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DETERMINANTS OF REDUCTIONS IN CHILDHOOD STUNTING IN MALAWI'S COMMUNITY-BASED NUTRITION PROGRAMS

DISCUSSION PAPER **April 2019**

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WORLD BANK GROUP
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Health, Nutrition, and Population (HNP) Discussion Paper

Determinants of Reductions in Childhood Stunting in Malawi's Community-Based Programs

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Abstract:

Childhood malnutrition is still a public health concern in Malawi. Since 2013 the government of Malawi (GoM) has been implementing a large-scale multisectoral nutrition program, which expanded to all districts of the country with the World Bank Group and other donor funding. At the start of this program a national baseline survey was conducted, and in early 2018, an endline survey was conducted. The endline survey followed a mixed-methods approach similar to the 2013 baseline survey, using both quantitative and qualitative data collection measurements. An Oaxaca-Blinder decomposition analysis was used to determine the pathways that contributed most to the program's success. In addition, a panel dataset was constructed to compare the nutritional outcomes of children within the same household who were born before and after the program intervention. The findings of the endline survey confirm the positive trends observed in childhood malnutrition in Malawi. Between 2013 and 2018, nutrition indicators improved and the percentage of children under age five who were stunted fell from 42 percent in 2013 to 37 percent in 2018. Improvements were observed in some underlying factors: the percentage of deliveries attended by a skilled birth attendant and handwashing both improved significantly between 2013 and 2018. The findings from the decomposition analysis and cross-sectional and panel data suggest that improvements in water, sanitation, and hygiene (WASH), in particular, handwashing and antenatal care (ANC) practices, were largely responsible for the observed improvements in child nutrition. The findings of the Community-Based Nutrition (CBN) Survey further suggest that the country should consider investing in more coordination and capacity at the district and community levels and should address inequalities in program performance across districts, delivering more context-specific investments and program designs while moving forward.

Keywords: Malawi, Nutrition, Stunting, Children, Multisectoral

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ACRONYMS

ANC	Antenatal care
BAZ	BMI-for-age
BMI	Body mass index
CBN	Community-based nutrition
CHW	Community health worker
DHS	Demographic and Health Survey
DiD	Difference in difference
EBF	Exclusive Breastfeeding
ECD	Early child development
ECDI	Early Childhood Development Index
FGD	Focus group discussion
FIAS	Food insecurity access scale
FLW	Frontline worker
GMP	Growth monitoring and promotion
GoM	Government of Malawi
HAZ	Height-for-age *Z*-score
IFA	Iron folic acid
IYCF	Infant and young child feeding
KII	Key informant interview
MAD	Minimum acceptable diet
MDD	Minimum dietary diversity
MFF	Minimum feeding frequency
MICS	Multiple Indicator Cluster Survey
MMF	Minimum meal frequency
MNP	Micronutrient powders
NECS	Nutrition Education and Communication Strategy
NHAP	Nutrition, HIV, and AIDS Project
NNPSP	National Nutrition Policy and Strategic Plan
SDG	Sustainable Development Goal
SEA	Standard enumeration area
SNIC	Support to Nutrition Improvement Component
SUN	Scaling Up Nutrition
TAs	Traditional authorities
WASH	Water, sanitation, and hygiene
WAZ	Weight-for-age *Z*-score
WHZ	Weight-for-height *Z*-score

SUMMARY

Background

Malawi has seen a remarkable decline in childhood stunting in the last 10 years, but with 37 percent of children under five years of age being stunted, childhood malnutrition is still a public health concern. With the World Bank Group's support, the government of Malawi (GoM) has implemented large-scale multisectoral nutrition intervention programs (Support to Nutrition Improvement Component [SNIC]) in a total of 14 districts starting in 2013, which expanded to all districts of the country with other donor funding. At the start of this program in 2013, a baseline survey was conducted in all of Malawi's districts to assess nutritional outcomes and their determinants. In early 2018, an independent endline survey was conducted to inform further scale-up and extension of the current project activities to document trends in nutritional status and underlying determinants, identify the main determinants and factors responsible for the decline in stunting, and evaluate the efficiency of targeting program activities and how this was affected by contextual factors.

Methods

The endline survey followed a mixed-methods approach similar to the 2013 baseline survey, using both quantitative and qualitative data collection measurements. Between January and March 2018, quantitative information was collected on the following outcomes, using a computerized standard household questionnaire: (a) nutritional status of mothers and children 0–59 months of age; (b) infant and young child feeding (IYCF) practices and dietary intake; (c) household food security; (d) prevention and cure of acute malnutrition; (e) water, sanitation, and hygiene (WASH); (f) child health; (g) antenatal care (ANC) and postnatal care practices PNC); (h) use of family planning services; (i) early child development (ECD) indicators; and (j) use of community program services.

Cross-sectional data from the baseline and endline surveys were used to track progress in nutritional outcomes and underlying determinants per district. An Oaxaca-Blinder decomposition analysis was used to determine the pathways that contributed most to the program's success. In addition, a panel dataset was constructed of households in which parents who were in a younger age cohort at baseline had another young child at endline surveys. The panel data were used to compare the nutritional outcomes of children within the same household, but to compare children who were born before and after the program intervention.

While the baseline survey included a total of 4,446 households, the final dataset for the endline survey included a total of 4,896 households (4,417 in the cross-sectional survey and 479 in the panel household dataset), with anthropometry measurements for a total of 5,365 children, 0–59 months of age.

Results

The findings of the endline survey confirm the positive trends observed in childhood malnutrition in Malawi. Between 2013 and 2018, nutrition indicators improved and the percentage of children under age five who were stunted fell from 42 percent in 2013 to 37 percent in 2018. Improvements were observed in some underlying factors; in particular, the percentage of deliveries attended by a skilled birth attendant and handwashing improved significantly between 2013 and 2018.

In contrast, child feeding practices, in particular the percentage of children 6 to 23 months of age consuming a minimum acceptable diet (MAD), declined between 2013 and 2018, while households' food security improved slightly between 2013 and 2018 but remained a concern in 2018 with one-third of the households still suffering from days without any food to eat. Despite efforts to establish income-generating activities that would improve households' food security, such as home gardening, small livestock farming, and cash transfers, very few households participated in these activities.

District-level data suggest large unequal program performance across districts, which is reflected in district-level disparities in child nutrition status and child feeding practices.

Findings from the decomposition analysis and cross-sectional and panel data suggest that improvements in WASH, in particular handwashing and ANC practices, were largely responsible for the observed improvements in child nutrition.

Conclusion

For Malawi, to meet Sustainable Development Goal (SDG) 2 to further reduce stunting and wasting levels and eliminate childhood malnutrition by 2030, nutrition programs across the country must be strengthened; findings of the Community-Based Nutrition (CBN) 2018 Survey provide some suggestions to inform future programming.

While Malawi has made remarkable strides in hygiene and sanitation measures, in 2018, only half of the surveyed mothers made more than four ANC visits; thus, future health and nutrition programs should keep a strong focus on ANC attendance.

Future nutrition programs should reinforce nutrition-specific interventions and ensure that frontline workers (FLWs) have the capacity to counsel mothers and grandmothers on adequate feeding practices, while continuing to invest and improve coverage and access to nutrition-sensitive interventions, including ANC practices, ECD, and food security.

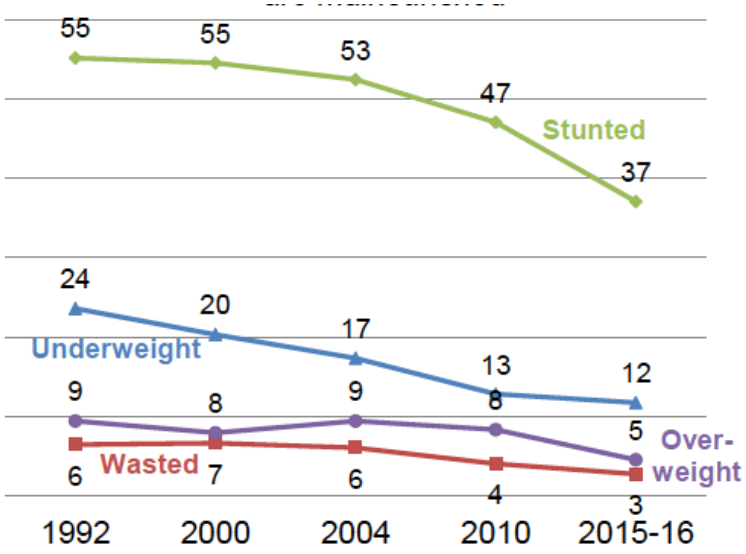
The findings of the CBN Survey also suggest that the country should consider investing in more coordination and capacity at the district and community levels as well as addressing inequalities in program performance across districts, delivering more context-specific investments and program designs while moving forward.

1. INTRODUCTION

Childhood malnutrition, stunting, and mortality have been alarmingly high in many sub-Saharan African countries. According to the Demographic and Health Survey (DHS) data, in 2010, 47 percent of children suffered from stunting (NSO 2011) in Malawi, which put Malawi in the top five sub-Saharan African countries with the highest stunting rates. In response to this alarmingly high rate of stunting, the government of Malawi (GoM), along with the global donor community, made a concerted effort to improve childhood nutrition. As a result, the prevalence of children who were stunted or underweight has decreased markedly in Malawi since 1992, with the greatest decrease in stunting being between 2010 (47 percent) and 2015–2016 (37 percent) (NSO 2017) (see Figure 1).

Figure 1: Trends over Time in Children under Five Who Are Undernourished in Malawi, 1992–2016

(*Percent*)



Source: DHS 2016 report, NSO 2017.

However, Malawi still faces a number of challenges, mainly emanating from the underlying causes of undernutrition, including low household incomes, poor child feeding practices, and, in particular, poor complementary feeding practices (61 percent exclusive breastfeeding up to 6 months of age, only 8 percent of children 6 to 23 months received a minimum acceptable diet [MAD]), poor hygiene and access to potable water, and inadequate education and lack of knowledge), which can lead to poor food processing and utilization (NSO 2017).

Rural children are more likely to be stunted (39 percent) than urban children (25 percent), and children in urban areas are twice as likely as those in rural areas to consume a MAD (16.0 percent in urban areas, 6.8 percent in rural areas). There is little regional variation, with high rates of stunting in all the regions: southern (36.6 percent), central (38.2 percent), and northern (35.1 percent). Education and wealth are both inversely related to stunting levels. The causes of child undernutrition include suboptimal child feeding practices, inadequate diet, frequent incidence of disease among young children, low socioeconomic status, and poor nutritional condition of many mothers (NSO 2017).

The observed decline in stunting is to a large extent believed to be attributed to the country's strengthening of nutrition programming. The GoM has elevated agriculture and nutrition as key national policy priorities to reduce poverty and food insecurity. A Food and Nutrition Security Policy (2007) and a National Nutrition Policy and Strategic Plan (NNPSP) are in place, and programs are implemented across the country to address five outcomes: improved maternal nutrition and care; improved infant and young child feeding (IYCF) practices (outlined in the Infant and Young Child Nutrition Strategy 2009–2014); improved intake of essential micronutrients; prevention and treatment of common infectious diseases; and improved management of acute malnutrition. In 2011, Malawi was the first country to join the Scaling Up Nutrition (SUN) initiative, a global movement that unites national leaders, civil society, bilateral and multilateral organizations, donors, businesses, and researchers in a collective effort to improve nutrition. In this context, since 2011, Malawi has been implementing a World Bank–supported integrated community-based nutrition (CBN) project (the World Bank Nutrition Project) as part of the larger Malawi Nutrition, HIV, and AIDS Project (NHAP). With the support of other partners (including the United States Agency for International Development [USAID] and Irish Aid), the project was rapidly expanded to all districts in the country under the SUN National Nutrition Education and Communication Strategy (NECS).

Malawi has focused on community-based action, with the 1,000 Special Days National NECS being prioritized from 2012 to 2017 to reduce child stunting among children under two years of age. A National Nutrition Committee chaired by the Secretary for Nutrition, HIV, and AIDS in the Office of the President leads the coordination on nutrition among technical specialists and development partners. The committee's main function is to mobilize resources and support for the implementation of nutrition interventions in line with the country's NNPSP, and to monitor progress and evaluate impact.

The country's CBN project combines intervention activities aimed at enhancing (a) IYCF practices; (b) home-based care and care seeking for common infectious diseases; (c) hygiene and utilization of safe water and sanitation; (d) prevention of parasitic infections; (e) iron intake by women and children; (f) dietary intake by women before, during, and after pregnancy; (g) household care of pregnant women and utilization of antenatal services; (h) increased spacing of pregnancies for mothers postpartum; and (i) adequate weight gain in children under two years of age and in pregnant women.

To inform further scale up and extension of the current project activities, baseline and endline surveys covering all districts of Malawi were conducted in November to December 2013 and in early 2018, respectively, under the umbrella of the broader Malawi NHAP. A traditional impact evaluation study in the context of Malawi was not possible because by 2016, all districts in Malawi were covered by some types of health and nutritional interventions under the broader SUN initiatives, and therefore no true control group could be identified. This project thus aimed to document trends in nutritional status and underlying determinants using comparable data, and to identify the main determinants and factors responsible for the decline in stunting. This report uses decomposition analysis and household-level panel data to shed light on the underlying determinants. As already noted, the analysis points to proximate determinants without attributing causality to the findings.

This report will describe the main findings of the endline survey and compare these to the baseline survey, which has been reported elsewhere (Centre for Agricultural Research and Development 2014). As such, the report will describe trends in nutritional status and underlying determinants by age, gender and region (Chapter 3); the determinants of change in stunting rates during the

last decade (Chapter 4); and the factors responsible for the observed improvements in height-for-age *Z*-scores (HAZs) and thus stunting rates (Chapters 5 and 6).

2. METHODS

The endline survey followed a mixed-methods approach similar to the 2013 baseline survey, using both quantitative as well as qualitative data collection measurements, expanded by a detailed effective coverage survey, and a strengthened qualitative component.

As already mentioned, the successful utilization of a difference-in-difference (DiD) framework requires identification of suitable controls. The DiD requires a control group that is not exposed to the treatment in both survey rounds. As we already noted, that assumption is violated in our context as the program was expanded rapidly across all districts. In the absence of such controls, a combination of approaches was used, and outcomes will be described later in this report.

(a) **Cross-sectional data** from the baseline and endline surveys were used to track progress in nutritional outcomes and underlying determinants per district (described in Chapter 3). The objectives of the quantitative cross-sectional survey were to compare baseline and endline data on the following key indicators and determinants: (a) nutritional status of mothers and children 0 to 59 months of age, (ii) IYCF practices and dietary intake, (iii) household food security, (iv) prevention and cure of acute malnutrition, (v) WASH, (vi) child health, (vii) ANC and postnatal care practices, and (viii) use of family planning services. In addition, the cross-sectional survey collected information on indicators of early child development (ECD) and use of community program services at endline only. Program exposure in endline was regressed on baseline characteristics of the areas' traditional authorities (TAs) to investigate targeting efficiency (for example, did it reach poor and nonpoor households equally?).

(b) **Decomposition analysis**. An Oaxaca-Blinder decomposition analysis was used to determine the pathways that correlate most to the program outcomes (described in Chapter 5), using data from the two cross-sectional surveys.

(c) In addition, a **panel dataset** was constructed of households in which parents, who were in a younger age cohort at baseline, had another young child at endline surveys. The panel data were used to compare the nutritional outcomes of children within the same household who were born before and after the program intervention (described in Chapter 6).

2.1 PARTICIPANTS AND SAMPLING

The baseline survey took place in November to December 2013, included 4,446 households from 28 districts, and has been described in full detail in the baseline report (Centre for Agricultural Research and Development 2014). The endline survey followed a similar methodology and sampling plan and targeted all of Malawi's 28 districts in three regions: northern, central, and southern. Administratively, the districts are subdivided into TAs, presided over by chiefs. Each TA comprises a group of villages, which are the smallest administrative units and presided over by village headmen or headwomen.

A multistage cluster sampling, proportionate to size of district, was used to ensure that the survey was representative at the district and national levels. The sample size was calculated for each of Malawi's 28 districts separately, using Epidemiological Statistics for Public Health open source software available from http://www.openepi.com/OE2.3/Menu/OpenEpiMenu.htm.

In the first stage, TAs were selected as standard enumeration areas (SEAs) with probability proportional to the SEA size, based on the number of children under the age of five and with independent selection in each sampling stratum. In the second stage of selection, a fixed number of households per cluster were selected with an equal probability systematic selection, and all children under the age of five and their caregivers, as well as pregnant women in these households were eligible for the survey.

Assuming one child per household, an adjusted total sample of 4,496 households with children under the age of five were selected, based on a two-side confidence limit of 5 percent, design effect of 1, an expected reduction in stunting of 7 percentage points based on DHS data, and adjusted for 10 percent nonresponse rate or households without a child under the age of five.

For the panel survey, a panel dataset was constructed of 479 households that were included in the baseline survey, in which parents—who were in a younger age cohort at baseline—were expected to have young children at endline surveys. Based on an expected difference of 10 percent decline in stunting, 80 percent power of detecting a change, α-error of 5 percent, and a cluster effect of approximately 2, a total of 360 households were expected to be enrolled and would serve as their own control. The panel survey was also restricted to households from 10 Support to Nutrition Improvement Component (SNIC) districts.

The final dataset for the endline survey included a total of 4,896 households (4,417 in the cross-sectional survey and 479 in the panel household dataset), with anthropometry measurements on a total of 5,365 children 0 to 59 months of age, and feeding information on a total of 2,476 children 6 to 23 months of age (index children).

2.2 DATA COLLECTION

A presurvey data collection to identify households for inclusion in the panel dataset was performed in the first week of January 2018. Data collection for the endline survey took place from January 15, 2018, up to early March 2018. The same team from the Centre for Agricultural Research and Development, Lilongwe University of Agriculture and Natural Resources (LUANAR), Bunda, Malawi, which was responsible for the baseline survey, implemented the endline survey.

A total of 118 research assistants were trained to use the survey instruments during January 10–13, 2018, using Survey Solutions Software on tablets, data collection, survey ethics, and anthropometric measurements. A pretest of the survey instruments and data collection was part of the training. The research assistants were grouped into 14 teams. Each team consisted of one supervisor, two anthropometry technicians, two facilitators of key informant interviews (KIIs) and focus group discussions (FGDs), three enumerators, and two drivers.

The survey questionnaires were finalized based on feedback from the pretest and feedback provided by the World Bank team, and consisted of a household questionnaire, a community questionnaire, and a service provider questionnaire (see final survey questionnaire in Annex 2).

Anthropometry

A team of well-trained research assistants was deployed in the participating communities to collect anthropometric data. Maternal height and weight were measured for nonpregnant women, only to assess the nutritional status of the mothers using body mass index (BMI) based on World Health Organization (WHO) cutoff values (WHO 2010). Children's weight and stature were measured and were used to assess nutritional status using three traditional indexes of weight-for-height (which measures wasting), weight-for-age (which measures underweight), and height-for-age (which measures stunting). In addition, the prevalence of childhood overweight and obesity was assessed using BMI-for-age (BAZ). The child growth indicators were based on 2006 WHO standards (WHO 2006), which Malawi adopted, and were used in the 2010 and 2015–2016 Malawi DHS.

Infant and Young Child Feeding

Information on IYCF practices were assessed for the following indicators using the WHO/United Nations Children's Fund (UNICEF) definitions (WHO 2008): Early initiation of breastfeeding (by recall); exclusive breastfeeding (by recall); timely introduction of complementary foods (by recall); the proportion of children 6 to 23 months of age who receive MAD, achieve minimum dietary diversity (MDD), and those being fed at acceptable minimum feeding frequency (MFF); and the proportion of children 12 to 15 months who continued breastfeeding. IYCF indicators were recalculated for baseline and endline, following the same methodology as described by WHO/UNICEF (WHO 2008).

The use of iodized salt and/or other fortified foods (including multiple micronutrient powders [MNPs]) was assessed at endline only.

ANC, Child Care, and WASH

Information on antenatal care (ANC) services during the last pregnancy was asked by recall. Information on child care included questions of the use of a high dose vitamin A supplement, use of bednets, and adequate treatment of diarrhea (with oral rehydration salts [ORS] or with zinc and ORS) as well as the occurrence of the following common illnesses during the past two weeks in children under five years: fever, diarrhea, cough/cold, and fast breathing. The following information on WASH was also collected: sources of drinking water; in-house treatment of drinking water; time spent fetching drinking water; ownership, use, and type of toilets; and handwashing practices during toilet use and during cooking. The percentage of households with an improved drinking water source, improved sanitation, and handwashing scores were calculated following the definitions for post-2015 WASH targets and indicators described by UNICEF (UNICEF 2015).

Food Security

The household questionnaire assessed the prevalence of household food insecurity using a universal tool, which was adopted and is being used in Malawi in other surveys as well—the food insecurity access scale (FIAS). Unlike the commonly used questions (for example, do you still have food from your last harvest?) on whether or not a household has food from its previous harvest, the FIAS gauges cues of food insecurity using a set of validated questions, which when analyzed together, provide a more reliable estimate of a household's food security status within a period of four weeks preceding the survey.

Early Child Development

Information on ECD and home-based stimulation and learning were collected following the methodology developed by UNICEF's Multiple Indicator Cluster Survey (MICS) program (McCoy et al. 2017).

The Early Childhood Development Index (ECDI) is the first widely available tool for measuring the early development of three- and four-year–old children at the population level.

The ECDI is a caregiver-reported index of 10 yes/no questions designed for children ages 36 to 59 months to assess four domains of development: literacy-numeracy, learning/cognition, physical development, and socioemotional development. Social stimulation and learning were assessed using six caregiver-reported items regarding whether an adult in the household read to, played with, told stories to, counted with, sang to, or traveled outside of the home with the child.

In addition, information was collected on the presence of an ECD center in the village and the number and percentage of children ages three to five attending the ECD center in the village.

Use of Program Services

The use of available public health and nutrition services by members of the household in the past four weeks was assessed. These included growth monitoring and promotion (GMP); antenatal and postnatal services; preventive and curative services; and behavior change communication (BCC) services; and whether the household benefited from cash transfers or participated in integrated homestead farming (that is, at least three of the following activities: small livestock, vegetable gardens, fish ponds, and integrated farming).

2.3 QUALITATIVE DATA COLLECTION

As part of the endline survey, a qualitative assessment was added to gain a deeper understanding of social, cultural, and other factors that different cultural groups and societies uphold, but which may be negatively affecting access to and utilization of nutrition and related program services, and behavior changes. In each district 4 focus group discussions (FGDs) were held, each with mothers, grandmothers, men, and community leaders, totaling 56 FGDs 14 districts. To complement FGDs, key informant interviews (KIIs) were held with local community leaders, traditional authorities (TAs), Village Development Committees, district commission, and representatives of the Ministry of Agriculture at the district level. Civil societies at the district level and community leaders were employed to gather in-depth information on caregivers' knowledge and practices with regard to IYCF, household food security and emergency response, WASH, child care, ANC, and prevention and cure of acute malnutrition. Information on the enabling environment (including male participation, women's empowerment, and support from local community leaders) was discussed. In addition, access, use, perceived quality and barriers, and enablers of use of existing services and project components were discussed in the FGDs. KIIs included interviews with local project implementers, TAs, and district-level staff to collect in-depth information on implementation, (perceived) support, and coordination of project activities.

All FGDs and KIIs were performed by a group of experienced, trained qualitative interviewers in local languages. Data were transcribed and translated and back-translated into English. Interviews were coded and analyzed using the qualitative analytical software package Maxqda.

The findings of the qualitative survey have been presented in a separate report and will be briefly summarized here in the discussion section.

2.4 Data Cleaning and Data Analyses

All data were collected on tablets using the World Bank's Survey Solutions software and exported into SPSS22.0 for initial data analyses and data cleaning.

WHO Anthro 3.2.2 was used to calculate the anthropometry indicators. For all nonpregnant women, weight and height data were computed into BMI, which enabled the estimation of the prevalence of underweight (BMI<18.5), overweight (BMI≥25.0), and obesity (BMI≥30.0). Further, the proportion of women of very short stature (<155 cm) was also computed.

The nutritional status of children was assessed using the three common anthropometric indexes of weight-for-height *Z*-scores (WHZs), HAZs, and weight-for-age *Z*-scores (WAZs) using the WHO 2006 reference population. Stunting, wasting, and underweight were defined as HAZ, WHZ, and WAZ <−2, while values <−3 were used to define severe stunting, wasting, and underweight. The 2006 WHO Growth Standards were used to assess nutritional status (WHO 2006). To assess the prevalence of childhood obesity, the BAZ index was used. Children were classified as being overweight if they had *Z*-scores ≥2 and obese if *Z*-scores were ≥3. Children with missing values for weight, height, and/or age were excluded. In addition, children with extreme values for these indexes were excluded following the WHO (2006) proposed cutoffs for data exclusion: HAZ below –6 or above +6; WAZ below –6 or above +5; WHZ below –5 or above +5, or Body Mass Index *Z*-score below –5 or above +5, because these extreme values are most likely a result of errors in measurement or in data entry (WHO 2006).

Differences between baseline and endline nutritional outcomes and determinants were explored using chi-square for categorical and independent two-sample t-tests for continuous variables.

To identify the determinants of observed reductions in stunting, multivariate regression models were used. The set of explanatory variables used in the regression analysis falls into four different categories: socioeconomic status indicated by household head's education; mother's height and BMI; household's use of safe water and sanitation represented by whether household is using improved sanitation and water, and its handwash scores (before/after five different activities); and household's access to food indicated by answer to the question, whether it faced food insecurity during the past four weeks. The food insecurity variable is thus a binary variable. The surveys do not have detailed information on a household's income or wealth, which is usually inversely associated with lowering of stunting rates. However, at least a part of the effect of socioeconomic background is captured by the household's access to water and sanitation variables in addition to a household head's education and the household's level of food insecurity.[1] The health variables include whether the mother went for four or more ANC visits, whether the child was delivered in a health facility, whether the child received required vaccinations, whether the child ate a diet that meets MDD, whether the child slept under a bednet, and whether the child suffered from diarrhea. The MDD is defined as an indicator variable if the child ate at least four food groups out of seven during the day before the interview. While the survey collected information on breastfeeding, the variations in breastfeeding are small, and regressions did not include this as an explanatory variable. All regressions control for child's age and, when appropriate, child's gender. The logit regressions are run to examine the association between stunting and its

1. Asset ownership was assessed at endline but not at baseline and therefore could not be included in the determinant analyses.

potential determinants, as mentioned earlier. The marginal effects of explanatory variables on stunting status are estimated at the mean of all explanatory variables. The standard errors are clustered at the village level. To explore heterogeneity across age group, gender, and geography, the regressions are run and marginal effects are estimated for different sample cuts. The regression analysis presented here pools data from both rounds of survey (2013 and 2018).

The Oaxaca-Blinder decomposition techniques were used to identify the factors behind the observed improvements in HAZ. More details on these analyses are described in Chapter 5 but are presented in brief here: the Oaxaca-Blinder decomposition method combines the estimated coefficients of regressions and changes in respective explanatory variables to determine the explained part of the HAZ changes between two survey years. To be more precise, the coefficient of an explanatory variable *X* is multiplied by changes in its levels between the two years to determine its contribution to improvement in HAZ. Following suggestions from Headey, Hoddinott, and Park (2016), data from both survey rounds were pooled to estimate the coefficient vector.

Fixed-effects panel regression was used to examine trends in stunting outcomes and to identify underlying determinants in the household panel dataset. The panel survey collected information on 479 households in 13 SNIC districts. However, the sample size for panel analysis is smaller (288 households). The loss of observations in the panel analysis results from the restriction that a household must have at least one child under five years of age in both rounds of the survey. Some loss is also because of the fact that the endline survey did not collect anthropometric data for children below six months of age. Finally, outliers in HAZ are dropped, resulting in a smaller sample. Considering the small sample size, the regression analysis took a stepwise approach by running bivariate regressions focusing on one regressor at a time. This stepwise preliminary analysis helped narrow down the list of explanatory variables to be used in the final regressions. The regression controlled for child's age and gender and included household-level fixed effects to nullify any confounding and time-invariant unobservable factors that are common to the household in both rounds.

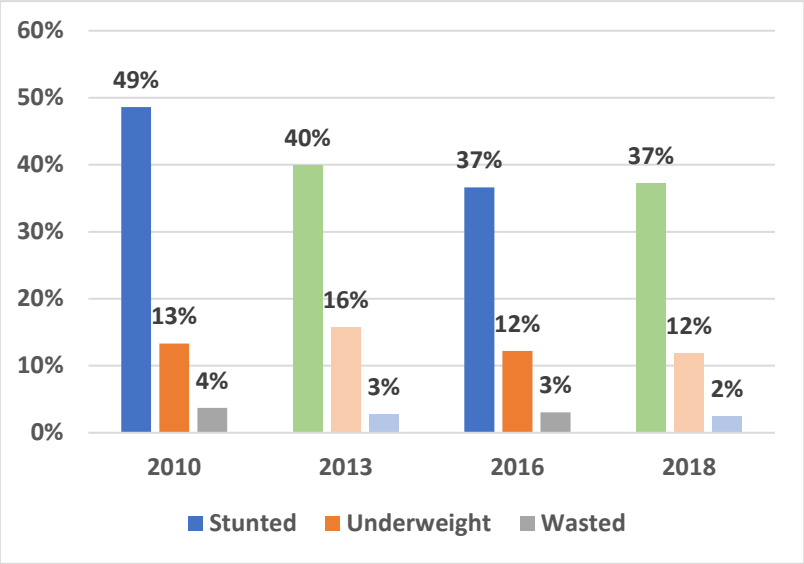
3. TRENDS IN NUTRITIONAL STATUS AND UNDERLYING DETERMINANTS, 2013–2018

Data from the two cross-sectional surveys at baseline in 2013 and endline 2018 have been used to describe trends in nutritional status and the underlying determinants. The surveys covered 4,446 households with 4,159 children under the age of five in 2013 and 4,896 households with 5,138 children under the age of five in 2018. Because the age distribution differed between the two surveys, the 2018 surveys had very few children under 6 months of age; data on nutritional status were compared for children 6 to 59 months only. A total of 3,574 and 5,052 children 6 to 59 months of age were included in the 2013 baseline and 2018 endline survey, respectively.

3.1 TRENDS IN NUTRITIONAL STATUS

Figure 2 describes the decline in rates of stunting, underweight, and wasting between 2010 and 2018. The DHS data indicate a decline of the stunting rate from 49 percent in 2010 to 37 percent in 2016. The CBN Survey also confirms this finding: stunting rate declined from 40.0 percent in 2013 to 36 percent in 2018.

Figure 2: Stunting, Underweight, and Wasting incidence in Malawi: Demographic and Health Survey (2010 and 2016) and Community-Based Nutrition Survey (2013 and 2018) (6–59 Months of Age)

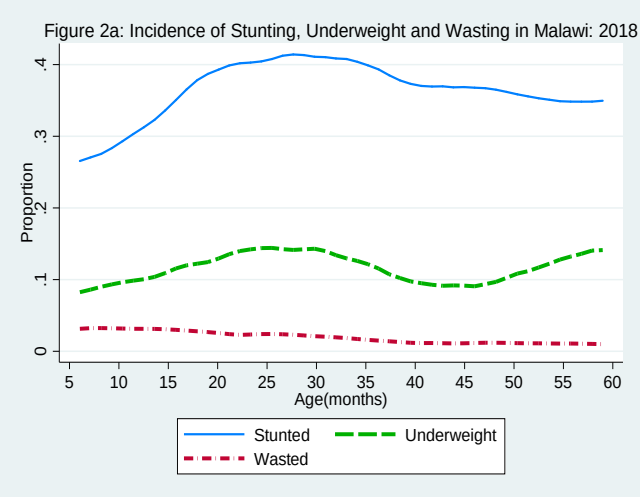


A comparison across DHS and CBN Surveys indicates a possible slowing down of the pace of reduction in stunting between 2016 and 2018. Such slowing down is not unexpected, as early improvements in stunting are often triggered by basic changes in health, nutrition, food production, and concomitant economic growth. Further reduction in stunting would require far more concerted efforts on all those fronts.

Stunting by Age Profile

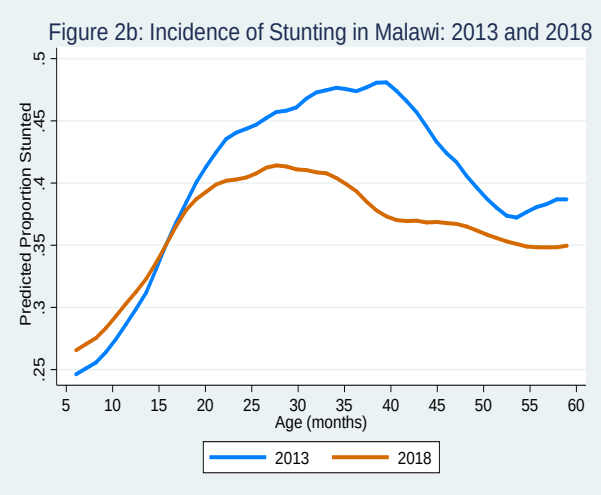
The importance of early childhood development, particularly the "first 1,000 days," is well known in literature. To see how children fair during early childhood, the nonparametric graph of stunting rates in 2018 are plotted against children's age in Figure 2a. There is a sharp increase in stunting rates from 6 months onward to 22 months, and then the rate stays high and stable until 35 months and starts declining slightly thereafter.

Figure 2a: Incidence of Stunting, Underweight, and Wasting in Malawi, 2018



The pattern is similar for 2013 as well, as shown in Figure 2b.

Figure 2b: Incidence of Stunting in Malawi, 2013 and 2018

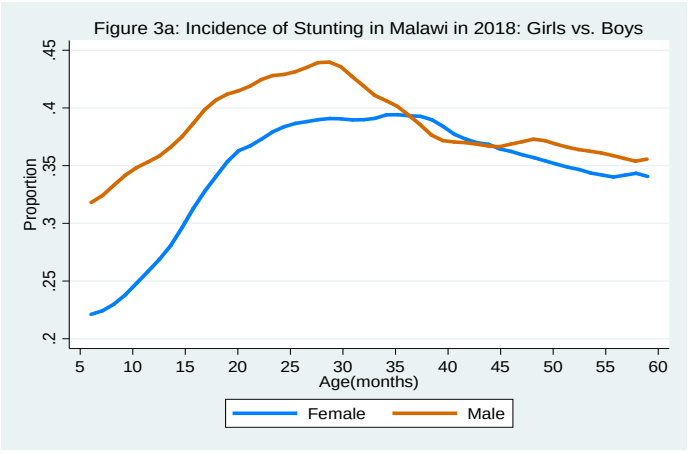


Source: 2013 is Nutritional baseline survey and 2018 is endline survey

The underweight rate displays a similar pattern but is small relative to the stunting rate. The rate of wasted children is quite small and stays nearly flat over the entire age range. The age profile of stunting rate highlights the need for early childhood interventions to stem the sharp increase in stunting during the critical months up to 33 months of age. Figure 2b indicates a sharp improvement in stunting for children in the age range 20 to 60 months. For children younger than 20 months, the stunting rates are not significantly different between 2013 and 2018.

Stunting by Gender

Figure 3a: Incidence of Stunting in Malawi in 2018: Girls vs. Boys

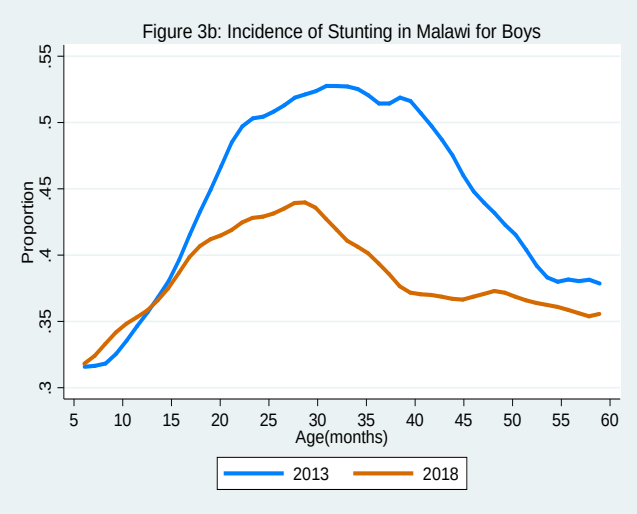


Source: 2013 is Nutritional baseline survey and 2018 is endline survey

The stunting rate at early childhood tends to be lower for girls than boys in Africa. Malawi is no exception in this regard. Stunting is much higher for boys than girls for age below 35 months, and the difference between boys and girls disappears after 35 months (Figure 3a).

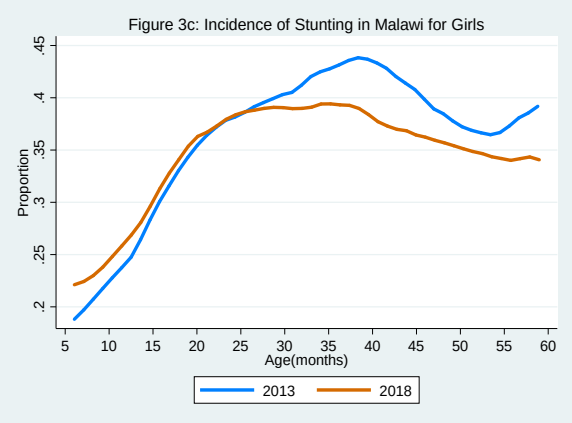
Between 2013 and 2018, the decline in stunting rates differed between boys and girls as well. The stunting rates among boys decreased significantly for those between 15 and 60 months (Figure 3b). In contrast, the decline in stunting among girls was quite modest and was limited to those above 30 months of age (Figure 3c). Because of this differential progress in stunting reduction, the gap between boys and girls narrowed somewhat between 2013 and 2018.

Figure 3b: Incidence of Stunting in Malawi for Boys



Source: 2013 is Nutritional baseline survey and 2018 is endline survey

Figure 3c: Incidence of Stunting in Malawi for Girls



Source: 2013 is Nutritional baseline survey and 2018 is endline survey

Geographical Profile

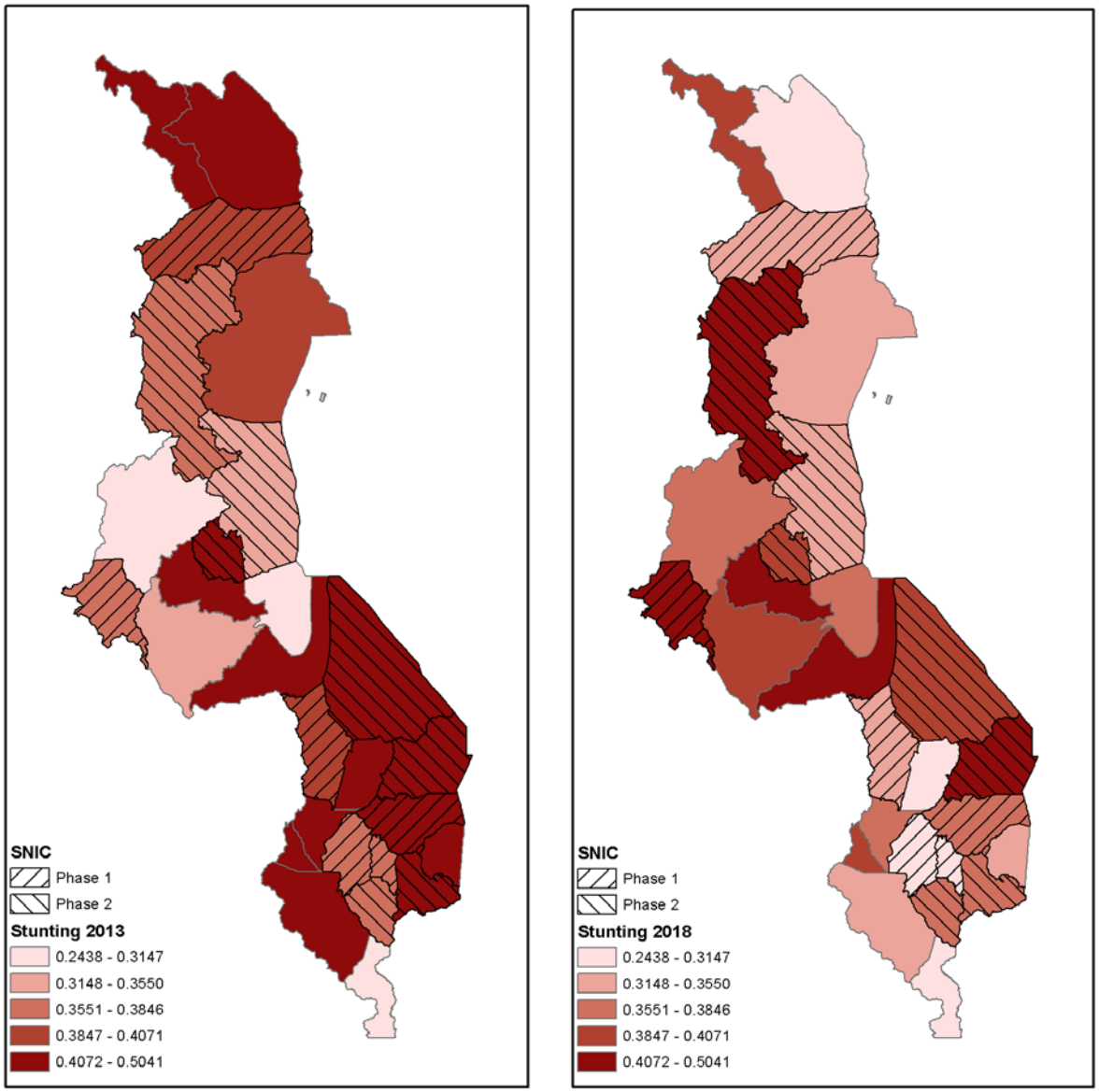
As poverty tends to vary across areas, along with access to food, health, and water services, one would expect stunting rates to vary as well. The geographical profile of stunting incidence over time helps visualize the progress across areas and to identify those areas that would need more attention in future. Figure 4 plots the district-level stunting rates in 2013 and 2018 on the map of Malawi. The reduction in stunting appears to have been spread over the entire country (maps in Figure 4). The improvement in the stunting rate was concentrated in areas with high rates of stunting in 2013. The areas with little improvements are located near Lilongwe and its surrounding

districts. The districts that had very high rates of stunting in 2013 appear to have been targeted for nutrition projects as is evident from the SNIC districts on the map. The significant decline in stunting rates in those districts is suggestive of the success of these projects in addressing malnutrition.

Summary

The decline in the stunting rate in Malawi during the last decade has been impressive, but progress has been uneven across different groups and areas. The decline has been more prominent for boys and relatively older children. Moreover, areas with higher levels of stunting appear to have experienced larger declines in stunting. This heterogeneity in the decline in stunting rates is explored further in Chapter 4.

Figure 4: District-Level Stunting Rates, 2013 and 2018



3.2 TRENDS IN UNDERLYING DETERMINANTS

Infant and Young Child Feeding Practices

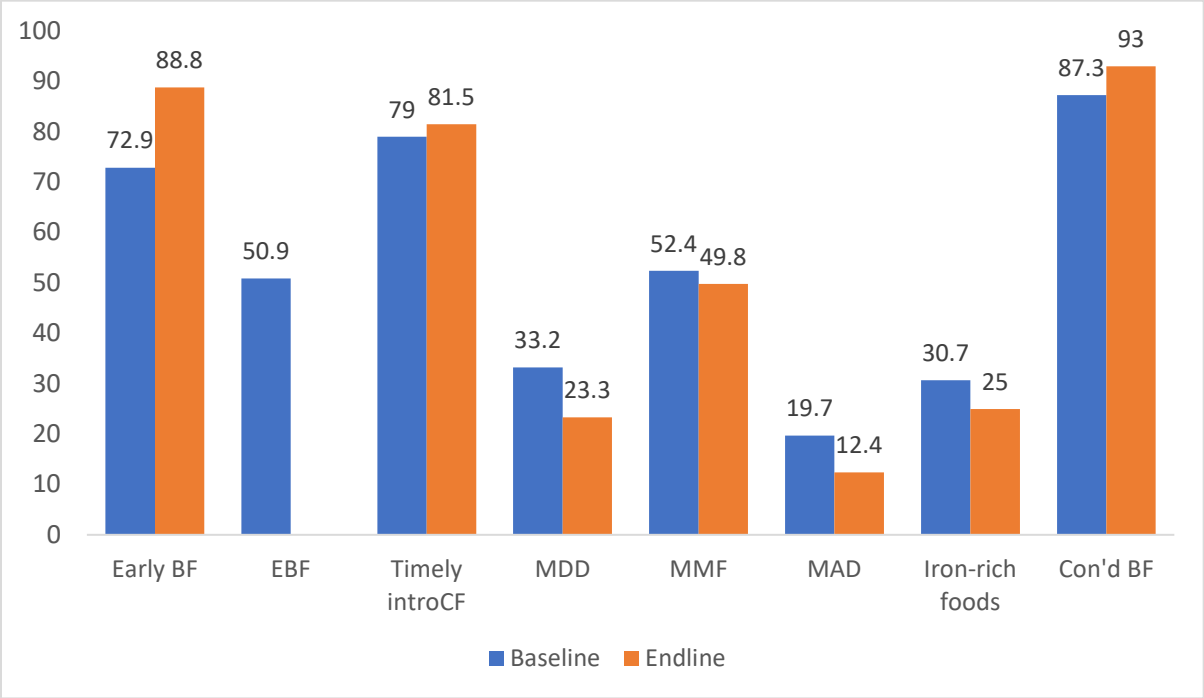
Data for the main indicators of IYCF practices at baseline and endline are presented in Figure 5 and Annex 3.

The findings suggest that the quality of complementary feeding has decreased between baseline and endline, with fewer children 6 to 23 months of age receiving diets with adequate dietary diversity (that is, foods from at least four food groups) and iron-rich foods (that is, meat or iron-fortified foods). The percentage of children receiving a MAD decreased from 19.7 percent in 2013 to 12.4 percent in 2017. Although these differences may partly be due to methodological issues around the correct definition of adequate dietary diversity between the two surveys, they may also reflect a true deterioration in feeding practices, probably associated with a worsened food security situation, or to decreased counseling received from community nutrition workers.

Breastfeeding practices seem to be stable, with an increase in the percentage of early initiation of breastfeeding (that is, within one hour after birth) from 72.9 percent in 2013 to 88.8 percent in 2018. This may reflect an improvement in ANC attendance and counseling as well as of deliveries in health facilities. The percentage of children being exclusively breastfed for the first six months of life was 50.9 percent in 2013. Unfortunately, this indicator could not be reliably assessed in the 2018 survey because of the small number of children zero to five months of age (*N* = 45 or 1 percent) included in the sample. Out of these 45 children, 69.9 percent were exclusively breastfed.

In 2018, only 7 percent of children ages zero to five years received micronutrient powders (MNPs), this indicator was not assessed at baseline in 2013. Malawi is yet to step up efforts for general distribution of MNPs, to complement the daily diets of children; an increase in the percentage of children receiving MNPs is expected in subsequent surveys.

Figure 5*:* IYCF Practices, 2013 and 2018



Source: 2013 is Nutritional baseline survey and 2018 is endline survey Note: All values are percentages. Early BF = Early Initiation of breastfeeding (<1 hour after delivery); EBF = Exclusive Breastfeeding; Timely IntroCF = solid, semisolid, or soft foods introduced at 6 to 8 months of age; MDD = Minimum Dietary Diversity; MMF = Minimum Meal Frequency; MAD = Minimum Acceptable Diet; Iron-rich foods: consumption of flesh foods or iron-fortified foods in last 24 hours; Con'd BF = Child still being breastfed at 12 to 15 months (WHO 2008).

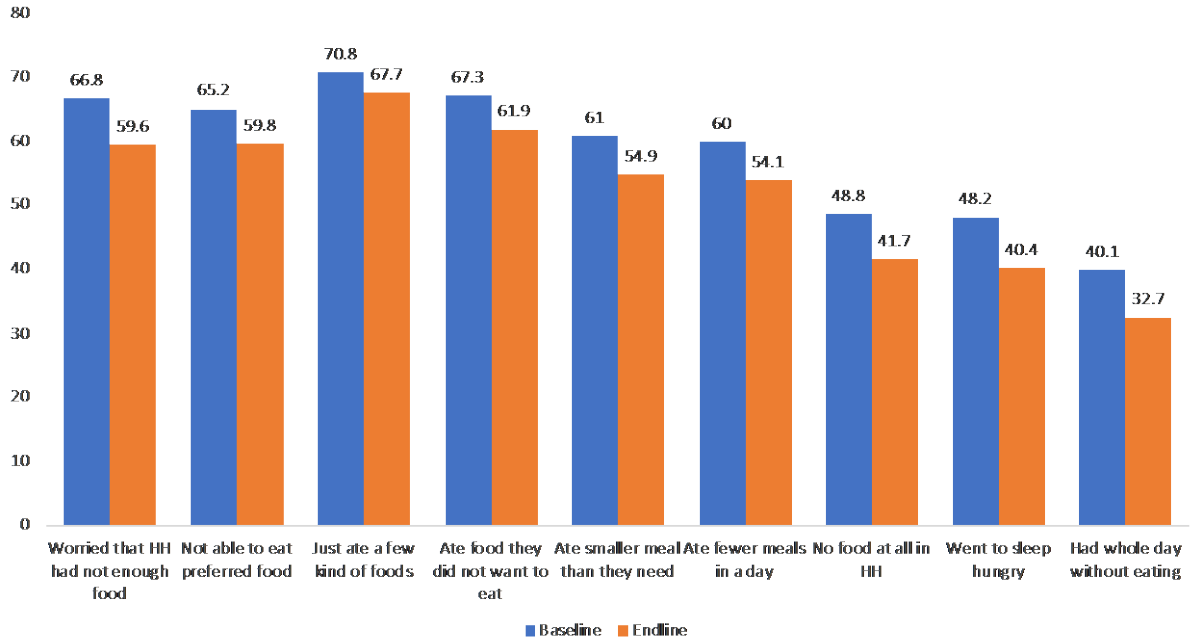
District-level data show large variations in IYCF practices between districts (Annex Table 3A.1). For instance, in Lilongwe only 4.2 percent of children received a MAD, whereas 26.7 percent did in Likoma. The differences may reflect the variation in nutrition program performance between districts. Overall, no differences were observed between the group of districts where the World Bank Nutrition program (SNIC) was rolled out in 2013 (the SNIC-1 districts), in 2016 (the SNIC-2 districts), or in the non-SNIC districts.

Food Security

Questions were asked about the different aspects of the food security situation experienced by the household in the past four weeks; those findings are summarized in Figure 6 and Annex Table 3A.2.

Overall, food security seems to have improved between 2013 and 2018, with fewer respondents mentioning their household members had to compromise on their food intake or had a day with nothing to eat during the past four weeks. Yet, overall the food security situation remains grim: in 2018, 40.4 percent of respondents indicated that household members had gone to bed hungry at least once in the past four weeks, while 32.7 percent had at least one day without any food in the household in the past four weeks.

Figure 6: Household Food Security Experienced in the Past Four Weeks[a]

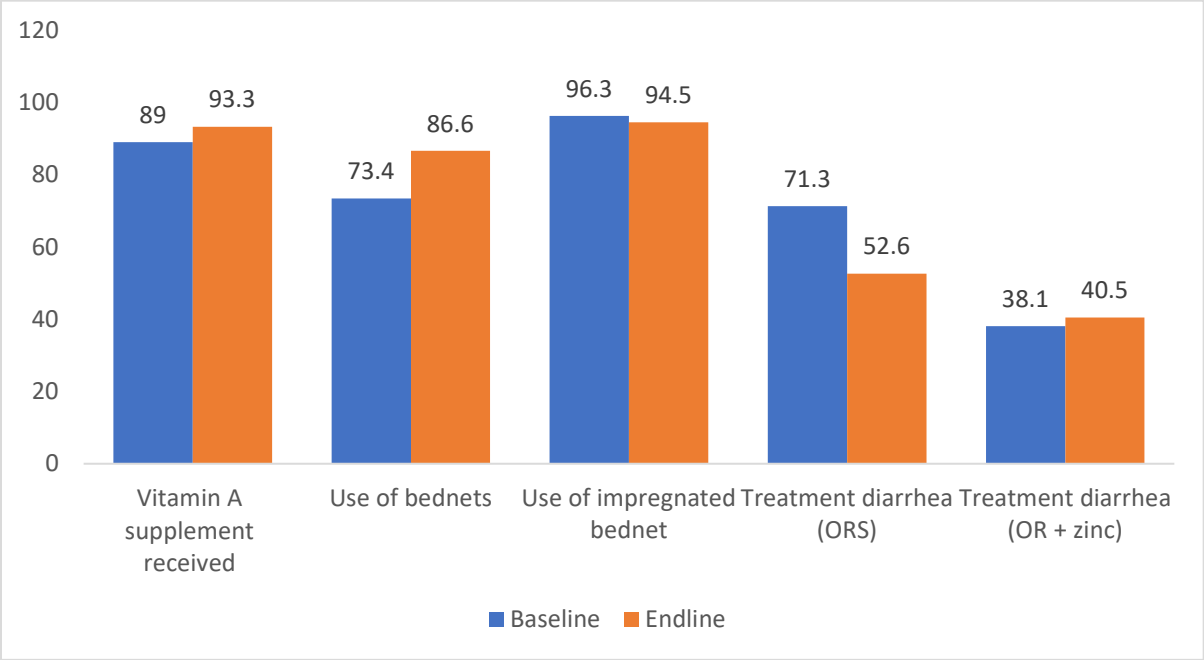


Source: 2013 is Nutritional baseline survey and 2018 is endline survey
Note: a. Questions asked: In the past four weeks, did members of your household…?

Child Care and Child Illnesses

The percentage of children 6 to 59 months of age who had received vitamin A supplements and the percentage of households that use bednets remained high in 2018 (see Figure 7). At endline, 93.3 percent of children had received high dose vitamin A supplementation, 86.6 percent slept under a bednet, and of those bednets 94.5 percent were impregnated. The percentage of children under five years receiving adequate treatment for diarrhea with ORS decreased from 71.3 percent in 2013 to 52.6 percent in 2018.

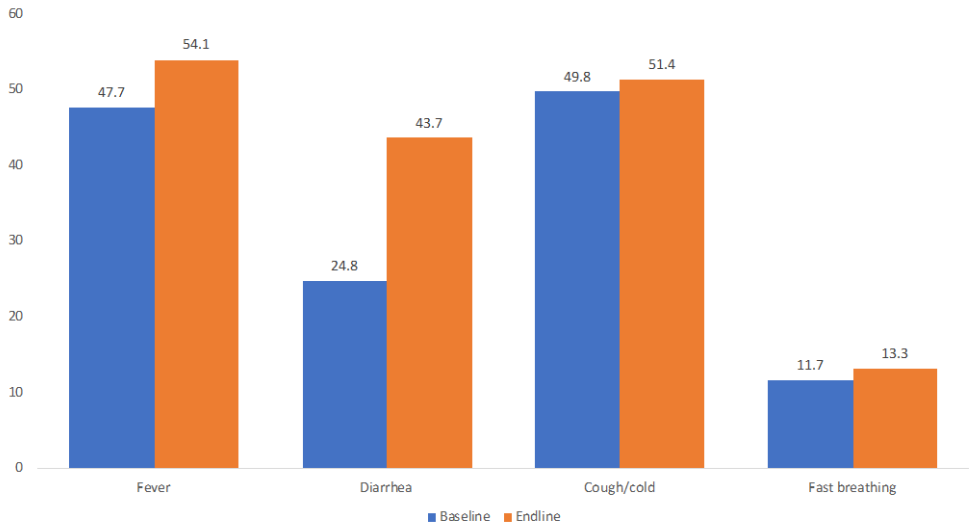
Figure 7: Child Care in 2013 and 2018



Source: Source: *2013 is Nutritional baseline survey and 2018 is endline survey*

Despite the improvements in child care, significantly more children were reported to have been sick with diarrhea during the past two weeks in 2018 than in 2013. This could have been caused by a decline in the percentage of children that received ORS as treatment for diarrhea. In addition, a higher prevalence of fever, cold/cough, and rapid breathing was reported in 2018 compared to 2013 (see Figure 8).

Figure 8: Childhood Illnesses in the Past Two Weeks, 2013 and 2018



Water, Sanitation, and Hygiene

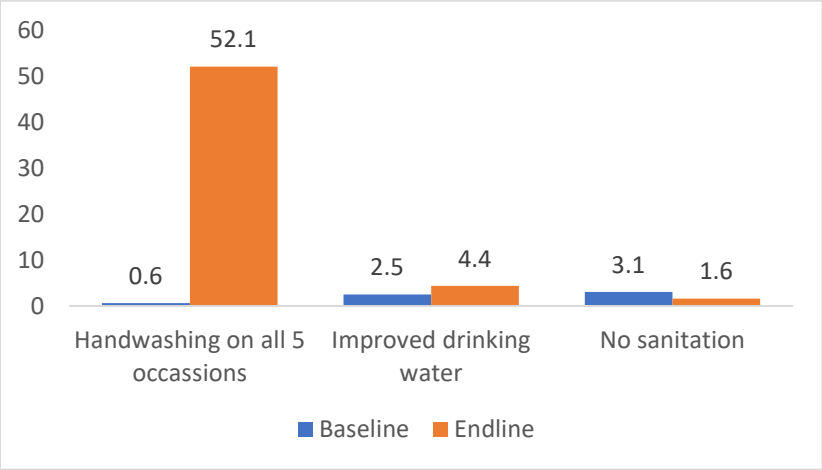
Between 2013 and 2018 significant improvements in WASH indicators were observed. The percentage of households with an improved drinking water source (UNICEF 2015) significantly increased from 85.6 percent in 2013 to 90.7 percent in 2018 (see Table 1). In 2018, only 1.6 percent of households had no sanitation at all, which was a decline from 3.1 percent in 2013. In particular, hygiene practices improved: the mean handwashing score (out of five occasions) was 2.34 (0.88) in 2013 and significantly increased to 4.05 (1.17) in 2018, whereas the percentage of respondents who indicated they had washed their hands on all five occasions improved from 0.6 percent in 2013 to 52.1 percent in 2018 (Figure 9).

Table 1: WASH Indicators in Households in Malawi 2013, 2018

WASH Indicators	Year	All
		N = 4,449 (Baseline) *N* = 4,892 (Endline)
Improved drinking water source (%)	2013	85.6
	2018	90.7*
Always clean drinking water (%)	2013	42.5
	2018	43.7*
Improved sanitation (toilet/ventilated improved pit) (%)	2013	82.9
	2018	84.0*
No sanitation (%)	2013	3.1
	2018	1.6*
Households using pit latrine (%)	2013	94.5
	2018	95.9*
Households using shared sanitation facilities (%)	2013	47.9
	2018	37.8*
Handwashing mean score (out of 5 occasions)	2013	2.34 (0.88)
	2018	4.05 (1.17) **

Source: 2013 is Nutritional baseline survey and 2018 is endline survey
Note: WASH = Water, sanitation, and hygiene.
*p<0.05 (Chi-Square test); **mean (SD); p<0.05 (independent two-sample t-test).

Figure 9: Hygiene, Drinking Water, and Sanitation in 2013 and 2018



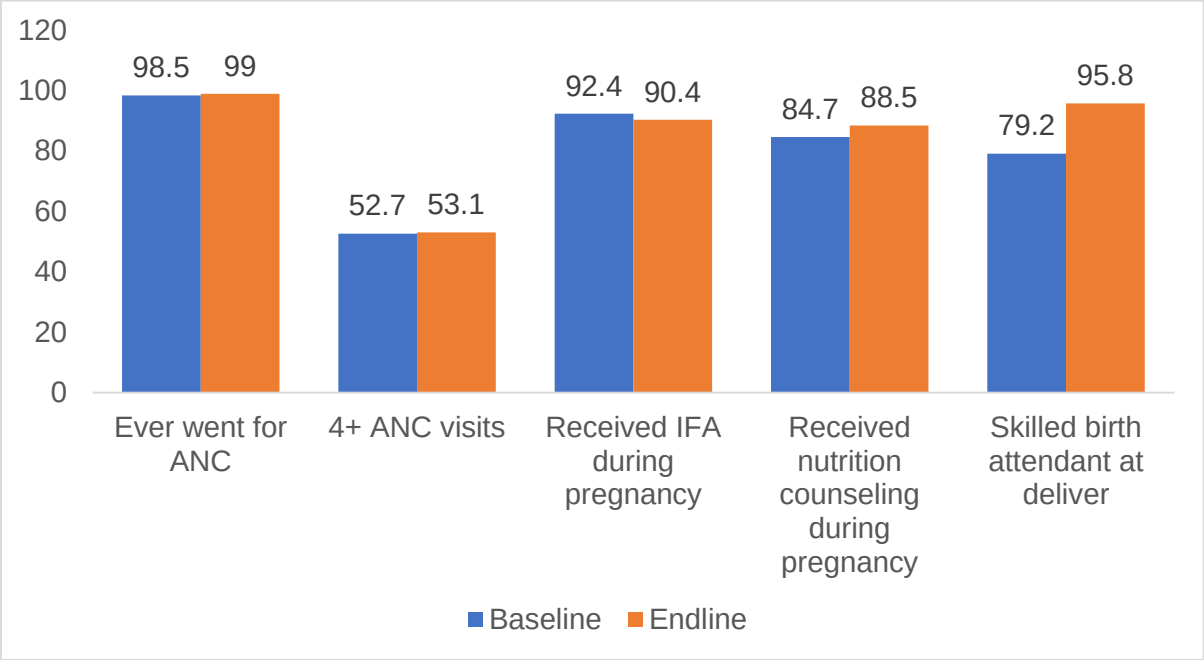
Source: 2013 is Nutritional baseline survey and 2018 is endline survey

Antenatal Care Practices

The percentage of women who went for ANC during their last pregnancy was high both in 2013 (98.5 percent) and 2018 (99.0 percent) (Figure 10). However, only half of the women went for four or more ANC visits in both years. The provision of iron folic acid (IFA) supplements and nutrition counseling during pregnancy was high and did not differ between 2013 and 2018. The percentage of deliveries with a skilled birth attendant rose significantly from 79.2 percent in 2013 to 95.8 percent in 2018.

Annex 3, Table C provides the information by type of district. Overall, there was very little variation in ANC practices across districts.

Figure 10: ANC Practices in 2013 and 2018



Source: 2013 is Nutritional baseline survey and 2018 is endline survey

Early Child Development

Indicators for ECD were only assessed in the 2018 survey, so a comparison between the two surveys could not be made (Table 2).

A little over half of the villages (52.4 percent) had an ECD center, but only 31.7 percent of eligible children ages three to five attended the ECD centers. Despite the fact that access to other early learning activities was poor in most households (only 6.2 percent of households had children's books), 46.8 percent of parents were engaged in four or more child stimulation activities in the past three days.

Overall, only 35.6 percent of children ages three to five were developmentally on track, defined as three out of four of the ECD domains on track. In particular, scores in the literacy domain were poor (only 21.4 percent of children were on track in the literacy domain), whereas 62.5 percent and 60.4 percent of children were on track in the socioemotional and learning domains, respectively. The poor scores in the literacy domain may speak to the absence of ECD centers and/or poor attendance of the services provided by the ECD centers. Improving these program services could potentially have a strong effect on overall ECD in these settings.

Annex 3, Table D summarizes the findings of the ECD indicators by the SNIC program districts. Although there were slightly more villages with an ECD center in districts with a SNIC program in place since 2014, overall, there were no differences in child development scores between the program and nonprogram districts.

Table 2: Early Childhood Development Indicators (2018 only)

Indicators	
Village has ECD center (%)	52.4
For children < 5 years:	5,747
Household has children's books (< 5 years) (%)	6.6
Household has 3 or more children's books (%)	1.6
Played with toys—homemade (%)	40.7
Played with toys—from shop (%)	18.9
Played with toys—household objects (%)	66.4
Leaving child without adult (child > 10 years) supervision (%)	43.4
For children 24–59 months	3,268
Adults engaged with child in at least 4 activities in past 3 days (%)	46.8
Father engaged with child in at least 1 activity in past 3 days (%)	5.1
For children 36–59 months	2,149
Attendance of ECD program (%)	31.7
Child can identify or name at least 10 letters of alphabet (%)	24.3
Child knows the name and can recognize symbol of all numbers from 1 to 10 (%)	28.8
Child can pick up a small object with two fingers from the ground (%)	73.3
Child is sometimes too sick to play (%)	61.2
Child gets along well with other children (%)	74.2
Child gets distracted easily (%)	41.2
Child can read at least four simple popular words (%)	22.8
Child can follow simple instructions (%)	55.2
When given something to do, child can do it independently (%)	50.3
Child on track in literacy domain (%)	23.4
Child on track in physical domain (%)	60.0
Child on track in socioemotional domain (%)	62.5
Child on track in learning domain (%)	60.4
ECDI (at least 3 out of 4 development domains on track) (%)	35.6

Source: 2013 is Nutritional baseline survey and 2018 is endline survey
Note: ECD = Early childhood development; ECDI = Early Childhood Development Index.

Use of Program Services

Use of CBN was asked in 2013 and 2018, whereas some of the program-specific activities, such as households with children benefiting from care group services, or households engaged in livestock activities, were asked at endline in 2018 only (Table 3).

Overall, small improvements were seen from 2013 and 2018 in percentage of households with access to nutrition and community health worker (CHW) services in the past four weeks (22.8 percent in 2013 and 27.3 percent in 2018), whereas there was no change in the percentage of caregivers who went for GMP in the past four weeks in 2013 (58.9 percent) and 2018 (57.7 percent). Even in 2018, less than one-third of households had access to nutrition or CHW services or had a frontline worker (FLW) visiting the home in the past four weeks. In addition, in 2018, only 22.26 percent of households with children under two years of age had access to IYCF information from a FLW in the past four weeks. Overall, a very low percentage of households was benefiting from cash transfers and livestock activities.

Table 3: Use of Program Services in 2013 and 2018

		All
	Households with child <2	*N* = 2,864 (Endline)
Children < 2 years benefiting from monthly care groups in households	Baseline	n.a.
	Endline	46.2
	Households with child <5	*N* = 4,316 (Baseline); *N* = 4,891 (Endline)
Went for GMP in past 4 weeks (child <5 years) (%)	Baseline	58.9
	Endline	57.7
	Households with child <2	*N* = 2,864 (Endline)
Access to IYCF information from FLW in past 4 weeks (child <2 years) (%)	Baseline	n.a.
	Endline	28.4
	All	*N* = 4,891 (Endline)
Households benefited from social cash transfer in last 4 weeks (%)	Baseline	n.a.
	Endline	8.5
Households involved in small livestock farming (%)	Baseline	n.a.
	Endline	4.2
Households involved in fish farming (%)	Baseline	n.a.
	Endline	0.7
Households involved in kitchen garden farming (%)	Baseline	n.a.
	Endline	8.9
Households involved in poultry farming (%)	Baseline	n.a.
	Endline	28.5
	All	*N* = 4,349 (Baseline) *N* = 4,841 (Endline)
Access to nutrition services outside home (%)	Baseline	24.8
	Endline	27.5
FLW visited home in past 4 weeks (%)	Baseline	23.0
	Endline	24.8
Received any CHW services in past 4 weeks (%)	Baseline	22.8
	Endline	27.3

Source: 2013 is Nutritional baseline survey and 2018 is endline survey Note: GMP = Growth monitoring and promotion; n.a. = Not applicable; IYCF = Infant and young child feeding; CHW = Community health worker FLW = Frontline worker.

The use of program services varied substantially by district, as illustrated in Table 4. For instance, the percentage of households with children under two years of age benefiting from care groups was 0 percent in Lilongwe, Kasungo, Likoma and Noka-Kota, whereas in Nokotchi 88.9 percent of all households with children under two years benefited from care group services (Table 4). There were no differences between the SNIC program districts and nonprogram districts in the use of program services, access to nutrition and CHW services, and participation in livestock activities (see Annex 3 Table E). However, the percentage of households with children under two years that had received IYCF counseling from a FLW in the past four weeks was slightly higher in the SNIC program districts (75.5 percent) compared to the non-SNIC districts. In addition, it should be emphasized again that by 2019 all districts in the country had CBN projects in place funded by other donors.Table 4: Households with Children under Two Years of Age, Benefiting from Care Group Services, by District

	Children under two years of age benefiting from monthly care group services (of households that report having children under 2 years of age)[a] (%)
All SNIC-1 Districts	27.7
Rumphi	50.0
Mchinji	35.3
Ntcheu	7.1
Zomba	5.3
Ciradzulu	66.7
Blantyre	45.5
Mwanza	13.3
All SNIC-2 Districts	65.4
Mzimba	62.5
Nkotakota	0.0
Ntchisi	75.3
Magochi	88.9
Machinga	58.8
Thyolo	22.2
Mulanje	16.7
Non-SNIC Districts	43.9
Chitpa	46.9
Karonga	57.4
Nkhata Bay	27.3
Likoma	0.0
Kasungu	0.0
Dowa	57.1
Salima	33.3
Lilongwe	0.0
Dedza	18.2
Phalombe	43.5
Chikawa	48.0
Nsanje	66.0
Balaka	30.8
Neno	15.8

Source: 2013 is Nutritional baseline survey and 2018 is endline survey
Note: a. The sample size per district for those that have children under two years of age in their household can be very small.

Summary of Underlying Determinants

A child's growth and nutritional status are multicausal outcomes determined by a number of direct and underlying factors. The trends observed in Malawi between 2013 and 2018 suggest improvements in some of these underlying factors, particularly in some of the nutrition-sensitive determinants. In particular, the percentage of deliveries attended by a skilled birth attendant and the practice of handwashing improved significantly between 2013 and 2018.

In contrast, child feeding practices, in particular the percentage of children 6 to 23 months of age consuming a MAD declined between 2013 and 2018, which may be related to the fact that only one-fifth of households with children under two years of age reported having access to information on IYCF in the past four weeks.

Although they are based on cross-sectional and descriptive data only, the findings summarized in this chapter seem to suggest that there is still room for further improvement on reduction of malnutrition, through reinforcement of nutrition-specific program components, including counseling on IYCF practices and more frequent visits of FLWs. In addition, more ECD centers and encouraging families with children to benefit from these ECD services may further improve child development, an important underlying factor of growth and nutrition. Findings from the 2018 survey further suggest that food insecurity is still an important limiting factor for optimal growth and nutrition, with one-third of the households still suffering from days without any food to eat. Despite efforts to establish income-generating activities that would improve households' food security, such as home gardening, small livestock farming, and cash transfers, very few households participate in these activities.

District-level data suggest a large unequal program performance across districts, which is reflected in district-level disparities in child nutrition status and child feeding practices.

4. DETERMINANTS OF STUNTING IN MALAWI

The logit regressions were run to examine the association between stunting and its potential determinants described in Chapter 3. The marginal effects of explanatory variables on stunting status are estimated at the mean of all explanatory variables. The standard errors are clustered at village level. To explore heterogeneity across age group, gender, and geography, the regressions are run and marginal effects are estimated for different sample cuts. The regression analysis presented here pools data from both rounds of surveys (2013 and 2018).

Table 5 reports the estimated marginal effects for all different samples. The estimates for the full sample and for boys and girls separately are reported in Columns 1, 2, and 3, respectively. To explore differences between districts, the districts are divided into two groups depending on whether district-level stunting rate in 2013 was above or below the mean stunting rate across all districts. The rationale behind this sample split is that districts with a high rate of stunting in 2013 may have received much more public attention in terms of targeted projects. The results for these two samples reported in Columns 4 and 5 help highlight the types of interventions that may have influenced stunting, though the results do not imply causality. For age group, a distinction is made between those in age range 6–24 months and those older than 24 months but younger than 60 months. Results for these age groups are reported in Columns 6 and 7.

As already seen in the age and gender profile, the results confirm that stunting is higher among boys and tends to increase with age up to a point. Among socioeconomic determinants, mother's

height and BMI are the most important determinants; both are highly statistically significant. The stunting rates are much higher among children whose mothers have short stature (less than 155 cm) and low BMI (less than 18.5). Both short stature and low BMI are associated with poor maternal nutrition. Among other determinants, access to safe water, handwashing, and improved sanitation are the most important determinants of stunting. Stunting is negatively associated with these three determinants. Sleeping under a bednet is associated with lower stunting rates, particularly among older children (24–60 months). Stunting is negatively correlated with better food security as reported by households, though the coefficient is not precisely estimated.[2] There are some interesting differences between boys and girls. For boys, correlations between stunting and access to sanitation and handwashing are much stronger, whereas for girls, the correlation is much stronger with access to water. Another interesting finding is that stunting among girls is correlated significantly negatively with a household head's education, whereas for boys, the head's education does not appear to matter much.

Interesting differences are observed for districts below and above the national stunting rate in 2013. In districts with higher initial stunting rates, access to improved water, sanitation, and handwashing are the most important determinants of stunting. For these districts, stunting is associated with diarrhea. For districts that had lower initial stunting rates, access to improved sanitation and better food security are the two most important determinants.

For stunting among older children, access to improved water and sanitation, handwashing, and sleeping under a bednet matters more. Access to improved water and sanitation matters for younger children as well. Interestingly, MDD is associated negatively with stunting among younger children.

In terms of order of magnitude, the correlation between stunting and access to improved sanitation is strongest, and ranks high along with the mother's short stature. The correlation of stunting with some variables of interest, such as ANC or hospital delivery, is negative in most cases, but such correlations are not estimated with precision. This is not surprising as many of the determinants of stunting are highly correlated with each other, leading to a multicollinearity problem. That is expected, as many of the health interventions are implemented as a package. Another reason for ANC to be weakly correlated with stunting could be that most of the children in the sample are older, particularly as children younger than six months are not in the sample at all.

2. Food security is a binary variable indicated by the answer to the question of whether a family faced food insecurity during past four weeks.

Table 5: Determinants of Stunting in Malawi (Pooled Data from 2013 and 2018): Marginal Effects from Logit Regressions

		Gender		District stunting rate in 2013		Age groups	
Variables	Full Sample	Boys	Girls	Below Mean	Above Mean	6–24 months	24–60 months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age (months)	0.00185***	0.000533	0.00311***	0.00212***	0.00151**	0.0154***	–0.00293***
	(0.000447)	(0.000648)	(0.000525)	(0.000505)	(0.000749)	(0.00205)	(0.000741)
Female (yes=1)	–0.0651***			–0.0733***	–0.0477***	–0.0958***	–0.0443***
	(0.0120)			(0.0159)	(0.0172)	(0.0176)	(0.0156)
Mother's BMI (<18.5)	0.0705***	0.0989***	0.0395	0.0424	0.113***	0.0415	0.0928**
	(0.0253)	(0.0349)	(0.0344)	(0.0345)	(0.0372)	(0.0342)	(0.0394)
Mother's short stature (<155 cm)	0.167***	0.186***	0.146***	0.162***	0.172***	0.158***	0.177***
	(0.0122)	(0.0185)	(0.0150)	(0.0159)	(0.0196)	(0.0172)	(0.0154)
Head's education (>primary)	–0.0270**	–0.0144	–0.0417**	–0.0233	–0.0234	–0.0207	–0.0277
	(0.0128)	(0.0177)	(0.0183)	(0.0173)	(0.0208)	(0.0185)	(0.0177)
ANC visits (4+)	–0.00787	–0.00638	–0.0114	–0.0188	0.00571	–0.000129	–0.00972
	(0.0119)	(0.0169)	(0.0158)	(0.0147)	(0.0200)	(0.0169)	(0.0168)
Delivery in health facility	0.00389	0.00678	0.00481	0.00612	–0.0114	0.00707	0.00772
	(0.0205)	(0.0317)	(0.0259)	(0.0281)	(0.0344)	(0.0344)	(0.0283)
Handwash score (>3)	–0.0322**	–0.0398**	–0.0232	–0.0442***	–0.0141	-0.0239	–0.0442***
	(0.0133)	(0.0182)	(0.0174)	(0.0157)	(0.0214)	(0.0220)	(0.0162)
Access to safe water	–0.0624***	–0.0395	–0.0811***	–0.0667***	-0.0426	-0.0513**	–0.0745***
	(0.0188)	(0.0268)	(0.0250)	(0.0225)	(0.0306)	(0.0261)	(0.0237)
Access to improved sanitation	–0.174***	–0.212***	–0.131***	–0.143***	–0.224***	-0.153**	–0.199***
	(0.0340)	(0.0608)	(0.0497)	(0.0538)	(0.0429)	(0.0670)	(0.0434)
Food security	–0.0171	–0.0151	–0.0194	–0.000766	–0.0362**	-0.0146	–0.0212
	(0.0120)	(0.0183)	(0.0159)	(0.0155)	(0.0180)	(0.0176)	(0.0169)
MDD	–0.00756	–0.0203	0.00414	–0.0208	0.0196	-0.0450**	0.00487
	(0.0148)	(0.0204)	(0.0204)	(0.0194)	(0.0232)	(0.0211)	(0.0190)
Vaccination	0.00797	0.00164	0.0163	0.0104	0.00875	-0.00547	-0.0298
	(0.0157)	(0.0230)	(0.0223)	(0.0195)	(0.0257)	(0.0227)	(0.0237)
Slept under a bednet	–0.0314*	–0.0301	-0.0340	–0.0286	–0.0264	0.0114	–0.0553**
	(0.0173)	(0.0235)	(0.0227)	(0.0208)	(0.0305)	(0.0251)	(0.0243)
Diarrhea	–0.00880	–0.0260	0.00830	–0.0340*	0.0256	-0.00413	–0.000518
	(0.0153)	(0.0220)	(0.0201)	(0.0198)	0.0234)	(0.0198)	(0.0236)

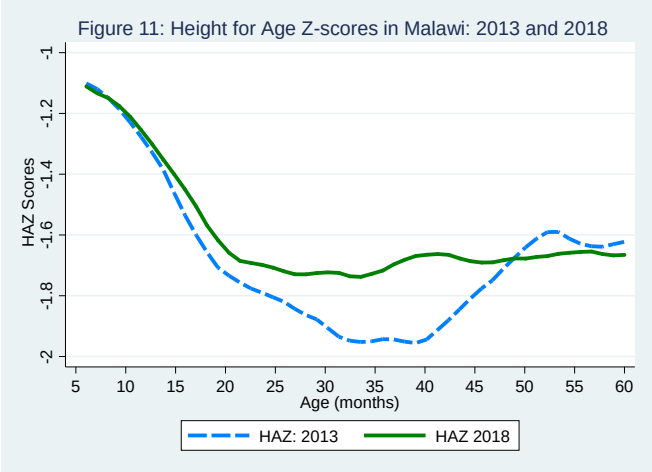
		Gender		District stunting rate in 2013		Age groups	
Constant	0.0603	0.112	–0.0622	0.0653	0.0366	–0.186**	0.319***
	(0.0432)	(0.0696)	(0.0661)	(0.0692)	(0.0669)	(0.0827)	(0.0673)
Observations	6,999	3,468	3,531	4,385	2,614	2,959	4,040

Source: 2013 is Nutritional baseline survey and 2018 is endline survey
Note: BMI = Body Mass Index; ANC = Antenatal care; MDD = Minimum dietary diversity.
Standard errors in parentheses, standard errors clustered at village level
*** p<0.01, ** p<0.05, * p<0.1.

5. CHANGES IN STUNTING IN MALAWI BETWEEN 2013 AND 2018: RESULTS FROM DECOMPOSITION

The empirical analysis in the previous chapter pointed to proximate determinants of stunting in Malawi. However, the factors that may have contributed to a reduction in stunting between 2013 and 2018 are not immediately clear from the analysis. This chapter uses the Oaxaca-Blinder decomposition technique to discern the factors behind the observed decline in stunting.

Figure 11: HAZs in Malawi, 2013 and 2018



2013 is Nutritional baseline survey and 2018 is endline survey

The nonparametric graph of HAZs against age for 2013 and 2018 is presented in Figure 11. The improvement in HAZs is evident in Figure 11 and is consistent with the stunting rate plotted in Chapter 3 (Figure 3b). Much of the improvement in HAZ between 2013 and 2018 is concentrated among children in the age range 20 to 45 months. The HAZ profile was checked with respect to gender and geography. They indicate patterns comparable to those found in Figures 3a to 3c and Figure 4 and are thus omitted here.

5.1 CHANGES IN POTENTIAL DETERMINANTS OF HAZ BETWEEN 2013 AND 2018

As a first step to the decomposition analysis, the difference between the mean of potential explanatory variables is estimated, and its significance is tested using the standard two-sample t-test. The summary statistics and respective test results are reported in Table 6. As already shown in Figure 11, the average HAZ improved significantly, as did most of the indicators for water, sanitation, and food security. The most dramatic increase has been in the handwash scores, which rose from 2.44 to 4.05. However, some of the health and nutrition indicators such as vaccination and MDD worsened. The proportion of mothers making four-plus ANC visits remained nearly unchanged from the baseline to the endline year. Though the decline in the vaccination rate is worrisome, it may be because parents tend not to make vaccination trips to a health facility for a relatively healthy child. The improvement in food security appears to have been associated with a decline in dietary diversity. The trends in the potential explanatory variables have implications for the decomposition analysis. The explanatory variables that did not change or changed in the opposite direction from a change in HAZ cannot be expected to explain the change in HAZ over time. These variables are dropped from the decomposition regressions. Some of the variables that lacked statistical significance in all regressions are also dropped to improve model fit.

Table 6: Characteristics of Full Sample in 2013 and 2018 CBN Surveys

	2013			2018			Test of difference in mean	
	Mean	SD	*N*	Mean	SD	*N*	Difference	*P*-value
HAZ score	–1.670	1.373	3238	–1.568	1.393	4190	0.102	0.00
Proportion of households that are food secure	0.323	0.468	3335	0.399	0.490	4286	0.076	0.00
Proportion of households with improved sanitation	0.966	0.181	3335	0.984	0.124	4286	0.018	0.00
Handwash score	2.414	0.856	3326	4.055	1.169	4286	1.640	0.00
Proportion of households with improved water	0.857	0.349	3335	0.911	0.285	4286	0.053	0.00
Vaccination	0.745	0.410	3325	0.493	0.282	4286	–0.252	0.00
Vaccinated ever	0.967	0.177	3335	0.774	0.270	4286	–0.193	0.00
Proportion of households that slept under a bednet	0.715	0.451	3335	0.861	0.225	4286	0.146	0.00
MDD	0.434	0.494	3316	0.226	0.387	4286	–0.208	0.00
Proportion of households that eat iron-rich food	0.367	0.478	2955	0.252	0.408	4286	–0.115	0.00
Diarrhea incidence	0.247	0.428	3329	0.466	0.353	4286	0.219	0.00
Never breastfed	0.014	0.118	3334	0.000	0.000	4286	–0.014	0.00
Mother's BMI <18.5	0.057	0.231	3335	0.046	0.210	4286	-–0.010	0.04
Mother's height <155 cm	0.399	0.490	3335	0.444	0.497	4286	0.045	0.00
4+ ANC visits	0.531	0.499	3228	0.533	0.499	3920	0.002	0.89
Delivery in a health facility	0.845	0.358	3335	0.955	0.199	4286	0.110	0.00
Household head’s education = primary	0.609	0.488	3335	0.647	0.478	4286	0.039	0.00
Household head’s education >primary	0.264	0.441	3335	0.299	0.458	4286	0.035	0.00

Source: 2013 is Nutritional baseline survey and 2018 is endline survey

Note: HAZ = Height-for-age *Z*-score; SD = Standard deviation; MDD = Minimum dietary diversity; BMI = Body Mass Index; ANC = Antenatal care.

5.2 RESULTS FROM DECOMPOSITION ANALYSIS

The last stage of decomposition analysis involves decomposition regressions to estimate the extent to which observed changes in determinants can explain the change in HAZs. The regressions are similar in specification to those reported in Table 5. The Oaxaca-Blinder decomposition method combines the estimated coefficients of regressions and changes in respective explanatory variables to determine the explained part of the HAZs change between two survey years. To be more precise, the coefficient of an explanatory variable *X* is multiplied by changes in its levels between the two years to determine its contribution to improvement in HAZs. Following suggestions from Headey, Hoddinott, and Park (2016), data from both survey rounds were pooled to estimate the coefficient vector. The regressions results are comparable to those reported in Table 5 and are thus omitted here. The analysis is carried out for all different samples discussed earlier.

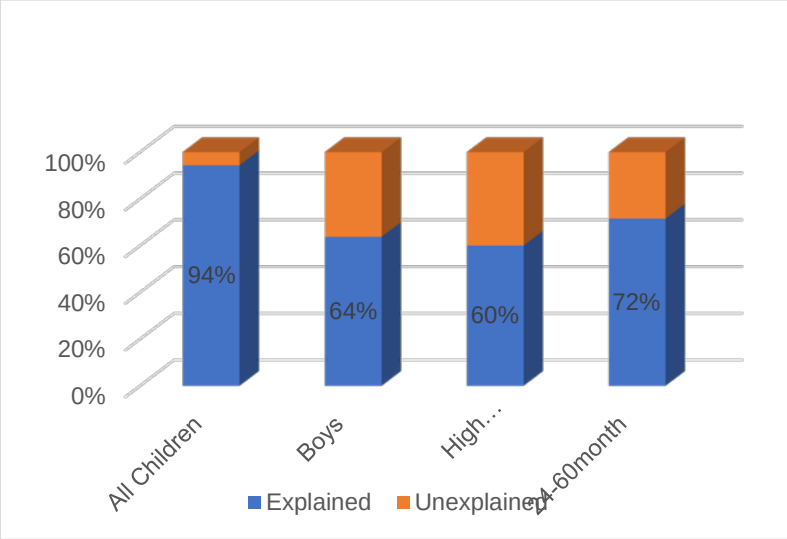
Table 7 reports the average HAZs for 2013 and 2018 along with statistical tests of significance of the difference between them. The differences in HAZs for most of the sample cuts are statistically significant and indicate improvements between the years with a couple of exceptions. The samples of girls, districts with stunting rates below the national mean in 2013, and younger children (6 to 24 months of age) show no statistically significant progress with respect to HAZ: the mean for 2018 is slightly lower than that for 2013, but the difference is not statistically significant. This is consistent with the findings for stunting rates reported in the section on stylized facts. For the rest of the analysis, we focus on samples where we detect significant changes in HAZ between the two survey years. As seen in Table 7, the improvement in HAZ is quite large in samples of districts with high initial stunting rate, as well as for boys.

Table 7: Summary Results for Oaxaca-Blinder Decomposition of HAZ Changes between 2013 and 2018

				Districts with initial stunting rate		Age groups	
	All Children	Boys	Girls	High	Low	6–24 months	24–60 months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
HAZ in 2013	–1.670***	–1.787***	–1.554***	–1.762***	–1.525***	–1.446***	–1.814***
	(0.0287)	(0.0363)	(0.0369)	(0.0350)	(0.0446)	(0.0476)	(0.0316)
HAZ in 2018	–1.568***	-1.632***	-1.507***	–1.592***	–1.528***	–1.402***	–1.687***
	(0.0248)	(0.0310)	(0.0327)	(0.0349)	(0.0369)	(0.0383)	(0.0263)
HAZ change between 2013 and 2018	-0.102***	-0.155***	–0.0467	–0.170***	0.00241	-0.0436	–0.127***
	(0.0375)	(0.0472)	(0.0490)	(0.0489)	(0.0573)	(0.0603)	(0.0412)
HAZ change accounted for by explanatory variables	–0.0963***	-0.0988**	–0.0826**	–0.102***	-0.0675	–0.126***	–0.091***
	(0.0268)	(0.0410)	(0.0328)	(0.0341)	(0.0437)	(0.0471)	(0.0254)
N	7,428	3,664	3,764	4,607	2,821	3,018	4,410

Source: 2013 is Nutritional baseline survey and 2018 is endline survey
Note: HAZ = Height-for-age *Z*-score.
Standard errors in parentheses, standard errors clustered at village level.
*** p<0.01, ** p<0.05, * p<0.1.

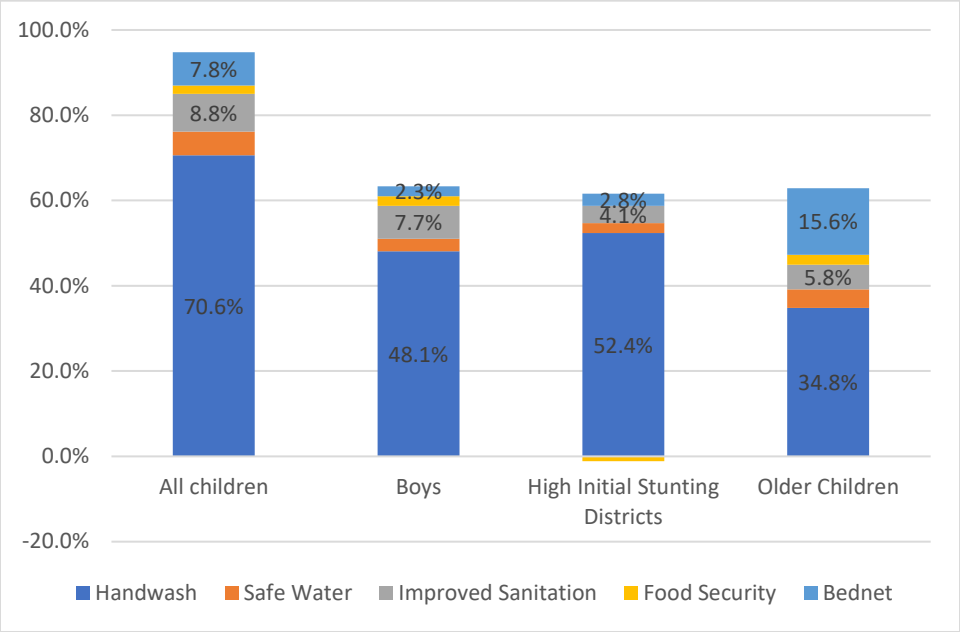
Figure 12: Changes in HAZ between 2013 and 2018



The detailed decomposition analysis has been carried out for all children, boys, older children, and districts with high initial stunting. Figure 12 shows the ability of the estimated model to explain the changes in HAZ between 2013 and 2018. For the sample of all children, the changes in the explanatory variables in the regression can explain more than 90 percent of the change in HAZ. For other samples, the model can explain 60 percent to 72 percent of the change in HAZ. Overall, the few explanatory variables elaborated later perform well in explaining change in HAZ.

The decomposition analysis is used to estimate individual contribution of explanatory variables. Though regressions were controlled for the child's age and gender (when appropriate), we focus on the contributions of factors that relate directly to WASH. Figure 13 plots the relative contributions of individual determinants to improvements in HAZ. By far the biggest contributor to improvement in HAZ is handwashing. Handwashing accounts for about 70 percent of increase in HAZ between our two survey years. The second important source of improvement in HAZ is sanitation though its contribution lags far behind that of handwashing. Access to safe water and food security also contributed, but the magnitude of contribution is rather small. For older children, sleeping under a bednet also contributed significantly, accounting for 15.6 percent of change in HAZ.

Figure 13: Contribution of Factors to HAZ Changes between 2013 and 2018



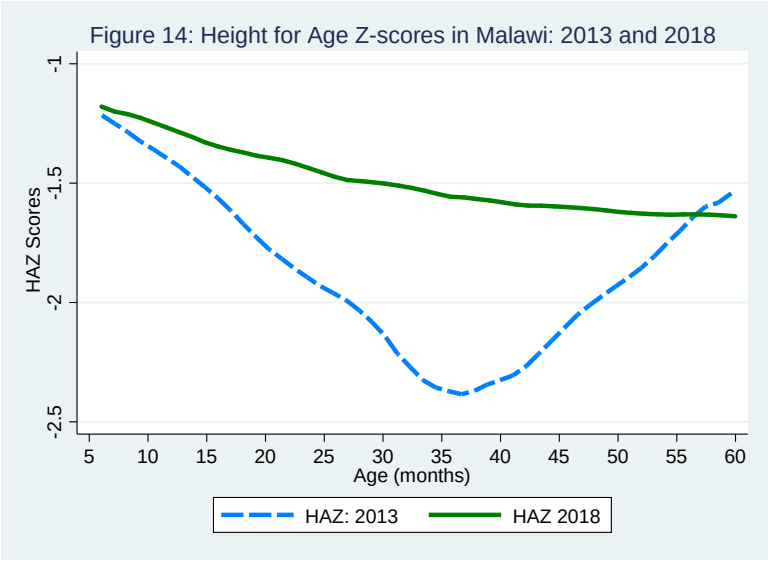
Overall, we find that the HAZ score improved considerably between 2013 and 2018, with increases more concentrated for groups that were particularly vulnerable to malnutrition (boys in Malawi's context) and in areas that had higher stunting rates in 2013. The survey data indicate quite dramatic improvement in handwashing and access to safe water and sanitation. Handwashing has been by far the most significant factor behind the improvement in HAZs between these two years. An improvement in handwashing scores requires concerted efforts of information campaigns, direct teaching and demonstrations, and other interventions. To an extent, improvement in handwashing encompasses various health and nutritional interventions, as results from the decomposition analysis suggests significant returns to those interventions. Another important point to emerge from the decomposition analysis is that the main sources of improvement in HAZ, and hence stunting, are all related to safe water and sanitation access and practices. As most of the households appear to have secured access to sanitation and safe water (more than 95 percent in 2018) and learned the practice of handwashing (score more than 4 out of 5), these margins of HAZ improvement appear to have been exhausted already. Future efforts for improvements in HAZ would have to focus more on health and nutrition interventions along with improvement in food security.

6. PROGRESS IN STUNTING REDUCTION IN MALAWI—RESULTS FROM PANEL DATA

The panel survey was restricted to 13 SNIC districts. The target sample was about 500 households with among the younger cohorts of mothers in 2013. These households had a higher probability of having another child in the 6–60 months age cohort in 2018. Though about 479 households were interviewed, some of the households could not be matched properly between the two rounds of surveys. However, a considerable number of households did not have a child

in the required age range.[3] The overall sample of households for the panel survey with complete information on child anthropometric measurements is about 297. However, the number of households with valid HAZs is about 288. Some of the households had multiple children in the required age group, increasing the sample size to 657. The sample was restricted to those households with at least one child in 2013 and another in 2018 in the same age group (6–60 months). The overall sample for the regression analysis is 280 households.

Figure 14: HAZs in Malawi: 2013 and 2018



The stunting rates among our sample of panel households was about 40 percent in 2013, falling to 37 percent in 2018. The trend in improvement in the stunting rates among panel households is nearly identical to the national trend. Figure 14 displays the age profile of HAZs for 2013 and 2018. While the overall changes in HAZs appear to be similar to that at the national level (Figure 11 in decomposition analysis), the progress is better for the 30 to 45 months age group in the panel sample. HAZs for this age group in 2013 in the panel sample is much smaller than that at the national level. This is perhaps due to the fact that SNIC projects have been targeted toward districts with high initial levels of stunting. The panel sample also has a larger number of boys than girls (51:49) than the national sample (50:50). Given the small sample size, a distinction between geographic areas is not possible.

The summary statistics for panel households are shown in Table 8. As with the national sample, the increase in handwashing score is significant and of similar order as for the country itself. Trends among most of the other statistics are also comparable to national trends. One area where the panel households are faring better is in number of ANC visits. About 47 percent of mothers had four-plus ANC visits in 2013, which increased by 5.5 percentage points by 2018. In the cross-sectional sample, there was no change in ANC visits between 2013 and 2018. The improvement in the ANC visits in the panel sample is expected, as the panel survey was carried out in districts that were targets of SNIC projects. The change in the number of ANC visits will also help explore its impact on child nutrition while comparing children from the same households.

3. The loss of observations in the panel analysis is due to the restriction that households must have at least one child below five years of age in both rounds of the survey. Some loss is also because the endline survey did not collect anthropometric information for children below six months of age.

Table 8: Characteristics of Panel Sample in 2013 and 2018 CBN Surveys

	2013			2018			Test of difference in mean	
	Mean	**SD**	***N***	**Mean**	**SD**	***N***	**Difference**	***P*-value**
HAZ score	–1.675	1.437	288	–1.515	1.306	369	0.160	0.137
Proportion of households that are food secure	0.293	0.456	297	0.338	0.474	379	0.045	0.215
Proportion of households with improved sanitation	0.970	0.172	297	0.976	0.152	379	0.007	0.600
Handwash scores	2.345	0.915	291	4.092	1.161	379	1.748	0.000
Proportion of households with improved water	0.875	0.331	297	0.929	0.258	379	0.053	0.019
MDD	0.350	0.474	287	0.150	0.344	375	–0.200	0.000
Proportion of households that eat iron-rich food	0.309	0.455	264	0.198	0.390	377	–0.111	0.001
Diarrhea incidence	0.314	0.462	295	0.386	0.433	309	0.073	0.046
Never breastfed	0.010	0.100	296	0.000	0.000	301	-0.010	0.080
Mother's BMI <18.5	0.054	0.226	297	0.032	0.175	379	-0.022	0.151
Mother's height <155 cm	0.367	0.483	297	0.409	0.492	379	0.042	0.268
4+ ANC visits	0.473	0.500	292	0.528	0.500	345	0.055	0.168
Delivery in health facility	0.835	0.366	297	0.948	0.220	375	0.113	0.000
Household head's education = primary	0.660	0.475	297	0.702	0.458	379	0.042	0.246
Household head's education >primary	0.239	0.427	297	0.264	0.441	379	0.025	0.462

Source: 2013 is Nutritional baseline survey and 2018 is endline survey

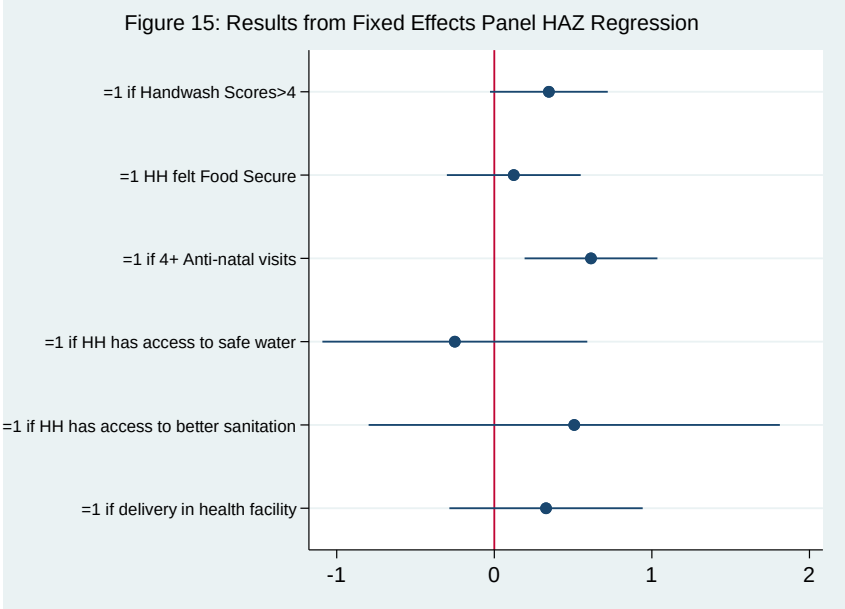
Note: HAZ = Height-for-age *Z*-score; SD = Standard deviation; MDD = Minimum dietary diversity; BMI = Body mass index; ANC = Antenatal care.

The panel regressions included household-level fixed effects to wipe out any confounding unobservable factors that are common to the household. These would include, for instance, home environment, parental characteristics, and village characteristics that are common to children growing up in the same household. Parental characteristics include parental education; income; mothers' health and well-being (for example, height, BMI, and so on); and genetics (which are unobservable). Village-level variables include observable and unobservable village infrastructure, weather, and environmental factors. Some household environment variables are air pollution due to cooking or smoking, as well as emotional and psychological factors that result from adult interactions. The household-level fixed effects control these observable and unobservable variables. However, the estimates should be considered as lower-bound estimates. Many health and nutritional interventions have positive spillover effects in the sense that households benefit not only from their own actions, but also from their neighbors' actions (for example, open defecation). The fixed effects also wipe out these beneficial spillover effects. On the other hand, sometimes variant unobservable variables at the household and village levels can confound the estimates as well. The inclusion of an intercept term in the regressions is expected to control for common time trends between the two survey rounds.

Considering the small sample size, the regression analysis took a stepwise approach by running bivariate regressions focusing on one regressor at a time. This stepwise preliminary analysis (omitted here) helped narrow down the list of explanatory variables to be used in the final regressions. The preliminary analysis also indicated that in the case of handwashing, having a score of 5 mattered for stunting reduction in the panel sample, as opposed to scores of 4 or more in the cross-sectional regressions in the decomposition analysis.

The results from the fixed-effects panel regression are presented in Figure 15, which plots the estimated coefficients and their respective 95 percent confidence intervals. The regression is controlled for the child's age and gender.

Figure 15: Results from Fixed-Effects Panel HAZ Regression



Among the key variables, only two are statistically significant: four-plus ANC visits and a handwash score of more than 4. The handwash result is consistent with the decomposition regressions. The effect of handwashing is somewhat muted in the panel regression. This could be because, as a hygiene measure, the impact of handwashing could involve positive externality, which is wiped out in the fixed-effects regression.

Access to sanitation and health facility delivery have a positive coefficient in the HAZ regression but are not statistically significant at 5 percent level, partly because of a smaller sample size. The panel regression in Figure 15 indicates that ANC is the most significant determinant of HAZ. In other words, the stunting outcome of a child from the second pregnancy is significantly better than a child from the first pregnancy of the same mother, if the mother has visited a health facility/health care giver at least four or more times during the second pregnancy but not during the first. With the simple cross-sectional analysis, we were not able to detect this correlation, perhaps due to the presence of confounding factors that are controlled for in the panel regression. This could also be because panel households come from districts where nutritional projects actively promoted ANCs much more than the country did as a whole.

We also explored whether the impact of ANC on HAZs varied by initial conditions and socioeconomic factors. Instead of splitting the sample, we used interaction terms to estimate the differential impacts. To improve efficiency of estimation, access to water and food security variables were dropped. The regressions' results are reported in Table 9. Column 1 of Table 9 reports the results when impacts of ANC visits can vary by gender. The omitted category is girls*fewer than four ANC visits. The results show that both boys and girls benefit from their mother's four-plus ANC visits, but the benefit is numerically larger for girls than for boys.

Table 9: ANC Visits and HAZ: Results from Fixed-Effects Panel Regressions

Variables	HAZ	HAZ	HAZ	HAZ
	(1)	(2)	(3)	(4)
Boy*4+ANCVisit (yes)	0.387**			
	(0.194)			
Boy*4+ANCVisit (no)	-0.0728			
	(0.284)			
Girl*4+ANCVisit (yes)	0.573***			
	(0.198)			
Older kid*4+ANC (yes)		0.402*		
		(0.240)		
Older kid*4+ANC (no)		0.288		
		(0.362)		
Younger kid*4+ANC (yes)		0.838***		
		(0.196)		
Mother tall*4+ANC (yes)			1.016***	
			(0.337)	
Mother tall*4+ANC (no)			0.518	
			(0.356)	
Mother short*4+ANC (yes)			0.492*	
			(0.274)	
Education <secondary school level*4+ANC (yes)				0.449**
				(0.212)
Education <secondary school level*4+ANC (no)				–0.149
				(0.269)
Education >secondary school level*4+ANC (yes)				0.370

Variables	HAZ	HAZ	HAZ	HAZ
				(0.240)
Handwash score >4	0.321*	0.309*	0.330*	0.322*
	(0.187)	(0.171)	(0.187)	(0.183)
Access to improved sanitation	0.456	0.467*	0.467	0.467
	(0.288)	(0.274)	(0.290)	(0.285)
Delivery in a health facility	0.434*	0.460*	0.503*	0.435*
	(0.244)	(0.259)	(0.258)	(0.240)
Observations	498	498	498	498
R-squared	0.080	0.101	0.096	0.080
Number of households	280	280	280	280

Source: 2013 is Nutritional baseline survey and 2018 is endline survey Note: HAZ = Height-for-age *Z*-scores; ANC = Antenatal care.
Older kids: 24–60 months of age; younger kids: 6–24 months; mother tall: height >155 cm; mother short: height ≤ 155 cm; standard errors in parentheses, standard errors clustered at village level.
*** p<0.01, ** p<0.05, * p<0.1.

Next, we look at whether the benefits of the ANC visits are different for older (24–60 months) children than they are for younger children (6–24 months). The estimates in Column 2 of Table 9 show that while both benefit from four-plus ANC visits, the benefits for younger children are twice as large as those for older children. Two socioeconomic indicators, which are observed to be important for child's stunting outcomes, are considered. The mother's height is perhaps the most important determinant of a child's HAZ. To see if benefits of the ANC visits vary by mother's height, the mothers were divided into two groups: tall when height is greater than 155 cm and short otherwise. The omitted category in this case is mothers who are short and did not make four-plus ANC visits. Relative to that group of mothers, HAZs of children of all other mothers are significantly higher. However, four-plus ANC visits increased HAZs by 0.49 for children of short mothers. This increase is large enough to close the gap that children of shorter mothers suffer relative to tall mothers who did not make four-plus ANC visits. In other words, four-plus ANC visits by mothers of shorter stature can eliminate the disadvantage their children are born with. On the other hand, four-plus ANC visits help children of tall mothers as well, and the marginal benefit is of the same magnitude as that for children of short mothers. Apart from mother's height, a household's economic condition tends to have a strong impact on children's HAZs. The education of a household's head is a key indicator of the household's economic well-being. Households are divided into two groups differentiated by the head's education: whether the head's education is above or below secondary level. The results reported in Column 4 of Table 9 show that four-plus ANC visits matter most for children in households whose head is relatively uneducated (below secondary education). The ANC visits benefit children in relatively more educated households as well, but the coefficient is not precisely estimated and is smaller in magnitude than that for less educated households. In other words, the ANC visits tend to benefit children from poorer households more. This could be because mothers from richer households have better nutrition and may also tend more toward ANC visits than mothers from poorer households to begin with. More frequent ANC visits are associated with better pregnancy outcomes, reduced pregnancy complications, and improved maternal weight gain, all of which could be responsible for the contribution to nutritional improvement. While one may expect an improvement of HAZ at birth due to more frequent ANC visits, Figure 6 does not show such improvement at six months of age.[4] It is possible that the ANC visits help improve mothers' knowledge of how to take care of children once they are born, thus, having a longer-term effect beyond birth weight or height.

4. HAZ at birth cannot be computed because the anthropometric data were not collected for children below six months of age.

The results from fixed-effects panel regressions confirm the role of handwashing and sanitation in reducing stunting in Malawi, as highlighted in decomposition analysis. The panel regressions point to important policy levers in combating stunting. The ANC visits are found to benefit all children significantly but more so the children from poorer socioeconomic backgrounds. While Malawi made remarkable strides in hygiene and sanitation measures, only half of the mothers in 2018 made four-plus ANC visits. The broader benefits of the ANC visits suggest that they should be an important element of future health and nutrition initiatives for eliminating childhood malnutrition in Malawi.

7. DISCUSSION AND CONCLUSION

The findings of the endline survey confirm the positive trends observed in childhood malnutrition in Malawi. Between 2013 and 2018, nutrition indicators improved, and the percentage of children under five years who were stunted fell from 42 percent in 2013 to 37 percent in 2018. Current trends in nutrition do seem to level off slightly, with no further improvements observed between DHS 2016 (NSO 2017) and the CBN survey 2018.

The prevalence of child undernutrition is known to vary by season in Malawi, and efforts were made to conduct the endline survey in the same season as the baseline survey, which was conducted in November to December 2013. Due to some unforeseen delays, the endline survey was conducted slightly later in the year, in January to February 2018. Both endline and baseline surveys were conducted in the lean cropping season, which, contrary to expectations, has been associated with a lower risk of stunting and underweight in children (Humphrey et al. 2019). We therefore do not expect that seasonality has affected the observed differences in nutritional status, dietary intake, and morbidity indicators between baseline and endline.

For Malawi, to meet Sustainable Development Goal 2 of further reducing stunting and wasting levels and eliminating childhood malnutrition by 2030, nutrition programs across the country must be strengthened; findings of the CBN 2018 Survey provide some suggestions to inform future programming.

The findings from the cross-sectional, decomposition, and panel data suggest that improvements in WASH, in particular handwashing, and ANC practices were largely responsible for the observed improvements in child nutrition. There has been a strong emphasis on improved handwashing practices as part of a larger effort to improve WASH in the NECS in Malawi in recent years, which could partly explain these findings as they may reflect improvements in general hygiene and care practices. The relationship between WASH indicators and child stunting is currently being debated (Gera, Shah, and Sachdev 2018). Two recent meta-analyses did not find a significant effect of improved WASH practices on stunting (Gera, Shah, and Sachdev 2018; Nguyen et al. 2017). However, recent analyses on drivers behind improved stunting levels in several countries consistently identified improvements in hygiene as one of the important underlying determinants of nutritional change (Headey, Hoddinott, and Park 2016; Nguyen et al. 2017). These findings and our findings in Malawi seem to suggest that the relation between improved hygiene (handwashing) and reduced stunting may be context specific.

Attending the ANC visits and having a skilled birth attendant at delivery were also important contributors to the reduction in stunting observed in Malawi. Changes in access to ANC were among the most important drivers for nutritional improvement, along with changes in household wealth and mothers' education, in recent analyses using data from surveys in Bangladesh, Nepal, Ethiopia, India, and Senegal (Headey, Hoddinott, and Park 2016). More frequent ANC visits are

associated with better pregnancy outcomes, reduced pregnancy complications, and improved maternal weight gain, all of which could be responsible for the contribution to nutritional improvement (Headey, Hoddinott, and Park 2016). In this study, we can only speculate about the mechanism behind the positive impact of more frequent ANC visits and improved nutritional outcomes as we do not have reliable data for some of these intermediary outcomes, including maternal gestational weight gain and HAZ at birth; information on maternal food intake during pregnancy was only collected at endline, and by recall. Nevertheless, the findings from the CBN surveys suggest that future nutrition programs in Malawi should further invest in improving quality and access to ANC services. These programs should target men in the communities as well because findings from the FGDs suggested that men play an important role in encouraging their wives to attend ANC sessions.

Information on ECD, household food security, and program performance was only assessed in 2018, and these important determinants of child nutrition could therefore not be included in the decomposition and panel analyses. In addition, information on some important socioeconomic indicators, such as household assets and maternal education, were also only available at endline and could therefore not be included in the decomposition and panel analyses. However, the poor scores on child development suggest that investing in more ECD centers and encouraging more children to benefit from these ECD services may further improve child development, an important underlying factor of growth and nutrition. The findings from the qualitative survey confirmed that many villages currently do not have an ECD center, while those that have such a center seem to be able to enroll most of the target children in the village. Findings from the 2018 survey further suggest that food insecurity is still an important limiting factor for optimal growth and nutrition, with one-third of the households still suffering from days with no food to eat. Despite efforts to establish income-generating activities that would improve a household's food security, such as home gardening, small livestock farming, and cash transfers, very few households participate in these activities. In addition, findings from the qualitative survey suggest that food production in these communities was constrained by the expensive farm inputs, especially high costs of fertilizer; small land hold size; and climate change, which results in drought or erratic rains and floods.

Contrary to expectations, child feeding practices did decline between 2013 and 2018, and overall, only one-fifth of the children 6 to 23 months of age were consuming a MAD. The decline in child feeding practices was significant, but could not be used to explain the observed reductions in child stunting. These findings are in contrast with most evidence showing positive associations between improved IYCF practices, in particular increased dietary diversity, and HAZ scores in children (Bhutta et al. 2013; Jones et al. 2014). Since IYCF practices directly impact dietary intakes, they are considered to affect the most direct cause of child growth and nutrition (Jones et al. 2014).

The percentage of caregivers with children under two years of age who received specific counseling on IYCF practices was low, suggesting that caregivers may lack specific knowledge and resources to implement adequate feeding practices. Information from the qualitative interviews seems to confirm this, while most mothers claim to receive most of their information on appropriate feeding practices from the CHWs, the key informant interviews with local and district authorities identified a lack of resources, particularly among the FLWs, and a lack of capacity in nutrition education among the FLWs, who are already overburdened with other responsibilities. In addition, the FGD interviews among caregivers identified some important barriers for attending GMP sessions and the supplementary feeding programs/events where mothers would typically receive nutrition counseling as well. Mothers related that they were asked to pay a fine if they had to skip a GMP session because of funerals or other obligations. This practice made them stop going for GMPs as soon as their children had received all vaccinations. Participation in the

supplementary feeding practices seemed to be biased in the selection of the beneficiaries. One mother said, "*They favor some people; you wonder why they do not choose some of our children."*

One possible explanation for the decline in IYCF practices and counseling could be that the program's increasing focus on nutrition-sensitive interventions, including WASH, ECD, and ANC practices, has unintentionally drawn away resources from the nutrition-specific interventions, particularly nutrition counseling. Among its conclusions, *the 2018 Global Nutrition Report* (Development Initiatives 2018) reported that global investments in nutrition programming were largely directed to the so-called nutrition-sensitive interventions, affecting the underlying causes of malnutrition, while investments in the nutrition-specific interventions seem to be decreasing globally (Development Initiatives 2018). The findings in Malawi do seem to confirm this trend, with a lack of coordination among different stakeholders and interventions at district and community level, lack of financial resources, and lack of capacity cited as the most important constraints for effective programming in the key informant interviews.

Future nutrition programs should therefore reinforce nutrition-specific interventions and ensure that FLWs have the capacity to counsel mothers and grandmothers on adequate feeding practices, while continuing to invest and improve coverage and access to nutrition-sensitive interventions, including ANC practices, ECD, and food security.

Finally, district-level data showed large inequalities in program performance across districts; this is reflected in district-level disparities in child nutrition status and child feeding practices. Differences in the ability to coordinate key stakeholders and allocate sufficient funding and resources among the nutrition interventions may explain the district-level differences in program performance, but the qualitative data did not allow for different district level comparisons. New geospatial data techniques have recently been used to map inequalities in child malnutrition in Africa (Osgood-Zimmerman et al. 2018) and India (Nguyen et al. 2018), and these inequalities exist in Malawi as well. The findings of the CBN Survey suggest Malawi should address these inequalities and consider more context-specific investments and program designs while moving forward.

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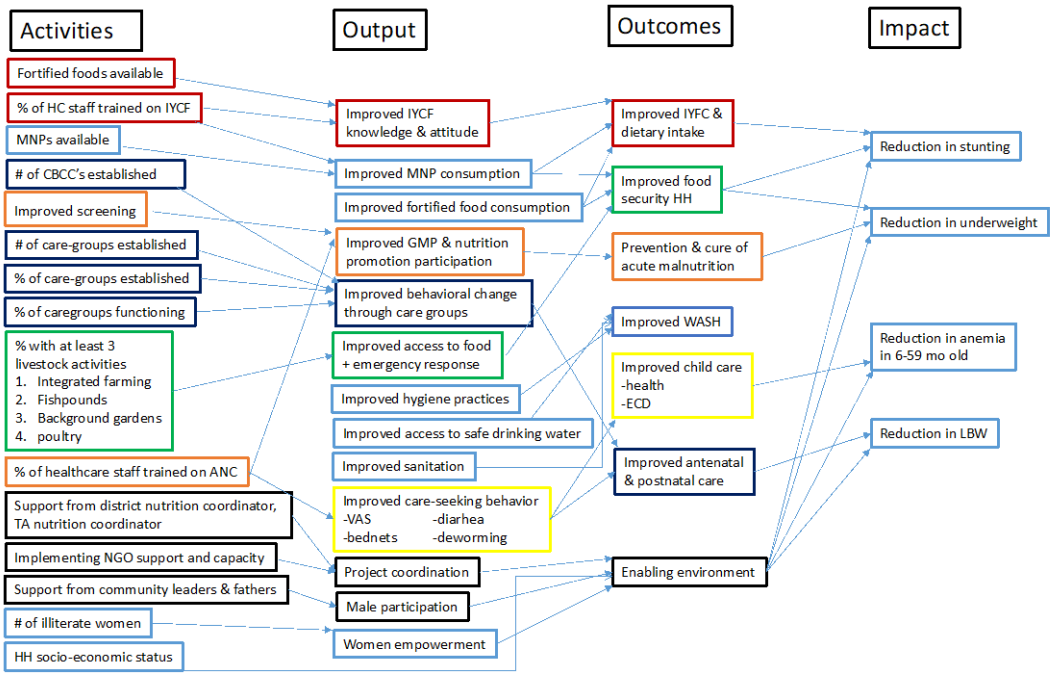
ANNEX 1. PROGRAM IMPACT PATHWAY



ANNEX 2. FINAL 2018 SURVEY QUESTIONNAIRE

Technical proposal and questionnaires/18JANUARY_CROSS SECTIONAL MALAWI CBN ENDLINE SURVEY 18JANUARY2018_SO.pdf

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Questionnaire created by pangapanga, 1/18/2018 9:06:51 PM
Last modified by pangapanga, 1/18/2018 9:06:51 PM

Not shared with anyone

Sections: 19, Sub-sections: 7,
Questions: 543.
Questions with enabling conditions: 260
Questions with validation conditions:6
Rosters: 14
Variables: 0

Survey Solutions

18JANUARY_CROSS SECTIONAL MALAWI CBN ENDLINE SURVEY 18JANUARY2018

s: 18, Static texts: 1.

ANNEX 3. TABLES WITH DISTRICT-LEVEL INFORMATION

Table 3A.1: Infant and Young Child Feeding Practices by District at Endline

	Early initiation of breastfeeding (0–23 months, by recall) (%)	Continued breastfeeding (12–15 months, by recall) (%)	Timely introduction of soft, semisolid, and solid foods (6–8 months) (%)	MDD (6–23 months) (%)	Minimum meal frequency (6–23 months) (%)	MAD (6–23 months) (%)
All	88.9	93.0	81.5	23.3	49.7	12.4
All SNIC-1 Districts						
Rumphi	89.2	100.0	61.5	34.6	33.3	13.6
Mchinji	83.0	91.7	100.0	15.1	47.2	9.4
Ntcheu	93.8	100.0	60.0	17.0	44.7	8.5
Zomba	85.7	81.3	37.5	21.7	35.0	6.7
Chiradzulu	72.9	76.5	100.0	24.6	50.9	15.8
Blantyre	79.5	100.0	81.3	20.3	47.8	11.6
Mwanza	84.9	87.5	100.0	21.7	46.4	13.0
All SNIC-2 Districts						
Mzimba	95.5	88.2	77.8	24.2	51.5	12.1
Nkotakota	88.0	100.0	70.0	18.0	52.0	14.0
Ntchisi	87.9	97.1	100.0	14.5	54.0	10.6
Mangochi	93.4	100.0	73.3	13.5	56.8	8.1
Machinga	91.6	87.5	85.7	23.9	53.3	14.1
Thyolo	88.7	100.0	81.8	28.3	47.2	13.2
Mulanje	83.7	87.5	70.0	23.8	47.6	14.3
Non-SNIC Districts						
Chitipa	88.9	80.0	75.0	48.4	32.3	12.9
Karonga	92.2	100.0	88.9	35.8	48.4	14.1
Nkhata Bay	92.5	81.3	76.5	39.5	50.0	21.1
Likoma	90.2	91.7	90.9	60.0	53.3	26.7
Kasungu	90.5	100.0	82.4	14.6	56.1	9.8
Dowa	89.9	100.0	91.7	10.8	68.9	9.6
Salima	88.2	94.1	77.8	14.6	72.9	10.4
Lilongwe	84.0	100.0	90.9	4.2	56.3	4.2
Dedza	87.9	88.2	71.4	15.4	41.5	10.8
Phalombe	88.2	94.4	66.7	28.8	33.3	18.2
Chikawa	92.6	100.0	100.0	7.5	54.7	7.5
Nsanje	93.8	100.0	83.3	8.5	40.4	4.3
Balaka	94.1	91.7	84.6	27.3	45.5	12.1

	Early initiation of breastfeeding (0–23 months, by recall) (%)	Continued breastfeeding (12–15 months, by recall) (%)	Timely introduction of soft, semisolid, and solid foods (6–8 months) (%)	MDD (6–23 months) (%)	Minimum meal frequency (6–23 months) (%)	MAD (6–23 months) (%)
Neno	94.1	90.0	75.0	39.2	43.1	19.6

Source:

Note: SNIC = Support to Nutrition Improvement Component; MAD = Minimum acceptable diet; MDD = Minimum dietary diversity.

Table 3A.2: Food Security by Program Districts

		All	Non-SNIC District	SNIC District Phase 1	SNIC District Phase 2
In the past 4 weeks due to lack of resources		*N* = 4,449 (Baseline) *N* = 4,892(Endline)	*N* = 2,444 (Baseline) *N* = 2,578 (Endline)	*N* = 919 (Baseline) *N* = 1,100 (Endline)	*N* = 1,086 (Baseline) *N* = 1,215 (Endline)
Worried that households would not have enough food (%)	Baseline	66.8	65.3	68.6	68.5
	Endline	59.6	57.6	67.5	56.8
Household members not able to eat preferred food due to lack of resources (%)	Baseline	65.2	64.3	66.1	66.5
	Endline	59.8	56.2	65.9	61.9
Household members eat just a few kinds of foods due to lack of resources (%)	Baseline	70.8	69.9	70.9	72.9
	Endline	67.7	64.0	73.8	70.0
Household members eat food they did not want to eat because of lack of resources (%)	Baseline	67.3	66.2	68.8	68.7
	Endline	61.9	58.2	68.9	63.5
Household members eat smaller meals than they need (%)	Baseline	61.0	59.3	63.2	63.2
	Endline	54.9	52.4	59.5	55.9
Household members eat fewer meals in a day (%)	Baseline	60.0	58.0	62.1	62.8
	Endline	54.1	52.4	58.0	54.2
No food at all in the household (%)	Baseline	48.8	45.5	51.5	53.8
	Endline	41.7	40.3	45.5	41.4

		All	Non-SNIC District	SNIC District Phase 1	SNIC District Phase 2
Household members went to sleep at night feeling hungry (%)	Baseline	48.2	45.5	50.1	52.8
	Endline	40.4	39.0	45.4	39.1
Household members went whole day without eating (%)	Baseline	40.1	37.9	41.9	43.3
	Endline	32.7	31.2	35.8	32.9

Source: ***2013 is Nutritional baseline survey and 2018 is endline survey***

Note: SNIC = Support to Nutrition Improvement Component.

Table 3A.3: ANC Practices by Program Districts

		All	Non-SNIC District	SNIC District Phase 1	SNIC District Phase 2
		N = 4,397 (Baseline) *N* = 4,762 (Endline)	*N* = 2,248 (Baseline) *N* = 2,271 (Endline)	*N* = 1,075 (Baseline) *N* = 1,276 (Endline)	*N* = 1,074 (Baseline) *N* = 1,215 (Endline)
Women tested for HIV when attending ANC services (Endline only) (%)	Baseline	n.a.	n.a.	n.a.	n.a.
	Endline	98.1	97.8	98.1	98.6
Ever went for ANC (%)	Baseline	98.5	98.0	98.5	99.4
	Endline	99.0	99.0	98.7	99.3
Had 4+ ANC visits (%)	Endline	52.7	53.7	53.2	50.2
	Baseline	53.1	52.9	55.2	51.2
# of ANC visits (mean [SD])	Baseline	3.7 (1.4)	3.8 (1.4)	3.7 (1.3)	3.7 (1.3)
	Endline	3.8 (2.5)	3.8 (1.3)	3.9 (4.4)	3.7 (1.4)
Received IFA during pregnancy (%)	Baseline	92.4	92.3	93.8	91.4
	Endline	90.4	92.1	90.3	87.3
# of IFA taken during pregnancy (mean # months [SD])	Baseline	2.79 (2.16)	2.88 (2.48)	2.76 (1.61)	2.63 (1.97)
	Endline	2.76 (3.22)	2.85 (3.87)	2.87 (1.75)	2.44 (3.01)
Received nutrition counseling during	Baseline	84.7	84.5	84.0	85.9
	Endline	88.5	86.7	89.1	91.4

		All	Non-SNIC District	SNIC District Phase 1	SNIC District Phase 2
pregnancy (%)					
Received BF counseling during pregnancy (%)	Baseline	86.7	86.9	86.0	87.2
	Endline	88.7	87.3	87.8	92.4
Received IYCF counseling during pregnancy (%)	Baseline	81.4	81.6	80.6	81.7
	Endline	85.7	84.7	83.4	90.0
Skilled birth attendant at delivery (%)	Baseline	79.2	78.4	82.0	78.2
	Endline	95.8*	96.0	96.1	95.0

Source: ***2013 is Nutritional baseline survey and 2018 is endline survey***

Note: SNIC = Support to Nutrition Improvement Component; ANC = Antenatal care; n.a. = Not applicable; IFA = Iron folic acid; SD = Standard deviation; BF = Breastfeeding; IYCF = Infant and young child feeding.

Table 3A.4: Early Child Development Indicators by Program Districts

	All	Non-SNIC District	SNIC District Phase 1	SNIC District Phase 2
Village has ECD center	52.4	51.1	58.9	49.1
For children < 5 years:	5,747	3,013	1,258	1,476
Household has children's books (< 5 years) (%)	6.6	6.7	5.2	7.5
Household has 3 or more children's books (%)	1.6	2.0	1.0	1.1
Played with toys—homemade (%)	40.7	37.6	43.9	44.3
Played with toys—from shop (%)	18.9	15.9	21.8	22.8
Played with toys—household objects (%)	66.4	66.1	64.6	68.8
Leaving child without adult (child > 10 years) supervision (%)	43.4	41.5	39.4	50.6
For children 24–59 months	3,268	1,662	782	824
Adults engaged with child in at least 4 activities in past 3 days (%)	46.8	41.8	46.9	56.6

	All	Non-SNIC District	SNIC District Phase 1	SNIC District Phase 2
Father engaged with child in at least 1 activity in past 3 days (%)	5.1	5.8	4.1	4.9
For children 36–59 months	2,149	1,075	535	539
Attendance of ECD program (%)	31.7	27.3	41.5	30.8
Child can identify or name at least 10 letters of alphabet (%)	24.3	21.8	30.4	23.3
Child knows the name and can recognize symbol of all numbers from 1 to 10 (%)	28.8	25.7	38.2	25.6
Child can pick up a small object with two fingers from the ground (%)	73.3	72.4	73.0	75.6
Child is sometimes too sick to play (%)	61.2	61.2	52.9	69.4
Child gets along well with other children (%)	74.2	71.2	75.7	78.8
Child gets distracted easily (%)	41.2	38.7	42.5	45.0
Child can read at least four simple, popular words (%)	22.8	16.4	30.5	27.9
Child can follow simple instructions (%)	55.2	54.9	54.3	56.7
When given something to do, child can do it independently (%)		49.2	51.9	50.8
Child on track in literacy domain (%)	23.4	20.0	32.3	21.5
Child on track in physical domain (%)	60.0	59.9	52.2	67.4
Child on track in socioemotional domain (%)	62.5	63.9	63.2	59.1
Child on track in learning domain	60.4	59.7	59.8	62.4
ECDI (at least 3 out of 4 development domains on track) (%)	35.6	35.5	35.7	35.6

Source: ***2013 is Nutritional baseline survey and 2018 is endline survey***

Note: SNIC = Support to Nutrition Improvement Component; ECD = Early child development; ECDI =. Early Childhood Development Index. **[[Formatting: Pls. remove hanging indent.]]**

Table 3A.5: Use of Community-Based/Program Services by Program Districts

		All	Non-SNIC District	SNIC District Phase 1	SNIC District Phase 2
	Households with child <2	*N* = 2,864 (Endline)	*N* = 1,494 (Endline)	*N* = 676 (Endline)	*N* = 694 (Endline)
Children < 2 years benefiting from monthly care groups in extended family (%)	Baseline	n.a.	n.a.	n.a.	n.a.
	Endline	46.2	43.9	27.7	65.4
	Households with child <5	*N* = 4,316 (Baseline) *N* = 4,891 (Endline)	*N* = 2,209 (Baseline) *N* = 2,399 (Endline)	*N* = 1,049 (Baseline) *N* = 1,277 (Endline)	*N* = 1,058 (Baseline) *N* = 1,215 (Endline)
Went for GMP in past 4 weeks (child < 5 years) (%)	Baseline	58.9	58.2	59.8	59.6
	Endline	57.7	58.9	56.6	57.7
	Households with child <2	*N* = 2,864 (Endline)	*N* = 1,494 (Endline)	*N* = 676 (Endline)	*N* = 694 (Endline)
Access to IYCF info from FLW in past 4 weeks (child < 2 years) (%)	Baseline	n.a.	n.a.	n.a.	n.a.
	Endline	28.4	31.1	28.7	21.3
	All	*N* = 4,891 (Endline)	*N* = 2,398 (Endline)	*N* = 1,278 (Endline)	*N* = 1,215 (Endline)
Households that benefited from social cash transfer in last 4 weeks (%)	Baseline	n.a.	n.a.	n.a.	n.a.
	Endline	8.5	9.6	7.2	7.7
Households involved in small livestock farming (%)	Baseline	n.a.	n.a.	n.a.	n.a.
	Endline	4.2	2.9	2.9	8.1
Households involved in fish farming (%)	Baseline	n.a.	n.a.	n.a.	n.a.
	Endline	0.7	0.9	0.2	1.0
Households involved in kitchen garden farming (%)	Baseline	n.a.	n.a.	n.a.	n.a.
	Endline	8.9	10.0	5.2	10.5

		All	Non-SNIC District	SNIC District Phase 1	SNIC District Phase 2
Households involved in poultry farming (%)	Baseline	n.a.	n.a.	n.a.	n.a.
	Endline	28.5	28.6	28.8	27.9
	All	*N* = 4,349 (Baseline) *N* = 4,841 (Endline)	*N* = 2,234 (Baseline) *N* = 2,398 (Endline)	*N* = 1,049 (Baseline) *N* = 1,278 (Endline)	*N* = 1,066 (Baseline) *N* = 1,215 (Endline)
Access to nutrition services outside home (%)	Baseline	24.8	25.0	22.0	27.2
	Endline	27.5	28.9	22.3	30.0
FLW visited home in past 4 weeks (%)	Baseline	23.0	21.4	23.8	25.3
	Endline	24.8	28.3	21.4	21.7
Received any CHW services in past 4 weeks (%)	Baseline	22.8	22.1	20.9	25.7
	Endline	27.3	28.5	25.4	26.8

SOURCE: *2013 is Nutritional baseline survey and 2018 is endline survey*

Note: n.a. = Not applicable; CHW = Community health worker; GMP = Growth monitoring and promotion; IYCF = Infant and young child feeding; FLW = Frontline worker; SNIC = Support to Nutrition Improvement Component.

Childhood malnutrition is still a public health concern in Malawi. Since 2013 the government of Malawi (GoM) has been implementing a large-scale multisectoral nutrition program, which expanded to all districts of the country with the World Bank Group and other donor funding. At the start of this program a national baseline survey was conducted, and in early 2018, an endline survey was conducted. The endline survey followed a mixed-methods approach similar to the 2013 baseline survey, using both quantitative and qualitative data collection measurements. An Oaxaca-Blinder decomposition analysis was used to determine the pathways that contributed most to the program's success. In addition, a panel dataset was constructed to compare the nutritional outcomes of children within the same household who were born before and after the program intervention. The findings of the endline survey confirm the positive trends observed in childhood malnutrition in Malawi. Between 2013 and 2018, nutrition indicators improved and the percentage of children under age five who were stunted fell from 42 percent in 2013 to 37 percent in 2018. Improvements were observed in some underlying factors: the percentage of deliveries attended by a skilled birth attendant and handwashing both improved significantly between 2013 and 2018. The findings from the decomposition analysis and cross-sectional and panel data suggest that improvements in water, sanitation, and hygiene (WASH), in particular, handwashing and antenatal care (ANC) practices, were largely responsible for the observed improvements in child nutrition. The findings of the Community-Based Nutrition (CBN) Survey further suggest that the country should consider investing in more coordination and capacity at the district and community levels and should address inequalities in program performance across districts, delivering more context-specific investments and program designs while moving forward.

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