.5% at baseline to 79.7% at midline. Increases were observed in both rural (75.0% to 81.8%) and urban (70.0% to 75.8%) areas. Early initiation of breastfeeding for male children increased from 73.1% to 78.6% and for females from 73.9% to 80.8%, at baseline and midline, respectively.

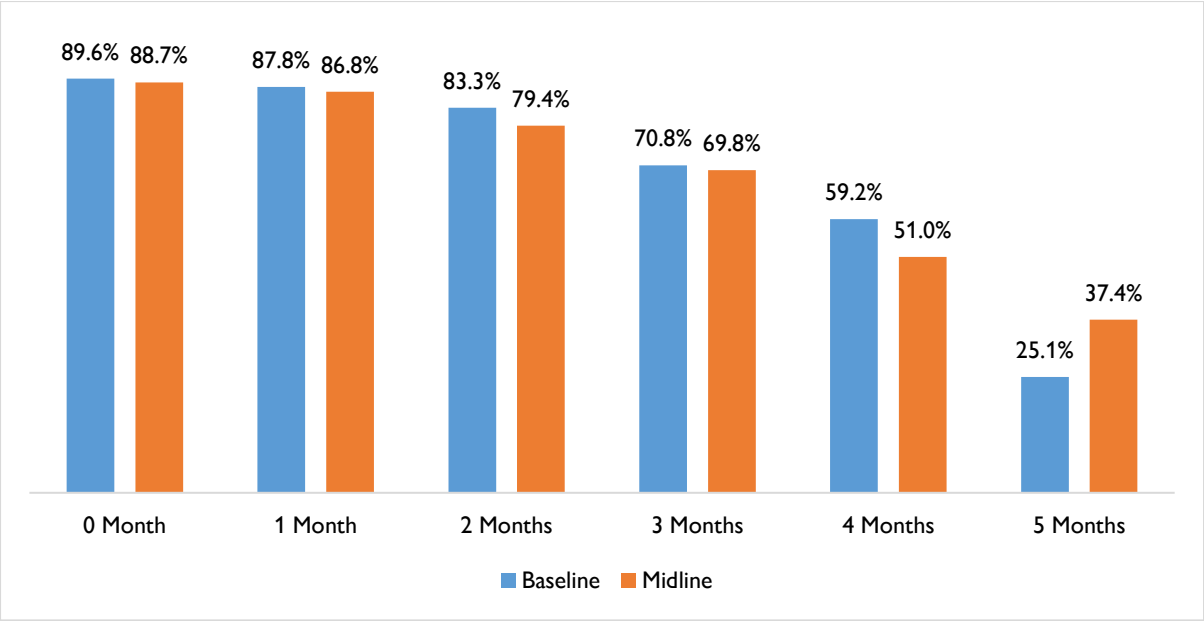
Exclusive breastfeeding (0-5 months)

Exclusive breastfeeding for children 0- 5 months of life is important for child survival. Exclusive breastfeeding is defined as feeding only breast milk to a child from birth until 6 months of age with no other solids or liquids.

Exclusive breastfeeding among children less than 6 months old generally remained the same at baseline (68.4%; CI [66.4-70.5] and midline (69.6%; CI [67.6-71.6]; (p=0.422). The proportion of male children exclusively breastfed increased from 66.4% at baseline to 68.5% at midline, while there was no change in the proportion of exclusively breastfed female children. Further, exclusive breastfeeding increased in rural areas from 69.6% at baseline to 72.1% at midline and decreased slightly in urban areas from 65.9% at baseline to 64.9% at midline.

Examination of exclusive breastfeeding across children aged 0 to 5 months shows a similar pattern in midline and baseline (Figure 33) with exclusive breastfeeding declining with increasing age of the child.

Figure 33. Percent of exclusive breastfeeding by months



Exclusive breastfeeding increased in 18 of 32 districts from baseline to the midline. Significant improvements in exclusive breastfeeding rates were observed in Mansa (p=0.031), Samfya (p=0.007), and Mpika (p<0.0001) districts, while significant declines were observed in Ndola (p=0.011), Chipata (p=0.030), Lundazi (p=0.031), and Luwingu (p=0.010). There were no significant differences in the

exclusive breastfeeding rates of the remaining districts (P>0.05) (Table 18).

Table 18. Percent of Exclusive breastfeeding by District

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	64	62.5	3.1	11.5	20.6	66.0	71.2	2.9	14.0	23.6	0.385
	Kabwe	71	77.5	2.6	16.9	27.1	58.0	72.4	2.8	12.2	21.4	0.648
	Kapiri Mposhi	77	72.7	2.8	17.3	27.7	50.0	76.0	2.7	10.7	19.7	0.839
	Mumbwa	67	83.6	2.3	17.2	27.6	62.0	88.7	2.0	16.9	27.1	0.558
Copperbelt	Kitwe	57	73.7	2.8	12.2	21.4	77.0	64.9	3.0	15.0	25.0	0.373
	Ndola	52	69.2	2.9	10.0	18.8	64.0	43.8	3.1	7.3	15.1	0.011***
Eastern	Chipata	74	77.0	2.7	17.8	28.3	76.0	59.2	3.1	13.2	22.8	0.030***
	Katete	60	76.7	2.7	13.6	23.2	62.0	87.1	2.1	16.6	26.9	0.207
	Lundazi	65	64.6	3.0	12.2	21.5	49.0	42.9	3.1	5.0	11.8	0.034***
	Petauke	60	61.7	3.1	10.4	19.3	65.0	72.3	2.8	14.0	23.6	0.282
Luapula	Mansa	62	58.1	3.1	10.0	18.8	52.0	78.8	2.6	11.9	21.1	0.031***
	Kawambwa	39	82.1	2.4	8.7	16.9	68	76.5	2.7	15.8	25.8	0.666
	Nchelenge	62	45.2	3.2	7.3	15.2	68.0	55.9	3.2	10.8	19.8	0.296
	Samfya	71	57.7	3.1	11.8	21.0	78.0	79.5	2.6	19.4	30.2	0.007***
	Mwense	47	68.1	2.9	8.7	16.9	63	60.3	3.1	10.7	19.7	0.524
Lusaka	Lusaka	65	66.2	3.0	12.5	21.9	65.0	73.8	2.8	14.3	24.1	0.444
Muchinga	Chinsali	82	61.0	3.1	15.0	25.0	52.0	67.3	3.0	9.7	18.3	0.577
	Isoka	74	66.2	3.0	14.7	24.5	53.0	73.6	2.8	11.1	20.1	0.489
	Mpika	67	40.3	3.1	7.0	14.6	57.0	77.2	2.7	12.9	22.4	0.000***
Northern	Kaputa	64	50.0	3.2	8.7	16.9	78.0	67.9	3.0	16.1	26.3	0.046***
	Kasama	60	65.0	3.0	11.1	20.1	66.0	59.1	3.1	11.1	20.2	0.618
	Luwingu	78	79.5	2.6	19.4	30.2	73.0	58.9	3.1	12.5	21.9	0.010***
	Mbala	57	66.7	3.0	10.7	19.7	70.0	64.3	3.0	13.2	22.8	0.926
North-western	Mwinilunga	59	66.1	3.0	11.1	20.2	71.0	69.0	2.9	14.7	24.5	0.869
	Solwezi	59	54.2	3.2	8.7	16.9	71.0	60.6	3.1	12.6	22.0	0.583
	Zambezi	65	63.1	3.1	11.8	21.0	82.0	69.5	2.9	17.6	28.0	0.518
Southern	Choma	70	87.1	2.1	19.3	30.1	70.0	75.7	2.7	16.1	26.3	0.128
	Monze	67	79.1	2.6	16.1	26.3	57.0	71.9	2.8	11.8	21.0	0.472
Western	Kalabo	62	79.0	2.6	14.7	24.6	53.0	84.9	2.3	13.2	22.8	0.568
	Kaoma	67	79.1	2.6	16.1	26.3	75.0	70.7	2.9	16.2	26.4	0.337
	Mongu	43	81.4	2.5	9.7	18.4	55.0	78.2	2.6	12.6	22.0	0.889
	Shang'ombo	58	81.0	2.5	14.0	23.6	70.0	81.4	2.5	17.6	28.0	1.000

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

Introduction to semi-solids for children 6-8 months old.

The overall proportion of children introduced to semi-solids at the right age (6-8 months) decreased from 89.2% at baseline to 87.4% at the midline. A reduction was noted in both urban (from 94.8% to 91.9%) and rural areas (from 86.9% to 85.1%).

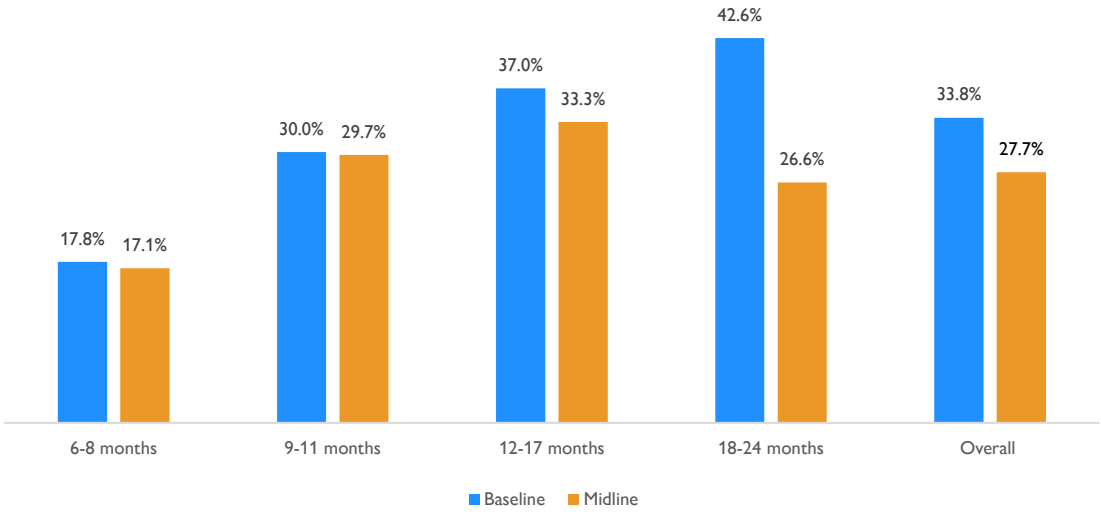
Child Dietary Diversity (CDD) (6-24 months)

Child Dietary Diversity was assessed using the updated 2021 WHO indicators[25], which states that that children aged 6-24 months should consume at least 5 of 8 food groups in the previous day. In the baseline, child dietary diversity was based on the earlier WHO guideline which indicated that a child would meet the recommended dietary diversity if it consumed at least 4 of the 7 food groups in the last 24 hours.

At baseline, 33.8% (CI; [32.6-35.0]) of children met the recommended dietary diversity using the earlier WHO recommendation, while 28.1%; (CI; [27.0-29.3]) (Figure 34) of children did so at midline using the updated WHO recommendations. Although these two values cannot be compared because different methods were used in computing the indicator, it is evident that few children generally met recommended dietary diversity in both surveys.

[25] Indicators for assessing infant and young child feeding practices: definitions and measurement methods. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2021. Licence: CC BYNC-SA 3.0 IGO; https://data.unicef.org/wp-content/uploads/2021/04/Indicators-for-assessing-infant-and-young-child-feeding-practices-2.pdf

Figure 34. Percent of children achieving recommended child dietary diversity by age group.



At midline survey children were reported to be mainly fed on breast milk (98.9%), grains (81.6%) and Vitamin A- rich foods (66.0%) (Figure 35).

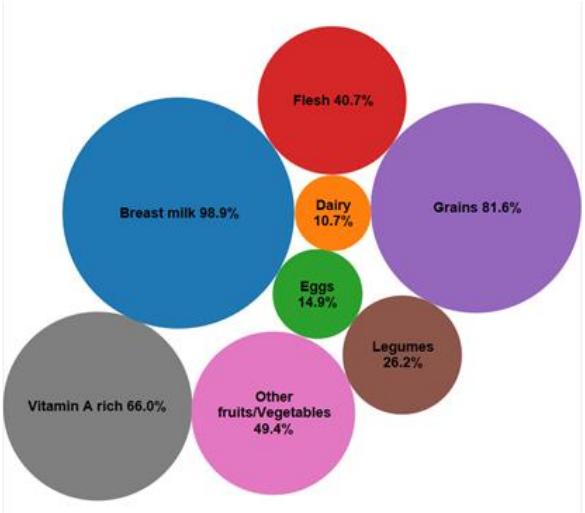
Dietary diversity was lowest among children 6- 8 months old at both baseline and midline surveys. Although all age groups recorded a decline in child dietary diversity, the decline was more prominent among children aged 18-24 months.

Across most districts, CDD declined, although geographical variations were observed (Table 19). While all districts in Central, Copperbelt, Southern, and Eastern provinces recorded a decline in children meeting CDD, other provinces showed variations among districts. For instance, CDD declined in most districts in Luapula Province except in Nchelenge and Kawambwa. Similarly, CDD declined in most districts in Western Province, with the exception of Kaoma District, which showed a large increase at midline. In contrast, Solwezi and Zambezi districts in North-western Province and Kaputa District in Northern Province recorded increases in children meeting CDD.

Minimum Meal Frequency (MMF)

Minimum meal frequency is met when a child consumes the minimum recommended number of meals for its age. According to the WHO Infant and Young Child Feeding guidelines, children aged between 6-8 months should consume between 2 to 3 meals per day, and those aged between 9 to 23 months need to eat between 3 to 4 meals, with an additional 1 to 2 snacks[24].

Figure 35. Most common foods consumed by children at midline.



The proportion of children less than 24 months old who met MMF for their age (across all age groups) decreased slightly from 44.0% (CI [42.7-45.3]) at baseline to 41.9% at the midline (CI [40.7-42.3]) (p=0.0257). Slight reductions were observed across all age groups, with a larger reduction noted among children aged 6-8 months (Figure 36). A bigger proportion of children in urban areas achieved MMF both at baseline (52.3%) and midline (45.3%) compared to those in rural areas (40.0% at baseline and 38.8% at midline).

Figure 36. Percent of children meeting minimum meal frequency by child age group

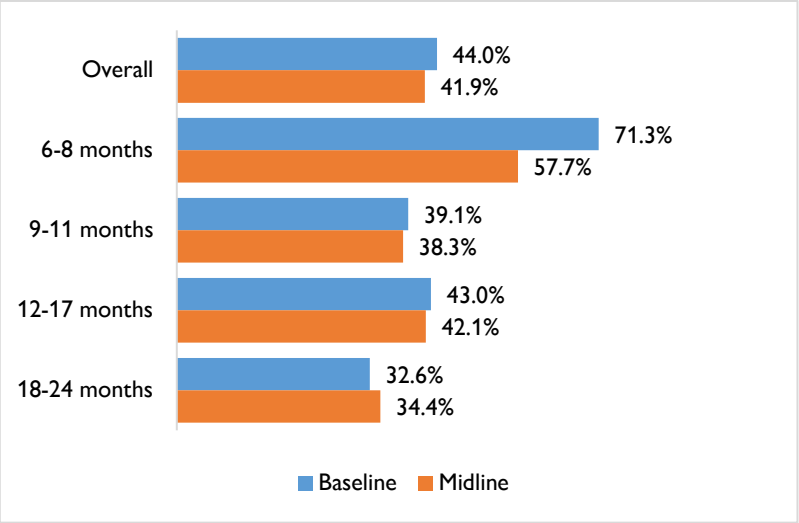
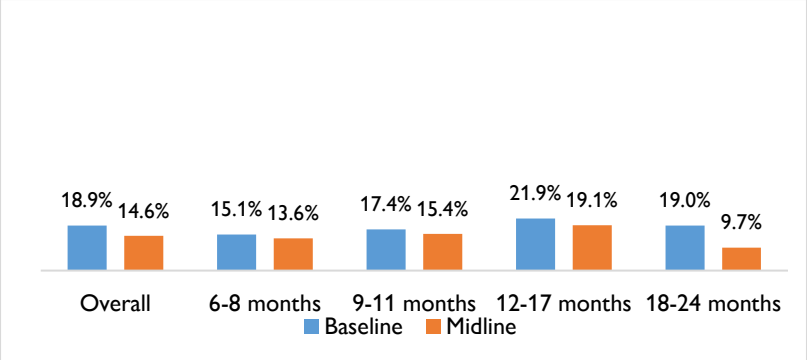


Figure 37. Percent of children who received minimum acceptable diet by age



Further, a total of 20 of 32 districts showed declines in MMF at midline compared to baseline, including all districts in Copperbelt, Eastern, and Luapula provinces (except Kawambwa), while districts in Southern Province showed improvements. Kaoma and Solwezi districts showed significant improvements (Table 19).

Minimum Acceptable Diet (MAD)

Children are said to meet the minimum acceptable diet if they meet the minimum dietary diversity and the minimum meal frequency for their age.

A significant decrease in the proportion of children who achieved MAD was observed at midline (14.6%, CI [13.7-15.6]) compared to baseline (18.9%, CI [17.9-19.9]) (p<0.001).

The reported MAD is slightly higher than that reported in the ZDHS 2018 and compared with the reported average MAD in sub-Saharan countries[26] [27].

Both baseline and midline surveys show MAD increasing with age until 12-17 months, after which it declines (Figure 37). There was a sharper decline in MAD among the 18-to-23-month age group at

[26] Zambia Statistics Agency, Ministry of Health (MOH) Zambia, and ICF. 2019. Zambia Demographic and Health Survey 2018. Lusaka, Zambia, and Rockville, Maryland, USA: Zambia Statistics Agency, Ministry of Health, and ICF

[27] https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-022-12966-8

midline than at baseline.

Across most districts, MAD declined between baseline and midline. Kaputa, Kaoma, and Solwezi districts showed improvements while all districts in Central, Copperbelt, and Eastern provinces showed declines. (Table 19).

Table 19. Percent of children fed according to MMF, CDD, and MAD by District

Province	District	Child Dietary Diversity		Minimum Meal Frequency		Minimum Acceptable Diet	
		Baseline n=5953	Midline n=5865	Baseline n=5613	Midline n=5865	Baseline n=5944	Midline n= 5865
Central	Chibombo	36.8	27.1	45.5	35.4	18.9	11.1
	Kabwe	54.8	32.3	57.0	54.0	35.2	21.2
	Kapiri Mposhi	43.6	28.3	44.3	45.0	23.3	16.2
	Mumbwa	41.0	26.0	54.8	40.0	29.0	9.2
Copperbelt	Kitwe	49.0	32.6	62.1	60.5	31.8	19.2
	Ndola	51.5	27.4	61.5	53.8	33.3	12.9
Eastern	Chipata	46.2	34.3	59.4	53.5	28.9	23.8
	Katete	42.3	24.5	61.6	56.5	25.9	14.1
	Lundazi	42.4	30.0	64.3	64.0	29.9	23.4
	Petauke	31.2	24.7	54.4	40.7	18.0	11.5
Luapula	Mansa	49.5	29.1	43.7	32.1	29.3	11.7
	Kawambwa	35.7	36.3	39.0	41.2	16.7	19.8
	Nchelenge	34.2	38.3	41.4	37.2	16.1	17.2
	Samfya	33.5	15.6	35.4	17.4	16.9	4.2
	Mwense	32.7	31.2	34.6	31.2	16.3	15.6
Lusaka	Lusaka	47.6	43.5	37.9	26.6	22.2	10.3
Muchinga	Chinsali	21.0	21.2	30.5	38.4	7.8	11.6
	Isoka	31.8	28.9	42.9	46.4	17.6	19.1
	Mpika	26.2	29.5	36.8	31.1	11.6	11.1
Northern	Kaputa	13.5	26.9	23.2	30.4	3.8	12.9
	Kasama	35.3	27.2	33.9	40.0	13.7	11.1
	Luwingu	23.4	26.9	26.3	25.1	11.1	5.7
	Mbala	40.9	39.0	40.7	31.6	19.7	17.0
North-western	Mwinilunga	32.1	19.0	38.9	28.5	15.8	8.9
	Solwezi	46.6	50.6	44.6	60.1	23.7	32.6
	Zambezi	23.8	27.4	37.5	34.5	14.1	13.7
Southern	Choma	36.2	33.9	59.0	64.4	24.9	22.8
	Monze	37.2	34.7	63.9	70.5	23.5	24.4
Western	Kalabo	7.0	5.2	23.1	25.4	5.9	3.6
	Kaoma	10.9	37.4	37.4	57.5	5.5	25.3
	Mongu	19.5	9.3	41.2	37.6	13.2	5.2
	Shang'ombo	4.2	4.4	16.8	28.3	2.1	2.2

3.6.2 Maternal Health and Nutrition

Maternal nutrition was assessed by examining the women dietary diversity, mean number of food groups consumed by women, and consumption of nutrient-rich value chain commodities. Additionally, we assessed the body mass index, incidence of anaemia, and family planning use among women of reproductive age. The results of each are discussed below.

Family Planning

Family planning is an important contributor to child health and nutrition outcomes. Family planning can postpone the age of first birth and increase inter-pregnancy intervals, which in turn have the potential to reduce stunting and improve child development outcomes. Modern family planning methods include injectables, intrauterine devices (IUDs), contraceptive pills, implants, female and male condoms, sterilisation, the standard days method, the lactational amenorrhoea method, and emergency contraception.

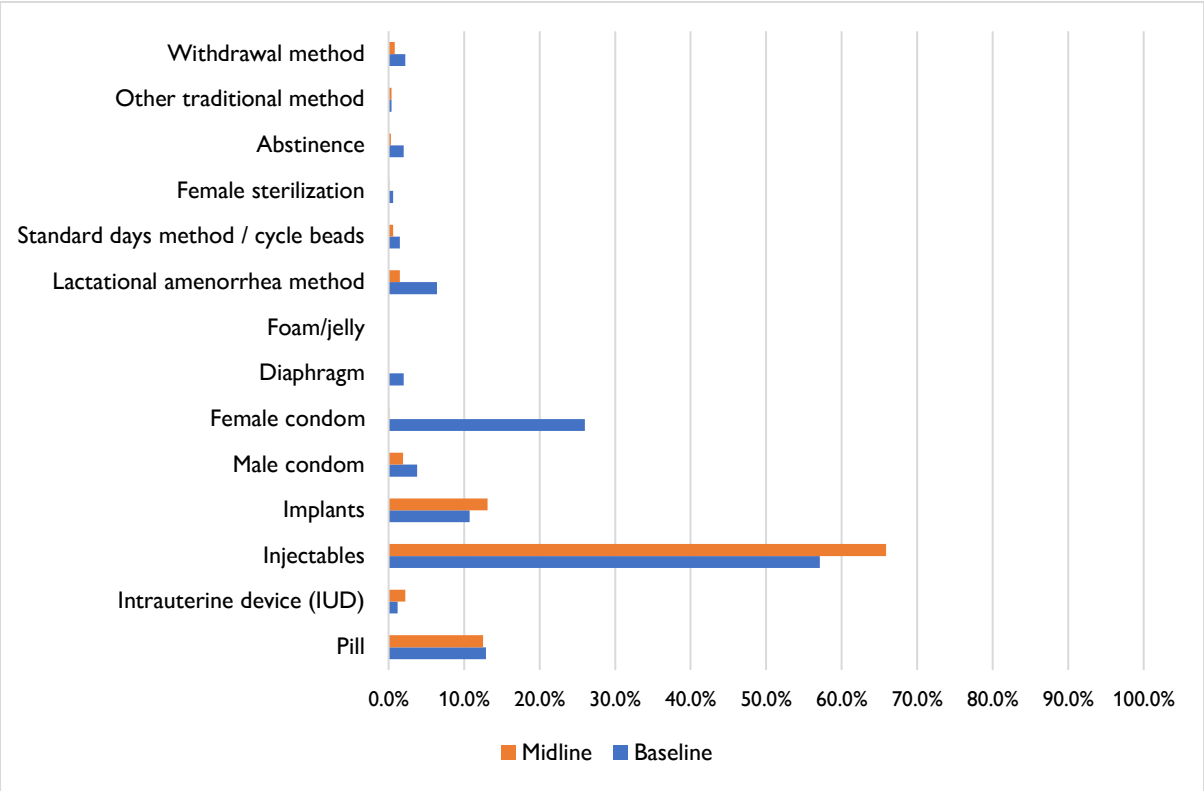
In the midline survey, 73.7% of WRA reported using a modern family planning method (CI [72.7-74.7] – considerably higher than observed at baseline (53.5%) (CI [52.4-54.6], (p=0.000).

Consistent with the baseline, family planning use was higher among WRA in urban areas (78.8%) compared to rural areas (71.0%) and among WRA living in households with 5 or fewer people (76.5%) compared to women in households greater than 5 people (71.8%).

As shown in Figure 38, injectable contraceptives were the most widely used modern method (65.9%), followed by implants (12.5%), pills (13.1%), and the IUD (2.0%). This is similar to baseline findings though more family planning users reported using injectables at midline (65.9%) compared to baseline (57.1%).

Use of modern family planning methods varied by and within provinces. At midline, higher use of modern family planning was observed in Lusaka (84.8%), Copperbelt (84.6%), and Southern (82.6%) provinces and lowest in Western (64.7%) and Luapula (69.9%) provinces. The greatest intra-provincial variation was observed in Western Province, where family planning use ranged from 47.6% in Kalabo to 81.5% in Kaoma. Among all the districts, modern family planning use was highest in Ndola (86.0%) and lowest in Kalabo (47.6%).

Figure 38. Current family planning method users, by method

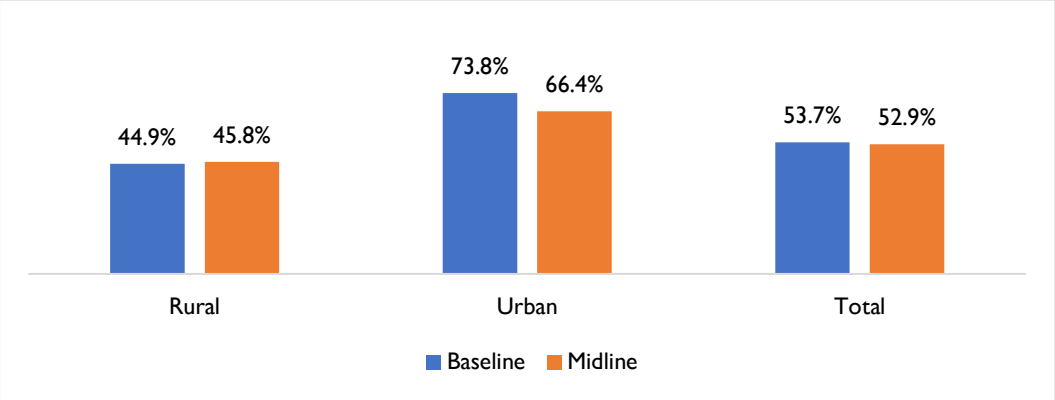


Women's Dietary Diversity (MDD-W)

Minimum dietary diversity for women (MDD-W), measured as the consumption of 5 or more foods out of 10 food groups in the preceding 24 hours, is a proxy for quality of diet and micronutrient adequacy among women of reproductive age[28].

Overall, there was a slight decline (about 0.8%) in the proportion of women who met MDD from baseline to midline. Despite more women in urban areas (66.4%) meeting MDD than in rural areas (45.8%), an overall decline was still noted in urban areas from the baseline (Figure 39).

Figure 39. Percent of women meeting minimum dietary diversity for women



District-level disaggregation (Table 20) shows that Lusaka District had the highest proportion of women meeting MDD (over 80%) in both surveys; Shang'ombo and Kalabo districts, both in Western Province, had the least (less than 10%). Kaoma recorded the highest percentage increase in MDD from baseline (Table 20).

Table 20. Women's dietary diversity (MDD-W) by district

Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	246	53.7	0.032	47.2	60.0	250	62.8	0.031	56.5	68.8	0.039***
	Kabwe	240	77.1	0.027	71.2	82.2	250	69.2	0.029	63.1	74.9	0.049***
	Kapiri Mposhi	238	63.9	0.031	57.4	70.0	250	59.2	0.031	52.8	65.4	0.290
	Mumbwa	226	63.7	0.032	57.1	70.0	250	49.6	0.032	43.2	56.0	0.002***
Copperbelt	Kitwe	237	82.3	0.025	76.8	86.9	250	58.8	0.031	52.4	65.0	0.000***
	Ndola	239	79.9	0.026	74.3	84.8	250	61.2	0.031	54.9	67.3	0.000***
Eastern	Chipata	240	71.7	0.029	65.5	77.3	250	79.6	0.025	74.1	84.4	0.041***
	Katete	245	73.1	0.028	67.0	78.5	248	59.7	0.031	53.3	65.8	0.002***
	Lundazi	244	77.5	0.027	71.7	82.5	250	71.2	0.029	65.2	76.7	0.112
	Petauke	244	64.8	0.031	58.4	70.7	250	50.8	0.032	44.4	57.2	0.002***
Luapula	Mansa	228	62.3	0.032	55.6	68.6	249	58.6	0.031	52.2	64.8	0.416
	Kawambwa	234	57.7	0.032	51.1	64.1	250	56.4	0.03	50.0	62.6	0.774
	Nchelenge	239	55.6	0.032	49.1	62.1	248	68.5	0.029	62.4	74.3	0.003***
	Samfya	235	45.1	0.032	38.6	51.7	250	26.0	0.028	20.7	31.9	0.000***

[28] FAO and FHI 360. 2016. Minimum Dietary Diversity for Women: A Guide for Measurement. Rome: FAO. https://www.fao.org/3/i5486e/i5486e.pdf

Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
	Mwense	243	50.2	0.032	43.7	56.7	250	59.2	0.03	52.8	65.4	0.045
Lusaka	Lusaka	218	80.3	0.027	74.4	85.3	250	80.8	0.025	75.4	85.5	0.886
Muchinga	Chinsali	245	49.8	0.032	43.4	56.2	250	35.6	0.030	29.7	41.9	0.001***
	Isoka	235	61.3	0.032	54.7	67.5	250	46.4	0.032	40.1	52.8	0.001***
	Mpika	241	48.5	0.032	42.1	55.0	249	51.8	0.032	45.4	58.2	0.471
Northern	Kasama	240	61.3	0.031	54.8	67.4	249	61.4	0.031	55.1	67.5	0.965
	Kaputa	246	26.4	0.028	21.0	32.4	250	51.6	0.032	45.2	57.9	0.000***
	Luwingu	243	43.2	0.032	36.9	49.7	250	48.0	0.032	41.7	54.4	0.286
	Mbala	245	72.7	0.028	66.6	78.1	250	60.0	0.031	53.6	66.1	0.003***
North-western	Mwinilunga	242	46.7	0.032	40.3	53.2	250	29.2	0.029	23.6	35.3	0.000***
	Solwezi	234	66.7	0.031	60.2	72.7	249	79.9	0.025	74.4	84.7	0.001***
	Zambezi	234	30.3	0.030	24.5	36.7	250	31.2	0.029	25.5	37.3	0.838
Southern	Choma	239	52.7	0.032	46.2	59.2	250	62.0	0.031	55.7	68.0	0.038***
	Monze	241	47.3	0.032	40.9	53.8	250	72.4	0.028	66.4	77.8	0.000***
Western	Kalabo	244	8.6	0.018	5.4	12.9	250	6.0	0.015	3.4	9.7	0.265
	Kaoma	240	19.6	0.026	14.8	25.2	249	58.2	0.031	51.8	64.4	0.000***
	Mongu	231	24.2	0.028	18.9	30.3	249	24.5	0.027	19.3	30.3	0.948
	Shang'ombo	247	4.9	0.014	2.5	8.3	250	4.0	0.012	1.9	7.2	0.642

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

Both at baseline and midline, most women consumed grains, white roots and tubers, and plantains (97.6% vs 98.7%); dark green leafy vegetables (82.2% vs 79.0%), and meat, poultry, and fish (60.2% vs 60.1%). Though high consumption was observed, a decline in consumption of these foods were observed at midline. On the other hand, very few women consumed eggs both at baseline and midline (11.1% vs 12.7%), though a significant increase in consumption of eggs was observed at midline (Table 21).

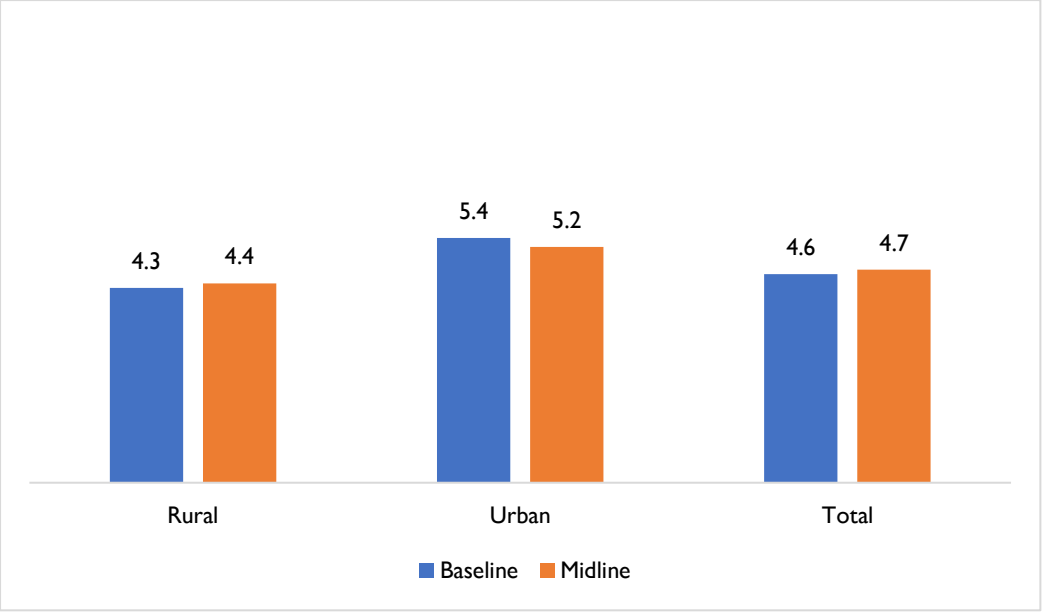
Table 21. Percent of women consuming foods from particular food groups

Food Groups	Baseline			Midline			p-value
	%	LCL	UCL	%	LCL	UCL	
Grains, white roots and tubers, and plantains	97.6	97.2	97.9	98.7	98.4	99.0	0.000***
Dark green leafy vegetables	82.2	81.4	83.1	79.0	78.1	79.9	0.000***
Other fruits	62.4	61.3	63.4	59.7	58.6	60.7	0.000***
Meat, poultry, and fish	60.2	59.1	61.3	60.1	59.0	61.2	0.897
Other vegetables	48.4	47.3	49.5	46.9	45.8	48.0	0.065
Nuts and seeds	40.9	39.9	42.0	38.0	36.9	39.0	0.000***
Pulses (beans, peas, and lentils)	23.2	22.3	24.2	30.5	29.5	31.5	0.000***
Other vitamin A-rich fruits and vegetables	23.5	22.6	24.4	28.2	27.2	29.2	0.000***
Dairy	14.9	14.1	15.7	11.6	10.9	12.3	0.000***
Eggs	11.1	10.4	11.8	12.7	12.0	13.5	0.000***

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

Overall, women consumed, on average, 4.7 food groups at the midline (CI [4.6-4.7]) (Figure 40). However, women in urban areas consumed more food categories ((5.2); CI [5.1-5.2]) in comparison to those in rural areas ((4.4); CI [4.3-4.4]) (Figure 40). The average consumption of food groups by women in the urban areas declined slightly at midline survey – from 5.4 to 5.2 food groups.

Figure 40. Average number of food groups consumed by women



At district level, women in Chipata District consumed an average of 5.8 food groups at midline: (CI [5.6-6.0]), the highest across all the districts. With an average consumption of 2.5 food groups (CI [2.3-2.6]), women in Kalabo District consumed the least (Table 22).

Table 22. Average number of food groups consumed by women, by district.

Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	246	4.8	0.09	4.6	4.9	250	5.0	0.10	4.9	5.2	0.580
	Kabwe	240	5.3	0.08	5.2	5.5	250	5.1	0.09	4.9	5.3	0.300
	Kapiri Mposhi	238	5.0	0.10	4.8	5.2	250	4.9	0.09	4.7	5.1	0.688
	Mumbwa	226	4.9	0.09	4.7	5.1	250	4.6	0.11	4.3	4.8	0.000***
Copperbelt	Kitwe	237	5.9	0.10	5.7	6.1	250	4.8	0.10	4.7	5.0	0.000***
	Ndola	239	5.7	0.09	5.5	5.8	250	4.9	0.10	4.7	5.1	0.000***
Eastern	Chipata	240	5.4	0.09	5.2	5.6	250	5.8	0.10	5.6	6.0	0.054
	Katete	245	5.4	0.09	5.2	5.6	248	5.1	0.10	4.9	5.3	0.029***
	Lundazi	244	5.4	0.08	5.2	5.5	250	5.5	0.10	5.3	5.7	0.026
	Petauke	244	4.9	0.09	4.7	5.1	250	4.7	0.10	4.5	4.9	0.066
Luapula	Mansa	228	4.9	0.10	4.8	5.1	249	5.0	0.13	4.8	5.3	0.001***
	Kawabwa	234	4.9	0.09	4.7	5.1	250	4.8	0.10	4.6	5.0	0.047
	Nchelenge	239	4.7	0.09	4.5	4.9	248	5.1	0.10	4.9	5.3	0.001***
	Samfya	235	4.3	0.10	4.2	4.5	250	3.6	0.10	3.4	3.7	0.000***
	Mwense	243	4.5	0.10	4.3	4.7	250	4.8	0.10	4.6	5.0	0.232
Lusaka	Lusaka	218	5.5	0.10	5.3	5.7	250	5.7	0.09	5.5	5.8	0.302
Muchinga	Chinsali	245	4.6	0.11	4.4	4.8	250	3.9	0.10	3.7	4.1	0.001***
	Isoka	235	4.9	0.10	4.7	5.1	250	4.5	0.09	4.3	4.7	0.008**
	Mpika	241	4.5	0.10	4.3	4.7	249	4.6	0.09	4.4	4.8	0.285
Northern	Kaputa	246	3.7	0.09	3.6	3.9	250	4.6	0.10	4.4	4.8	0.000***
	Kasama	240	4.9	0.09	4.7	5.1	249	4.9	0.09	4.7	5.0	0.843
	Luwingu	243	4.3	0.10	4.1	4.5	250	4.5	0.10	4.2	4.7	0.661
	Mbala	245	5.4	0.10	5.2	5.6	250	5.2	0.13	4.9	5.4	0.001***
North-western	Mwinilunga	242	4.5	0.11	4.3	4.8	250	3.8	0.10	3.6	4.0	0.001***
	Solwezi	234	5.3	0.12	5.1	5.6	249	5.7	0.09	5.5	5.9	0.006**
	Zambezi	234	3.8	0.11	3.6	4.0	250	3.9	0.11	3.7	4.2	0.552
Southern	Choma	239	4.6	0.10	4.4	4.8	250	5.1	0.10	4.9	5.3	0.040***
	Monze	241	4.5	0.10	4.3	4.7	250	5.4	0.10	5.2	5.6	0.000***
Western	Kalabo	244	2.6	0.09	2.4	2.8	250	2.5	0.07	2.3	2.6	0.196
	Kaoma	240	3.3	0.08	3.2	3.5	249	5.0	0.11	4.8	5.2	0.000***
	Mongu	231	3.5	0.10	3.3	3.7	249	3.5	0.09	3.3	3.7	0.247
	Shang'ombo	247	2.5	0.07	2.3	2.6	250	2.8	0.06	2.7	2.9	0.001

*LCL= Lower Confidence Interval: UCL= Upper confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

Consumption of Nutrient-Rich Value Chains among women

Women are encouraged to consume nutrient-rich value chain commodities as highlighted in Box 5.[29]

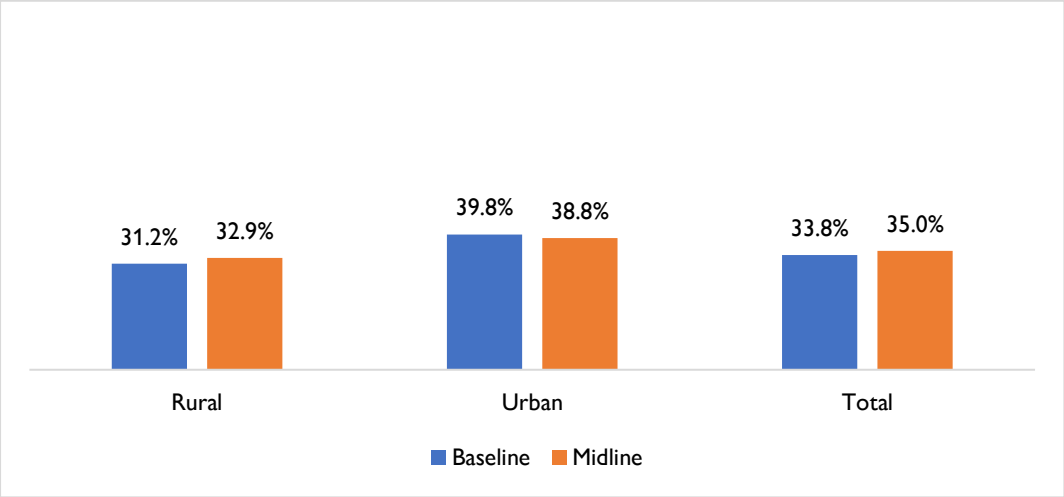
Box 5. Nutrient-Rich Value Chain foods

- Bio-fortified foods; legumes; nuts; some seeds (e.g., sesame, sunflower, and pumpkin seeds), wheat germ, or sprouted legume seeds.
- Animal-source food, such as dairy products (milk, yogurt, cheese); fish; eggs.
- Organ meats, flesh foods, and other miscellaneous small animal protein (e.g., insects);
- Dark yellow or orange-fleshed roots or tubers; and fruits or vegetables that meet the threshold for being a "high source" for one or more micronutrients.

Overall, there was a slight increase (about 1.2%) in women who consumed targeted nutrient-rich commodities from baseline (33.8%; CI [32.7-34.9]) to midline (35.0%; CI [33.9-36.6]) (p=0.123) (Figure 41).

At midline, more women in urban areas (38.8%); CI [37.0-40.7] consumed targeted nutrient-rich commodities than women in rural areas (32.9%); CI [31.7-34.2], a similar pattern to that observed in the baseline survey (Figure 41). However, there was a slight decline in the proportion of women in urban areas consuming targeted nutrient-rich commodities. In contrast, there was a slight increase in the proportion of women in rural areas consuming targeted nutrient-rich commodities. However, these changes were not statistically significant (decline in urban; p=0.472, while the increase in rural; p=0.053).

Figure 41. Percent of women of reproductive age who consumed targeted nutrient-rich value chain commodities



Proportion of women consuming nutrient-rich value chain commodities by household size remained roughly the same between the baseline and midline surveys, with a slight reduction in consumption among women from larger households (more than 10 members) from 41.3% in the baseline to 37.0% in the midline survey.

As observed in the baseline survey, districts in the Western province had the lowest percentage of women consuming nutrient-rich value commodities, with none registering above 20% except Kaoma district. Consumption of nutrient-rich value commodities among women in Kaoma district jumped from 15.4%; CI [10.4-19.2] in the baseline survey to 46.6%; CI [40.4-52.8] in the midline (P=0.000) – placing it among the top 5 districts across all 32 districts, a sharp contrast to its position in the bottom 5 districts

[29] https://www.usaid.gov/sites/default/files/documents/1864/nutrition-sensitive-agriculture-508.pdf

in the baseline survey (Table 23).

Table 23. Percent of women of reproductive age who consumed targeted nutrient-rich value chain commodities, by district

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	246	29.3	2.9	23.3	34.5	250	39.2	3.1	33.1	45.3	0.025***
	Kabwe	240	35.0	3.0	27.7	39.5	250	29.6	2.9	23.9	35.3	0.237
	Kapiri Mposhi	238	37.0	3.1	29.4	41.3	250	31.2	2.9	25.5	36.9	0.211
	Mumbwa	226	35.0	3.0	25.8	37.4	250	41.2	3.1	35.1	47.3	0.192
Copperbelt	Kitwe	237	41.4	3.1	33.1	45.3	250	26.0	2.8	20.6	31.4	0.000***
	Ndola	239	35.6	3.0	28.1	39.9	250	34.8	3.0	28.9	40.7	0.934
Eastern	Chipata	240	42.9	3.1	35.6	47.8	250	48.8	3.2	42.6	55.0	0.224
	Katete	245	42.9	3.1	35.9	48.1	248	38.3	3.1	32.3	44.4	0.349
	Lundazi	244	45.5	3.2	38.4	50.8	250	51.2	3.2	45.0	57.4	0.238
	Petauke	244	45.5	3.2	38.4	50.8	250	36.0	3.0	30.0	42.0	0.040***
Luapula	Mansa	228	39.9	3.1	30.4	42.4	249	43.0	3.1	36.8	49.1	0.559
	Kawambwa	234	29.5	2.981	23.7	35.8	250	46.0	3.152	39.7	52.4	0.000***
	Nchelenge	239	39.7	3.1	32.1	44.2	248	41.5	3.1	35.4	47.7	0.758
	Samfya	235	32.3	3.0	24.7	36.1	250	17.6	2.4	12.9	22.3	0.000***
	Mwense	243	22.2	2.667	17.2	28.0	250	36.0	3.036	30.0	42.3	0.001***
Lusaka	Lusaka	218	33.0	3.0	23.2	34.4	250	40.4	3.1	34.3	46.5	0.121
Muchinga	Chinsali	245	44.9	3.1	37.8	50.2	250	28.8	2.9	23.2	34.4	0.000***
	Isoka	235	35.3	3.0	27.4	39.0	250	29.2	2.9	23.6	34.8	0.179
	Mpika	241	40.2	3.1	32.8	44.8	249	26.9	2.8	21.4	32.4	0.002***
Northern	Kaputa	246	29.3	2.9	23.2	34.4	250	35.2	3.0	29.3	41.1	0.188
	Kasama	240	42.5	3.1	34.7	46.9	249	40.2	3.1	34.1	46.2	0.665
	Luwingu	243	36.2	3.0	29.3	41.1	250	40.4	3.1	34.3	46.5	0.388
	Mbala	245	53.9	3.2	46.6	59.0	250	49.2	3.2	43.0	55.4	0.342
North-western	Mwinilunga	242	37.6	3.1	30.6	42.5	250	25.2	2.7	19.8	30.6	0.004
	Solwezi	234	43.6	3.1	34.7	46.9	249	47.4	3.2	41.2	53.6	0.455
	Zambezi	234	21.4	2.6	15.0	25.0	250	30.4	2.9	24.7	36.1	0.031***
Southern	Choma	239	30.5	2.9	23.9	35.2	250	37.6	3.1	31.6	43.6	0.121
	Monze	241	41.1	3.1	33.5	45.7	250	49.6	3.2	43.4	55.8	0.071
Western	Kalabo	244	5.7	1.5	2.8	8.5	250	6.4	1.5	3.4	9.4	0.905
	Kaoma	240	15.4	2.3	10.4	19.2	249	46.6	3.2	40.4	52.8	0.000***
	Mongu	231	12.1	2.1	7.3	15.2	249	18.1	2.4	13.3	22.9	0.092
	Shang'ombo	247	4.9	1.4	2.2	7.4	250	7.2	1.6	4.0	10.4	0.364

*LCL= Lower Confidence Interval: UCL= Upper confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

3.7 Maternal Nutrition Status

3.7.1 Women Body Mass Index

Women's Body Mass Index (BMI) was assessed using height and weight measurements. Women with a BMI less than 18.5 were classified as underweight or having low BMI (LBMI). LBMI among women 15 to 49 years old was 7.4% [CI=6.8-8.0] at baseline and 7.0% (CI= [6.4-7.6] at midline, there were no significant differences between the values at baseline and midline (p>0.05). However, a reduction in LBMI was observed among women aged 30- 44 years, while an increase was observed among women

aged 15-19 years old and those aged 45-49 years old (Table 24).

One-fifth of women were found to be overweight or obese (BMI ≥25.0) in both the baseline and midline.

Table 24. Body Mass Index of women

Mother age group	Underweight %		Normal %		Overweight/obese %	
	Baseline	Midline	Baseline	Midline	Baseline	Midline
15-19	9.3	9.7	82.0	81.9	8.8	7.0
20-24	7.3	6.9	77.7	79.0	15.0	12.8
25-29	6.0	5.3	70.9	67.9	23.1	25.7
30-34	7.1	3.6	64.6	63.8	28.3	31.4
35-39	8.0	5.6	62.4	62.1	29.6	31.3
40-44	9.2	8.2	63.9	65.8	26.8	25.4
45-49	8.3	9.6	72.2	65.4	19.4	23.1
Overall	**7.4**	**7.0**	**71.8**	**71.6**	**20.8**	**20.9**

Variations in the prevalence of LMBI among women was observed by districts, with some districts recording an increase in the proportion of women with low BMI while others showed a reduction. Among those with notable reductions from baseline were Kalabo (20.8% vs 11.1%) in Western Province and Katete (5.4% vs 1.8%) in Eastern Province. Districts with notable increases in the proportion of women with LBMI between baseline and midline include Solwezi (3.1% vs 7.4%) in Northwestern Province and Isoka in Muchinga Province (3.4% vs 6.9%) (Table 25). The results indicate no statistically significant change in the proportion of women with low BMI in all districts except Kalabo and Kaoma, where it significantly declined, and Shang'ombo, where the proportion significantly increased.

Table 25. Percent of women with low BMI by district

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	243	6.6	1.6	3.4	9.5	244	8.6	1.8	5.0	11.8	0.502
	Kabwe	237	5.5	1.4	2.4	8.0	249	7.2	1.6	4.0	10.4	0.548
	Kapiri Mposhi	235	5.1	1.4	2.2	7.5	248	6.0	1.5	3.1	8.9	0.801
	Mumbwa	219	7.3	1.6	3.4	9.4	221	5.9	1.5	2.4	8.0	0.682
Copperbelt	Kitwe	233	3.0	1.1	0.8	4.8	248	4.4	1.3	1.9	6.9	0.558
	Ndola	236	6.8	1.6	3.4	9.4	244	9.0	1.8	5.3	12.3	0.460
Eastern	Chipata	237	3.4	1.1	1.0	5.4	247	1.6	0.8	0.0	3.2	0.342
	Katete	242	5.4	1.4	2.4	8.0	228	1.8	0.8	0.0	3.2	0.064
	Lundazi	240	3.8	1.2	1.3	5.9	246	2.0	0.9	0.3	3.7	0.389
	Petauke	240	4.2	1.3	1.6	6.5	228	4.4	1.3	1.6	6.4	1.000
Luapula	Mansa	228	9.2	1.8	5.0	11.8	249	12.0	2.1	8.0	16.1	0.393
	Kawambwa	227	6.6	1.6	3.7	10.7	250	10.8	2.0	7.2	15.3	0.107
	Nchelenge	226	7.1	1.6	3.4	9.5	245	9.4	1.9	5.7	12.9	0.459
	Samfya	226	10.2	1.9	5.6	12.8	250	8.0	1.7	4.6	11.4	0.505
	Mwense	234	13.7	2.2	9.5	18.8	250	8.4	1.8	5.3	12.6	0.063
Lusaka	Lusaka	215	5.6	1.5	2.2	7.4	249	4.8	1.4	2.2	7.4	0.873
Muchinga	Chinsali	241	5.0	1.4	2.2	7.4	237	7.6	1.7	4.0	10.4	0.322
	Isoka	232	3.4	1.2	1.0	5.4	233	6.9	1.6	3.4	9.4	0.145
	Mpika	235	6.8	1.6	3.4	9.4	249	4.4	1.3	1.9	7.0	0.343
Northern	Kaputa	239	8.8	1.8	5.0	11.8	247	8.5	1.8	5.0	11.8	1.000

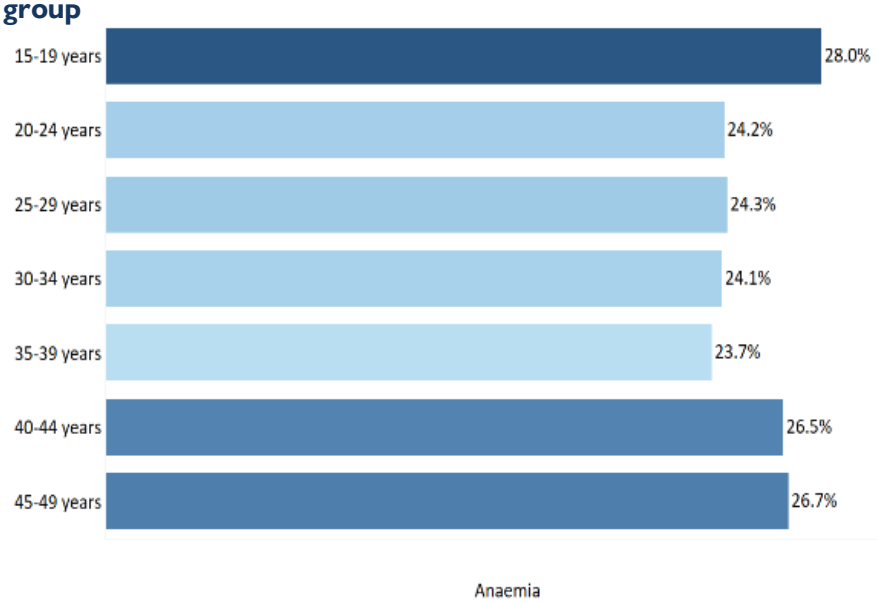
Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
	Kasama	236	5.9	1.5	2.7	8.5	249	3.6	1.2	1.3	5.9	0.324
	Luwingu	235	5.1	1.4	2.2	7.4	248	7.3	1.6	4.0	10.4	0.429
	Mbala	241	4.6	1.3	1.9	6.9	248	2.4	1.0	0.5	4.3	0.295
North-western	Mwinilunga	233	11.6	2.0	7.0	14.7	245	13.9	2.2	9.4	17.8	0.540
	Solwezi	224	3.1	1.1	0.8	4.8	248	7.3	1.6	4.0	10.4	0.072
	Zambezi	228	9.6	1.9	5.3	12.3	250	9.2	1.8	5.6	12.8	0.991
Southern	Choma	231	6.9	1.6	3.4	9.5	250	6.4	1.5	3.4	9.4	0.961
	Monze	233	8.2	1.7	4.3	10.9	250	6.0	1.5	3.1	8.9	0.455
Western	Kalabo	240	20.8	2.6	15.1	25.1	249	11.2	2.0	7.3	15.1	0.006***
	Kaoma	233	15.5	2.3	10.0	18.8	249	7.6	1.7	4.3	10.9	0.011***
	Mongu	229	7.4	1.7	3.7	10.0	235	11.9	2.1	7.3	15.2	0.140
	Shang'ombo	242	10.7	2.0	6.6	14.2	250	4.4	1.3	1.9	6.9	0.013***

*LCL= Lower Confidence Interval: UCL= Upper confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

3.7.2 Anaemia among Women of Reproductive Age (Assessed only in the midline survey)

Nutritional Anaemia in women was determined by collecting data from 6,587 non-pregnant women aged 15-49 years. A woman was considered to have anaemia if her haemoglobin level was <120g/dl. Overall, 24.6% of the women of reproductive age were anaemic, of which 0.4% were severely anaemic. Anaemia was higher in younger women (28.0%) and lowest among women aged 35 to 39 years old (23.7%) (Figure 42).

Figure 42. Anaemia prevalence in non-pregnant women by age group



Overall, anaemia was higher in women in rural areas (27.0%) compared to those in urban areas (20.3%). Anaemia was highest among women in Mansa District, where 60.2% of women had anaemia, 32.4% in moderate form and 27.8% in mild form. In Samfya District, 53.0% of women had anaemia, with 31.4% moderate and 21.2% mild. In Shang'ombo District, 52.0% of women had anaemia - 25.2% moderate and 24.8% mild. Anaemia was lowest among women in Ndola (6.8%) and Chibombo (8.4%) districts (Table 26).

Table 26. Prevalence of anaemia in women of reproductive age by region and district

		Any anaemia	Severe	Moderate	Mild
REGION	Rural	27.0%	0.5%	10.9%	15.6%
	Urban	20.3%	0.3%	7.9%	12.1%
Central	Chibombo	8.4%	0.0%	3.1%	5.3%
	Kabwe	23.0%	0.0%	7.8%	15.2%

		Any anaemia	Severe	Moderate	Mild
	Kapiri Mposhi	21.7%	0.0%	9.4%	12.3%
	Mumbwa	33.3%	0.4%	12.2%	20.7%
Copperbelt	Kitwe	11.9%	0.0%	4.7%	7.2%
	Ndola	6.8%	0.0%	1.3%	5.5%
Eastern	Chipata	21.7%	0.4%	9.0%	12.3%
	Katete	11.6%	0.0%	1.7%	10.0%
	Lundazi	23.3%	0.0%	9.0%	14.3%
	Petauke	15.3%	0.0%	1.3%	14.0%
Luapula	Mansa	60.2%	0.0%	32.4%	27.8%
	Nchelenge	41.1%	0.9%	15.6%	24.7%
	Samfya	53.0%	0.4%	31.4%	21.2%
Lusaka	Lusaka	14.3%	0.0%	7.4%	7.0%
Muchinga	Muchinga	17.8%	0.4%	6.8%	10.6%
	Chinsali	13.9%	0.5%	6.9%	6.4%
	Isoka	20.9%	0.4%	5.4%	15.1%
	Mpika	18.1%	0.4%	8.0%	9.6%
Northern	Kaputa	40.7%	0.9%	13.1%	26.6%
	Kasama	11.3%	0.0%	3.0%	8.3%
	Luwingu	28.1%	0.4%	11.8%	15.8%
	Mbala	14.8%	0.0%	4.4%	10.5%
North-Western	Mwinilunga	20.8%	0.4%	5.2%	15.2%
	Solwezi	22.0%	2.0%	9.3%	10.6%
	Zambezi	16.3%	0.0%	3.6%	12.7%
Southern	Choma	29.0%	0.0%	9.2%	19.7%
	Monze	23.3%	0.4%	6.4%	16.5%
Western	Kalabo	34.0%	0.0%	14.6%	19.4%
	Kaoma	27.4%	3.7%	13.2%	10.5%
	Mongu	23.3%	0.0%	11.0%	12.4%
	Shang'ombo	52.0%	2.0%	25.2%	24.8%
Total		24.6%	0.4%	9.8%	14.4%

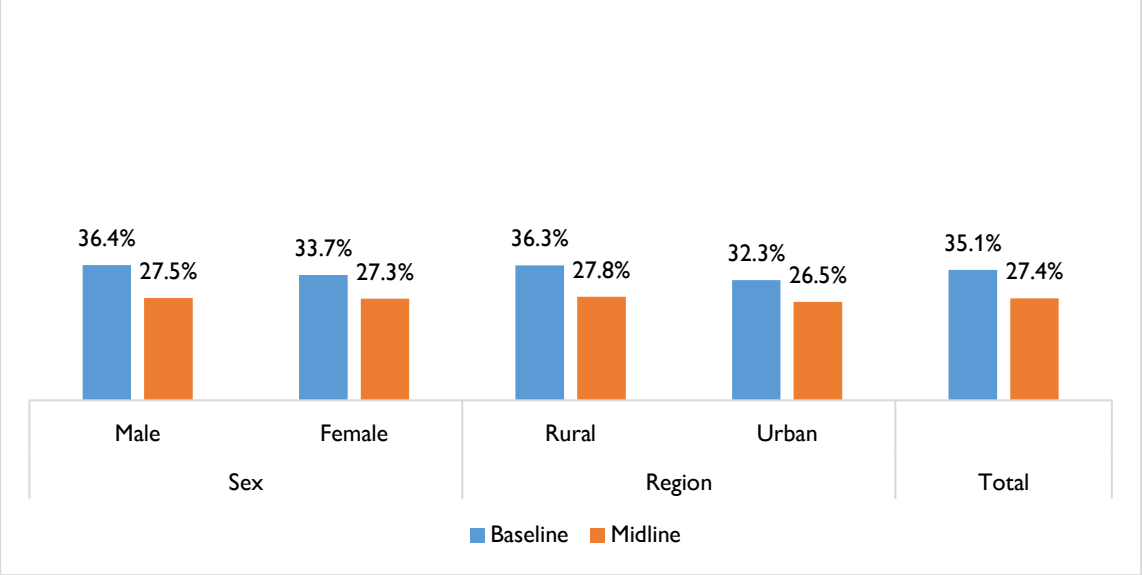
3.8 Child Health and Nutrition Status

3.8.1 Child Diarrhoeal Incidence and Treatment

Diarrhoea among children was assessed by asking the mother or caregiver if the child had passed at least three loose stools in a single day in the two weeks preceding the survey.

At midline, 2,084 or 27.4% (CI [26.2-28.3]) of children under 2 years of age were reported to have had diarrhoea in the 2 weeks preceding data collection, down from 2,257 or 28.3% (CI [33.5-35.6]) in the baseline survey (Figure 42). In both surveys, the diarrhoeal incidence was highest in children 9-11 months (35.9%) and 12-17 months (34.2%) at midline, and 45.8% and 45.1%, respectively, at baseline. At midline, urban and rural children had similar incidences of diarrhoea (27.7% and 26.5%, respectively), and the incidence in both groups declined from baseline. Similarly, incidence among boys (27.5%) and girls (27.3%) at midline was lower than at baseline (36.4% and 33.7%, respectively) (Figure 43).

Figure 43. Incidence of diarrhoea among children <2 years in the two-weeks preceding the survey



Most districts (26 of 32) recorded some decline in the incidence of diarrhoea, ranging from 1.1% in Kasama District (Northern Province) to 29% in Kaputa District (Northern Province). In contrast, 6 districts recorded higher incidences of diarrhoea at the midline than at baseline, with Isoka District (Muchinga Province) exhibiting the highest increase, from 28.5% at baseline to 39.8% at the midline (Table 27).

Table 27. Percent of children with diarrhoea two weeks preceding the survey, by district

Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	249	33.7	3.0	27.9	39.6	250	26.8	2.8	21.3	32.3	0.112
	Kabwe	250	31.2	2.9	25.5	36.9	203	21.7	2.6	12.9	22.3	0.030***
	Kapiri Mposhi	248	29.8	2.9	24.0	35.4	206	30.6	2.9	19.8	30.6	0.945
	Mumbwa	250	34.8	3.0	28.9	40.7	215	26.0	2.8	17.2	27.6	0.053
Copperbelt	Kitwe	250	34.4	3.0	28.5	40.3	217	26.7	2.8	18.0	28.4	0.091
	Ndola	250	28.0	2.8	22.4	33.6	225	24.9	2.7	17.2	27.6	0.507
Eastern	Chipata	247	37.7	3.1	31.6	43.7	250	25.6	2.8	20.2	31.0	0.005***
	Katete	249	41.0	3.1	34.7	46.9	248	26.2	2.8	20.7	31.7	0.001***
	Lundazi	249	39.8	3.1	33.7	45.8	250	24.8	2.7	19.4	30.2	0.001***
	Petauke	249	38.2	3.1	32.1	44.2	250	32.0	3.0	26.2	37.8	0.178
Luapula	Mansa	250	36.0	3.0	30.0	42.0	249	15.7	2.3	11.1	20.2	0.000***
	Kawambwa	250	44.8	3.145	38.5	51.2	250	20.4	2.549	15.6	25.9	0.000
	Nchelenge	249	46.6	3.2	40.4	52.8	248	33.5	3.0	27.6	39.3	0.004***
	Samfya	250	32.4	3.0	26.6	38.2	250	12.8	2.1	8.7	16.9	0.000***
	Mwense	250	41.2	3.113	35.0	47.6	250	37.6	3.063	31.6	43.9	0.410
Lusaka	Lusaka	250	31.6	2.9	25.8	37.4	250	24.4	2.7	19.1	29.7	0.090
Muchinga	Chinsali	250	26.8	2.8	21.3	32.3	224	29.9	2.9	21.3	32.3	0.517
	Isoka	249	28.5	2.9	22.8	34.0	221	39.8	3.1	29.3	41.1	0.013***
	Mpika	249	33.7	3.0	27.7	39.5	249	21.7	2.6	16.6	26.8	0.004***
Northern	Kaputa	249	57.4	3.1	51.1	63.3	250	28.4	2.9	22.8	34.0	0.000***
	Kasama	250	30.8	2.9	25.1	36.5	249	29.7	2.9	24.0	35.4	0.869
	Luwingu	250	30.0	2.9	24.3	35.7	250	26.8	2.8	21.3	32.3	0.488
	Mbala	250	26.8	2.8	21.3	32.3	250	30.4	2.9	24.7	36.1	0.429

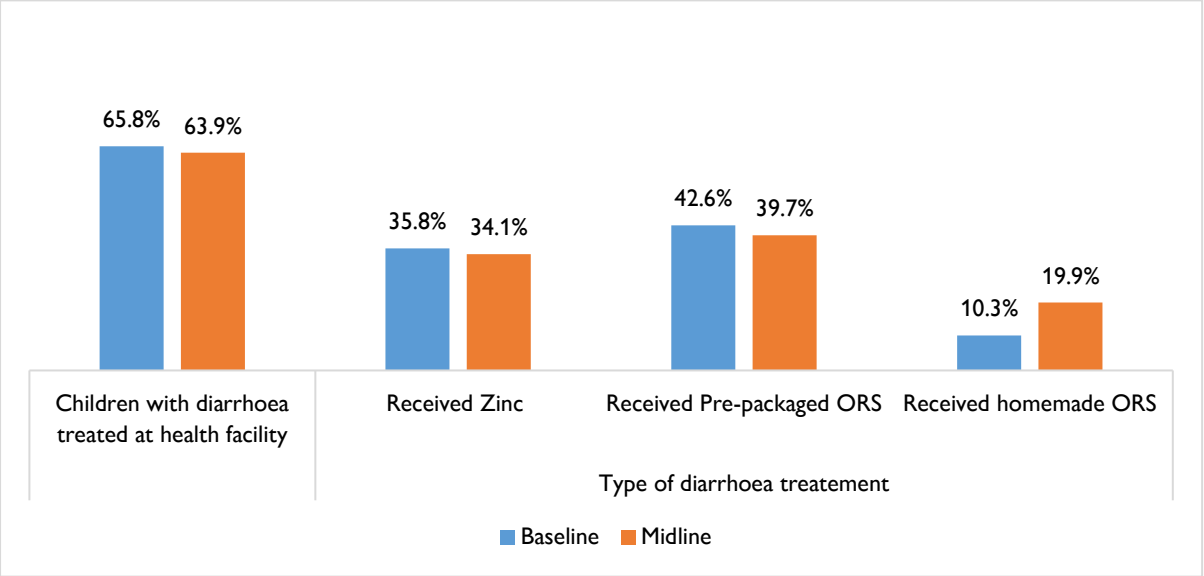
Province	District	Baseline					Midline					p-value
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
North-western	Mwinilunga	249	30.9	2.9	25.2	36.7	250	29.6	2.9	23.9	35.3	0.822
	Solwezi	248	31.9	2.9	25.8	37.4	211	28.9	2.9	19.2	29.8	0.561
	Zambezi	250	34.0	3.0	28.1	39.9	214	21.0	2.6	13.2	22.8	0.003***
Southern	Choma	247	29.6	2.9	23.9	35.2	250	21.6	2.6	16.5	26.7	0.054
	Monze	250	35.2	3.0	29.3	41.1	250	28.0	2.8	22.4	33.6	0.102
Western	Kalabo	249	30.9	2.9	25.2	36.7	250	33.2	3.0	27.4	39.0	0.654
	Kaoma	250	28.0	2.8	22.4	33.6	206	33.5	3.0	22.2	33.3	0.243
	Mongu	249	41.0	3.1	34.9	47.1	225	32.4	3.0	23.7	35.0	0.068
	Shang'ombo	250	45.6	3.2	39.4	51.8	250	33.2	3.0	27.4	39.0	0.006***

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

All caregivers who reported that their children had diarrhoea at baseline and midline were asked what had been done to treat the reported diarrhoeal cases.

Slightly higher proportion of children with diarrhoea received treatment from a health provider or at a health facility at baseline (65.8%; CI [64.0-67.6]) compared to midline (63.9%; CI [61.8-66.0]). Similar proportions of children with diarrhoea received zinc at baseline (35.8%) and midline (34.1%), but more received homemade ORS (19.9%) at midline compared to baseline (10.3%) (Figure 44)

Figure 44. Percent of children with diarrhoea who received treatment



The proportion of children who received treatment at health facilities reduced across all the districts, with significant reductions observed in Petauke (p=0.001) and Lundazi (p=0.020) districts (Table 28). This could be attributed to reduced contact between communities and health facilities due to COVID-19 restrictions. Even after restrictive measures were lifted, communities were reluctant to visit health facilities with sick children if they were not critically ill. This could have contributed to the observed increase in the proportion of households using homemade ORS for diarrhoeal treatment (Figure 44). This suggests that children could have continued losing nutrients due to diarrhoea because of delayed treatment.

Table 28. Percent of children who had diarrhoea two weeks preceding the survey and had received treatment at a health facility, by district

Province	District	Baseline					Midline					p-values
		n	%	SE	LCL	UCL	n	%	SE	LCL	UCL	
Central	Chibombo	84	56.0	3.1	14.0	23.7	67	61.2	3.1	11.8	21.0	0.629
	Kabwe	78	53.8	3.2	12.2	21.4	44	63.6	3.0	7.3	15.1	0.390
	Kapiri Mposhi	73	60.3	3.1	12.9	22.4	63	47.6	3.2	8.0	16.0	0.192
	Mumbwa	87	66.7	3.0	18.0	28.4	56	69.6	2.9	11.1	20.1	0.850
Copperbelt	Kitwe	85	68.2	2.9	18.0	28.4	58	60.3	3.1	9.7	18.3	0.428
	Ndola	70	51.4	3.2	10.0	18.8	56	48.2	3.2	7.0	14.6	0.858
Eastern	Chipata	93	65.6	3.0	19.3	30.1	64	59.4	3.1	10.7	19.7	0.532
	Katete	102	76.5	2.7	25.5	36.9	65	66.2	3.0	12.6	22.1	0.201
	Lundazi	99	80.8	2.5	26.3	37.9	62	62.9	3.1	11.1	20.1	0.020***
	Petauke	95	74.7	2.8	22.9	34.1	80	48.8	3.2	11.1	20.1	0.001***
Luapula	Mansa	90	71.1	2.9	20.2	31.0	39	76.9	2.7	8.0	16.1	0.641
	Kawambwa	112	73.2	4.2	64.0	81.1	51	74.5	6.1	60.4	85.7	0.862
	Nchelenge	116	74.1	2.8	28.6	40.4	83	74.7	2.8	19.6	30.4	1.000
	Samfya	81	65.4	3.0	16.1	26.3	32	62.5	3.1	4.6	11.4	0.940
	Mwense	103	81.6	3.8	72.7	88.5	94	84.0	3.8	75.0	90.8	0.644
Lusaka	Lusaka	79	43.0	3.1	9.4	17.8	61	62.3	3.1	10.7	19.7	0.037***
Muchinga	Chinsali	67	64.2	3.0	12.5	21.9	67	56.7	3.1	10.7	19.7	0.480
	Isoka	71	77.5	2.6	16.9	27.1	88	67.0	3.0	18.3	28.9	0.203
	Mpika	84	58.3	3.1	14.7	24.5	54	66.7	3.0	10.1	18.8	0.422
Northern	Kaputa	143	73.4	2.8	35.9	48.1	71	70.4	2.9	15.0	25.0	0.764
	Kasama	77	42.9	3.1	9.0	17.4	74	58.1	3.1	12.6	22.0	0.087
	Luwingu	75	65.3	3.0	14.7	24.5	67	80.6	2.5	16.5	26.7	0.065
	Mbala	67	64.2	3.0	12.5	21.9	76	72.4	2.8	16.9	27.1	0.383
North-western	Mwinilunga	77	63.6	3.0	14.7	24.6	74	50.0	3.2	10.4	19.2	0.127
	Solwezi	79	55.7	3.1	12.9	22.3	61	44.3	3.1	7.0	14.7	0.241
	Zambezi	85	70.6	2.9	18.7	29.3	45	71.1	2.9	8.7	16.9	1.000
Southern	Choma	73	53.4	3.2	11.2	20.3	54	57.4	3.1	8.3	16.5	0.790
	Monze	88	51.1	3.2	13.2	22.8	70	54.3	3.2	10.7	19.7	0.815
Western	Kalabo	77	63.6	3.0	14.7	24.6	83	78.3	2.6	20.6	31.4	0.061
	Kaoma	70	68.6	2.9	14.3	24.1	69	58.0	3.1	11.5	20.6	0.262
	Mongu	102	69.6	2.9	22.9	34.1	73	71.2	2.9	15.8	25.9	0.949
	Shang'ombo	112	70.5	2.9	25.8	37.4	83	59.0	3.1	14.7	24.5	0.129

*LCL= Lower Confidence Interval: UCL= Upper Confidence Interval; SE= Standard Error. . *** statistically significant change (p<0.05)*

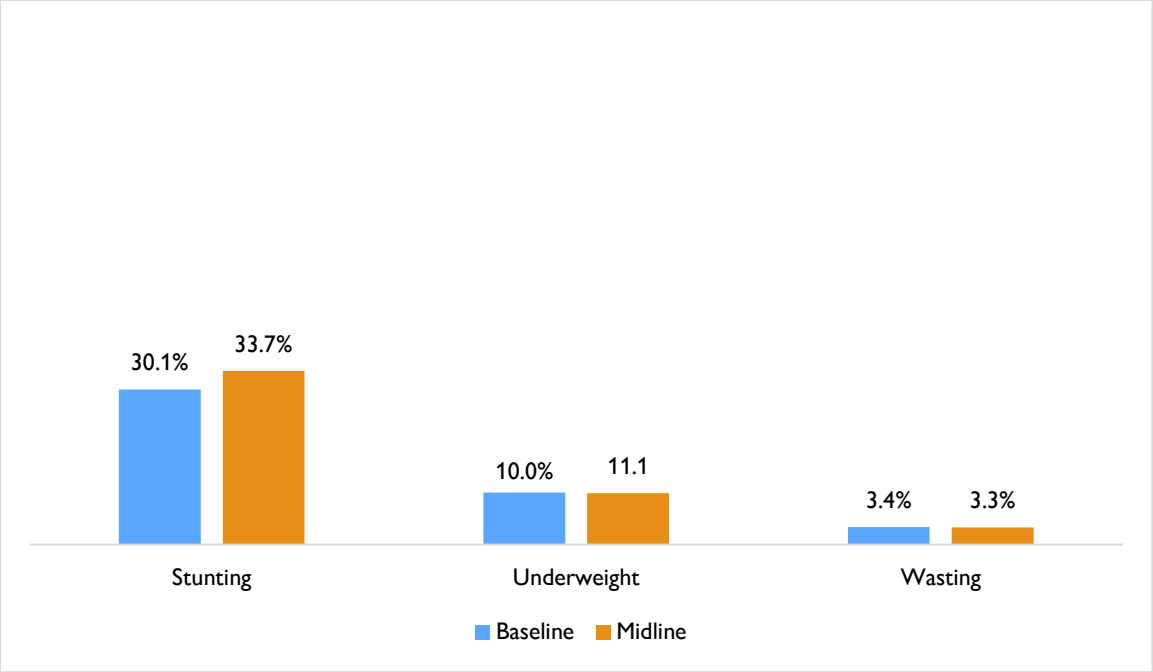
3.8.2 Child Nutrition Status

Anthropometric measurements (height/length and weight) for children were taken to determine their nutritional status. Anthropometric indices were generated using the WHO Multicentre Growth Reference Study (2006) standards, which compares measurements of children in a survey to the WHO reference population of well-nourished children. In line with these standards, three nutritional status indices were calculated for children 0-23 months old: stunting, wasting, and underweight. At baseline, 7,891 children less than 24 months were included in the analysis and 7,810 at midline. Further to data quality assurance and cleaning described in section 2, additional data quality assessment on anthropometric measurements were undertaken and results are presented in Appendix 1.0.

Overall, a significant increase in stunting was noted from 30.1% (CI [29.1-31.2] at baseline to 33.7%, (CI [32.6-34.7] at midline (p<0.0001), translating to a 3.6% increase in stunting (Figure 45).

Prevalence of underweight increased from 10.0%, CI [9.3-10.6] at baseline to 11.1%, CI [10.5-11.9] (p=0.016), while wasting remained more or less the same from 3.4%, CI [3.0-3.8] at baseline to 3.3%, CI [2.9-3.7] midline (p=0.808). The results indicate that child malnutrition, especially the chronic form (stunting), is still a major problem and the situation might have worsened.

Figure 45. Percent of children by nutritional status



The co-existence of different forms of malnutrition in the same child is also noteworthy. Many children were both underweight and stunted or wasted and stunted. The survey showed an increase in the proportion of children who were both underweight and stunted from 6.8% at baseline to 7.4 % at midline. However, the proportion of children with all three conditions (stunting, underweight, and wasting) did not change from baseline (1.1%).

Child Nutrition Status by Sex

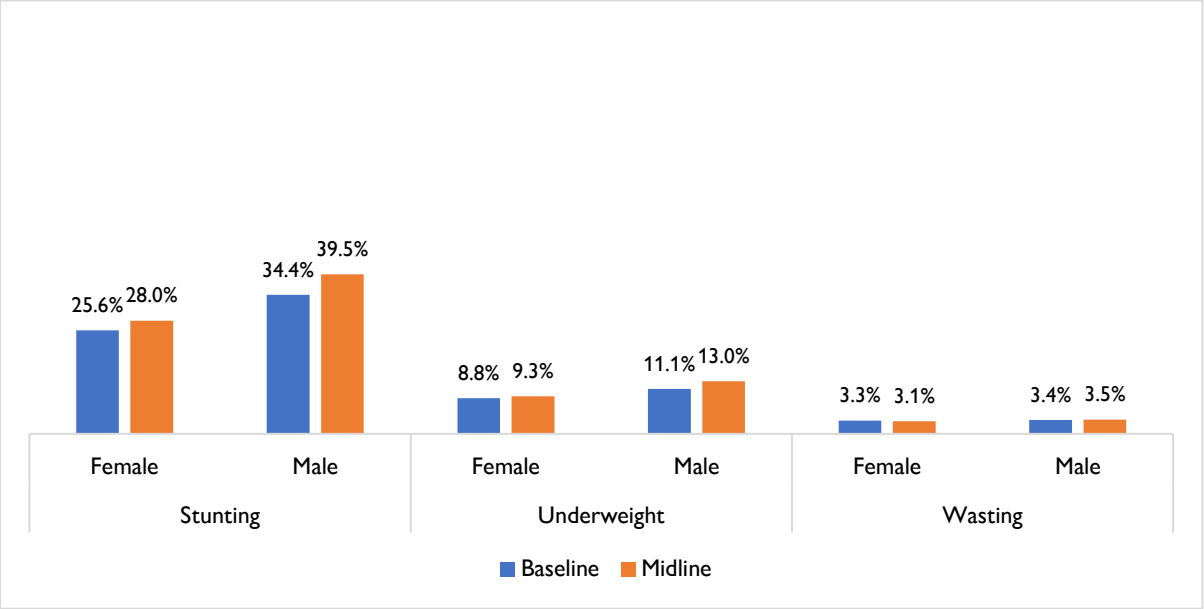
Stunting differed by the sex of the child, with more male children found to be stunted than female children in both surveys. Prevalence of stunting increased among both males and females (Figure 46). The increase in the prevalence of stunting among male children was almost double that of female children.

Prevalence of underweight also increased among both male and female children from baseline to midline. The proportion of underweight children increased from 11.1% to 13.0% in males and from 8.8% to 9.3% in female children.

Prevalence of wasting remained almost the same among male and female children. At baseline 3.4% of males were wasted compared to 3.5% at midline, and, in females, 3.3% at baseline to 3.1% at midline.

Evidence shows that sex differences in malnutrition are associated with biological factors[30,31], suggesting a vulnerability of male children to poor nutrition outcomes. Evidence indicates that "male foetuses are known to be at an increased risk of poor outcomes compared to female foetuses. It is estimated that new-born females are physiologically similar to a male at four to six weeks of age, suggesting that females are more developed at birth and potentially better able to withstand adverse conditions".[32]

Figure 46. Prevalence undernutrition from baseline to midline by sex of child



Child Nutrition Status by Age Group

In both baseline and midline surveys, stunting and underweight was lowest among children aged 6-8 months old, and highest among children 18 months and older (Table 29). While stunting increased among all age groups between baseline and midline, the increase was more prominent among older children (18-23 months) (43.5% to 49.9%).

Table 29. Percent of children by nutrition status by age group

Age group	Stunting			Underweight			Wasting		
	Baseline	Midline	Change	Baseline	Midline	Change	Baseline	Midline	Change
<6 months	22.7%	25.1%	2.4%	6.6%	6.7%	0.1%	2.9%	3.0%	0.1%
6-8 months	19.8%	22.5%	2.7%	7.5%	8.9%	1.4%	2.5%	3.8%	1.3%
9-11 months	22.9%	26.3%	3.4%	10.1%	10.2%	0.1%	4.0%	3.1%	-0.9%
12-17 months	35.5%	38.4%	2.9%	14.1%	13.4%	-0.7%	5.1%	3.7%	-1.4%
18-23 months	43.5%	49.9%	6.4%	10.7%	15.9%	5.2%	2.2%	3.1%	0.9%

Underweight also increased across most age groups from baseline to midline, except among those aged

[30] Kirsten A Bork and Aldiouma Diallo. 2017. Boys Are More Stunted than Girls from Early Infancy to 3 Years of Age in Rural Senegal. The Journal of Nutrition Community and International Nutrition.

[31] Samantha Lee Huey, Julia Leigh Finkelstein, Sudha Venkatramanan, et al. 2019. Prevalence and Correlates of Undernutrition in Young Children Living in Urban Slums of Mumbai, India: A Cross Sectional Study 2019

[32] Thurstans, S. (2022). Understanding sex differences in childhood malnutrition. *Field Exchange* 67, 58.

12-17 months old. The highest increase in underweight was among children aged 18-23 months old, while the lowest increase in underweight was among children less than 6 months old (Table 29).

Wasting increased among younger children under 8 months old and older children (18-23 months old), while it reduced in those aged 9-17 months old (Table 29).

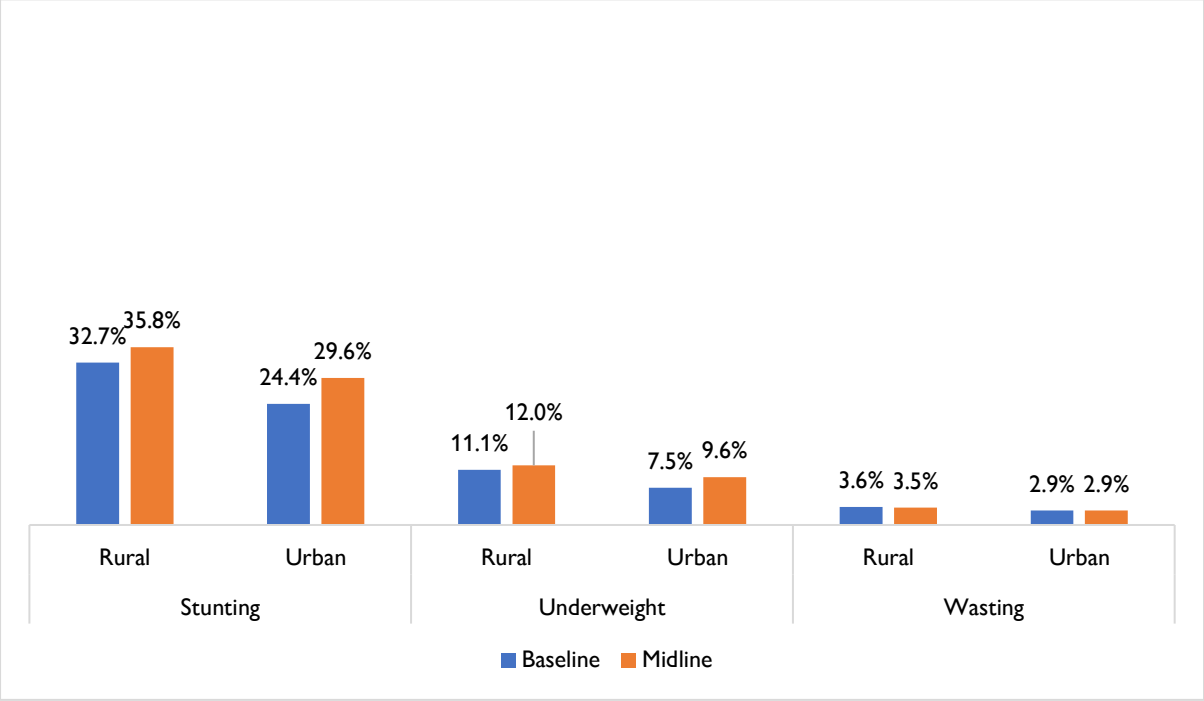
In summary, the increase in the prevalence of stunting was statistically significant for all age groups. The change in wasting was minimal, with the statistically significant increase limited to children aged 6-8 months.

Higher stunting and wasting among children less than 6 months correspond to suboptimal IYCF feeding practices (Table 17), specifically exclusive breastfeeding, which is a protective factor against malnutrition. The results suggest that younger children are likely introduced to solid foods earlier than recommended, contributing to poor nutrition outcomes in this age group. For older children, the midline survey shows that only 35.9% of children continued breastfeeding to 12 to 23 months of age, indicating that most children did not obtain the nutrients supplied by breast milk as they grew older.

Child Nutrition Status by Region

Child nutrition varied by region across all three indicators. The increase in stunting between the baseline and midline surveys was higher in urban areas (5.2%) than in rural areas (3.1%). Similarly, underweight increased in both rural and urban areas, with only a 0.9% increase observed in rural areas compared to a 2.1% increase in urban areas. Wasting remained the same in rural and urban areas (Figure 47). The results suggest a worsening of chronic undernutrition in the urban areas compared to rural areas.

Figure 47. Percent of children by nutrition status by region

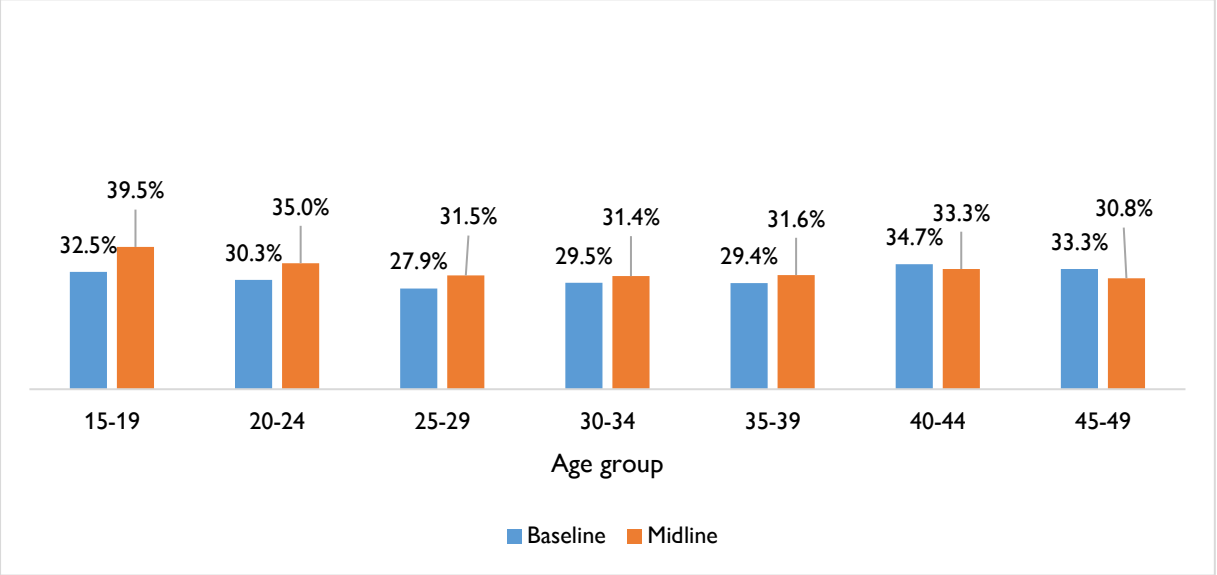


Child Stunting by Mothers' Age

A significant increase in stunting was observed among children of younger mothers – an increase of 7.0% among children of mothers aged 15-19 years and 4.7% in those whose mothers were 20-24 years old.

On the other hand, stunting among children whose mothers were 40 years and older declined at midline compared to baseline (Figure 48). The findings suggest that children born of younger mothers are at high risk of developing malnutrition.

Figure 48. Percent of stunted children by the mother's age



Child Nutrition Status by District

Stunting

Geographical variations in stunting were observed across districts. The prevalence of stunting increased in 20 out of the 32 districts. Among districts with reductions in stunting rates, the highest reductions were observed in Kaoma (34.1% to 24.6%), Choma (28.1% to 20.3%), Chinsali (32.4% to 24.9%), and Chibombo (28.9% to 23,3%). However, the only statistically significant reduction in the prevalence of stunting was that observed in Kaoma ($p<0.001$); the rest of the declines were not statistically significant ($p>0.05$). In contrast, stunting statistically increased in Luwingu (from 30.0% to 49.4%), Mumbwa (28.2% to 43.9%), and Ndola (from 15.8% to 31.0%) districts ($p<0.001$) (Table 30).

Underweight

Changes in the proportion of children who were underweight varied by district. Underweight rates increased in 22 out of the 32 districts, including all districts of Copperbelt, Muchinga, and North-western provinces, and most districts in Northern and Western provinces. The increases in most of these districts were not statistically significant ($p>0.005$), except in Mwinilunga District in North-western Province, where a significant increase was noted ($p<0.001$). On the other hand, no significant reductions in underweight were observed (Table 30). The results suggest an upward trend in the prevalence of underweight children in most districts.

Wasting

Prevalence of wasting declined in 15 out of 32 districts, with major reductions observed in Chibombo (6.0% to 2.9%), Lusaka (4.8% to 2.0%), and Kaoma (6.9% to 4.5%) districts. The highest increase in wasting occurred in Choma District (3.5%), followed by Nchelenge (3.0%). No statistically significant increases or reductions were noted in wasting across all 32 districts (Table 30).

In summary, Chibombo, Monze, and Mwense are the only districts that reported reductions in all the

child undernutrition outcome measures, i.e., stunting, underweight, and wasting. On the other hand, all three nutrition outcome indicators worsened in Kitwe, Ndola, Zambezi, Nchelenge, Isoka, Kawambwa and Kalabo districts.

Table 30. Percent of children by nutrition status by district

Province	District	Stunting									Underweight									Wasting								
		Baseline				Midline				p-values	Baseline				Midline				p-values	Baseline				Midline				p-values
		%	SE	LCL	UCL	%	SE	LCL	UCL		%	SE	LCL	UCL	%	SE	LCL	UCL		%	SE	LCL	UCL	%	SE	LCL	UCL	
Central	Chibombo	28.9	2.9	23.3	34.5	23.3	2.7	17.2	27.6	0.19	9.2	1.8	5.6	12.8	8.6	1.8	5.0	11.8	0.94	6.0	1.5	3.1	9.0	2.9	1.1	0.8	4.8	0.14
	Kabwe	34.3	3.0	28.1	39.9	33.2	3.0	27.0	38.6	0.87	6.0	1.5	3.1	8.9	7.6	1.7	4.3	10.9	0.59	2.4	1.0	0.5	4.3	1.6	0.8	0.0	3.2	0.74
	Kapiri Mposhi	30.5	2.9	24.8	36.2	33.2	3.0	27.0	38.6	0.59	13.7	2.2	9.4	17.9	8.5	1.8	5.0	11.8	0.09	3.6	1.2	1.3	5.9	2.4	1.0	0.5	4.3	0.61
	Mumbwa	28.2	2.8	22.4	33.6	43.9	3.1	33.1	45.3	0.00***	8.4	1.8	5.0	11.8	12.5	2.1	7.3	15.1	0.19	4.0	1.2	1.6	6.4	2.2	0.9	0.3	3.7	0.39
Copperbelt	Kitwe	28.9	2.9	23.2	34.4	33.1	3.0	26.6	38.2	0.37	8.4	1.8	5.0	11.8	10.1	1.9	6.3	13.7	0.61	2.4	1.0	0.5	4.3	2.8	1.1	0.8	4.8	0.99
	Ndola	15.8	2.3	11.1	20.1	31.0	2.9	24.3	35.7	0.00***	5.2	1.4	2.4	8.0	10.2	1.9	6.3	13.7	0.05	2.8	1.0	0.8	4.8	3.7	1.2	1.3	5.9	0.75
Eastern	Chipata	33.1	3.0	26.9	38.6	30.6	2.9	23.9	35.3	0.62	6.1	1.5	3.1	9.1	8.2	1.7	4.6	11.4	0.48	1.6	0.8	0.0	3.2	1.6	0.8	0.0	3.2	1.00
	Katete	29.4	2.9	23.6	34.8	37.4	3.1	31.1	43.1	0.07	7.2	1.6	4.0	10.4	6.0	1.5	3.1	9.0	0.74	2.8	1.0	0.8	4.8	0.8	0.6	0.0	1.9	0.18
	Lundazi	34.7	3.0	28.2	40.0	39.0	3.1	31.6	43.6	0.37	10.1	1.9	6.3	13.8	8.7	1.8	5.0	11.8	0.70	2.0	0.9	0.3	3.8	1.6	0.8	0.0	3.2	1.00
	Petauke	29.8	2.9	24.0	35.4	41.7	3.1	35.1	47.3	0.01***	8.5	1.8	5.0	11.9	10.8	2.0	7.0	14.6	0.47	2.0	0.9	0.3	3.8	2.0	0.9	0.3	3.7	1.00
Luapula	Mansa	37.5	3.1	31.2	43.2	39.9	3.1	32.9	45.0	0.65	12.4	2.1	8.3	16.5	10.1	1.9	6.3	13.8	0.49	2.8	1.0	0.8	4.8	3.7	1.2	1.3	5.9	0.76
	Kawambwa	28.7	2.9	22.4	33.6	36.1	3.0	28.9	40.7	0.08	6.6	1.6	3.7	10.7	10.8	2.0	7.2	15.3	0.11	11.3	2.0	7.6	15.9	11.7	2.0	8.0	16.4	0.88
	Nchelenge	43.1	3.1	36.8	49.1	43.8	3.2	36.2	48.5	0.97	15.3	2.3	10.8	19.7	18.4	2.5	13.3	22.9	0.43	3.2	1.1	1.0	5.4	6.2	1.5	3.1	9.0	0.18
	Samfya	43.0	3.1	36.7	48.9	52.0	3.2	44.6	57.0	0.05	12.9	2.1	8.7	16.9	12.9	2.1	8.7	16.9	1.00	2.0	0.9	0.3	3.7	4.5	1.3	1.9	6.9	0.20
	Mwense	29.8	2.9	23.6	34.8	29.4	2.9	23.6	34.8	0.93	13.7	2.2	9.5	18.8	8.4	1.8	5.3	12.6	0.06	12.2	2.1	8.4	17.0	11.2	2.0	7.6	15.8	0.72
Lusaka	Lusaka	23.3	2.7	18.0	28.4	25.2	2.7	19.8	30.6	0.69	9.2	1.8	5.6	12.8	8.0	1.7	4.6	11.4	0.75	4.8	1.4	2.2	7.4	2.0	0.9	0.3	3.7	0.14
Muchinga	Chinsali	32.4	3.0	26.6	38.2	24.9	2.7	19.4	30.2	0.08	12.8	2.1	8.7	16.9	15.2	2.3	10.7	19.7	0.52	5.2	1.4	2.4	8.0	3.6	1.2	1.3	5.9	0.51
	Isoka	24.1	2.7	18.7	29.3	26.1	2.8	20.6	31.4	0.68	8.4	1.8	5.0	11.8	13.6	2.2	9.4	17.8	0.09	2.8	1.0	0.8	4.8	4.8	1.4	2.2	7.4	0.34
	Mpika	30.1	2.9	24.3	35.7	37.0	3.1	30.6	42.5	0.13	7.2	1.6	4.0	10.4	10.1	1.9	6.3	13.8	0.32	2.8	1.0	0.8	4.8	2.4	1.0	0.5	4.3	1.00
Northern	Kaputa	39.5	3.1	33.1	45.3	36.0	3.0	28.9	40.7	0.47	17.7	2.4	12.9	22.3	18.0	2.4	12.9	22.3	1.00	2.4	1.0	0.5	4.3	3.7	1.2	1.3	5.9	0.58
	Kasama	29.7	2.9	23.6	34.8	35.1	3.0	28.6	40.4	0.23	12.4	2.1	8.3	16.5	12.9	2.1	8.7	17.0	0.99	3.3	1.1	1.0	5.4	1.2	0.7	0.0	2.6	0.21
	Luwingu	30.0	2.9	23.9	35.3	49.4	3.2	42.6	55.0	0.00***	12.4	2.1	8.3	16.5	14.6	2.2	10.0	18.8	0.56	2.8	1.0	0.8	4.8	2.8	1.1	0.8	4.8	1.00
	Mbala	32.3	3.0	26.2	37.8	47.1	3.2	39.8	52.2	0.00***	11.6	2.0	7.6	15.6	10.8	2.0	7.0	14.6	0.90	2.0	0.9	0.3	3.7	3.2	1.1	1.0	5.4	0.56
North-western	Mwinilunga	34.9	3.0	29.0	40.9	35.9	3.0	29.7	41.5	0.90	10.4	1.9	6.6	14.2	17.6	2.4	12.9	22.3	0.03	5.2	1.4	2.5	8.0	4.8	1.4	2.2	7.4	1.00
	Solwezi	25.8	2.8	19.8	30.6	23.6	2.7	17.7	28.1	0.64	9.6	1.9	5.9	13.3	13.1	2.1	8.7	17.0	0.28	3.3	1.1	1.0	5.4	4.1	1.3	1.6	6.5	0.81
	Zambezi	19.2	2.5	14.0	23.6	30.0	2.9	24.3	35.7	0.01***	6.9	1.6	3.7	9.9	12.4	2.1	8.3	16.5	0.05	1.6	0.8	0.0	3.2	3.6	1.2	1.3	5.9	0.28
Southern	Choma	28.1	2.9	20.8	31.8	20.3	2.5	15.0	25.0	0.06	6.5	1.6	3.4	9.5	4.8	1.4	2.2	7.4	0.54	0.9	0.6	0.0	1.9	4.4	1.3	1.9	6.9	0.03***
	Monze	25.7	2.8	19.4	30.2	21.4	2.6	16.1	26.3	0.30	8.4	1.8	5.0	11.8	6.8	1.6	3.7	9.9	0.61	4.1	1.3	1.6	6.4	2.8	1.0	0.8	4.8	0.59

Province	District	Stunting									Underweight									Wasting								
		Baseline				Midline				p-values	Baseline				Midline				p-values	Baseline				Midline				p-values
		%	SE	LCL	UCL	%	SE	LCL	UCL		%	SE	LCL	UCL	%	SE	LCL	UCL		%	SE	LCL	UCL	%	SE	LCL	UCL	
Western	Kalabo	29.1	2.9	23.3	34.5	33.5	3.0	27.0	38.6	0.35	7.3	1.7	4.0	10.4	10.0	1.9	6.3	13.7	0.36	3.3	1.1	1.0	5.4	5.6	1.5	2.7	8.5	0.29
	Kaoma	34.1	3.0	27.7	39.5	24.6	2.7	18.8	29.4	0.03	9.7	1.9	5.9	13.3	10.1	1.9	6.3	13.8	1.00	6.9	1.6	3.7	9.9	4.5	1.3	1.9	7.0	0.32
	Mongu	17.8	2.4	12.9	22.4	28.9	2.9	21.4	32.4	0.01	10.8	2.0	7.0	14.7	13.7	2.2	8.7	17.0	0.41	6.4	1.6	3.4	9.5	4.3	1.3	1.6	6.5	0.40
	Shang'ombo	31.8	2.9	25.5	36.9	32.0	2.9	25.8	37.4	1.00	10.5	1.9	6.6	14.2	9.6	1.9	5.9	13.3	0.87	4.9	1.4	2.2	7.4	4.9	1.4	2.2	7.4	1.00

*LCL= Lower Confidence Interval: UCL= Upper confidence Interval; SE= Standard Error. *** statistically significant change (p<0.05)*

3.8.3 Factors Associated with Stunting

Regression Analysis

We conducted a stepwise logistic regression analysis to examine the relationship between child stunting and selected background and intermediate factors as per the SUN/MCDP II theory of change. The dependent variable 'stunting' was expressed as dichotomous variables 'stunted' or 'not stunted'. Independent variables included all factors collected in the survey known (based on various studies) to be associated with stunting (Appendix 2.0).

As a first step, the dependent variable was regressed with each independent variable (bivariate analysis) to identify a set of the most important variables to include in the final model. The selection criteria for inclusion in the final model was a significance level of $p<0.1$. Before running the final logistics regression model, the selected variables were tested for collinearity; and explanatory variables that showed high collinearity ($p<0.1$) with another were dropped.

Results of the final logistic regression model, provided in Figure 49, indicate that stunting is associated with several household, parental, child, and environmental factors, which are further discussed below.

Household characteristics:

Age of the household head and economic activity were associated with the odds of child stunting:

- Children in households where the head was 45-54 years were more likely to be stunted (OR= 1.403; p>0. 1) compared to children in households whose heads were <24 years.
- Children in households where the head was on salaried employment were significantly less likely to be stunted (OR=0.732; p>0. 1) compared to those where the head was not involved in any economic activity.

Mothers' characteristics

Mothers age, economic activity, and highest education level were found to be strongly associated with the odds of child stunting:

- The odds of child stunting generally decreased with increasing maternal age. For instance, children whose mothers were aged 20-24 years were 50% less likely to be stunted (OR=0.582; p<0.01) compared to those whose mothers were aged 15-19 years.
- In addition, children whose mothers used family planning had reduced odds of being stunted compared to those whose mothers did not use any form of modern family planning method (OR=0.855; p>0.1).
- On the other hand, children whose mothers were salaried had a higher likelihood of being stunted than those whose mothers were not involved in any economic activity. This could be attributed to childcare, as most salaried mothers are in full time jobs, requiring them to cede responsibility of their child's care to other persons.

Figure 49. Factors associated with stunting

age_mths	1.174***
BMI less than 18.5	Base
BMI categories = 2, Average (18.5-24.9)	1.011
BMI categories = 3, Overweight (>= 25.0)	0.769
Breastfeeding initiation	1.121
Childeren less than 12 months	Base
Child age category = 4, 12-17 months	3.055
Child age category = 5, 18-24 months	2.03
Child left alone or in the care of another child younger than 10 years of age	1.051
Child with diarrhea	1.266**
Children reached with 90% Community level Interventions	1.343*
Continued breastfeeding 12-23 Months	0.922
Household head age = 1, 15-24	Base
Household head age = 2, 25-34	1.245
Household head age = 3, 35-44	1.238
Household head age = 4, 45-54	1.403
Household head age = 5, 55-64	1.124
Household head age = 6, 65+	1.331
Household head economic status = 0, None	Base
Household head economic status = 1, Farmer	0.926
Household head economic status = 2, Salaried	0.732
Household head economic status = 3, Self-employed	0.827
Household head economic status = 4, Business woman	1.079
Household head economic status = 5, Charcoal burning	0.917
Household head economic status = 6, Casual labour	0.989
Household head economic status = 7, Students	1.966
Household head economic status = 8, Other	0.366
Household head marital status = 1, Single (Never Married)	Base
Household head marital status = 2, Married (Monogamous)	1.218
Household head marital status = 3, Married (Polygamous)	0.96
Household head marital status = 4, Divorced	1.566
Household head marital status = 5, Widow	1.07
Household head marital status = 6, Separated	1.615
Household head marital status = 7, omitted	-
Household Hunger Scale - FAO definition	0.896
Household diet Diversity	1.022
RECODE of water_access_score	1.02
household_v01 Head sex = 2, Female	1.018
Households Practising Essential Hygiene Actions	0.847
Households Practising essential Nutrition Actions	0.971
Households practising safe food handling	1.072
Households Producing and selling Nutritious crops/livestocks	0.964
Households Producing and Consuming Nutritious crops/Livestock	1.125
minimum diet diversity for women (MDDW)	1.015
Minimum diet diversity-Child	1.077
Mother age group = 1, <20	Base
Mother age group = 2, 20-24	0.582***
Mother age group = 3, 25-29	0.437***
Mother age group = 4, 30-34	0.471***
Mother age group = 5, 35-39	0.445***
Mother age group = 9, 40-44	0.370***
Mother age group = 10, 45-49	0.306**
Mother economic status = 0, None	Base
Mother economic status = 1, Farmer	1.28
Mother economic status = 2, Salaried	1.668
Mother economic status = 3, Self-employed	1.182
Mother economic status = 4, Business woman	0.918
Mother economic status = 5, Charcoal burning	1.275
Mother economic status = 6, Casual labour	1.142
Mother economic status = 7, Students	0.743
Mother economic status = 8, Other	0.54
Mother highest education level = 0, None	Base
Mother highest education level = 1, Preschool	0.58
Mother highest education level = 2, Primary	0.877
Mother highest education level = 3, Jr Secondary	0.888
Mother highest education level = 4, Sr Secondary	0.749
Mother highest education level = 5, Higher	0.410*
SBCC: Exclusive breastfeeding	1.156
SBCC: Diet during pregnancy	0.678***
SBCC: Diet when breastfeeding	1.086
SBCC:Feeding the sick child	0.879
SBCC:Complementary feeding	1.114
The child is underweight: Weight-for-Age < 2SD	9.550***
Modern family planning users	0.855

*- p value <0.1; ** - p value <0.05 : ***p value<0.01

Risk Factors
Protective Factors

Child Factors

The age of the child was strongly associated with stunting. Older children aged 18-23 months old and those aged 12-17 months old were more likely to be stunted compared to children younger than 12 months old (OR=2.03; p>0.1 and OR=3.055, p>0.1, respectively). Similar trends were observed in the 2018 ZDHS, where stunting rates peaked around 12 months. In addition, children who were underweight had increased odds of being stunted compared to those with normal weight (OR=9.550; p<0.01), suggesting the existence of high co-morbidity of stunting and underweight.

Qualitative Comparative Analysis (QCA) of district-level results

We conducted qualitative comparative analysis to further identify conditions in the districts that could explain the increase in the prevalence of child stunting. Each district was considered a 'case' and coded as "0" if prevalence of aggregate stunting in the district did not decrease and "1" if the prevalence of stunting decreased. Key survey indicators aligned with the theory of change (i.e., 'conditions') were recorded as 0 if the condition did not improve and 1 if the condition improved. These codes were then summarised in a matrix as shown in Table 31.

Table 31. District indicator (conditions) performance

Location	Conditions																					
District	MAD	MDD_W Increased	Diarr. In 2 weeks	HHMDD	HH Hunger	BF Init	Cont. BF to 2 yrs	MMF	IYCF Stds	Excl BF	CDD	HH with soap and water	Growth monitoring	Deworming	Access to basic Water	Access to basic sanitation	HH with clean covered latrines	Ferrous/Folic Acid suppl.	SBCC:Diet during pregnancy	SBCC: Diet when breastfeeding	SBCC: Comple. feeding	SBCC: Feeding the sick child	Stunting
Chibombo	0	1	1	0	0	1	1	0	1	1	1	0	0	0	0	1	0	1	0	1	0	1	1
Kabwe	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	1	0	1	1
Chipata	0	1	1	1	1	1	1	0	0	0	0	1	0	0	1	1	1	0	0	1	0	1	1
Mwense	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	0	0	1	0	1	1
Chinsali	1	0	0	0	0	0	0	1	1	1	1	1	0	1	1	1	1	0	0	1	0	0	1
Kaputa	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1	1
Solwezi	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1	1
Choma	0	1	1	1	1	1	0	1	0	0	1	0	0	1	1	1	0	0	0	0	0	0	1
Monze	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	1	1
Kaoma	1	1	0	1	1	0	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	1	1
Kapiri	0	0	0	0	1	1	1	1	0	1	0	0	0	0	1	1	1	0	1	1	0	1	0
Mumbwa	0	0	1	0	0	1	1	0	0	1	0	0	0	1	1	1	1	0	0	1	0	1	0
Kitwe	0	0	1	0	0	1	1	0	0	0	0	1	0	1	1	1	1	0	0	1	0	1	0
Ndola	0	0	1	0	0	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	0	1	0
Katete	0	0	1	0	1	1	0	0	1	1	0	1	0	1	1	0	0	0	0	1	0	1	0
Lundazi	0	0	1	0	1	1	0	0	0	0	0	1	0	0	1	1	1	0	0	1	0	0	0
Petauke	0	0	1	0	1	1	1	0	1	1	1	1	0	0	1	1	1	0	0	1	0	1	0
Mansa	0	0	1	0	0	0	1	0	0	1	0	1	0	1	1	1	1	0	0	1	0	1	0
Nchelenge	1	1	1	1	1	1	1	0	1	1	1	0	0	0	1	1	1	0	0	1	0	1	0
Samfya	0	0	1	0	0	1	1	0	1	1	0	1	0	1	1	0	1	0	0	1	0	1	0
Kawambwa	1	0	1	1	0	1	0	1	1	0	1	0	0	0	1	1	1	0	0	1	0	1	0
Lusaka	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	1	1	0	1	0
Isoka	1	0	0	0	0	1	0	1	1	1	1	0	0	1	1	0	0	0	0	1	0	0	0
Mpika	0	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	0	0	1	0	1	0
Kasama	0	1	1	0	1	1	1	1	0	0	1	1	0	1	1	1	1	0	0	1	0	1	0
Luwingu	0	1	1	0	1	1	1	0	0	0	1	1	0	1	1	1	1	0	0	1	0	1	0
Mbala	0	0	0	0	1	1	1	0	1	0	1	1	0	0	0	1	1	0	0	1	0	1	0
Mwinilunga	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	1	1	0	0	0
Zambezi	0	1	1	1	1	1	0	0	1	1	1	0	0	1	0	0	0	0	1	1	0	0	0
Kalabo	0	0	0	0	0	0	0	1	0	1	1	1	0	0	1	0	0	0	1	1	0	1	0
Mongu	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Shangombo	1	0	1	0	0	0	0	1	1	1	1	0	0	1	1	0	1	0	1	1	0	0	0

In the next stage of analysis, we grouped the conditions using the UNICEF conceptual framework for maternal and child nutrition into two broad categories (i.e., the immediate and underlying factors) and then into 5 subgroups associated with stunting reduction: 1) immediate factors, 2) household food consumption, 3) adequate child diet, 4) healthy environment, and 5) exposure to social behaviour change communication.

Analysis then focused on identifying specific combinations of conditions associated with the decrease in stunting at district level. The cases (i.e., districts) and all conditions (i.e., indicators) were exported into

the QCA analysis software to generate key combinations of specific conditions necessary for reduction in stunting using the Crisp[33] method.

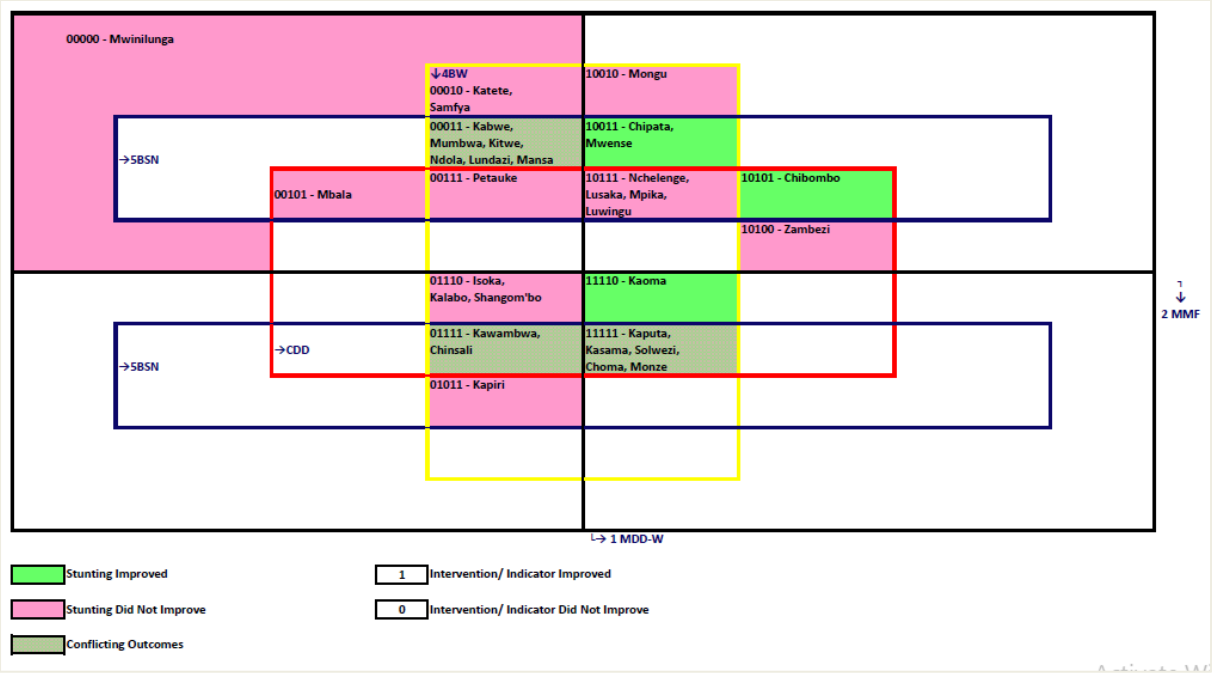
The software identified 5 necessary conditions for the decrease in the prevalence of stunting, using a consistency rate of 89%. In other words, these 5 conditions improved in 89% of cases where there was a decline in the prevalence of stunting. These conditions/indicators were:

1. Minimum dietary diversity for women (MDD-W)
2. Minimum meal frequency (MMF)
3. Child dietary diversity (CDD)
4. Access to Basic water (BW), and
5. Access to Basic sanitation (BSN)

All other conditions had a weak association of less than 50% consistency with stunting improvement, hence were omitted.

The five necessary individual conditions were then modelled against the aggregate stunting outcome at district level. The improvement in each of the conditions was coded as "1", while lack of improvement was coded as "0". Therefore, if all five conditions improved in a given district, the district would be coded as "11111" and "00000" if none of the conditions improved, with each digit representing one of the five conditions. In the model output presented in Figure 50, the position of each digit corresponds to the order of the five conditions listed above, as follows: the first digit represents MDD-W, the second represents MMF, the third represents CDD, the fourth represents access to basic drinking water, and the fifth represents access to basic sanitation services.

Figure 50. Conditions associated with stunting reduction at district level



[33] Crisp method in QCA is the "reduction" of a long, complex expression into a shorter, more parsimonious expression, i.e., using yes/no, 0/1, etc., to denote the presence or absence of a condition. More details in https://us.sagepub.com/sites/default/files/upm-assets/23237_book_item_23237.pdf

The QCA revealed four groups of districts in relation to the five necessary conditions and the reduction in the prevalence of stunting:

- Group 1 – Districts that improved in all five conditions. The five districts (Kaputa, Solwezi, Choma, Monze, and Kasama) that improved in all five conditions all recorded a decline in the prevalence of stunting, except Kasama. This shows that there was some convergence of the five high-impact interventions in those districts.
- Group 2 – Districts that improved in four of the five conditions. Seven districts improved in 4 conditions, but only two (Kaoma and Chinsali) recorded a decline in the prevalence of stunting. The remaining five districts (Nchelenge, Lusaka, Mpika, Kawambwa, Luwingu) recorded an increase in stunting prevalence. The difference between these two sets of districts (except in the case of Kawambwa) is that those that recorded an increase in stunting had not improved in minimum meal frequency for children, implying that meeting children's minimum meal frequency may have significantly contributed to the reduction in stunting. A combination of child dietary diversity and minimum meal frequency seems to have contributed to the decline in the prevalence of stunting in Kaoma District. The analysis shows that districts where stunting did not decrease may need to strengthen interventions focusing on child feeding frequency, as dietary diversity seems to be better in these districts. It can be observed that in districts where the prevalence of stunting did not reduce, the percent of children reaching minimum meal frequency had reduced (Table 19). The results imply a need to strengthen SBCC, with a focus on improving child feeding frequency and child dietary diversity, along with messages focusing on other interventions within the minimum package of SUN/ MCDP II services.
- Group 3 – Districts that improved in three out of the five conditions. Of the 8 districts that improved in 3 out of the five conditions, three (Chipata, Chibombo, Mwense) recorded a decline in stunting, while five (Kapiri, Petauke, Isoka, Kalabo, and Shang'ombo) did not. The former set of districts made better improvements in MDD-W compared to the latter set of districts, indicating that improving MDD-W may have played an important role in reducing stunting in these districts.
- Group 4 – Districts that improved in 2 or less conditions. All 12 districts that improved in two or fewer conditions (i.e., improvements in 2, 1, or no conditions) did not record declines in stunting, except Kabwe. This suggests that improvements in only a few key interventions are less likely to produce declines in stunting.

By showing the link between 5 key underlying conditions and their contribution to stunting reduction, the QCA analysis underscores the importance of the convergence of SUN/MCDP II interventions. Stunting can only improve if key underlying indicators improve in combination and not in isolation.

3.8.4 Anaemia in Children[34]

Data were collected from 5,467 children less than 24 months old. A child is said to be anaemic if it has <110g/dl of haemoglobin in the blood. About 62.6% of the tested children had anaemia, although most had moderate or mild forms of anaemia. Levels of severe anaemia were low; only 0.8% of children were found to be severely anaemic, with more cases seen among males (64.3%) compared to female (60.9%) children.

Anaemia was common across all age groups. More than half of children under 6 months old had anaemia,

[34] Only conducted in the midline survey. Anaemia data not collected in Mwense and Kawambwa districts.

and this increased with age, reaching a peak in children 9-11 months old before dropping to 57.8% in older children aged 18-23 months old.

Anaemia was slightly higher among children in rural (63.2%) than in urban areas (61.3%). Geographical variations in anaemia were observed across districts, with the highest prevalences observed in Mansa (98.6%), Samfya (85.9%), Mbala (77.7%), Shang'ombo (72.1%), and Kabwe (71,7%). The prevalence of anaemia was lower in Katete (44.5%), Petauke (45.8%), and Chibombo (49.0%) districts (Table 32).

Table 32. Prevalence of anaemia in children 6-23 months old by sex, region, and district

		Any anaemia (n=5,467) (<11.0 g/dl)	Severe <7.0 g/dl	Moderate 7.0–9.9 g/dL	Mild 10.0–10.9 g/dL
SEX	Male	64.3%	1.0%	31.9%	31.4%
	Female	60.9%	0.5%	29.3%	31.1%
REGION	Rural	63.2%	0.8%	30.9%	31.5%
	Urban	61.3%	0.6%	30.0%	30.8%
Central	Chibombo	49.0%	0.0%	19.6%	29.4%
	Kabwe	71.7%	1.1%	40.1%	30.5%
	Kapiri Mposhi	57.8%	0.6%	31.1%	26.1%
	Mumbwa	50.5%	0.5%	23.9%	26.1%
Copperbelt	Kitwe	60.4%	0.0%	28.7%	31.7%
	Ndola	62.3%	0.0%	25.9%	36.3%
Eastern	Chipata	51.7%	1.2%	16.3%	34.3%
	Katete	44.8%	0.0%	5.5%	39.2%
	Lundazi	52.5%	1.1%	13.4%	38.0%
	Petauke	45.8%	0.0%	8.9%	36.8%
Luapula	Mansa	98.6%	0.0%	81.5%	17.1%
	Nchelenge	64.7%	0.5%	38.6%	25.5%
	Samfya	85.9%	1.8%	64.4%	19.6%
Lusaka	Lusaka	59.1%	1.1%	34.3%	23.8%
Muchinga	Chinsali	65.5%	0.6%	19.2%	45.8%
	Isoka	63.1%	1.6%	33.2%	28.3%
	Mpika	67.7%	0.5%	32.8%	34.4%
Northern	Kaputa	69.9%	0.0%	34.6%	35.3%
	Kasama	67.2%	0.0%	25.5%	41.7%
	Luwingu	65.5%	2.9%	35.7%	26.9%
	Mbala	77.7%	0.0%	38.0%	39.7%
North-Western	Mwinilunga	58.7%	2.8%	31.3%	24.6%
	Solwezi	51.4%	1.6%	24.6%	25.1%
	Zambezi	54.7%	0.0%	26.5%	28.2%
Southern	Choma	65.2%	0.5%	22.9%	41.8%
	Monze	66.5%	1.0%	33.5%	32.0%
Western	Kalabo	63.4%	0.0%	32.3%	31.1%
	Kaoma	50.9%	1.9%	21.7%	27.3%
	Mongu	58.1%	0.0%	24.2%	33.9%
	Shang'ombo	72.1%	1.1%	44.8%	26.2%
Total		62.6%	0.7%	30.6%	31.2%

4 CONCLUSION AND DISCUSSION

The midline survey was designed to assess progress in key indicators 3 years after the onset of the implementation of the SUN/MCDP II (2019). We found that stunting among children under 2 years had not reduced but had instead increased by about 3.6% overall. Our results show that the prevalence of stunting among children under 2 years had statistically significantly declined in only one district (Kaoma) and statistically significantly increased in 7 districts (Mumbwa, Ndola, Petauke, Luwingu, Mbala, Zambezi, and Mongu). Although the magnitude of changes in the prevalence of stunting in the rest of the districts was not statistically significant, results showed an increasing trend in the prevalence of stunted children among children under 2 years. The midline survey observed improvements in WASH indicators – especially access to basic drinking water. Equal emphasis is needed to improve access to basic sanitation and intensified SBCC to improve general hygiene practices for the programme to have an impact.

Evidence shows that stunting reduction is complex and, in many contexts, difficult to achieve in the short term. This is especially the case with the SUN/MCDP II, given that the baseline and midline surveys were only three years apart, a short period to bring about a meaningful reduction in stunting levels. While stunting declines are difficult to achieve, sizeable increases in stunting over relatively short periods have been observed. For example, the prevalence of stunting among children under 5 years more than doubled in Argentina (from 7.1% to 16.9%) between 1994 and 1996[35]. In Zambia, the prevalence of stunting increased by more than 10% (from 48.1% to 59.4%) in Eastern Province between 1996[36] and 2001[37]. Evidence suggests that reducing the prevalence of stunting requires an examination of a broader range of factors, not only nutritional but also social, political, and economic, that underlie stunting. Improvements in such factors may require long-term investment in sectors outside the SUN/MCDP II's sphere of control and are thus beyond the scope of this survey.

The survey identified a number of factors associated with stunting performance. The age of the mother played a key role in the stunting status of the child, with children of younger mothers having a higher likelihood of stunting. The likelihood of stunting also increased with the age of the child. Further, a district-level analysis of how the communication of interventions interfaced with stunting showed that districts which improved in more than 5 key nutrition indicators were likely to have reduced their prevalence of stunting. These were minimum dietary diversity for women, minimum meal frequency for children, child dietary diversity, access to basic drinking water, and access to basic sanitation facilities.

Nutrition is directly affected by dietary intake. Zambia continues to experience regionally differentiated food and nutrition security situations. Climate change, pest infestations, economic shocks, and growing inequalities have been the main drivers of food and nutrition insecurity. More households are shifting from the moderate hunger category to the severe hunger category[38]. While the midline survey noted a reduction in crop and livestock production, the survey also observed an increase in the sale of nutritious crops and livestock produced by households, coupled with a reduction in the consumption of nutritious crops households produce – a practice that further limits households' access to diverse and nutritious foods. Among other factors, the observed declines in household dietary diversity (HDD), MDD-W, and child dietary indicators could be attributed to the high cost of acquiring food in both rural (where households depend on their own production of food) and urban areas (where access to food is

[35] https://data.worldbank.org/indicator/SH.STA.STNT.ZS

[36] Central Statistical Office Lusaka, Zambia Ministry of Health Zambia Macro International Inc. 1997. *Zambia Demographic and Health Survey 1996*. Macro International, Calverton, Maryland USA

[37] Central Statistical Office Lusaka, Zambia Ministry of Health Zambia Macro International Inc. 1997. *Zambia Demographic and Health Survey 1996*. Macro International, Calverton, Maryland USA

[38] https://reliefweb.int/report/zambia/zambia-ipc-acute-food-insecurity-2022

dependent on the economic situation of the household).

Studies have shown that the implementation of ten core nutrition-specific interventions at 90% coverage would decrease stunting by 20 percent[39], with investments in other sectors, such as WASH, further reducing stunting by up to 40%[40]. This underlies the importance of convergence of nutrition-specific and nutrition-sensitive interventions in addressing child undernutrition. In the midline survey, compared to the baseline survey, a lower proportion of children reportedly received 6 or more nutrition-specific interventions appropriate for their age from among the nutrition-specific interventions included in the SUN/MCDP II minimum package of interventions. For instance, the proportion of children aged 0-5 months who directly or indirectly received 6 or more nutrition-specific services reduced by 17.7% between baseline and midline survey; for children 6-11 months, by 10.9%, and for those 12 to 23 months, by 5.0%. According to the Zambia MOH 2021 report, declines in access to services were attributed to reduced contact between service providers and households/communities between 2020 and 2021 due to government enforcement of restrictive COVID-19 pandemic measures[41]. While critical in controlling the spread of the pandemic, these measures reduced the reach of services to the household level and women and children.

Program information also indicates that SUN/MCDP II nutrition support groups (NSGs) at the community level (instrumental for bringing key nutrition messages to this level) only commenced in late 2021 in most wards and were relatively nascent at the time of the midline survey. This suggests that systems to deliver SBCC at the household level have been weak, limiting households' access to information and services. As a result, household exposure to nutrition messages for behaviour change could have been reduced or hampered, resulting in the deterioration of nutrition actions such as MFF and MAD for children.

Informed by evidence[20, 39, 40]**Error! Bookmark not defined.**, the SUN/MCDP II programme presupposes that for stunting to reduce, the full package of interventions should cover approximately 90% of the wards in a district (and thereby at least 90% of the eligible households in the districts). This was based on the assumption that all core structures and GRZ capacities to support the programme implementation would be in place from the commencement of the programme. However, the 2020 Readiness and Performance Assessment (RPA) conducted by SUN LE in 2020 revealed low readiness levels of core structures and capacities to support the programme implementation. For instance, less than 25% of the ministries had essential commodities, supplies, and infrastructures to support service delivery. In addition, the funding mechanism was still in its infancy stage. Further, workforce levels to support the programme implementation in various ministries were low.

Lastly, the SUN/MCDP II rollout occurred in the context of major economic upheaval. According to the Ministry of Finance and Planning[42], real GDP contracted in the leadup to the midline survey after many years of growth, potentially pushing more households into poverty and hampering households' ability to purchase diversified and nutritious foods. Further, from various studies, including the Ministry of Health Annual Statistics Report, a separate SUN LE COVID-19 study[43], and others, there is evidence that the

[39] Bhutta, et al. 2013. Maternal and Child Nutrition Study Group. (2013). Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? *The Lancet*, *382*(9890), 452-477

[40] Shekar, et al. 2017. An Investment Framework for Nutrition: Reaching the Global Targets for Stunting, Anemia, Breastfeeding, and Wasting. *Directions in Development–Human Development*. Washington, DC: World Bank.

[41] MOH, 2022. Annual Health Statistical Report 2017-2021, MOH, Zambia.

[42] Eighth National Development Plan 2022-2026, Ministry of Finance and Planning, Republic of Zambia

[43] Scaling Up Nutrition Learning and Evaluation (SUN LE), Monitoring Household Food Security and Nutrition in 30 SUN 2.0

outbreak of the COVID-19 pandemic not only hampered access to services but also affected household income and restricted households' access to diversified and nutritious foods. While the midline survey did not assess these factors directly, poor economic performance and the COVID-19 pandemic could likely have contributed to the overall lack of progress in stunting reduction.

Districts in Zambia during COVID-19 Pandemic -6th Bi-Monthly Telephone Survey Report July 2021.

5 RECOMMENDATIONS

The observations made in the baseline and midline surveys suggest the need for concerted efforts to address undernutrition among children and women of childbearing age. The following are some recommendations based on the analysis of the midline survey data; however, broader consultations are required among stakeholders to devise short-term and medium-term practical measures to address malnutrition among children under 2 years old:

1. A large-scale, focused, and contextualised SBCC campaign with a renewed focus on inter-personal communication is required to, specifically:
    a. Intensify behaviour change at the household level with a focus on improving IYCF practices, particularly the provision of adequate and appropriate complementary feeding and continued breastfeeding.
    b. Strengthen access to basic sanitation in tandem with improvements in access to drinking water and intensify SBCC to improve adoption of recommended hygiene practices and essential nutrition actions.
    c. Strengthen programmes designed to reduce adolescent pregnancy and school re-entry programmes for adolescent mothers. Promote interventions targeted at delaying pregnancy among adolescents, as their children are particularly at high risk of stunting.
2. Need concerted efforts to improve service delivery quality, with a focus on promoting convergence of the SUN/MCDP II package of interventions at the household level to achieve a meaningful reduction in child undernutrition. Since the programme is supported by different partners, each with their specific focus, there is a need for stronger coordination of service delivery to ensure that interventions supported by all partners and line ministries converge at the household level to achieve desired practices and behaviours for stunting reduction.
3. Scale up community economic opportunities by improving access to financial resources through avenues like village lending schemes, saving for change, etc., under the SUN/MCDP II programme, and enterprise skills to improve household income generation resources and skills to improve household food security and resilience.
4. Given the high prevalence of anaemia, especially among children, the SUN/MCDP II's focus should be expanded to include strategies to address anaemia in children and women. Strategies can include the following:
    a. Targeted iron fortification of complementary foods for children (e.g., by adding micronutrients as appropriate powders).
    b. Large-scale fortification of staple foods such as maize flour, the main staple consumed in the majority of households.
    c. Strengthening the iron and folate supplementation programme among pregnant women, alongside the promotion of consumption (and production) of diversified foods, including iron-rich foods.
5. Improve crop and livestock production through promoting climate-smart agricultural practices to address the adverse effects of climate change on livestock and crop production. These could include but are not limited to integrated approaches for managing landscapes, cropland, livestock, forests, and fisheries, as well as promoting household consumption of produced nutritious food while

expanding households' access to credit to strengthen household resilience. There is also a need to promote the production of foods consumed in lower quantities, such as animal-source foods.

6. Design region-specific approaches to effectively deliver services that address stunting in each region (i.e., rural, urban), given higher increases in the prevalence of stunting in urban areas.

7. Moving forward, program planners can build on the momentum of households' increased access to sanitation facilities and basic drinking water to sustainably improve access to both soap and water availability at handwashing facilities. Given the high exposure of children to environmental animal waste, it will be paramount for the program to work with the communities to identify and address faecal-oral pathways at the household and community levels.

8. Further research is required to investigate why some districts achieved stunting reduction in contexts where many districts failed to do so. Such a study could explain what those districts did/do to improve stunting and provide best practices for scale-up in other districts.

APPENDIX 1. NOTES ON THE QUALITY OF ANTHROPOMETRIC MEASUREMENTS

We conducted the following data quality assessments on the height, weight, and age of the child using three recommended quality assessment on anthropometric data in 30 districts (excluding Mwense and Kawambwa whose data were collected separately):

- WHO flags of HAZ (height-for-age), WAZ (weight-for-age), and WHZ (weight-for-height)
- Standard deviations of Z- scores
- Heaping or digit preference (for height, weight, and age)
- WHO flags of HAZ, WAZ, and WHZ

To obtain anthropometric indicators on stunting, underweight, wasting, and overweight in children from height/length, weight, and/or age measurements, WHO growth reference standards were used to compute three nutritional scores described as z-scores. These z-scores are HAZ, WAZ, and WHZ; low values on these scales (below standard cut-offs) identify stunting, underweight, and wasting, respectively. Each z-score was calculated by comparing the child's height/length or weight with the median value in the reference population. The difference is divided by the standard deviation (SD) of the reference population (WHO Multicentre Growth Reference Study Group 2006), as shown in the formula below. The actual computation of z-scores requires the use of reference lists of coefficients.

Z-score = Individual value of the child – median value of children in the reference population standard deviation of the reference population

After obtaining the z-scores, the baseline and midline data sets were cleaned by flagging cases with z-scores beyond specified lower or upper cut-offs and excluding them from the computation of the prevalence of stunting, wasting, and underweight. The purpose of flagging was to eliminate extreme values that are most probably due to measurement or data-entry errors. Table 33 shows the cut-offs used which are consistent with the WHO 2006 standards. Flagged cases for HAZ, WAZ, and WHZ were higher in the midline than baseline. Nevertheless, all were within the WHO's recommended threshold of less than 20% of flagged cases. Flagged cases by districts ranged from 0-6.9% for HAZ and 0-10.4% for WAZ and WHZ. Therefore, there were not many implausible values in both baseline and midline and therefore stunting, underweight, and wasting were not influenced by extreme values.

Table 33. Percent of overall cases flagged and valid as per the WHO Growth Reference Standards and Flags

Indicator	Cut-offs	Baseline		Midline	
		Flagged	Valid	Flagged	Valid
HAZ	<-6 or >6	97 (1.3%)	7,402 (98.7%)	174 (1.3%)	7,321 (97.7%)
WAZ	<-6 or >5	13 (0.2%)	7,486 (99.8%)	102 (1.2%)	7,353 (98.8%)
WHZ	<-5 or >5	101 (1.3%)	7,398 (98.7%)	118 (1.6%)	7,389 (98.4%)

Table 34. Z- score flagged and valid cases by district

Province		Baseline				Midline				Baseline				Midline				Baseline				Midline			
	District	N	F*	V^	%F*	N	F*	V^	%F*	N	F*	V^	%F*	N	F*	V^	%F*	N	F*	V^	%F*	N	F*	V^	%F*
Central	Chibombo	249	0	249	0.0	250	10	240	4.4	249	0	249	0.0	250	8	242	3.2	249	0	249	0.00	250	7	243	2.8
	Kabwe	250	2	248	0.8	250	3	247	1.2	250	0	250	0.0	250	2	248	0.8	250	4	246	1.60	250	1	249	0.4
	Kapiri Mposhi	249	0	249	0.0	250	3	247	1.2	249	0	249	0.0	250	3	247	1.2	249	0	249	0.00	250	2	248	0.8
	Mumbwa	250	2	248	0.8	250	27	223	10.8	250	0	250	0.0	250	26	224	10.4	250	3	247	1.20	250	26	224	10.4
Copperbelt	Kitwe	250	1	249	0.4	250	5	245	2.0	250	0	250	0.0	250	4	246	1.6	250	2	248	0.80	250	3	247	1.2
	Ndola	250	3	247	1.2	250	8	242	4.0	250	0	250	0.0	250	8	242	3.2	250	1	249	0.40	250	6	244	2.4
Eastern	Chipata	247	2	245	0.8	250	8	242	3.2	247	0	247	0.0	250	7	243	2.8	247	3	244	1.21	250	5	245	2.0
	Katete	250	2	248	0.8	248	2	246	0.8	250	0	250	0.0	248	2	246	0.8	250	3	247	1.20	248	0	248	0.0
	Lundazi	249	4	245	1.6	250	9	241	3.6	249	0	249	0.0	250	6	244	2.4	249	3	246	1.20	250	8	242	3.2
	Petauke	249	1	248	0.4	250	3	247	1.6	249	0	249	0.0	250	1	249	0.4	249	2	247	0.80	250	0	250	0.0
Luapula	Mansa	250	2	248	0.8	249	6	243	2.4	250	0	250	0.0	249	6	243	2.4	250	1	249	0.40	249	1	248	0.4
	Nchelenge	249	1	248	0.4	248	8	240	2.8	249	0	249	0.0	248	7	241	2.8	249	1	248	0.40	248	3	245	1.2
	Samfya	250	1	249	0.4	250	6	244	2.8	250	0	250	0.0	250	6	244	2.4	250	3	247	1.20	250	1	249	0.4
Lusaka	Lusaka	250	1	249	0.4	250	0	250	0.0	250	0	250	0.0	250	2	248	0.8	250	2	248	0.80	250	0	250	0.0
Muchinga	Chinsali	250	0	250	0.0	250	1	249	0.8	250	0	250	0.0	250	-	250	0.0	250	0	250	0.00	250	0	250	0.0
	Isoka	250	1	249	0.4	250	1	249	0.4	250	0	250	0.0	250	2	248	0.8	250	0	250	0.00	250	0	250	0.0
	Mpika	250	1	249	0.4	249	3	246	1.6	250	0	250	0.0	249	1	248	0.4	250	0	250	0.00	249	2	247	0.8
Northern	Kaputa	250	2	248	0.8	250	8	242	3.2	250	0	250	0.0	250	4	246	1.6	250	1	249	0.40	250	5	245	2.0
	Kasama	250	4	246	1.6	249	4	245	1.6	250	0	250	0.0	249	1	248	0.4	250	5	245	2.00	249	1	248	0.4
	Luwingu	250	3	247	1.2	250	3	247	1.2	250	0	250	0.0	250	4	246	1.6	250	2	248	0.80	250	3	247	1.2
	Mbala	250	2	248	0.8	250	6	244	2.4	250	0	250	0.0	250	3	247	1.2	250	1	249	0.40	250	1	249	0.4
North wester	Mwinilunga	249	0	249	0.0	250	2	248	0.4	249	0	249	0.0	250	2	248	0.8	249	1	248	0.40	250	0	250	0.0
	Solwezi	250	6	244	2.5	249	7	242	2.8	250	0	250	0.0	249	5	244	2.0	250	6	244	2.40	249	5	244	2.0
	Zambezi	250	5	245	2.0	250	0	250	0.0	250	0	250	0.0	250	0	250	0.0	250	7	243	2.80	250	0	250	0.0
Southern	Choma	247	16	231	6.9	250	4	246	1.6	247	0	247	0.0	250	0	250	0.0	247	15	232	6.07	250	2	248	0.8
	Monze	250	9	241	3.7	250	2	248	0.4	250	0	250	0.0	250	1	249	0.4	250	6	244	2.40	250	0	250	0.0
Western	Kalabo	249	2	247	0.8	250	5	245	2.8	249	0	249	0.0	250	2	248	0.8	249	5	244	2.01	250	1	249	0.4
	Kaoma	250	4	246	1.6	249	5	244	2.0	250	0	250	0.0	249	2	247	0.8	250	5	245	2.00	249	1	248	0.4
	Mongu	249	2	247	0.8	249	17	232	6.4	249	0	249	0.0	249	16	233	6.4	249	0	249	0.00	249	16	233	6.4
	Shang'ombo	250	5	245	2.0	250	3	247	1.2	250	0	250	0.0	250	6	244	2.4	250	6	244	2.40	250	1	249	0.4
Total		**7486**	**84**	**7402**	**1.1**	**7490**	**169**	**7321**	**2.3**	**7486**	**21**	**7465**	**0.0**	**7490**	**137**	**7353**	**1.8**	**7486**	**88**	**7458**	**1.2**	**7490**	**101**	**7372**	**1.3**

F*= Flagged

V^= Valid

Distributions and Standard deviations of HAZ, WAZ, and WHZ

On the basis of the 1978 WHO/National Center for Health Statistics (NCHS) growth reference, the WHO indicated that the SD of Z-scores is reasonably constant across populations, irrespective of nutritional status, and thus can be used to assess the quality of anthropometric data[44]. We examined the SD of each HAZ, WAZ, and WHZ for the baseline and midline surveys and by district.

Overall, the low Z- score SDs indicate that the data were reasonably stable. Most districts had HAZ SD around 1.5, except for Chibombo, Katete, Lusaka, and Kasama at baseline and only Lusaka at midline, which had HAZ SD above 1.7. WAZ and WHZ SDs were lower than HAZ SDs at baseline and midline surveys. This trend is consistent with the observations in the report "An Assessment of the Quality of DHS Anthropometric Data in 52 countries, 2005-2014"[45].

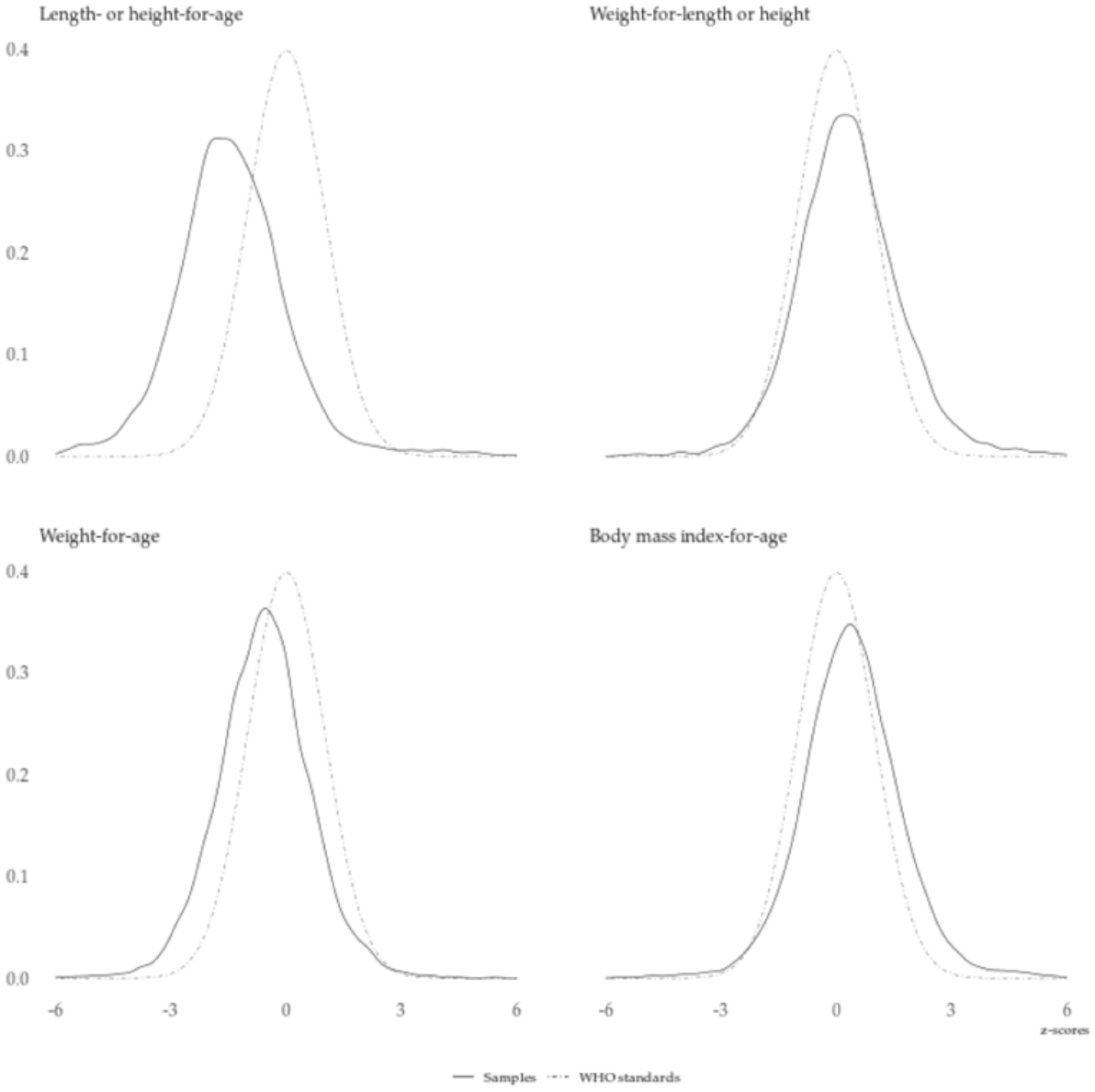
Table 35. Mean and Standard Deviations of Z-scores at baseline and midline

Indicator	Baseline			Midline		
	N	Mean	SD	N	Mean	SD
HAZ	7,402	-1.232	1.656	7,321	-1.420	1.526
WAZ	7,486	-0.494	0.014	7,353	-0.571	0.014
WHZ	7,403	0.308	0.015	7,389	0.376	0.015

[44] Physical status: the use and interpretation of anthropometry. Geneva: WHO; 1995. WHO technical report series

[45] Shireen Assaf, Monica T. Kothari Thomas Pullum. An Assessment of the Quality of DHS Anthropometric Data, 2005-2014. DHS Methodological Reports No. 16

Figure 52. Distribution of anthropometric indices at midline compared with WHO standard population



Heaping or digit preference (for height, weight, and age)

Heaping of height, weight and age measurements is a common problem in surveys and could underestimate or overestimate children's nutritional status. We examined the extent of heaping in our data using two indices: the percentage of observations with final digit 0 or 5 minus and Myers' Blended Index, which detects any pattern of digit preference, not just a preference for terminal digits 0 or 5. Myers' Index ranges from 0 (ideal) if there is no heaping and 100 (worst) if there is total heaping. Overall results are summarised in Table 36 and Table 37 below.

Table 36. Index of Dissimilarity (Myers Index) for Heaping of Height, Weight, and Age - overall

Height (.1 cm)		Weight (.1 kg)		Age in Days	
Baseline	Midline	Baseline	Midline	Baseline	Midline
25.6	38.0%	1.97%	1.4%	1.9%	3.7%

As can be seen in Table 36 and Table 37, there was minimal heaping on weight and age. Heaping on height was high at baseline and close to heaping reported in the ZDHS 2018 (25.5%). However, heaping at midline is much higher than reported in most Demographic Health Surveys. A review of heaping on each digit indicated that heaping occurred almost entirely on digit '0'.

Table 37. Summarised Index for Dissimilarity (Myers Index) for Height, Weight, and Age by district

Province	District	Heights (cm)	Weights (.1 kg)	Age in Days (All)
	Chibombo	75.6	6.3	5.2
	Kabwe	47.1	12.7	6.0
	Kapiri Mposhi	41.9	8.1	8.0
Central	Mumbwa	34.1	10.3	7.6
	Kitwe	51.7	6.3	6.0
Copperbelt	Ndola	59.6	12.2	7.6
	Chipata	44.2	11.4	7.6
	Katete	12.0	10.4	5.5
	Lundazi	32.7	7.6	9.6
Eastern	Petauke	28.8	6.0	6.0
	Mansa	47.6	8.0	5.6
	Nchelenge	13.3	5.7	7.0
Luapula	Samfya	37.0	7.8	10.0
Lusaka	Lusaka	71.2	8.4	5.6
	Chinsali	28.0	8.0	7.2
	Isoka	18.6	8.8	6.0
Muchinga	Mpika	33.6	8.4	6.6
	Kaputa	16.3	9.4	6.8
	Kasama	55.1	8.2	7.8
	Luwingu	36.5	10.1	9.2
	Mbala	46.5	7.4	8.4
Northern	Mwinilunga	15.6	8.0	8.4

Province	District	Heights (cm)	Weights (.1 kg)	Age in Days (All)
	Solwezi	77.2	10.2	5.5
North-western	Zambezi	23.2	7.2	6.4
	Choma	46.8	8.8	13.2
Southern	Monze	31.2	6.8	7.6
	Kalabo	40.4	11.2	11.2
	Kaoma	76.4	5.0	7.5
	Mongu	33.4	3.6	12.2
Western	Shangombo	32.6	5.4	8.4

To assess the effect of heaping on the child nutritional status, we analysed subsets of data that excluded certain proportions of measurements by some measurers (30%, 40%, 50%, 60%, 70%). This exclusion had only a minimal impact on the results. We concluded that the heaping on height at midline was not directional and should not impact the results in any direction.

APPENDIX 2. ALL Variables Assessed for Logistics Regression Model

	Variables/factors/Indicators
Dependent variable/Outcome	**The child is stunted:**
	1 = Yes (Stunted)
	2 = No (Not Stunted)
Independent/Explanatory variables or controls	**Child's age in months**
	Sex of the child
	1= Male
	2 = Female
	Mother's Economic status
	1 = Farmer
	2 = Salaried
	3 = Self-employed
	4 = Businesswoman
	5 = Charcoal burning
	6 = Casual labour
	7 = Students
	8 = Other
	Mother's Marital Status
	1 = Single 'never married'
	2 = Married (Monogamous)
	3 = Married (Polygamous)
	4 = Divorced
	5 = Widow / widower
	6 = Separated
	7 = Living with a man or woman but not married (Cohabiting)
	Mother's age group
	1 = 15-19 years
	2 = 20-24 years
	3 = 25-29 years
	4 = 30-34 years
	5 = 35-39 years
	9 = 40-44 years
	10 = 45-49 years
	Mother's level of education
	1 = Preschool
	2 = Primary
	3 = Junior Secondary
	4 = Senior Secondary
	5 = Higher
	Sex of the household head
	1 = Male
	2 = Female
	Household Head Economic status

	Variables/factors/Indicators
	1 = Farmer
	2 = Salaried
	3 = Self-employed
	4 = Businesswoman
	5 = Charcoal burning
	6 = Casual labour
	7 = Student
	8 = Other
	Household Head Marital status
	1 = Singe 'never married'
	2 = Married (Monogamous)
	3 = Married (Polygamous)
	4 = Divorced
	5 = Widow / widower
	6 = Separated
	7 = Living with a man or woman but not married (Cohabiting)
	Household Head Age-group
	1 = 15-19
	2 = 20-24
	3 = 25-29
	4 = 30-34
	5 = 35-39
	6 = 40+
	Household Head Highest education
	1 = Preschool
	2 = Primary
	3 = Junior Secondary
	4 = Senior Secondary
	5 = Higher
	Minimum dietary diversity-child = 1
	1= Yes
	2= No
	Minimum dietary diversity for women
	1= 5+ food groups
	2= <5 food groups
	Initiation of early breastfeeding
	1= Yes
	2= No
	Continued breastfeeding 12-23 months
	1= Yes
	2= No
	SBCC: Diet when breastfeeding
	1= Yes
	2= No
	SBCC: Exclusive breastfeeding

	Variables/factors/Indicators
	1= Yes
	2= No
	SBCC: Complementary feeding
	1= Yes
	2= No
	SBCC: Feeding the sick child
	1= Yes
	2= No
	Low body mass index for women (less than 18.5)
	1 = Yes (<18.5)
	2 = No (≥18.5)
	Child is underweight: weight-for-age
	1= Yes
	2 = No
	Children reached with 90% community level interventions for their age
	1= Yes
	2= No
	Household hunger scale - FAO definition
	1 = Yes (Food Insecure)
	2 = No (Food Secure)
	Households practising safe food handling
	1= Yes
	2 = No
	Households producing and selling nutritious crops/livestock
	1= Yes
	2 = No
	Households producing and consuming nutritious crops/livestock
	1= Yes
	2 = No
	Child Age category
	1 = 0-5 months
	2 = 6-8 months
	3=9-11 months
	4 = 12-17 months
	5 = 18-24 months
	Households practising essential nutrition actions
	1= Yes
	2= No
	Child meeting IYCF standards (WHO definition)
	1= Yes
	2 = No
	Child had diarrhoea incidence (last 2 weeks)
	1= Yes

	Variables/factors/Indicators
	2 = No
	Modern family planning users
	1= Yes
	2 = No
	Household with access to drinking water
	1= Yes
	2 = No
	Household with access to basic sanitation
	1= Yes
	2 = No
	Children exposed to environmental waste
	1= Yes
	2 = No
	Households with soap and water at hand washing stations
	1= Yes
	2 = No
	Child left alone or in the care of another child younger than 10 years of age
	1= Yes
	2 = No

APPENDIX 3. CONTRIBUTORS

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	Webby Mwamulela
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	Mokwane Maeke
	Justin Munyaka
	Eugine Kaango
	Harrison Banda

Data Collection Teams

Team 1	
Province(s):	Western/Northwestern
Districts:	Kaoma/ Solwezi
Designation	*Name*
Supervisor	Nswana Andrew
Data collector	Mayeba Milcah Kasweshi
Data collector	Kilele Ndaona
Data collector	Mukangwa Innocent
Data collector	Ngosa Bangwe
Nurse	Kapeso Selestin Mukuka

Team 2	
Province(s):	Central
Districts:	Kapiri/ Kabwe
Designation	*Name*
Supervisor	Phiri Zewelanji
Data collector	Memory Mposhi
Data collector	Alex Sinyangwe
Data collector	Nyirenda Kalenge Kifuka
Data collector	Chisanga Mukuka
Data collector	Maureen Kangwa
Nurse	Gondwe Muhanya

Team 3	
Province(s):	Copperbelt
Districts:	Ndola/ Kitwe
Designation	*Name*
Supervisor	Phiri Weluzani
Data collector	Christabel Mbewe
Data collector	Agness Nachinga
Data collector	Naomi Sakala
Data collector	Chewe Mulenga
Data collector	Chewe Mary
Nurse	Chilufya Mulenga

Team 4	
Province(s):	Eastern
Districts:	Lundazi/ Chipata
Designation	*Name*
Supervisor	Handongwe Lloyd Mudenda
Data collector	Ngwira Sarah
Data collector	Namwinga Elizabeth
Data collector	Zimba Fishani
Data collector	Shumba Elidah
Nurse	Thandiwe Banda

Team 5	
Province(s):	Eastern
Districts:	Petauke/ Katete
Designation	*Name*
Supervisor	Elijah Munsaka
Data collector	William Mwanza
Data collector	Mozah Wilson
Data collector	Nkhoma Racheal Grace
Data collector	Christabel Mwale
Data collector	Musenga Mubanga
Nurse	Annicia Phiri

Team 6	
Province(s):	Luapula
Districts:	Mansa/ Samfya
Designation	*Name*
Supervisor	Malama James Milambo
Data collector	Kondwani Machaka
Data collector	Jenala Mukwila
Data collector	Chisanga Mumba
Data collector	Mulnga Richard
Data collector	Victor Banda
Nurse	Hamiyanda Bridget

Team 7	
Province(s):	Luapula/ Northern
Districts:	Nchelenge/ Kaputa
Designation	*Name*
Supervisor	Kanganja Mutombu
Data collector	Floyd Chilambwe
Data collector	Chalwe Petronella
Data collector	M'kandawire Charity
Data collector	Mwape Moses
Data collector	Banda Jane
Nurse	Musonda Annie

Team 8	
Province(s):	Muchinga
Districts:	Chinsali/Isoka
Designation	*Name*
Supervisor	Lesho Joseph
Data collector	Nsama Sampa
Data collector	Chileshe T Kaoma
Data collector	Chongo Gladys
Data collector	Mercy Nalumbwe
Data collector	Berenice Lukungu
Nurse	Chanda Kapusa

Team 9	
Province(s):	Northern
Districts:	Mbala/ Luwingu
Designation	*Name*
Supervisor	Mwiya Thulani Ryan
Data collector	Banda Mary Tikulile
Data collector	Tembo Racheal
Data collector	Edgar Nyambe
Data collector	Alinani Silanda
Data collector	Elias Phiri
Nurse	Namonje Gracious Bwalya

Team 10	
Province(s):	Northern/ Muchinga
Districts:	Kasama/ Mpika
Designation	*Name*
Supervisor	Chayanga Romeo
Data collector	Otis Kalaba
Data collector	Chungulo Matria
Data collector	Chileshe Ngandwe
Data collector	Chanda Mwila
Nurse	Msunza Ruth

Team 11	
Province(s):	Central/ Lusaka
Districts:	Chibombo/ Lusaka
Designation	*Name*
Supervisor	Kayula M. Makasa
Data collector	Charity Chimpangu
Data collector	Njani Pumulo
Data collector	Exildah Nchimunya Simanela
Data collector	Catherine Mwangala Lubasi
Data collector	Chanda Kangombe
Nurse	Daka Glory

Team 12	
Province(s):	Northwestern
Districts:	Zambezi/ Mwinilunga
Designation	*Name*
Supervisor	Kapula Elijah Kahuma
Data collector	Mayeba Grace
Data collector	Sombo Mukuma
Data collector	Kapanga Isaac
Data collector	Salowu Evans
Nurse	Phiri Nkhopiwe

Team 13	
Province(s):	Southern
Districts:	Choma/ Monze
Designation	*Name*
Supervisor	Mboozi McDonald
Data collector	HimoongaMalungo
Data collector	Ndumwai Madabwali
Data collector	Mudenda Hakool
Data collector	Mulemwa Likando
Data collector	Mishiba Precious
Nurse	Maiwase Lungu

Team 14	
Province(s):	Western
Districts:	Kalabo/ Shang'ombo
Designation	*Name*
Supervisor	Saunders Robin
Data collector	Muntanga Maimbolwa
Data collector	Mate Lubinda
Data collector	Namenda Lisulo
Data collector	Mubiana Kakonga
Data collector	Gloria Siputuma
Nurse	Sibeso Mukonda Gracious

Team 15

Province(s):	Western/Central
Districts:	Mongu/Mumbwa
Designation	*Name*
Supervisor	Sikananu Sikananu
Data collector	Jama Nandi
Data collector	Hanyama Sarah
Data collector	Muhau Akakulubelwa
Data collector	Namusunga Kalaluka
Data collector	Samwinda Mubita Patrick
Nurse	Kalaluka Monde
Data collector	Sakala Dorinda
Data collector	Silishebo Nalikando

Team 16

Province(s):	Luapula
Districts:	Mwense
Designation	*Name*
Supervisor	Auckray Mang'wato
Data collector	Allan Kalaba
Data collector	Stanley Santula
Data collector	Charity Mubanga
Data collector	Ronald Chilufya
Data collector	Cynthia Lamya

Team 17

Province(s):	Luapula
Districts:	Kawambwa
Designation	*Name*
Supervisor	Titus Kaluba
Data collector	Lupupa Chonga
Data collector	Precious Chanda
Data collector	Ngambo Mutoshi
Data collector	Deborah Chisha
Data collector	Maxas Chipili