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Impact evaluation of WFP's programs targeting moderate acute malnutrition in humanitarian situations in Chad

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Summary

This study focuses on the interrelation between prevention and treatment of moderate acute malnutrition (MAM) on children aged 6–23 months. Although MAM affects an estimated 33 million children worldwide and is associated with more nutrition-related deaths than severe acute malnutrition (SAM) (IAEA 2014), the most effective way of addressing MAM is still not understood (Wegner et al. 2015).

The study took place in the Bahr el Ghazal (BEG) region of Chad. Chad is a landlocked, arid, low-income and food-deficit country, and one of the world's poorest countries (in 2015, it ranked 185 out of 188 countries in the UNDP Human Development Index, and 73 out of 78 on the Global Hunger Index). A number of conflicts (internal and in neighboring countries) have aggravated the high levels of poverty in Chad during the last few years that have contributed to political and economic instability and poor economic development.

In 2015, about one fourth of the population in Chad were food insecure, including 6 per cent who were severely food insecure (Ministère de l'Agriculture-SISAAP et al. 2015). The highest food insecurity rates are found in the Sahel, particularly in BEG (85.3%). Global acute malnutrition (GAM) and SAM rates in the Sahel belt in Chad have remained consistently high. GAM rates exceed 15 per cent during the lean season (June–September) every year and during humanitarian crises, but are high in both emergency and non-emergency contexts. The yearly estimated burden of cases for SAM is close to 200,000 and 500,000 for MAM.

WFP has a number of ongoing interventions to prevent and address MAM in Chad, all including a targeted supplementary feeding program (TSFP) for children aged under five years (under-fives) and pregnant and lactating women in areas where GAM exceeds 10 per cent, and a blanket supplementary feeding program (BSFP) during the lean season in areas of high food insecurity where GAM exceeds 15 per cent.

BSFP aims to *prevent* a deterioration of the nutritional status of individuals identified as vulnerable through food security and nutrition assessments. TSFP aims to *treat* moderately malnourished individuals identified through anthropometric screening within the Ministry of Health primary healthcare system and following national MAM protocols based on standard WHO (2012) guidance (MSP-CNNTA 2014).

The study assesses the impact of WFP's preventive intervention (BSFP) for children aged 6–23 months during the lean season on program beneficiaries' nutritional status and seeks to answer the study's primary evaluation question: What is the difference in impact of MAM prevention (BSFP) on the incidence and prevalence of MAM in acute and protracted emergencies on children under two years of age when access to MAM treatment (TSFP) is good or poor*?*

The study uses quasi-experimental methods to capture the effect of BSFP on beneficiaries. Study sites were identified through a list of BSFP beneficiary villages. In order to construct a counterfactual, two study groups were identified: those who received all planned BSFP distributions (intervention group) and those who did not receive any BSFP (control group). Some 766 children were allocated to the treatment group, while 464 were in the control group and received no BSFP. An analysis of covariates

(ANCOVA) approach was employed to control for unobserved child characteristics, while instrumental variables were used to test for selection bias of the program. Attrition bias was addressed using a two-stage Heckman estimator. Three main hypotheses were tested with the following results.

- **Hypothesis 1**: *BSFP reception has a positive effect on the incidence of MAM in the target group (6–23 months).*
  - Findings: Statistical models provide strong evidence that the effect of receiving all planned BSFP distributions significantly reduces MAM incidence for children in the intervention group.
- **Hypothesis 2**: *BSFP reception together with access to TSFP has a more positive impact on the incidence of MAM than reception of BSFP alone*.
  - Findings: (a) MAM incidence is lower in the BSFP group when access to TSFP is good (distance to health center or mobile clinic is less than two hours), and (b) BSFP is more effective among those who have poor access to TSFP.
- **Hypothesis 3**: *BSFP reception has positive spillover effects on the incidence of MAM among siblings*.
  - Findings: MAM incidence for children 24–59 months is 4 percentage points lower if a younger sibling receives BSFP than if no younger sibling receives BSFP.

Heterogeneity of the effect of BSFP was tested with respect to the study variables: gender, age, number of siblings aged less than 60 months, number of income sources, main household livelihood source, water and sanitation conditions, BSFP product type, other seasonal assistance received and BSFP ration sharing patterns. A statistically significant effect was found with respect to the main livelihood source: BSFP has a significant and positive effect for those whose main livelihood source is agriculture.

Due to geographical targeting for assistance being limited and seasonal, WFP does not cover 100 per cent of the target populations. Thus, alternate funding mechanisms and earlier mobilization of resources should be established to extend geographical and individual coverage of BSFP interventions. Furthermore, starting negotiations with relevant partners earlier can improve coordination among key stakeholders.

The study highlighted that further research may be needed to better understand the particular interactions between BSFP and potential external factors that can have an impact (such as other seasonal interventions). Improved coordination with agencies can assist in producing alternative ways to manage MAM. Additionally, with the promotion and use of locally produced products, alternate routes for cost-effectiveness can be explored; especially in combination with community-based delivery approaches and increases in TSFP coverage.

The impact evaluation therefore concludes that BSFP has a positive effect on MAM incidence in children aged 6–23 months during the lean season. There is some evidence that BSFP especially protects the older age group within that range and strong evidence that BSFP protects households subject to seasonal livelihoods (agriculture and herding). Households with more access to TSFP (closest to health center or mobile clinic) also have lower MAM incidence.

Contents

Acknowledgements .... **i**
Summary .... **ii**
List of figures and tables .... **v**
Abbreviations and acronyms .... **vii**
1. Introduction **1**
1.1 Study rationale 1
1.2 Evaluation questions 1
1.3 Evaluation design (summary) 2
1.4 Structure of the report 3
2. Summary of intervention, theory of change and research hypotheses **4**
2.1 Description of WFP intervention (summary) 4
2.2 Theory of change and key assumptions 4
2.3 Primary outcomes and impacts of interest 6
3. Context **7**
3.1 General context 7
3.2 Food security and nutrition context 9
3.3 Institutional and policy context for nutrition 10
3.4 Study site selection 10
3.5 Criteria for assessing the external validity and representativeness of the sample 12
4. Timeline of the evaluation **12**
5. WFP interventions the study is concerned with **13**
5.1 WFP programming in Chad 13
5.2 Targeted supplementary feeding program 17
6. Evaluation design, methods and implementation **18**
6.1 Ethical guidelines 18
6.2 Evaluation strategy 19
6.3 Data collection 23
6.4 Dataset construction 25
6.5 Limitations of the study 27
7. Impact analysis and results of the key evaluation questions **28**
7.1 Introduction to the analysis 28
7.2 Summary of results of the analysis 29
7.3 Sample and study group distribution 30
7.4 Nutritional status of children in the sample 32
7.5 Impact analysis and results of key evaluation questions 36
7.6 Cost analysis 46
8. Discussion **47**
8.1 Internal validity 47
8.2 Summary of interpretation of results of the impact analysis 48
8.3 Seasonality 51
9. Specific findings for policy and practice **55**
9.1 Extended geographical targeting for BSFP, with no beneficiary quotas 56
9.2 Improved timeliness for seasonal food assistance 57
9.3 Grant combined seasonal assistance for the most vulnerable 57
9.4 Better access to TSFP 58

Online appendices **60**
References **61**

List of figures and tables

Figure 1: Theory of Change 6
Figure 2: Regional prevalence of GAM in Chad: 2015 and 2016 comparison 9
Figure 3: Trends in GAM and SAM prevalence in the BEG region 11
Figure 4: Timeline for the field data collection for the impact study 12
Figure 5: Sample selection process 22
Figure 6: Sample selection and allocation of study groups 24
Figure 7: Changes in nutritional status in the global sample 32
Figure 8: Chad seasonal calendar for a typical year 51
Figure 9: Household asset ownership (endline versus baseline) 52
Figure 10: Percentage of households with different numbers of revenue sources (baseline versus endline) 53
Figure 11: Percentage of households for each main source of income (baseline versus endline) 53
Figure 12: Proportion of household expenditures (baseline versus endline) 54
Figure 13: Proportion of food consumed by families from different sources (baseline versus endline) 54
Figure 14: Proportion of households owning at least one animal 55
Figure 15: Child diet diversity score (endline versus baseline) 55

Table 1: Sub-prefecture of Mandjoura 15
Table 2: Sub-prefecture of Salal: Salal and Kounal distribution sites 15
Table 3: Sub-prefecture of Salal: Saaf and Soudoune distribution sites 15
Table 4: Sub-prefectures of Fizigui and Amsilep 16
Table 5: Total number of beneficiaries by intervention, per sub-prefecture 16
Table 6: Schedule of 2016 WFP seasonal food assistance distributions 17
Table 7: Sample distribution by geographical origin (sub-prefecture) 30
Table 8: Sample distribution by age and gender 31
Table 9: Distribution of the sample by study group and by gender 31
Table 10: Distribution of study group by sub-prefecture 32
Table 11: Nutritional status of children aged 6–23 months at baseline by age and gender 33
Table 12: Nutritional status of children aged 6–23 months at endline by age and gender 33
Table 13: Changes in nutritional status of children aged 6–23 months from baseline to endline 34
Table 14: Nutritional status of children aged 6–23 months at baseline by sub-prefecture 34
Table 15: Nutritional status of children aged 6–23 months at endline by sub-prefecture 34
Table 16: Endline nutritional status of children aged 6–23 months by study group 35
Table 17: Nutritional status of children aged 24–59 months at baseline, by age and gender 35
Table 18: Nutritional status of children aged 24–59 months at endline, by age and gender 35
Table 19: Endline nutritional status for children aged 24–59 months by study group 35

Table 20: Overview of models 38
Table 21: Overview of results of the empirical analysis 39
Table 22: Impact of BSFP reception on MAM incidence 40
Table 23: Correlation between MAM endline status and distance to TSFP (%) 41
Table 24: Effect of TSFP access (more/less two hours) on MAM incidence in BSFP group 41
Table 25: Interaction effect of BSFP and TSFP access (more/less than two hours) on MAM incidence 42
Table 26: BSFP impact for siblings aged 24–59 months 43
Table 27: Heterogeneity analysis 45
Table 28: Nutritional status at endline by study group 46
Table 29: BSFP cost analysis in BEG (June–November 2016) 47

Abbreviations and acronyms

ANCOVA	Analysis of Covariance
BEG	Bahr el Ghazal
BSFP	Blanket Supplementary Feeding Program
CAR	Central African Republic
CH	National Harmonized Framework (*Cadre Harmonisé)*
CMAM	Community-based Management of Acute Malnutrition
CNNTA	National Center for Nutrition and Food Technology
DDS	Diet Diversity Score
DNTA	Directorate for Nutrition and Food Technology
ECHO	European Commission's Directorate-General for European Civil Protection and Humanitarian Aid Operations
ENA	Emergency Nutrition Assessment
FANTA	Food and Nutrition Technical Assistance Project
GAM	Global Acute Malnutrition
H	Hypothesis
HH	Household
IPW	Inverse Probability Weights
IPWRA	Inverse Probability Weights with Regression Adjustment
INSEED	National Institute of Statistics and Economic and Demographic Studies
MAM	Moderate Acute Malnutrition
MICS	Multiple Indicators Cluster Survey
MoH	Ministry of Health
MUAC	Mid-Upper Arm Circumference
n-BSFP	no BSFP distributions
OLS	Ordinary Least Squares
PLW	Pregnant and Lactating Women
PRRO	Protracted Relief and Recovery Operation
REACH	Renewed Efforts against Child Hunger
SAM	Severe Acute Malnutrition
SMART	Standardized Monitoring and Assessment of Relief and Transitions
SUN	Scaling-Up Nutrition
TFA	Targeted Food Assistance
TSFP	Targeted Supplementary Feeding Program
UNEG	United Nations Evaluation Group
UNSCN	United Nations System Standing Committee on Nutrition
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme

1. Introduction

1.1 Study rationale

This study focuses on the interrelation between prevention and treatment of moderate acute malnutrition (MAM) because the most effective way of addressing MAM is still not understood (Wegner et al. 2015). There are no globally agreed-upon guidelines for the prevention and management of MAM[1] to carry out nutrition-specific and sensitive interventions in different contexts. While there is substantial interest in MAM interventions to prevent severe acute malnutrition (SAM) and relapses into SAM, MAM prevention and treatment programs suffer from low coverage compared with SAM interventions.

Research is limited because treatment and prevention have different aims and target different populations (treatment targets MAM cases and prevention targets non-MAM cases). However, in practice, there is sometimes an unintentional overlap between the two, especially when uptake of MAM treatment is low, as in the case of Chad, and where MAM prevention is often a seasonal intervention that is only implemented in the lean season through a blanket supplementary feeding program (BSFP).

The general consensus is that short-term solutions for addressing acute malnutrition, such as treatment, need to be integrated with longer-term prevention interventions within other sectors such as health, WASH (water, sanitation and hygiene) and food security, as the only way to reduce the incidence of malnutrition in a sustainable manner (Bloss et al. 2004). In the context of Chad, this means ensuring that food insecurity and other seasonal factors linked to an increase in infections or inadequate caring practices are taken into consideration to reduce seasonal peaks in wasting (Action Against Hunger 2013).

The evaluation findings are expected to provide insights for nutrition actors in Chad on the best design for addressing MAM in-country and provide inputs into the current national nutrition protocols, as well as influence WFP's MAM programs through its partners.

1.2 Evaluation questions

The primary evaluation question of the study is: What is the difference in impact of MAM prevention (BSFP) on the incidence and prevalence[2] of MAM in acute and protracted emergencies on children under two years of age when access to MAM treatment (TSFP) is good or poor?

---

[1] The MAM Decision Tool developed and published under the Inter-Agency Standing Committee's Global Nutrition Cluster, MAM Task Force, 2014

[2] Incidence of MAM is defined as the number of new cases of MAM over a defined period of time. Prevalence is the total number of MAM cases at a certain point of time. Because the estimated duration of an episode of MAM is 3–4 months, in this particular study MAM prevalence at endline equals the number of new incident cases of MAM during the period between both measurements (baseline: June–July 2016, and endline: November 2016). Hereafter, we will only use the term "incidence" in the present report.

In particular, our study focuses on the effect of prevention as well as the interaction between prevention and intervention. The following secondary questions were investigated:

- What is the effect of prevention on MAM status of children aged 6–23 months during the lean season?
- Are there any gender differences in impacts?
- Are there any age differences in impacts?
- Are there any age differences in impacts? (The siblings of BSFP recipients aged 24–59 months will also be included for anthropometric measurement.)

1.3 Evaluation design (summary)

The study was designed as an impact study to capture the effect of WFP's prevention and treatment programs using two measurement points, a baseline survey in June–July 2016 and an endline or follow-up survey in November 2016, at either side of WFP's lean season programming. The two data collection points allowed the analysis to control for baseline nutritional status and therefore to control for unobserved child-specific characteristics.

The study identified two study groups:

- BSFP group (intervention group): those who received all planned BSFP distributions
- n-BSFP group (control group): those who did not receive any BSFP distributions

Distance to the nearest health center was used as a proxy for access to TSFP, as physical distance determines the likelihood of a child's access to WFP supported services. This was measured as part of the study and used in the analysis (this is further explained in section 6 on the design of the study).

For both study groups, the same children were surveyed for the baseline and endline surveys, focusing on children's height measuring 60.0–87.0 cm (aged 6–23 months) and their siblings (aged 24–59 months).[3] In addition, the study collected household data through a household survey, to control for observed household-specific characteristics.

1.3.1 Fidelity to the pre-analysis plan

The methodology finally applied and presented in this report differs from the pre-analysis plan submitted in May 2016 mainly in two aspects.

Research questions

Due to budgetary and operational constraints, the following modifications have been made to the initial research questions:

- The question "What is the cost of the prevention intervention over the same time period?" was removed from the study due to budgetary issues, as explained in section 6.5 on limitations of the study, although a retrospective basic cost analysis based on data estimates provided by the WFP country office has been included in section 7.6

[3] The criterion "length/height" was used for the classification of children, as "age" is difficult to estimate in contexts such as Chad. Moreover, this is the recommendation made by the Chad National Protocol (MSP-DNTA 2014).

- Questions referring specifically to TSFP access and uptake (“What is the effect of prevention on MAM treatment uptake of MAM cases over the same time period?” and “What is the effect of distance-to-nearest health center on uptake of treatment of children receiving prevention?) had to be dropped, since reliable treatment data could not be collected.
- Furthermore, “presence of TSFP” was changed to “access to TSFP” in the primary evaluation question for clarity. Similarly, “access to BSFP” has been changed to “BSFP reception” in the main hypotheses, to avoid confusion with “access to TSFP”.
- Finally, the question regarding BSFP partial uptake had to be dropped, since only 40 children received some, but not all, of the BSFP distributions, and this sample is too small to provide meaningful analysis.

Study groups
The pre-analysis plan envisioned a design with stratification of the sample along BSFP as well as TSFP access. However, the reality of the field (lack of maps, unequal presence of mobile health clinics) meant that it was nearly impossible to identify groups with, a priori, poor access to TSFP. Therefore, it was decided to reduce the number of study groups to two (reception or no reception of BSFP) and measure the access to TSFP as part of the study to later include it as a variable in the analysis. Power calculations of the final sample carried show that this did not affect statistical validity (Appendix A: Sample size and power calculations).

1.4 Structure of the report

The report is divided into nine sections.

Sections 1 through 4 provide an introduction to the study, a brief description of the study design, proposed research hypotheses and the WFP interventions concerned. The sections also give an overview of the context and a timeline of the study field data collection and related contextual events.

Section 5 describes in detail the WFP interventions the study is concerned with: specific WFP programming in Chad, targeting of beneficiaries, rations distributed and calendar of distributions.

Section 6 starts by declaring the ethical principles, followed by the study and the evaluation team, and subsequently explains the evaluation design, methods and implementation. It provides details on the methodology behind the sample size determination and sampling. In addition, it covers the evaluation strategy, data collection, dataset construction and data quality control measures.

Section 7 describes the results of the analysis undertaken and provides the quantitative specifications and so forth. The section provides the results of the empirical analysis, discussion of impacts, and interpretation of the estimates reported from the quantitative analysis.

Section 8 presents a review of the internal validity of the study. It also offers the contextual explanation of the study’s quantitative results complemented by qualitative findings.

Section 9 describes the operational and policy-related implications of the results of the study.

2. Summary of intervention, theory of change and research hypotheses

2.1 Description of WFP intervention (summary)

WFP has a number of ongoing interventions to prevent and address MAM in Chad, including programs aimed at the local population, refugee populations (CAR - Central African Republic, Nigeria and Sudan), and returnees (from CAR and Nigeria).[4] This evaluation is concerned with the Protracted Relief and Recovery Operation (PRRO) Chad – 200713, which seeks to build the resilience and protect the livelihoods of and reduce malnutrition among refugees, returnees and other vulnerable people in Chad.

Moderately malnourished children aged 6–59 months, and pregnant and lactating women in regions where GAM exceeds 10 per cent are covered by TSFP. Where GAM exceeds 15 per cent, they are supported with BSFP according to WFP's nutrition policy and Government of Chad Harmonized Framework in areas of high food insecurity and during the lean season.

BSFP aims to *prevent* a deterioration of the nutritional status of all individuals when malnutrition rates are high, with the intended outcomes of: (1) prevention of MAM and SAM; and (2) identifying MAM and SAM cases and referring them for treatment.

TSFP aims to *treat* moderately malnourished individuals identified through anthropometric screening. The intended outcomes for the treatment of MAM include: rehabilitation, reducing mortality risk, preventing the development of SAM and providing follow-up support. In Chad, WFP supports the Ministry of Health (MoH) TSFP at health center level, where protocols and rations follow national MAM protocols based on standard WHO (2012) guidance (Ministère de la Santé Publique–CNNTA 2014).

Details on WFP seasonal assistance, including BSFP- and TSFP-supported activities are presented in section 5 on WFP interventions the study is concerned with.

2.2 Theory of change and key assumptions

MAM affects an estimated 33 million children worldwide and is associated with more nutrition-related deaths than severe acute malnutrition (SAM) (IAEA 2014). Children with MAM are at risk of morbidity from infectious diseases and delayed physical and cognitive development (Black et al. 2013). The most recent global community-based management of acute malnutrition (CMAM) evaluation (UNICEF 2013a) reported that there is not enough evidence on outputs and outcomes for MAM management. There is substantial interest in MAM interventions to prevent SAM and relapses into SAM. However, MAM prevention and treatment programs suffer from low coverage compared with SAM

[4] During the period 2015–16, WFP had five active operations in Chad: DEV 200288 (Jan. 2012–Dec. 2016, School feeding); EMOP 200799 (Jan.–Dec. 2015, Assistance to CAR refugees); Reg. EMOP 200777 (Jan.2015–Dec. 2016, Assistance to populations affected by North Nigeria crisis); UNHAS SO 20785 and PRRO 200713 (Jan. 2015–Dec. 2016, Building resilience, protecting livelihoods and reducing malnutrition of Refugees, Returnees and other vulnerable people).

interventions. This affects the sustainability and scaling-up expectations of the integrated CMAM approach that WHO recommends.

According to the most recent *Lancet* Series for Maternal and Child Nutrition (2013), nutrition-sensitive interventions and programs in agriculture and social protection have the potential to enhance the scale and effectiveness of nutrition-specific interventions. However, little is known about spontaneous recoveries; that is to say, children who develop MAM and recover without access to MAM treatment, in countries such as Chad where MAM treatment coverage is very low. There is limited research on children who recover from MAM, particularly with respect to growth, mortality and risk of further episodes of malnutrition. This requires an understanding of MAM prevalence and its associated risk factors.

Assumptions

- Children receiving MAM prevention and treatment opportunities recover from MAM more quickly and are slower to relapse.
- Prevention through BSFP alone only works during the period that the prevention is delivered and therefore does not provide sustainable long-term solutions for preventing malnutrition, even if, in the short term, its impact can be lifesaving and life-enhancing (Save the Children 2013).
- Nutrient intake is not the only cause of malnutrition leading to MAM; therefore, nutrient-based responses are often not enough to address MAM. Morbidity plays a key factor in nutritional status.
- The CMAM evaluation UNICEF commissioned in 2013 concluded that the cost of ready-to-use therapeutic food is 50 per cent of the recurrent cost of a CMAM program for SAM, but no cost for MAM was provided in this evaluation. According to this study, the cost of treatment for MAM is US$40–80 per child compared with the cost for treatment for SAM at US$200 per episode per child.[5]

2.2.1 Consultative process for the evaluation

As described in the serial progress reports of the evaluation and to obtain and maintain the agency (WFP) and stakeholders' engagement with the study, the following specific actions have been taken by the evaluation team throughout the evaluation.[6]

Grant preparation phase (2015): Preparation field visit

- Promoting understanding of the impact evaluation, including preparing the implementing agency for findings of no or negative impact.
- Ensuring involvement of the implementing agency and other stakeholders in the study design and identifying the research questions.
- Establishing the policy relevance of the evaluation.

[5] The treatment of MAM is estimated at US$44 per child. Thus, the combined cost, per child, of treating uncomplicated acute malnutrition is between US$110 and US$200.

[6] More details on the consultative process can be found in the stakeholder engagement and evidence uptake progress reports prepared in October 2015, March, May and September 2016, upon request.

Inception phase (March 2016): Inception field visit

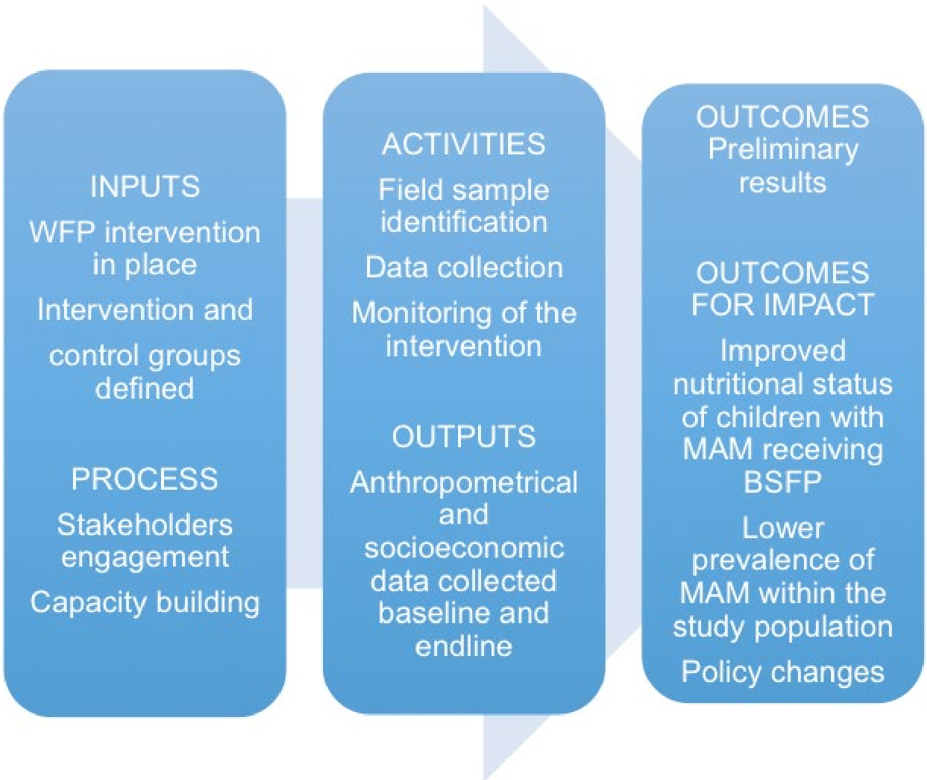
- Presentation of the new evaluation team.
- Meeting with stakeholders and update on the methodology and practical aspects of the evaluation, as well as ensuring their buy-in and support throughout the evaluation process.
- Collecting information essential to the preparation of the data collection.

Implementation phase (June–November 2016): Two field visits for surveys

- Meetings with national authorities and stakeholders.
- Training given to surveyors.

The diagram below (Figure 1) shows the steps for applying the Theory of Change to the evaluation.

Figure 1: Theory of Change



2.3 Primary outcomes and impacts of interest

The primary research hypotheses are the following:

- **Hypothesis 1**: *BSFP reception has a positive effect on the incidence of MAM in the target group (6–23 months).*
- **Hypothesis 2**: *BSFP reception together with access to TSFP has a more positive impact on the incidence of MAM than reception of BSFP alone.*
- **Hypothesis 3**: *BSFP reception has a positive spillover effect on the incidence of MAM among siblings.*

In order to assess these hypotheses, the following indicator and variables were used.

Impact indicator

- Incidence (%) of children aged 6–23 months who become moderately acute malnourished.

This indicator is constructed according to national protocol from weight-length/height (z-score), mid-upper arm circumference (MUAC) and the presence or absence of bilateral pitting edema.

Intervention variables

- BSFP reception: reception of all planned BSFP distributions.
- TSFP access: distance to nearest health center or mobile health clinic as declared by survey participants.

Control variables

- Child age and gender
- Household composition
- Household head characteristics
- Household income and assets
- Other household characteristics
- Access to services (water, sanitation, health)
- Food security: child's food consumption through two different indicators (both 24-hour recall):
  - Child's daily feeding frequency
  - Diet diversity score (DDS)
- Morbidity: disease (maximum of three) that the child has suffered in the past two weeks (two-week recall).

3. Context

This section briefly presents Chad's general context and its food security and nutrition situation. Then, criteria for study area selection are explained and the BEG region briefly described. The section ends with a presentation of the criteria used for assessing the external validity of the study site and issues emerging from the representativeness of the sample.

More detailed information on the general context of Chad and BEG, relevant food security and nutrition, and the related political and institutional framework for nutrition, as well as significant maps can be found in Appendix B: Further information on Chad and BEG context.

3.1 General context

Chad is a landlocked, arid, low-income and food-deficit country bordered by Central African Republic (CAR) to the south, Sudan to the east, Libya to the north, Cameroon and Nigeria to the southwest, and Niger to the west. It comprises an area of 1,284,200 square kilometers.

Population data are not readily available in Chad. The most recent census was in 2009 and accurate information on administrative divisions is limited, with new cantons, departments and sub-prefectures having been created since the 1990s and making the identification of populations very difficult. Based on the 2009 census and with an annual population growth of 3.3%, Chad has a population of 14,037,000(World Development Indicators 2015), of which 50.7 per cent are women and 49.3 per cent men, with an average household size of 5.4 members. The vast majority are sedentary (97%) and rural (78.3%). Average household size is 5.3 members, with 57.5 per cent of the total population under the age of 18 years (INSEED 2009).

In 2015, Chad ranked 185 out of 188 countries in the UNDP Human Development Index and 73 out of 78 countries on the Global Hunger Index. It is thus one of the world's poorest countries, with a gross national income per capita of US$890 (2015), where 87 per cent of the population live in multidimensional poverty, with a life expectancy as low as 51.2 years (World Development Indicators 2015). It also ranked 185 out of 188 countries in the UNDP Gender Inequality Index and the majority of the population rely on subsistence farming (World Development Indicators 2015).

Within Chad's territory there are three distinct geographical regions: the Sahara desert to the north, the arid Sahel region at the center of the country and the relatively fertile south Sudanese belt. The Sahara covers almost half of the country, but hosts only 5% of the population; the Sahel represents 28% of the country's land surface and 33% of its population; and although the Sudanese belt only covers 25% of the land area of the country, 63% of the total population are concentrated there.

Access to basic services (health and education) remains limited in many parts of Chad, due to inadequate coverage. The mortality rate for under-fives was 138.7 per 1,000 live births in 2015. Only 51 per cent of the population have access to improved water sources and only 12 per cent to improved sanitation facilities.[7] The health situation is characterized by the prevalence of potentially epidemic diseases, such as cholera and measles, and other diseases such as malaria, in a country where access to healthcare is low. Education remains limited due to lack of infrastructure and persistent food insecurity, which means households have to prioritize livelihood activities; the school net enrolment rate in 2012 was just 40.5 per cent,[8] and adult literacy rate was 34 per cent (2011).

The number of conflicts since independence (1960) have been aggravated by high levels of poverty in Chad, and ethnic tensions have contributed to political and economic instability and poor economic development. Due to conflict in neighboring countries, UNHCR (2015) estimates that at the end of 2015 Chad hosted more than 470,000 refugees from Sudan, CAR and Nigeria. In addition, more than 90,000 Chadians have been displaced within the country by the Darfur conflict or by the Boko Haram crisis in northern Nigeria. The influx of refugees, returnees and displaced people contributes to a deteriorating socio-economic situation, strained local resources and increased food insecurity among vulnerable communities.

[7] Source: The Human Development Index and World Development Indicators (2015).

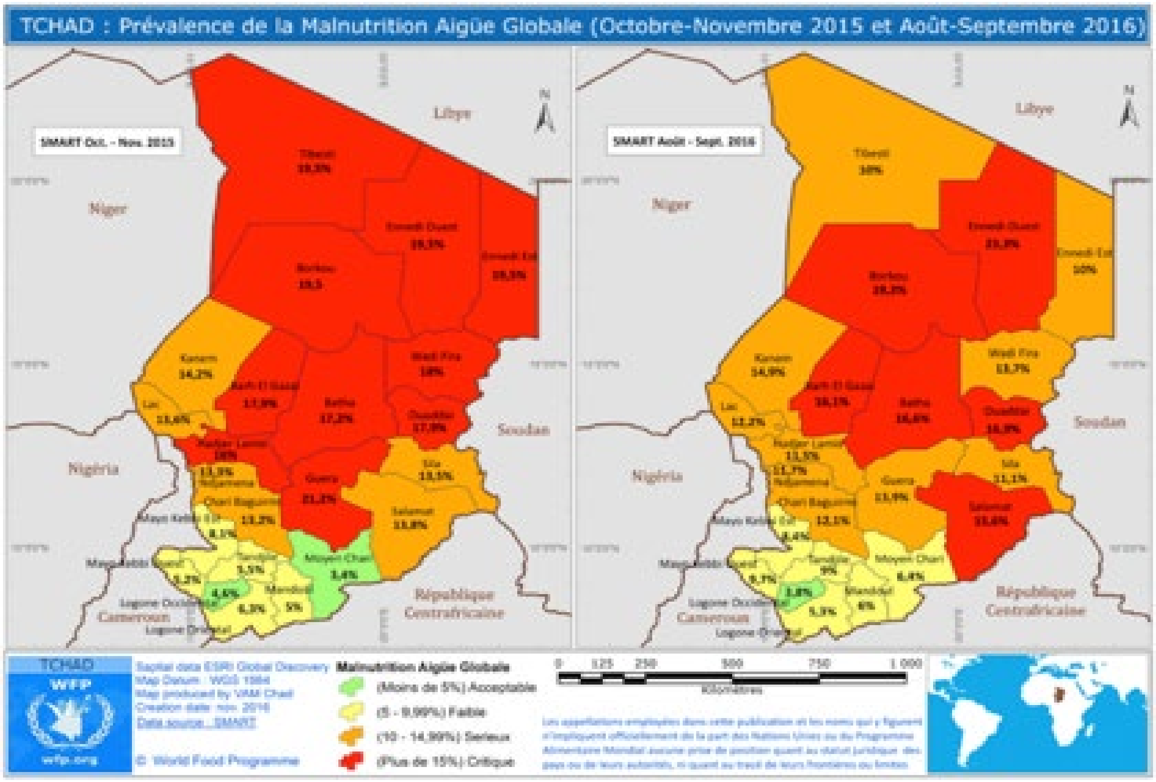
[8] Annuaire statistique national 2012

3.2 Food security and nutrition context

The **livelihoods profile**[9] developed in 2011 identifies nine livelihood zones in Chad. The **National Food Security Assessment** of 2015 (Ministère de l'Agriculture-SISAAP et al. 2015) identified that about one fourth of the population in Chad are food insecure, including 6 per cent who are severely food insecure. This represents 3,094,741 and 706,831 people, respectively. The highest food insecurity rates are consistently found in the Sahel, particularly in BEG (85.3%).

GAM and SAM rates in the Sahel belt in Chad have remained consistently high. GAM rates exceed 15 per cent during the lean season (June–September) every year, and during humanitarian crises, but are widespread in emergency and non-emergency contexts. According to the Multiple Indicators Cluster Survey 2014 (MICS), the under-five mortality rate was 176 per 1,000 and stunting affects around 40 per cent of under-fives. Yearly Standardized Monitoring and Assessment of Relief and Transitions (SMART) nutrition surveys in the Sahel belt show that levels of GAM remain above 15 per cent in most regions (Figure 2 below). Globally, the yearly estimated burden of cases for SAM is close to 200,000 and for MAM 500,000.

Figure 2: Regional prevalence of GAM in Chad: 2015 and 2016 comparison



Source: WFP Chad country office

[9] Famine Early Warning Systems Network (FEWSNET) in collaboration with its partners the Government of Chad through the Ministries of Agriculture and Livestock's Statistics Department, the Ministry of Water's Department of Water Resources and Meteorology, the decentralized regional bodies of the Action Committee for Food Security and Crisis Management, the Information Systems on Rural Development and Spatial Planning (SIDRAT/CHAD), WFP, the FAO, Oxfam, Action Against Hunger, AFRICARE and Solidarity. The profiles were produced as a knowledge base for FEWSNET's Food Insecurity Monitoring activities in the country.

3.3 Institutional and policy context for nutrition

The key actor for nutrition in Chad is the Ministry of Health (MoH), as nutrition falls within the health sector. In 2013, the National Center for Nutrition and Food Technology (CNNTA) was restructured into a Directorate (DNTA - Directorate for Nutrition and Food Technology) in its own right, with expanded responsibilities in the management and monitoring of nutrition programs.

The 2012–2025 National Nutrition and Food Policy (PNNA) (MSP 2013) has five main thematic intervention strategies: (1) nutrition in the health system; (2) nutrition in food security; (3) community-based nutrition; (4) nutrition in the education system; and (5) capacity building of local institutions. MAM-focused nutrition activities feature in numbers 1, 2, 3 and 5 above.

The Intersectoral Nutrition and Food Action Plan (PAINA) strengthens the DNTA in terms of financial, material and technological support for its leadership in the management and coordination of nutrition interventions. However, the low resources allocated to the nutrition sector by the government hamper an effective nutrition strategy. In addition, the lack of human resources trained in nutrition is a major obstacle, meaning that coverage and impact of actions tackling malnutrition in Chad remain extremely low and dependent on international support.

Chad joined broader nutrition initiatives such as SUN (Scaling-Up Nutrition)[10] and REACH (Renewed Efforts Against Child Hunger)[11] in 2013, providing a new space for coordinating nutrition activities beyond the humanitarian sector. There is also an active Inter-Agency Standing Committee nutrition cluster in-country, attended by the major nutrition players in-country.

3.4 Study site selection

Given the complex context described above, a number of locations[12] were initially considered for the study. Considerations of physical access, security and partners´ presence led the region of BEG to be selected, as it best met the study criteria:

- It has relatively stable delivery conditions, particularly in the rainy season. This was important to make sure that the reception of BSFP was relatively homogenous across the sample, and also to give the 'best case' for finding an effect of BSFP.
- The region has a significant part of the population living far from urban centers/health centers, which is necessary for identifying a difference in access to TSFP treatment.
- The region can be accessed relatively easily by the survey teams and there were no major security concerns.

[10] Scaling-Up Nutrition (SUN) is a movement founded on the principle that all people have a right to food and good nutrition. It unites people from governments, civil society, the UN, donors, businesses and researchers in a collective effort to improve nutrition and to recognize that malnutrition has multiple causes. Chad signed up on 2 May 2013. See:

<http://www.scalingupnutrition.org/sun-countries/chad/ >

[11]A UN initiative supported by the FAO, UNICEF, WFP and WHO.

[12] Regions of Batha, Bahr el Ghazal and Kanem, all in the Sahel Belt of Chad.

3.4.1 Bahrel Ghazal context

BEG is located in the Sahel belt, and covers 69,000 square kilometers. In 2015, it had an estimated population of 306,073. According to the 2009 census 46.3 per cent of the population were women and 53.7 per cent men. The average household size is 5.9 people, which is higher than the national average of 5.3.

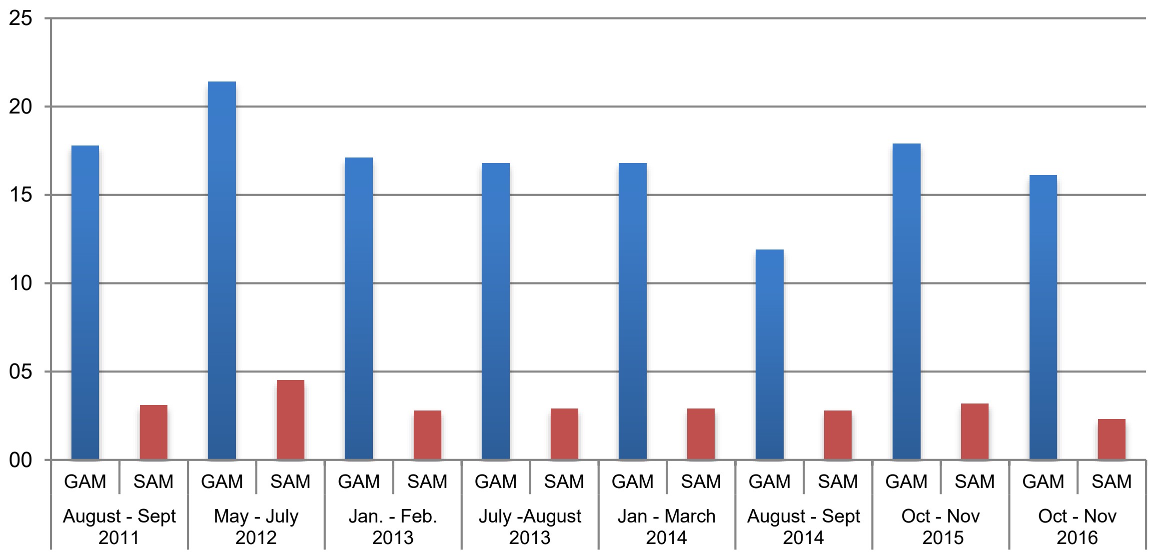
BEG has a higher percentage of the country's nomadic population, estimated at 49 per cent, and representing 23 per cent of the total nomadic population in Chad. It is more rural than the national average, by a difference of around 10 percentage points.

Since 2010, BEG has been administratively divided into three departments: BEG Nord, with the sub-prefectures Salal, Mandjouro and Dourgoulana; BEG Sud, with the sub-prefectures Michemiré, Fizigui, Amsilep and Moussoro; and BEG Ouest, with the sub-prefectures Chadra and Mouzaragui. The capital is the city of Moussoro.

The Emergency Food Security Assessment conducted in March–April 2016 identified 49% households as food insecure (40% in March 2015), with 9% being severely food insecure; specifically in BEG Nord, 73% of households were food insecure and 27% severely food insecure. The WFP post-distribution monitoring surveys carried out in July–August 2016 (after the launch of WFP seasonal food assistance distributions) found 49 per cent of households to be food insecure. Some 14 per cent of those were severely food insecure due to seasonal decline in cereal prices through rising cereal production; lower revenues from the sale of livestock, agricultural labor and transfers; and deterioration in terms of trade, declining purchasing power and lower livestock status due to the pastoral lean season.[13]

BEG suffers from higher prevalence of GAM and MAM than the national average (Figure 3 below), with values repeatedly above the emergency cut-off (15%).

Figure 3: Trends in GAM and SAM prevalence in the BEG region



Source: Compilation of results from nutrition surveys prepared by the evaluation team

[13] Cadre Harmonisé Tchad, November 2016.

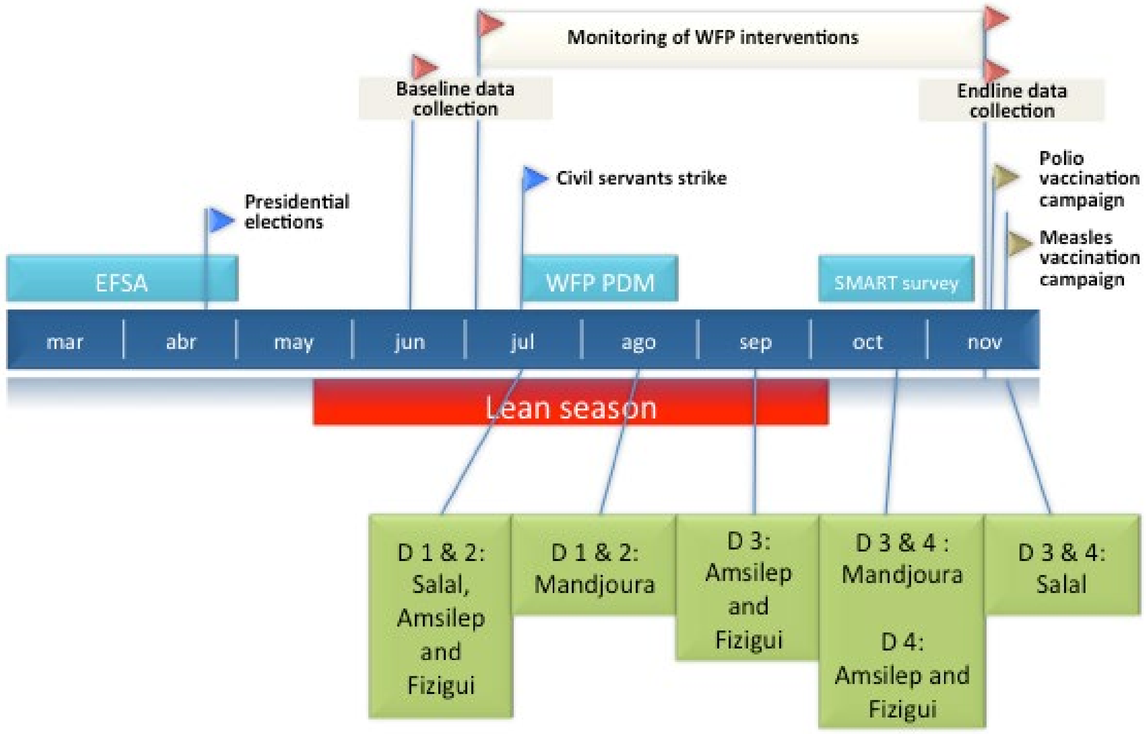
3.5 Criteria for assessing the external validity and representativeness of the sample

The study sample was selected to measure "the treatment (BSFP intervention) effect on the treated (those receiving BSFP)". This means that the control group was chosen to reflect the intervention groups to the highest possible degree. This design was necessary to achieve internal validity, but lowers the external validity and the representativeness of broader population groups beyond those targeted by WFP interventions in the sub-prefectures concerned by the study in BEG. However, the sample remains characteristic of the usual WFP target population and is therefore comparable to WFP target groups in other similar operational areas. The criteria for the selection of the study site have already been described in subsection 3.4.

4. Timeline of the evaluation

Figure 4 shows the timeline for both field data collection exercises and related contextual events.

Figure 4: Timeline for the field data collection for the impact study



Source: DARA evaluation team

5. WFP interventions the study is concerned with

5.1 WFP programming in Chad

WFP has a number of ongoing interventions to prevent and address MAM in Chad, including programs aimed at the local population, refugee populations (CAR, Nigeria and Sudan), and returnees (from CAR and Nigeria).[14] This impact evaluation is concerned with the PRRO Chad – 200713 which seeks to build the resilience and protect the livelihoods of and reduce malnutrition among refugees, returnees and other vulnerable people in Chad during the period 1 January 2015 – 31 December 2016 through a wide range of programs and activities, specifically in the BEG region:

- **TSFP** as a curative treatment for moderately malnourished children aged 6–59 months and pregnant and lactating women;
- **BSFP** to prevent acute malnutrition among children and pregnant and lactating women (PLW) during lean season. The original 2015 PRRO document target groups were modified in 2016, reducing the BSFP for all children under 24 months to children under two years living in households identified as food insecure by WFP vulnerability assessments and eligible for seasonal food assistance.
- **TFA** (targeted food assistance) includes seasonal livelihood programming that takes into account seasonal and livelihood patterns to determine which activities should be implemented at different times of the year. Vulnerable households receive cash or in-kind food transfers[15] during lean season in areas affected by production shortfalls, with a view to enabling them to maintain their assets and build resilience to future shocks.

Malnutrition prevention activities planned under the BSFP aim to increase the impact of household assistance (food and/or cash) on the food and nutritional situation of targeted households and communities. Distributions are generally conditional on participation in awareness-raising sessions on good food, nutrition, hygiene and sanitation practices, which are also open to the whole community and particularly aimed at pregnant women, nursing mothers and mothers of children under two years.

During the BSFP distributions, targeted children and women are screened for acute malnutrition by measuring their MUAC. Severe or moderate cases are then referred to the nearest health center or mobile clinic for effective treatment and follow-up.

Although Plumpy'Doz is the recommended nutritional product for this type of intervention for children aged 6–23 months, the final choice of the ration distributed depends on availability and pipelines, frequently changing during the same intervention period or

[14]During the period 2015–16, WFP had five active operations in Chad: DEV 200288 (Jan. 2012–Dec. 2016, School feeding); EMOP 200799 (Jan.–Dec. 2015, Assistance to CAR refugees); Reg. EMOP 200777 (Jan.2015–Dec. 2016, Assistance to populations affected by North Nigeria crisis); UNHAS SO 20785 (Humanitarian Flights) and PRRO 200713 (Jan. 2015–Dec. 2016, Building resilience, protecting livelihoods and reducing malnutrition of Refugees, Returnees and other vulnerable people).

[15] The daily ration per person distributed by WFP is composed of cereals (225 g), pulses (50g), vegetable oil (15g) and salt (5g), equivalent to 1,054 kcals per person per day. In 2016, salt was never distributed.

varying between neighboring targeted areas (in 2016, Plumpy'Doz was distributed in BEG Nord, and Super Cereal *Plus* in BEG Sud). Although no shortages have been observed this year in the study areas, delays in the reception of the product have modified the initial programming of the intervention (Table 6)

WFP operations are implemented by WFP's operational partners and programs are delivered following established protocols and procedures. For the BEG region, and for the areas targeted by the study, WFP has two main implementing partners, namely Action contre la Faim (ACF) and Oxfam. ACF operates in BEG Sud (sub-prefectures of Amsilep and Fizigui) and Oxfam operates in BEG Nord (sub-prefectures of Salal and Mandjoura). Both the international NGOs have a long and demonstrated experience of working with WFP and hold good knowledge of the geographical area covered by the interventions that include other non-nutrition or food security related activities (WASH, health).

5.1.1 Targeting for seasonal interventions

Geographical targeting of beneficiaries is established by food security and nutrition assessments in the Sahel zone of the country. The number and location of beneficiaries requiring seasonal assistance in BEG is determined yearly through the government's national harmonized framework[16] (*Cadre harmonisé*) that determines areas with the highest level of food and nutrition insecurity. BEG was classified as being in Phase 3 – Acute Food and Livelihood Crises, of the Integrated Food Security Phase Classification, by the March 2015 harmonized framework. This classification demands a coordinated response, to which WFP's specific contributions included Seasonal Food Assistance and BSFP.

Household targeting for TFA is carried out by WFP implementing partners in the geographical areas identified by the harmonized framework for intervention. The selection involves a participative process with project staff and local communities. Households are categorized by their socio-economic profiles, taking into account context-specific welfare and wealth based on the ownership of productive assets, equipment and resources available. Representative village general assemblies or village committees made up of various sectors of the population are set up and trained to carry out the selection process. The community validates the selection process publicly and WFP staff carry out random checks using the selected beneficiary lists.

Child targeting for BSFP: within households selected for seasonal assistance through the community-based approach described above, children aged 6–23 months and PLW are identified using a door-to-door field exercise to be included as beneficiaries of the BSFP.

Additional seasonal interventions in BEG Nord: in addition to the WFP seasonal food in-kind assistance, in two of the sub-prefectures of BEG Nord (Mandjoura and Salal), vulnerable households with children under 5 years were also eligible for other food

[16] Cadre Harmonisé d'identification et d'analyse des zones à risqué et des populations vulnérables au Sahel et Afrique de l'Ouest (CH), Système d'Information de la Sécurité Alimentaire et d'Alerte Précoce au Tchad.

assistance programs that include in-kind food and/or cash transfers in 2016.[17] This is a separate intervention funded by ECHO (European Commission's Directorate-General for European Civil Protection and Humanitarian Aid Operations) (Table 1). For Mandjoura, those households not receiving WFP TFA but BSFP (for children aged 6–23 months or PLW) have received a combination of in-kind food and cash. In Salal, households associated with the Salal and Kounal distribution sites exclusively received cereals from ECHO, and not cash, since they are too far from markets to warrant a cash distribution. In the same sub-prefecture of Salal, households associated to the Soudoune and Saaf distribution sites did not receive additional food from the ECHO project but directly from WFP, as the actual number of beneficiaries was too high compared to the number envisaged by ECHO.

Tables 1 to 4 below present the target groups and seasonal interventions that took place in 2016 in the four sub-prefectures included in the study.

Table 1: Sub-prefecture of Mandjoura

	Target groups	Type of intervention
WFP	Children aged 6–23 months	BSFP
	Pregnant and lactating women (PLW)	BSFP
	Households WITHOUT a child aged 6–23 months or a PLW	TFA
ECHO	Households WITH a child aged under 5 years and NOT INCLUDED in WFP programs	12,500 CFA franc & 34kg cereal

Table 2: Sub-prefecture of Salal: Salal and Kounal distribution sites

	Target groups	Type of intervention
WFP	Children aged 6–23 months	BSFP
	PLW	BSFP
	Households WITHOUT a child aged 6–23 months or a PLW	TFA
ECHO	Households WITH a child aged under 5 years and NOT INCLUDED in WFP programs	150kg cereal

Table 3: Sub-prefecture of Salal: Saaf and Soudoune distribution sites

	Target groups	Type of intervention
WFP	Children aged 6–23 months	BSFP
	PLW	BSFP
	Households WITHOUT a child aged 6–23 months or a PLW	TFA
WFP	Households WITH a child aged under 5 years and NOT INCLUDED in other WFP programs	TFA

[17] The same approach was followed in 2015 when ECHO funded cash distributions in all areas covered by WFP seasonal assistance.

Table 4: Sub-prefectures of Fizigui and Amsilep

	Target groups	Type of intervention
WFP	Children aged 6–23 months	BSFP
	PLW	BSFP
	Households WITHOUT a child aged 6–23 months or a PLW	TFA

5.1.2 Targeted beneficiaries for seasonal assistance rations

WFP uses a planning figure of five people per household, hence multiplies the planned individual daily ration by five and by the number of days covered by the distribution. The number of **intended beneficiaries** is initially estimated from the population figures of the most recent census (2009) and applying an annual growth rate. However, WFP calculates the actual **coverage rate for interventions** from the number of beneficiaries identified during targeting (June 2016).

Table 5 below shows the number of children aged 6–23 months assisted by WFP with BSFP in each sub-prefecture where the study was conducted.

Table 5: Total number of beneficiaries by intervention, per sub-prefecture

	TFA	BSFP children	BSFP PLW	ECHO Assistance
Mandjoura	16,770 persons (3,354 HH)	1,222	754	2,484 HH
Salal	8,461 persons (980 HH)	257	221	523 HH
Fizigui	5,000 persons (1,000 HH)	558	172	–
Amsilep	10,000 persons (2,000 HH)	1,241	449	–

Key: HH = households

5.1.3 Calendar of seasonal interventions in 2016

TFA and BSFP distributions would ideally start in April, before the lean season, to be most effective and prevent MAM, which tends to rise in July–August (Young 2015). To be most effective, the BSFP should span 120 days, to fully cover the lean season, and be combined with other food assistance interventions at household level to protect the child's ration. BSFP distributions should be monthly so as to maximize the chances that the child is given the ration on a daily basis throughout the intervention timeframe. Operational issues in a context such as Chad often lead to delays.

In 2016, the first BSFP distribution in the study area took place at the end of July–beginning of August, and the June and July rations were distributed together (60 days' worth of ration) because of delays in the selection and targeting process and in the contracting between WFP and its partners (Oxfam and ACF). In addition, there were issues with the regularity of the BSFP ration distribution, with ACF delivering a 30-day distribution during the first half of September, which was equivalent to the August ration, and in October the September ration. Oxfam distributed 60 days' worth of ration (for August and September) during the first week of October for Salal and during the first half of November for Mandjoura.

Table 6 below presents a brief summary of the actual schedule of distributions. The detailed calendar by sub-prefecture can be found in Appendix C: Distributions calendar.

Table 6: Schedule of 2016 WFP seasonal food assistance distributions

Sub-prefecture	Partner	June	July	August	Sept.
Salal	OXFAM	60 days, in July		60 days, in Oct.	
Mandjoura	OXFAM	60 days, in July		60 days, in Nov.	
Amsilep	ACF	60 days, in July		30 days, in Sept.	30 days, in Oct.
Fizigui	ACF	60 days, in July		30 days, in Sept.	30 days, in Oct.

ECHO-funded assistance was provided for three distributions: the first in July–August coupled with WFP distributions, the second in the second half of August, and the third in conjunction with the final WFP distribution (October–November).

BSFP distributions took place, alongside the other food assistance interventions on specifically designed distribution sites, respecting the criteria of access and acceptability (distance to villages).

5.2 Targeted supplementary feeding program

Besides seasonal interventions aiming to reduce the impact of the lean season on livelihoods, WFP supports TSFP aiming to treat moderately malnourished individuals identified through anthropometric screening, with the intended outcomes of: (1) rehabilitation from MAM; (2) reducing mortality risk; (3) preventing the development of SAM; and (4) providing follow-up support.

TSFP activities in Chad are integrated into the minimum package of activities within the national health system's first level of care of services provision (primary healthcare) as per the National Protocol for the Integrated Management of Acute Malnutrition (MSP-CNNTA 2014), as last reviewed in 2014. WFP supports the MoH TSFP through the provision of nutritional products, Plumpy'Sup (500kcals/day) being the one provided for children.

Children aged 6–59 months (60.0 to 110.0cm) and PLW are screened through MUAC using community-based approaches and referred to a health center for weight and length/height measurements. Children with WFH <-2SD and ≥ -3 SDs and/or MUAC ≥115mm and >125mm are admitted into the TSFP and provided with medical care, nutrition, education and a weekly or bi-monthly supplementary ration, until they meet the exit criteria (>-1.5 SD WFH and/or MUAC ≥125mm for one measure).

Program uptake and attendance are determined by several factors, most commonly: distance (geographical and time) to the services, cost and service quality (WFP-Valid International, n.d.).[18] Access to TSFP services remains mainly determined by the limited geographical coverage of the health system infrastructures (health centers, harmonized framework). A recent study on TSFP coverage in the BEG region (WFP-Valid

[18]Revue nationale de la prise en charge intégrée de la malnutrition aiguë (PCIMA) au Tchad, novembre 2015 – DNTA – UNICEF

International, n.d.) showed that only 2.44 per cent [1.70–3.18] of cases with MAM in the BEG region were effectively treated. Despite an effort to increase the number of health facilities able to provide MAM treatment, they are still insufficient and scattered, particularly in the BEG region. In the northern sub-prefectures, there are areas where the catchment area of a harmonized framework extends over a vast territory, lacking adequate communication and transport infrastructure.

Low harmonized framework coverage therefore automatically means low TSFP coverage. With the aim of improving access to healthcare, in the sub-prefectures of BEG Nord (Salal, Dourgoulanga and Mandjoura), International Rescue Committee organizes mobile clinics which, departing from a harmonized framework, provide health and nutrition services to more remote communities, including TSFP services. However, this activity depends on the funding received by the NGO and is therefore not continuously operational all year round. During 2016, mobile clinics were only operational until March and they were launched again in August 2016, due to lack of funding.

More information on TSFP access and uptake issues and particular outcomes for the BEG region are presented in Appendix D: TSFP access and outcomes.

6. Evaluation design, methods and implementation

This section describes the design of the evaluation. It describes: (1) the ethical guidelines observed during the study; (2) the evaluation strategy including the strategy for identifying the desired effect and controlling for selection bias, as well as potential issues; (3) the data collection process; (4) the dataset construction including measures to ensure quality; and (5) the limitations of the study.

6.1 Ethical guidelines

This evaluation strictly respects the ethical guidelines of United Nations Evaluation Group (UNEG 2016) and DARA's code of conduct on an ethics/quality/evidence-based approach and endeavors to reach conclusions regarding results supported by valid, reliable data. Ethical considerations were taken into account during the proposal stage. They were followed along all evaluation phases by informing participants of the nature of the activities when gathering information needed to get their consent for sharing personal information and also stating a commitment for non-disclosure. The research team adheres to 3ie quality and ethical guidelines in the course of this evaluation.

DARA has been transparent by declaring any limitations and risks occurring during the evaluation process. The evaluation team, as well as the firm hired for the field data collection, have respected people's right to provide information in confidence and will make participants aware of the scope and limits of confidentiality, while ensuring that sensitive information cannot be traced to its source. The evaluation has also followed a phased approach to ensure time for reflection and feedback.

In the same way, the evaluation process has been rigorous and evidence-based statistically and nutrition wise[19], [20]. In order to reach findings and conclusions, primary quantitative and qualitative data collected have been systematically triangulated with information obtained through secondary sources, supported by a consultative approach.

By striving to be as consultative as possible, the DARA evaluation team has promoted ownership and interaction with the WFP country office and with WFP's partners in Chad[21] throughout all phases, beginning during the preparation phase and strengthened during further field visits (inception and data collection). Stakeholders' views at all levels have been taken into account during all the evaluation process (details given in section 6.2.2). The stakeholder engagement and evidence uptake progress reports handed to 3ie during the study period describe in detail the continued consultative process.

For the data collection (baseline and endline surveys), teams were trained on ethical issues and field supervision and technical guidance provided. **Informed consent** was obtained through a short statement for survey participants, requesting permission for the interview and included in the household questionnaires used for the baseline and endline surveys (Appendix E and F).

Confidentiality of survey participants was guaranteed, as no names were used while constructing and analyzing databases, and only used for reference to ensure identification of WFP targets (baseline) and warrant that the same children were measured at endline.

For both field surveys, authorizations were requested from national authorities and at all levels: (i) the DNTA at the MoH and its representatives in the BEG region (regional health director and nutrition focal point), and (ii) the Ministry of Territorial Administration, requesting permission for the teams to travel and conduct the survey. Acceptance by the Ministry of Territorial Administration was implied through the transmission of a message (radio) to the governor of the region, who in turn informed the various prefects and sub-prefects of the areas to be visited. The DARA team and CIBLE surveys coordinator met the governor of the BEG and had appointments with the sub-prefect and the mayor of Moussoro town to obtain their authorization and collaboration for the pilot survey before the baseline survey.

6.2 Evaluation strategy

6.2.1 Evaluation design

The primary evaluation question of the study is:

What is the difference in impact of MAM prevention (BSFP) on the incidence of MAM in acute and protracted emergencies on children under two years of age during the lean season when access to MAM treatment (TSFP) is good or poor?

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[19] Evidence from previous studies (ENN 2013; Ministry of Health-UNICEF 2014) was used to design the study and choose the appropriate sample.

[20] Evidence guiding the nutritional part of the study included, among others, Action Against Hunger (2013) and Bloss and others (2004).

[21] Ministry of Health and local authorities, Oxfam, ACF and IRC

In particular, the study focused on the impact of prevention, as well as the impact of prevention together with access to treatment. Three main hypotheses were tested:

- **Hypothesis 1**: *BSFP reception has a positive effect on the incidence of MAM in the target group (6–23 months).*
- **Hypothesis 2**: *BSFP reception together with access to TSFP has a more positive impact on the incidence of MAM than reception of BSFP alone.*
- **Hypothesis 3**: *BSFP reception has a positive spillover effect on the incidence of MAM among siblings.*

The following secondary questions have also been investigated:

- What is the effect of prevention on MAM status of children 6–23 months during the lean season?
- Are there any gender differences in impacts?
- Are there any age differences in impacts? (The siblings of BSFP recipients aged 24–59 months will also be included for anthropometric measurement.)

Testing the evaluation questions required a study design that captured the effect on individual nutrition outcomes of the WFP's MAM prevention and access to TSFP. To this end, the impact study was designed with two measurement points, in line with WFP's seasonal interventions. The timing of the baseline and endline surveys therefore represents pre and post BSFP distributions:

- **Baseline survey**: June–July 2016
- **Endline survey**: November 2016

Data obtained through surveys (**quantitative data**) was complemented with **qualitative data** obtained through formal and informal interviews/meetings with population groups and relevant stakeholders, NGOs and WFP staff. Qualitative data has been used to inform interpretation of quantitative data during the descriptive and impact analysis.

6.2.2 Study group assignment and selection bias

As described in section 5, individual inclusion in a particular study group was based on the beneficiaries' targeting criteria established and implemented by WFP and its partners. Therefore, this was *not* a randomized control trial, and assignment to a particular study group depended on WFP's policies and capabilities (national harmonized framework, availability of partners, funding level). The geographical coverage distribution of the BSFP intervention is as follows:

- The intervention group was identified using WFP's lists and WFP partners' lists of seasonal assistance beneficiaries in Amsilep, Fizigui Salal and Mandjoura sub-prefectures.
- As planned,[22] part of the control group was sampled from the sub-prefecture (Dourgoulanga) where no WFP BSFP or other form of seasonal assistance took place. However, as this did not yield sufficient observations, the remaining

[22] The choice of Dourgoulanga as the area to select children for the study control group was presented in the inception report and pre-analysis plan of May 2016. The only modification made to what was mentioned in both documents is that, in the end, no cash or vouchers were distributed in this sub-prefecture as it was not finally included in the ECHO-funded project. The baseline analysis report of October 2016 was prepared based on these grounds and validated.

observations were sampled from villages not targeted for BSFP in sub-prefectures where WFP BSFP was present (Amsilep and Fizigui).

The expected and plausible differences between children in the intervention group and in the control group were controlled during the impact analysis (section 7.4.1 gives a detailed description).

First, the analysis was carried out on an “overlapping sample” to assure comparability between the study groups: a statistical model was used to calculate for each child a “score” that summarized the child’s characteristics and thereafter new intervention and control groups were constructed using only children with similar scores. In this manner, the intervention and control groups were restricted to consist only of those children who were considered to be comparable.

Second, the analysis was designed to control for observable and unobservable child and household/local characteristics that might differ in both study groups:

- Observable child and household characteristics that might affect nutritional outcomes were included as variables in the impact analysis.
- The baseline nutritional status was used to control for unobserved child characteristics, including it as a variable in the analysis, thereby controlling for whether the child already suffered from acute malnutrition, and thus indirectly capturing the presence of unobserved characteristics that lead to malnutrition.
- The geographical dispersion of interventions was used to control for **unobserved local conditions** that might affect nutritional outcomes, by including a sub-prefecture fixed effect in the analysis, which captured the general nutritional situation of each sub-prefecture.

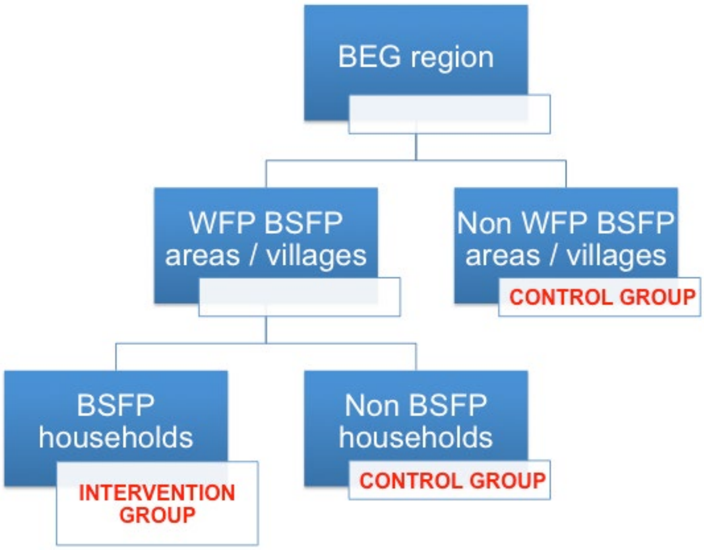
6.2.3 Sample selection and size

The sample was stratified into two study groups according to reception of the planned BSFP distributions. Access to TSFP was measured as part of the study using distance to the nearest health center (as declared by survey respondents), and this was later treated as a variable in the analysis.

Figure 5 shows the process followed. The two study groups were:

- **BSFP group (intervention group):** those who received all planned BSFP distributions.
- **n-BSFP group (control group):** those who did not receive any BSFP distributions

Figure 5: Sample selection process



Study sites were identified through the list of villages in the intervention areas, as provided by WFP implementing partners. This approach is described in Figure 5 above. See detailed description in Appendix G: Sample selection.
The **final sample size was 1,230 children** aged 6–23 months from 114 villages, who were measured at both baseline and endline. The distribution was of **766 children in group BSFP** and **464 in group n-BSFP**. The rate of attrition between baseline and endline was 28 per cent.[23] Since the baseline sample was not constructed to be representative, the attrition is not a matter of great concern. Nevertheless, an analysis of potential attrition bias in the sample can be found in Appendix H: Attrition.

The desired minimum detectable effect was a 35 per cent improvement in MAM incidence between BSFP and n-BSFP, and a 40 per cent improvement in MAM incidence between good and poor access to TSFP in group BSFP. Power calculations carried out on the final sample taking into account the two-level sampling effect show that the main hypotheses can be tested with at least 80 per cent power and a significance level of 10 per cent for the desired minimum detectable effects. See Appendix A for details.

In addition, data were collected on **685 siblings aged 24–59 months, 447 for the BSFP group** and **238 in the n-BSFP group.**

6.2.4 Spillovers, contamination and unintended effects
No compensation was received for participating in the survey, and therefore the main potential spillover was identified to be within-household sharing and, to a lesser degree, inter-household sharing of the BSFP and TSFP nutrition products received as part of the interventions. This information was included in the endline survey and controlled for

[23] Attrition occurred either due to mistakes in the anthropometric measurement or because the child was not found at endline. A small number of children (40) had partial reception of the BSFP distributions and did therefore not belong to either study group. Even though the number is too small to analyze separately, a robustness check with respect to their inclusion in the main analysis is carried out in Appendix N: Model selection, sample balance and robustness.

statistical analysis.[24] Survey teams were well trained and familiar with ways of working in rural settings in Chad. External and mixed teams were used to mitigate any possible interviewer bias or effects.

- **Contamination:** The likelihood of contamination of the sample with inputs from non-WFP activities was identified as high in the study design.[25] The only non-WFP food assistance intervention rolled out in the period and in the study area was the ECHO-financed project, which was limited to BEG Nord (cf. subsection 5.1.1). Thus, only households in the sample located in BEG Nord (sub-prefectures of Salal and Mandjoura, covered by Oxfam) received BSFP *and* in-kind food and/or cash transfers, while those in BEG Sud (Amsilep and Fizigui, covered by ACF) received BSFP but not any other kind of food assistance. Therefore, this contamination could be controlled for in the analysis.[26]
- **Hawthorne effect:** One self-induced Hawthorne effect was predicted in the study design. Since the survey identified children who suffer from MAM, the surveyors were obliged to refer any such child to treatment at baseline and endline, if he or she was not already receiving treatment. MAM treatment access was controlled for in the endline survey. No other behavior change of sufficient size was identified as being able to affect results, and therefore no further measures were taken.
- **John Henry effect:** No hypothesis on the possibility of the control group engaging in any reactive behavior due to the study was included. The members of the control group may already be seeking to become part of WFP programs, given the fact that the selection criterion for BSFP eligibility was dependent on being identified as a food-insecure household eligible for TFA. It is not believed that the study actively contributed to this.

6.3 Data collection

6.3.1 Setting for data collection

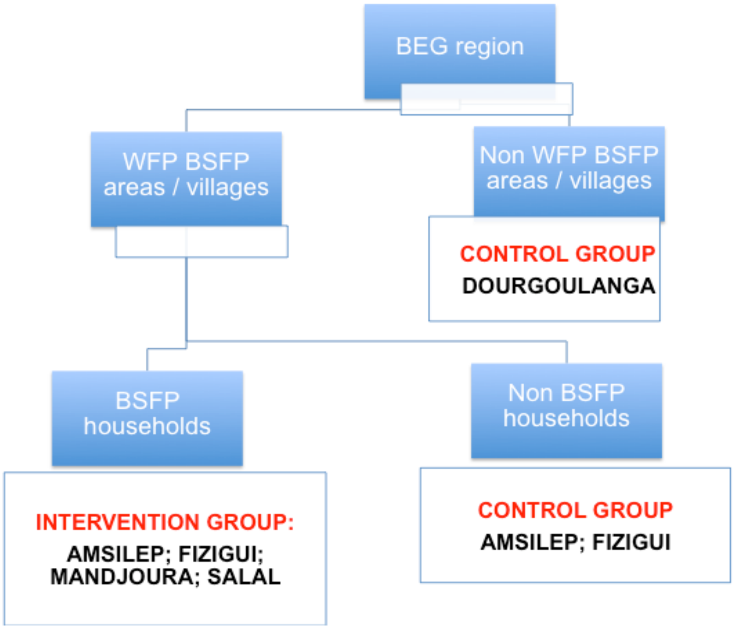
Data collection was carried out in five sub-prefectures of the BEG region. Four sub-prefectures (Amsilep, Fizigui, Mandjoura and Salal) included households targeted for BSFP, and the rest of the interventions for seasonal food assistance. The sub-prefecture of Dourgoulanga was selected as the “control area”, as no WFP BSFP or other form of food seasonal assistance took place there in 2016. In Amsilep and Fizigui, households not targeted for BSFP were also surveyed to complement the control group (Figure 6).

[24] Information on sharing of rations was collected and analyzed in the heterogeneity analysis. Food consumption data were collected and included as a variable in the analysis. Only 1 per cent of the BSFP households in the sample shared the ration with neighbors, therefore inter-household sharing was minimal.

[25] A monitoring tool was put in place between the two surveys to provide information on this issue.

[26] In particular, sub-prefecture effects were included in the ANCOVA models (section 7.6).

Figure 6: Sample selection and allocation of study groups



6.3.2 Instruments for data collection

The tools specifically prepared for field data collection included:

- **Household questionnaire** for the collection of primary data on household characteristics that may influence the child's nutrition outcomes, comprising 55 questions.
- **Tools for recording anthropometric measurements** of children aged 6–23 months, as well as their siblings aged 24–59 months, based on international standards and protocols.

All the instruments prepared for the surveys were designed based on WFP vulnerability, post-distribution assessments or following international recommendations (SMART survey methodology).

Besides these data collection tools, additional instruments and tools were prepared and used during both surveys. These are listed and described in Appendix I: Tools for the surveys, and Appendix J: Anthropometric measurements. These appendixes also describe the tools and techniques used for anthropometric measurements.

For the baseline survey, a household questionnaire was designed with questions for all variables of the analysis (Appendix E: Baseline household questionnaire) and then added to the smartphones used by teams in the field. Anthropometric measurements were recorded manually on a data collection sheet. For the endline survey, the baseline questionnaire was revised and adapted to the endline objectives (see Appendix F: Endline household questionnaire), and this time anthropometric measurements were also entered directly into the smartphones.

6.3.3 Local implementer

CIBLE RH & ETUDES[27] was selected as the local implementer for the surveys, after a transparent procurement process. The company has a long and varied experience in food security assessments and studies and has previously worked with WFP in Chad. The company hired 48 staff for the two data collection rounds, organized into 12 teams; each team composed of one supervisor, one interviewer and two measurers. The company maintained almost the same personnel in both surveys, with only eight team members being changed (none of them were supervisors).

Survey teams were trained before the two data collection exercises (in June and November 2016). Training included theoretical and practical sessions, concentrating the latter principally on nutrition and anthropometry. Specific details and agendas of both trainings can be found in Appendix K: Training for survey teams.

In addition to implementing the surveys, CIBLE was an effective partner during all steps of the study preparation, particularly while adapting the survey tools to the BEG context. CIBLE was responsible for the survey team's selection and training, the latter in collaboration with the evaluation team and DNTA staff. Furthermore, CIBLE assisted in the field with practical issues related to sample selection.

6.4 Dataset construction

This section describes the validation, merging and cleaning of data collected during surveys. See Appendix L: Dataset construction, for more detailed explanations on the dataset construction process.

Data entry was carried out by the local implementing partner, which transferred information collected in the field from smartphones to Excel. The data were later transferred to STATA software for analysis. Anthropometric data were only recorded manually on a printed questionnaire during the baseline survey and then transferred to Excel. For the endline survey, anthropometric data were recorded on smartphones as well as manually, ensuring a double registry of the data.

Given their importance for validating individual observations, anthropometric measurements were initially extensively checked by CIBLE for inconsistencies against the original manual records. Later on, children's age, gender, weight and length/height were examined and compared against WHO-CDC Growth Standards (WHO–Department of Nutrition for Health and Development 2006) case by case. Observations were only validated after an accurate plausibility test, through the Emergency Nutrition Assessment (ENA) for SMART software and manually. All flags and other potential errors were communicated to the local implementing partner, who would check the data against the manual records. For the endline survey data,[28] observations with anthropometric flags on weight and height/length that could not be corrected were dropped. Household data were also checked for errors and inconsistencies.

[27] See: <http://www.groupe-cible.com/en>

[28] In the baseline, observations with flags on age were kept in the dataset and marked for the survey teams to verify in the endline survey. In the endline, observations with flags on age were verified manually.

The **two datasets were merged** using a unique identifier assigned to each child at baseline, and the matching of the baseline and endline observations was validated by assessing consistency between anthropometric and household data collected during both surveys.

6.4.1 Quality control measures

Challenging contextual and operational factors were well known before the field work. The main expected difficulty was to identify and measure the exact same individuals in June and November, due to the characteristics of the population of BEG (transhumance and nomadic livelihoods, socio-cultural factors) and because the time of the endline survey coincided with harvest period, it kept families busy and often far away from their normal place of residence.

To maximize the ability to survey the same individuals at baseline and endline, the following measures were taken:

- Teams visited the same locations at baseline and endline. During the baseline survey, teams took notes and documented references (geographical, itineraries, communications, contacts for key informants) to make sure all relevant information was recorded for the second survey.
- Lists with all the baseline observations[29] were provided to the teams before endline field work, on which they manually recorded a new endline questionnaire number.
- After the survey, this information was added to Excel by the survey coordinator and sent to the evaluation team with the endline database.

To guarantee the quality of survey data, particularly anthropometric measurements, the following measures were taken:

- Standard procedures for maintenance of anthropometric equipment (daily check and recalibration) were in place.
- Training for baseline and refresher training for the endline.[30]
- A pilot pre-baseline survey was undertaken.
- Baseline data errors were documented and used during the refresher trainings pre-endline to improve endline data collection quality.
- Extra training was given before endline in key areas such as anthropometric measurements, assessing children's age and gender and introducing a double recording system for anthropometric data.

However, when merging baseline and endline datasets, a great number of inconsistencies were found. A number of new quality control measures were therefore implemented during the data cleaning process, including a detailed review of the plausibility of the anthropometric data. These are described in Appendix L: Dataset construction, in addition to the process of validating the coupling of the observations.

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[29] Baseline questionnaire ID (team code; household questionnaire number; child order within the household and child number on the anthropometrics database); household geographical information (sub-prefecture, canton, village); household head characteristics (age and gender, ethnic group and language) and whether the child was targeted or not for BSFP.

[30] These measures are only listed here. See Appendix K: Training for survey teams for more details on training given to the teams before both surveys.

6.5 Limitations of the study

The main limitations of the study, given the complex operational environment of the study, include budgetary and context-related limitations.

Budget restrictions limited the size of the study. The difficulties of operating in Chad meant that the cost factor was important for the survey, and obtaining a sufficiently large sample was a challenge. Although a statistically valid sample was obtained (Appendix G: Sample size and power calculations), the sample size remains a limitation of this study.

The budget restrictions led the evaluation team to decide not to include the question included in the pre-analysis plan “What is the cost of the prevention intervention over the same time period?”, as it would have been necessary to integrate more expertise and evaluator time into the evaluation team, which was impossible with the proposed budget.[31] However, it was decided to carry out a retrospective basic cost analysis, based on data estimates provided by the WFP country office.

Contextual limitations urged modification of the original study design during the baseline mission. The lack of reliable census data and maps meant that the identification of areas with good or poor access to TSFP had to be done directly in the field, and that it would be impossible to obtain *a priori,* a clear separation between these two proposed study groups. Therefore access to TSFP was measured as a variable in the survey.

Operational limitations included delays in implementing the WFP-supported BSFP through its contracted partners. The evaluation team had estimated a four-week window to launch the baseline survey as soon as targeting of BSFP beneficiaries was available But this took considerable time to be shared with the evaluation team, narrowing the planning window considerably and it was necessary to start without clearly identified target households. This caused some irregularities in the initial allocation of children to the study groups.

In addition, program implementation irregularities, in terms of the regularity of the BSFP ration distribution, resulted in differences in calendar and scheduling of distributions for both partners (Appendix C: Distributions calendar).

Finally, the late start and the modified schedule of distributions caused an adjournment of the endline survey, increasing the period between the two data collection exercises from three to four months.

[31] The difficulty in obtaining and analyzing the necessary information, including administrative data on staff salaries, overheads and operating/service delivery costs, and opportunity costs of participating in the program required: (1) inclusion of different profile in the evaluation team; and (2) given the particular context of Chad, the multiplicity of partners and activities, as well as high staff turnover, conducting a cost-effectiveness or cost-benefit analysis would have been challenging, as the necessary information did not seem to be available or collected at the implementation agency level.

7. Impact analysis and results of the key evaluation questions

This section contains the statistical analysis of data and information collected at the baseline and endline surveys. First the sample and the study groups are described. Then the main analysis is presented, combining the comparative analysis, which describes the study main outcome (MAM endline status) correlated with relevant variables, with the impact analysis, which assesses the effect of BSFP on MAM incidence, conditional on all the underlying information and taking account of issues such as selection bias. Finally, a brief cost analysis is carried out. The section is complemented with Appendix M: Heterogeneity analysis and correlations between MAM endline status and study variables, showing details of the results of the combined heterogeneity and correlations between MAM endline status and study variables.

The main statistical findings presented in this section (key points of the comparative analysis, heterogeneity tests and additional correlations) are then reorganized and interpreted in section 8 in light of qualitative information obtained through formal and informal interviews/meetings with population groups and relevant stakeholders, NGOs and WFP staff, as well as with relevant evidence found in the exhaustive literature review made during the evaluation process to allow for a better understanding of the results.

7.1 Introduction to the analysis

MAM incidence is defined as the proportion of new cases over the study period. However, there is evidence (Kismul et al. 2014; James et al. 2016; Isanaka et al. 2016) that acute malnutrition episodes last at most three months. Therefore, it can be argued that all endline MAM cases in the study sample are indeed new cases, given the four-month gap between the two surveys. A recall period of three months was used in the survey questionnaires covering the pre-lean season months of March, April and May for the baseline survey; and the months during the peak of the lean season, before harvest (August, September and October), for the endline survey. The second period matches with WFP's seasonal food assistance. Presence of MAM cases at endline is consequently related to events, actions or activities happening within the months before the November survey, thus only the information collected at endline is cross-tabulated with endline MAM. This is the case for household livelihood activities, household expenditures and household sources of food.

Age group allocation for study groups has been made using the prevalent age of the child at the time of the baseline survey, because this is the age that has been used for the BSFP targeting.

In some parts of the presentation of the results, the term "observation" has been used as it better reflects the meaning given to each study or sample unit, which is a "child".

For the comparative study, when cross-tabulating MAM incidence, the denominator used is the totality of children in the sample: the analysis of the effect of BSFP focuses on those children who received either all BSFP distributions (BSFP group or intervention group) or no BSFP distributions (n-BSFP group or control group). Whenever global values are referred to, these are values for the total of groups BSFP and n-BSFP.

For the survey questions on land and agriculture, the endline survey explored the household situation during the 2015–16 campaign, which ended in late summer 2016. In this case, MAM percentage of cases has also been correlated with the data collected at endline. The same applies for livestock owned by household.

The DDS variable has been constructed as follows:

1. The different food consumption options in the household questionnaires (Appendixes E and F) were reordered into a food groups list, adapted from FANTA (2006) (Food and Nutrition Technical Assistance Project) and later adapted by WFP-vulnerability assessment and mapping, and FAO (2011b), as follows:
    - cereals/tubers: sum of options 1 and 3 of the questionnaire
    - pulses: option 2
    - vegetables: option 6
    - fruits: option 8
    - animal products (meat/fish/eggs): option 4
    - milk and dairy products: option 5
    - breast milk: option 7
    - fortified products: option 9.
2. A binary value was assigned to each new category (YES = 1; NO = 0) and category values summed to obtain the individual child DDS. The maximum is 8.
3. As there are no established cut-off points for determining “adequate/inadequate” dietary diversity, IFPRI[32] advice was followed and categories were defined as:
    - DDS of 6 or more = good dietary diversity
    - DDS between 4 and 5 = medium dietary diversity
    - DDS of 3 or less = low dietary diversity.

7.2 Summary of results of the analysis

Out of the total 1,915 children of the global sample, there are 911 girls (48%) and 1,004 boys (52%), with a similar distribution in both age-groups. 1,230 children (64% of the total sample) were aged 6–23 months during the baseline survey and 685 (36%) were aged 24–59 months.

Geographically, most of the observations, for both the BSFP and n-BSFP group, are located in Amsilep sub-prefecture, followed by Dourgoulanga for n-BSFP (21.3% and 27.7%) and none for the BSFP group; and Mandjoura and Salal sub-prefectures for the BSFP group, which have only a few observations for the n-BSFP group.

Overall, the percentage of MAM cases in the global sample of children aged 6–23 months at endline is reduced by half the percentage of cases at baseline: 14 per cent against 28 per cent, respectively.

The hypotheses analyzed focus on children who either received all BSFP distributions or no BSFP distributions. On the correlations analysis, the percentage of MAM between those aged 6–23 months is 5 percentage points lower if the child receives BSFP than if the child does not receive BSFP. The results for the three hypotheses tested for the impact study are summarized below.

[32] International Food Policy Research Institute (IFPRI). See: <http://www.ifpri.org>

Hypothesis 1: *Reception of BSFP has a positive effect on the incidence of MAM at endline in the target group (6–23 months)*– The comparative analysis suggests that the effect of receiving all BSFP distributions compared to receiving no BSFP distributions can be as high as a 5 percentage point reduction in endline MAM, and the statistical models provide strong evidence that receiving BSFP significantly reduces MAM incidence for children in the intervention group. A child will, on average, lower its probability of becoming MAM by 4.7–8.0 percentage points from receiving all BSFP distributions versus receiving none.

Hypothesis 2: *Reception of BSFP together with access to TSFP, has a more positive impact on the incidence of MAM at endline than reception of BSFP alone*– Although the comparative analysis suggests that (a) MAM incidence is lower in the BSFP group when there is good access to TSFP, and (b) BSFP is more effective among those who have poor access to TSFP, the statistical models indicate that there is no interaction between the impact of BSFP and access to TSFP.

Hypothesis 3: *Reception of BSFP has a positive spillover effect on the incidence of MAM at endline among older siblings*– The comparative analysis suggests that MAM incidence for children aged 24–59 months is 4 percentage points lower if a younger sibling receives BSFP than if no younger sibling receives BSFP. However, the evidence does not suggest that BSFP has an effect on siblings, but the lack of effect may be due to the size of the sample of siblings being very small.

7.3 Sample and study group distribution

This section presents the findings of the study sample's characteristics from the final combined dataset.

Table 7 below shows the sample distribution by geographical origin (sub-prefecture). Almost half of the sample was located in the sub-prefecture of Amsilep, as it is the most populated within the sub-prefectures included in the study. The remainder is fairly evenly distributed (range 8–15% of the sample) among the other four sub-prefectures.

Table 7: Sample distribution by geographical origin (sub-prefecture)

Aged 6–23 months	Number	Percentage
Dourgoulanga	99	8
Mandjoura	188	15
Salal	144	12
Amsilep	645	52
Fizigui	154	13
Total aged 6–23 months	1,230	100
Aged 24–59 months	**Number**	**Percentage**
Dourgoulanga	66	10
Mandjoura	104	15
Salal	62	9
Amsilep	393	57
Fizigui	**60**	**9**
Total aged 24–59 months	**685**	**100**

Of the sample distribution by gender (Table 8), 1,230 children (64% of the total sample) were aged 6–23 months during the baseline survey and 685 (36%) were 24–59 months. Out of the total 1,915 children of the global sample, there are 911 girls (48%) and 1,004 boys (52%), with a similar distribution in both age groups.

Table 8: Sample distribution by age and gender

	Female		Male		Total
Aged 6–23 months	578	47%	652	53%	1,230
	Female		**Male**		**Total**
Aged 24–59 months	333	49%	352	51%	685
Grand total	**911**	**48%**	**1,004**	**52%**	**1,915**

The sample group of 1,915 children were surveyed in **1,207 households**, with an average of 1.02 children aged 6–23 months, and 0.57 children aged 24–59 months, per household visited. All households sampled had children aged 6–23 months as this was the main selection criteria. Therefore the sample household composition distribution may not be representative of the whole population.

Table 9 below shows the distribution of the global sample by study groups and by gender. The BSFP study group 6–23 months included 766 (62%) children and the n-BSFP group 464 (38%). The breakdown of the 685 siblings[33] in the study aged 24–59 months shows similar percentages (65% and 35%, respectively). In both cases, the gender distribution in the study groups is similar to that of the global sample.

Table 9: Distribution of the sample by study group and by gender

	BSFP		n-BSFP		Total
Female	361	47%	217	47%	578
Male	405	53%	247	53%	652
Total aged 6–23 months	766	62%	464	38%	1230
Female	217	49%	116	49%	333
Male	230	52%	122	51%	352
Total aged 24–59 months	447	65%	238	35%	685

Geographically (Table 10), most of the observations, for both the BSFP and n-BSFP group, are located in the Amsilep sub-prefecture for both age groups (6–23 and 24–59 months), followed by Dourgoulanga for n-BSFP (21.3% and 27.7%) that has no children for BSFP group, and consequently followed by Mandjoura and Salal sub-prefectures for the BSFP group, which have only a few observations for the n-BSFP group~~.~~

[33] BSFP and n-BSFP for siblings refers to whether a younger sibling received BSFP.

Table 10: Distribution of study group by sub-prefecture

	BSFP		n-BSFP		
Amsilep	343	45%	302	65%	645
Dourgoulanga	–	–	99	21%	99
Fizigui	96	13%	58	13%	154
Mandjoura	185	24%	3	1%	188
Salal	142	19%	2	0%	144
Total aged 6–23 months	766	100%	464	100%	1,230
Amsilep	239	54%	154	65%	393
Dourgoulanga	–	–	66	28%	66
Fizigui	45	10%	15	6%	60
Mandjoura	102	23%	2	1%	104
Salal	61	14%	1	0%	62
Total aged 24–59 months	447	65%	238	35%	685

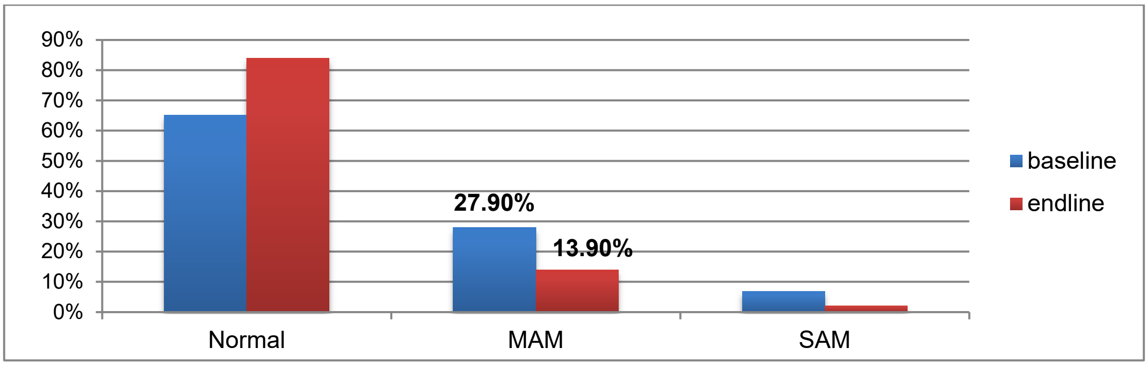
7.4 Nutritional status of children in the sample

This section describes the nutritional status of all children in the sample by age group and gender. Classification of acute malnutrition has been done following the international agreed criteria, as recommended by the Chad National Protocol for the Management of Acute Malnutrition (MSP-DNTA 2014).

7.4.1 Nutritional status of children aged 6–23 months

Table 11 and Table 12 below show the nutritional status of the children aged 6–23 months for the baseline and endline surveys by gender and by age sub-groups. Overall, the percentage of MAM cases at endline reduces to half the percentage at baseline: 14 per cent against 28 per cent, respectively (Figure 7) and for both genders, although globally, males have higher rates than females. The youngest age group (aged 6–11 months) has the highest percentage of MAM for both genders.[34] These results suggest that MAM percentage reduces as children grow.

Figure 7: Changes in nutritional status in the global sample



[34] T-tests for all children aged 6–23 months demonstrate that endline MAM is not statistically significantly lower for females than for males (p-value of 0.166), but is statistically significantly lower for the sub-group aged 12–17 months than for children aged 6–11 months (p-value 0.071). It is also statistically significantly lower for children aged 18–23 months than it is for those aged 6–11 months (p-value 0.017). The difference in endline MAM between children aged 12–17 months and 18–23 months is not statistically significant (p-value of 0.709).

Table 11: Nutritional status of children aged 6–23 months at baseline by age and gender

	Total general		Female		Male	
6–11 months	413		201		212	
Normal	279	68%	130	65%	149	70%
MAM	106	26%	57	28%	49	23%
SAM	28	7%	14	7%	14	7%
12–17 months	316		150		166	
Normal	173	55%	85	57%	88	53%
MAM	121	38%	56	37%	65	39%
SAM	22	7%	9	6%	13	8%
18-23 months	501		227		274	
Normal	350	70%	167	74%	183	67%
MAM	116	23%	48	21%	68	25%
SAM	35	7%	12	5%	23	8%
Total	1230		578		652	
Normal	802	65%	382	66%	420	64%
MAM	343	28%	161	28%	182	28%
SAM	85	7%	35	6%	50	8%

Table 12: Nutritional status of children aged 6–23 months at endline by age and gender

	Total		Female		Male	
6–11 months	**413**		**201**		**212**	
Normal	332	80%	162	81%	170	80%
MAM	72	17%	38	19%	34	16%
SAM	9	2%	1	1%	8	4%
12–17 months	316		150		166	
Normal	271	86%	134	89%	137	83%
MAM	40	13%	15	10%	25	15%
SAM	5	2%	1	1%	4	2%
18–23 months	501		227		274	
Normal	430	86%	205	90%	225	82%
MAM	59	12%	19	8%	40	15%
SAM	12	2%	3	1%	9	3%
Total	1230		578		652	
Normal	1033	84%	501	87%	532	82%
MAM	171	14%	72	13%	99	15%
SAM	26	2%	5	1%	21	3%

When assessing individual changes on nutritional status, Table 13 below shows that more than 90% of children who were normal at baseline kept an acceptable nutritional status at endline, around 5% became MAM and 1% deteriorated to SAM. For those initially MAM, 72% recovered a normal nutritional condition, 25% were again MAM at endline and less than 3% worsened to SAM. From those who were SAM at baseline, 7% were again SAM at endline and of the rest 46% were normal and 47% MAM.

Table 13: Changes in nutritional status of children aged 6–23 months from baseline to endline

		Endline status						
		Normal		MAM		SAM		Total
Baseline status	Normal	748	93%	44	6%	10	1%	802
	MAM	246	72%	87	25%	10	3%	343
	SAM	39	46%	40	47%	6	7%	85
	Total	1,033		171		26		1,230

On the other hand, 87 out of the 171 (51%) endline MAM cases were MAM at baseline, 44 normal (26%) and 40 SAM (23%). Given the clear correlation between baseline and endline nutritional status, the baseline status is used as an explanatory variable in the impact analysis.

Table 14 and Table 15 present baseline and endline MAM by sub-prefecture. For all sub-prefectures, MAM percentage at baseline is well above 20 per cent, with the three sub-prefectures of BEG Nord rising above 30 per cent. At endline, MAM percentage diminishes in all sub-prefectures by more than 10 percentage points and more than 20 percentage points for Mandjoura and Salal. T-test results on all children aged 6–23 months indicate that the difference in endline MAM between Salal and the rest of the sub-prefectures is not statistically significant (p-value of 0.806).

Table 14: Nutritional status of children aged 6–23 months at baseline by sub-prefecture

Sub-prefecture	**Amsilep**		**Dourgoulanga**		**Fizigui**		**Mandjoura**		**Salal**	
Normal	436	68%	56	57%	118	77%	113	60%	79	55%
MAM	**165**	**26%**	**33**	**33%**	**32**	**21%**	**63**	**34%**	**50**	**35%**
SAM	44	7%	10	10%	4	3%	12	6%	15	10%
Total	**645**		**99**		**154**		**188**		**144**	

Table 15: Nutritional status of children aged 6–23 months at endline by sub-prefecture

Sub-prefecture	**Amsilep**		**Dourgoulanga**		**Fizigui**		**Mandjoura**		**Salal**	
Normal	533	83%	76	77%	137	89%	167	89%	120	83%
MAM	**94**	**15%**	**20**	**20%**	**16**	**10%**	**20**	**11%**	**21**	**15%**
SAM	18	3%	3	3%	1	1%	1	1%	3	2%
Total	**645**		**99**		**154**		**188**		**144**	

Table 16 indicates that the percentage of MAM between those aged 6–23 months is 5 percentage points lower if the child receives BSFP than if the child does not receive BSFP. This will be tested statistically in the impact analysis.

Table 16: Endline nutritional status of children aged 6–23 months by study group

Absolute numbers	Global	BSFP	n-BSFP
Normal	1,033	665	368
MAM	171	91	80
SAM	26	10	16
Total	**1,230**	**766**	**464**
% of MAM	**14**	**12**	**17**

7.4.2 Nutritional status of children aged 24–59 months

Table 17 and Table 18 below show, respectively, the nutritional status of children aged 24–59 months during the baseline survey and at endline by age sub-group and gender.

As with the children aged 6–23 months, the percentage of MAM cases at endline reduces considerably (10 percentage points at endline versus baseline), and the proportion of normal cases rises from around 68 per cent at baseline to 83 per cent at endline, showing an amelioration of the nutritional condition of this group after the intervention.

Table 17: Nutritional status of children aged 24–59 months at baseline, by age and gender

	Total		Female		Male	
Normal	463	68%	229	69%	234	67%
MAM	**176**	**26%**	**83**	**25%**	**93**	**26%**
SAM	46	7%	21	6%	25	7%
Total	**685**		**333**		**352**	

Table 18: Nutritional status of children aged 24–59 months at endline, by age and gender

	Total		Female		Male	
Normal	568	83%	274	82%	294	84%
MAM	**106**	**15%**	**52**	**16%**	**54**	**15%**
SAM	11	2%	7	2%	4	1%
Total	**685**		**333**		**352**	

Table 19 shows that the percentage of MAM among those aged 24–59 months is 4 percentage points lower if a younger sibling receives BSFP than if no younger sibling receives BSFP. This will be tested statistically in the impact analysis.

Table 19: Endline nutritional status for children aged 24–59 months by study group

Absolute numbers	Global	BSFP	n-BSFP
Normal	568	378	190
MAM	106	62	44
SAM	11	7	4
Total	**685**	**447**	**238**
% of MAM	**15**	**14**	**18**

7.5 Impact analysis and results of key evaluation questions

7.5.1 Models

The empirical strategy of the study couples an ANCOVA approach with a propensity score model. First, sample balance is discussed and then the model is described.

Sample balance

Generally, potential bias arises if observations in intervention and control groups have different characteristics, either because of the initial sample and study group selection (selection bias) or because of the later attrition of the sample (attrition bias). Our study deals with these biases in the following way: (1) the analysis uses an *overlapping sample* with similar characteristics; (2) instrumental variables are used to test for potential selection bias in uptake; and (3) a two-stage Heckman estimator is used to test for attrition bias.

Propensity score models correct for selection bias by accounting for the child's probability of being in the intervention group (the propensity score), and thereby balance the sample. The approach has been shown to work best when the scores of the intervention and control groups overlap (Dehejia and Wahba 1999), and therefore observations may have to be discarded to focus the analysis on the common support.[35]

As the children in the sample came from different regions with different characteristics, an overlapping sample consisting of 810 observations was constructed to improve sample balance. It was chosen by calculating propensity scores for the BSFP and n-BSFP groups, and restricting the sample to a subsample with significant overlap. The sample balance of the overlapping sample was then evaluated using balance tables, which showed no material difference in the control variables between the BSFP and n-BSFP groups; and a statistical test, which did not reject that the control variables are balanced between the BSFP and n-BSFP groups in the overlapping sample (p-value 0.70). The overlapping sample was therefore concluded to be balanced. See Appendix N: Models selection, sample balance and robustness for further details.

Selection bias was tested using an instrumental variable estimator, in which the instruments are: whether the household was targeted for BSFP, the distance to the BSFP point and the source of information regarding the date of distribution. A Wooldridge robust score test did not reject that BSFP uptake is exogenous (p-value of 0.57). It was therefore concluded that, conditional on the covariates, there was no evidence of selection bias in uptake. See Appendix N for more information.

A Heckman correction model was used to test for attrition bias.[36] A Wald test did not reject the hypothesis that the attrition model and the outcome model are independent (p-value of 0.81). It was therefore concluded that there was no evidence of attrition bias (Appendix H: Attrition).

[35] For other studies imposing common support, see for instance Johar (2009) and Admassie and others (2009).

[36] In the context of attrition, the Heckman model controls for bias by estimating two stages. The first stage is an attrition model; and the second stage is an outcome model which uses the first stage to correct for attrition bias. See, for instance Grasdal (2001).

Empirical model

The outcome variable of the study is whether or not the child is MAM at endline.[37] The intervention variable is whether the child received all BSFP distributions. Distance to the nearest health center or mobile clinic (walking time as declared by survey respondents) is used to measure access to TSFP.

The effect of BSFP is estimated using ANCOVA, which controls for the lagged outcome variable (baseline MAM) to account for unobserved child characteristics. Given the low autocorrelation in MAM status in the sample, ANCOVA is preferred to a difference-in-difference estimator as it generally has higher power in cases of low autocorrelation (McKenzie 2012) and it is commonly used in the evaluation literature (Hidrobo et al. 2014; De Brauw et al. 2015; Aker 2015). The main equation estimated is:

$$y_{i,1} = \alpha + \gamma \cdot BSFP_i + \theta \cdot TSFPAccess_i + \delta \cdot y_{i,0} + \beta' X_i + \varepsilon_i$$

where $y_{i,t}$ is the outcome (equal to 1 if MAM, 0 if not) of child *i* at time *t*, where *t=0* is baseline and *t=1* is endline. $BSFP_i$ indicates whether the child was in group BSFP. $TSFPAccess_i$ indicates whether the child had good access to TSFP. X_i is a vector of covariates for child *i*, and ε_i is an error term. γ measures the impact of BSFP, θ measures the effect of TSFP access, δ captures the effect of baseline nutritional status, β the effect of the covariates and α is a constant.

The vector of covariates contains all the variables described in Appendix O: Variables definition. They are classified as follows:

- G: Sub-prefecture dummy variables
- C: Child-specific variables
- S1: Household characteristics and composition
- S2: Housing and household equipment
- S3: Income sources and expenses
- S4: Food sources and consumption
- S5: Access to service.

The ANCOVA model was estimated using two methods: ordinary least squares (denoted OLS) and probit (denoted PROBIT). This analysis was complemented with two propensity score models: inverse probability weights (denoted IPW) and inverse probability weights with regression adjustment (denoted IPWRA). The models differ in the following sense. OLS is linear in the coefficients, and provides an easy-to-interpret estimate of the effect. The PROBIT model adds to this by accounting for the binary outcome variable.

The IPW and IPWRA models estimate the propensity of each child to receive BSFP based on their characteristics (the propensity score). When estimating the effect of BSFP, they then weigh observations (children) according to their propensity score, such that children with the same propensity to receive BSFP receive the same weight. This assures better comparability of the two study groups. IPWRA furthermore uses a regression adjustment to control for the effect of the control variables on the outcome.

[37] MAM status was calculated using the national protocol. See the variable definition in Appendix O: Variable definitions for details.

The advantage of the IPWRA model is that it is ‘double robust’, in the sense that it specifies two models, one for the probability weights and one for the regression adjustment, and estimates are unbiased if just one of the two models is correct (Wooldridge 2010). Both IPW and IPWRA use a PROBIT model to estimate the probability weights (Appendix N for the results of this PROBIT model).

The two ANCOVA models (OLS and PROBIT) incorporate sub-prefecture effects to control for issues such as unobserved local conditions or differences in the aid received.[38] Since several sub-prefectures belong either exclusively or almost exclusively to one study group, IPW or IPWRA, they however, cannot include sub-prefecture effects.[39] The results of all the models are interpreted together to get a range of estimates for the effect.

The robustness of the model choice with respect to the overlapping sample, the control variables, and the use of ANCOVA rather than difference-in-difference is tested in Appendix N. Table 20 below gives an overview of the models.

Table 20: Overview of models

	OLS-FULL	OLS	PROBIT	IPW	IPWRA
Estimation method	Ordinary least squares	Ordinary least squares	Probit	Inverse probability weights	Inverse probability weights with regression adjustment
Control variables	G,C,S1-S5	G,C,S1-S5	G,C,S1-S5		-
Matching variables	–	–	–	C,S1–S5	C,S1–S5
Regression adjustment	–	–	–	C,S1–S5	C,S1–S5
Overlapping sample imposed	No	Yes	Yes	Yes	Yes

7.5.2 Primary empirical analysis

The three hypotheses analyzed, focus on children who either received **all** BSFP distributions or **no** BSFP distributions. Since the study’s main interest is the effect *on the target group,* all reported estimates are average treatment effect on the treated (ATT).

The results of a reference model (OLS-FULL), which is estimated for the entire sample, are reported so as to compare with the effects of the other models that are estimated in the overlapping sample. Thus, the results of model (1) in all tables should not be taken as relevant for the conclusions. In all tables, only the variables of interest are reported. The models are estimated using the variables in Table 20, unless otherwise indicated.

[38] Other seasonal programs were available to the sample households only in the sub-prefectures in BEG Nord. As these programs were available to all the sampled households in these sub-prefectures, controlling for sub-prefecture effects will capture the impact of these other programs, thereby controlling for contamination.

[39] IPW and IPWRA require all variables—both those used for the propensity score estimation and those used for the regression adjustment—to have variation in both study groups to be identified.

Another potential concern is the probability of false discoveries, which increases when multiple hypotheses are being tested. To control for this, *adjusted p-values* (also known as 'q-values'), which take account of the probability for false discoveries, are reported in the discussion below each of the tables.[40]

Table 21 below provides an overview of the results of the analysis of the main hypotheses.[41] In summary, the impact analysis provides evidence to support Hypothesis 1, but not to Hypothesis 2 and Hypothesis 3. However, with respect to Hypothesis 2, there is some evidence to support that TSFP access has an effect on its own, even though its effect does not interact with that of BSFP reception. Detailed results for each hypothesis are presented below.

Table 21: Overview of results of the empirical analysis

Hypothesis (H)	Effect direction	Effect size	Significant
H1: Effect of BSFP reception on MAM	BSFP reception reduces MAM	*4.7–8.0 pp.*	+
H2: Interaction between TSFP access and BSFP reception	BSFP reception effect is greater when TSFP access is poor	3.6–8.7 pp.	-
H3: Effect of BSFP reception on MAM	BSFP reception reduces MAM	0.2–7.1 pp.	-

Hypothesis 1: Reception of BSFP has a positive effect on the incidence of MAM in the target group (6–23 months)

Table 16 (cf. subsection 7.4) presents the raw correlation between BSFP and endline MAM, and suggests that the effect of receiving all BSFP distributions compared to receiving no BSFP distributions can be as high as a 5 percentage point reduction in endline MAM (from 17% to 12%).

To test statistically whether there is an effect on endline MAM from BSFP reception, the models of Table 20 are estimated on children aged 6–23 months who received either all or no distributions of BSFP. In Table 22 below, results for each of the models are reported. Notice that the regression coefficients for the PROBIT model are evaluated at the mean. The variable capturing reception of all BSFP rations is denoted BSFP.

[40]The approach is implemented by the command qqvalue in STATA. To calculate the adjusted p-value, a set of models must be chosen. The chosen model set is the IPWRA models of hypotheses 1–3, as reported in Table 22, Table 25 and Table 26 and the PROBIT model of Table 24. The methodology is outlined in Newson (2010).

[41] In Table 21, *pp.* refers to 'percentage points'; "-" refers to an effect which is not statistically significant; "+" refers to a significant effect with adjusted p-values, and "(+)" refers to the effect being significant using unadjusted p-values, but not with adjusted p-values. The "effect size" refers to the range of estimates delivered by the models OLS, PROBIT, IPW and IPWRA of the effect on MAM from BSFP reception.

Table 22: Impact of BSFP reception on MAM incidence

VARIABLES	(1) OLS-FULL	(2) OLS	(3) PROBIT	(4) IPW	(5) IPWRA
BSFP	-0.0227	-0.0509	-0.0465*	-0.0507*	-0.0800***
	(0.0289)	(0.0331)	(0.0258)	(0.0303)	(0.0301)
Observations	1,230	810	810	810	810
R-squared	0.181	0.232	0.277	–	–

Note: Robust standard errors in parentheses. For the OLS and PROBIT models, standard errors are clustered at village level. *** p<0.01, ** p<0.05, * p<0.1 PROBIT model: Coefficient is marginal effect calculated at the mean. The R-squared is Pseudo R-Squared.

Comparing the reference model (1) to the remaining models, which are restricted to the overlapping sample, it can be seen that estimating the regression model on the entire sample seems to lead us to underestimate the effect, since all the remaining models consistently estimate the effect to be higher.

The estimated effect of receiving all versus no BSFP distributions in the four main models is a 4.7-8.0 percentage point reduction in the propensity to become MAM. The effect is significant in the models PROBIT, IPW and IPWRA, and the adjusted p-value is 0.032, implying that the result is significant at the 5 per cent level, taking into account the possibility of false discoveries. The 8 percentage point estimate of the IPWRA model seems high given that OLS, PROBIT and IPW estimate the effect at around 5 percentage points. This may be due to IPWRA not using sub-prefecture effects, however, neither does the IPW model which estimates a 5.1 percentage points effect. Therefore, it is not evident that the difference stems from this issue. Furthermore, estimating the IPW and IPWRA models on a subsample without the sub-prefectures Mandjoura and Salal (which are the only sub-prefectures where TFA was received alongside with BSFP) yields BSFP effect estimates of 5.2 and 12.2 percentage points, respectively, and therefore it does not seem as if contamination has biased the estimates of the propensity score models upward.

Conclusion: *The models provide strong evidence that receiving all planned BSFP distributions significantly reduces MAM incidence for children in the target group. The reduction is 4.7-8.0 percentage points.*

Hypothesis 2: Reception of BSFP together with access to TSFP has a more positive impact on the incidence of MAM than reception of BSFP alone

Two tests are considered for this hypothesis:

- First, a test of whether **TSFP access has a positive impact on MAM incidence** for those children already receiving BSFP.
- Second, a test of whether **the impact of BSFP depends on TSFP access**, that is to say, whether there is an interaction effect between the two.

Thus, the first test seeks to evaluate whether access to TSFP is effective on reducing MAM incidence, and the second seeks to evaluate whether TSFP access makes BSFP more or less effective.

Table 23 indicates the correlation between MAM status, BSFP reception and the distance to TSFP. Results suggest that (i) MAM incidence is lower in the BSFP group when access to TSFP is good (distance to health center or mobile clinic is less than 2 hours), and (ii) BSFP is more effective among those who have poor access to TSFP: there is a 4 percentage point improvement of BSFP versus n-BSFP for those with good access to TSFP (distance to health center or mobile clinic less than 2 hours) compared to a 7.4 percentage point improvement of BSFP versus n-BSFP for those with poor access to TSFP (distance to health center or mobile clinic greater than 2 hours).

Table 23: Correlation between MAM endline status and distance to TSFP (%)

	Global	BSFP	n-BSFP
Less than 2 hours	12	11	15
More than 2 hours	17	14	21

Analysis of whether MAM incidence was the same in the BSFP group regardless of the fact that access to TSFP was carried out. Since this analysis concerns only BSFP children, there was no BSFP selection issue. Therefore, all children aged 6–23 months in the BSFP group were used rather than only the overlapping sample, and the matching estimators IPW and IPWRA were not used. Thus, the two models OLS and PROBIT were considered. These are identical to those used in the testing of Hypothesis 1, except for the previously mentioned changes to the sample. Access to TSFP is captured by the variable **HCLessThan2h**, which measures whether the child resides at a distance which is less than two hours from the nearest health center or mobile clinic.[42]

Table 24: Effect of TSFP access (more/less two hours) on MAM incidence in BSFP group

VARIABLES	(1) OLS	(2) PROBIT
HCLessThan2h	-0.0364	-0.0365**
	(0.0277)	(0.0180)
Observations	766	766
R-squared	0.212	0.272

Note: Sample is of all children aged 6–23 months who received all BSFP distributions. Standard errors (in parenthesis) are clustered at village level. *** p<0.01, ** p<0.05, * p<0.1.PROBIT: The R-squared is Pseudo R-Squared.

The reduction in MAM incidence from having good versus poor access to a health center or mobile clinic (as a proxy for access to TSFP) is 3.6–3.7 percentage points. As can be seen, the effect of good access to TSFP is estimated to have almost the same effect in the two models, but is only statistically significant in the PROBIT model. However, the adjusted p-value of this test is 0.188, indicating that one should be careful in interpreting this result as being significant. Therefore, the evidence to support the hypothesis is partial.

Conclusion: *There is some evidence that MAM incidence is significantly lower when there is good access to TSFP.*

[42]The cut-off of two hours was chosen based on testing. See Appendix O: Variable definitions for details.

The effect found above may come either because good access to TSFP by itself lowers MAM incidence or because there is a positive interaction between BSFP and access to TSFP. To test this, HCLessThan2h is interacted with BSFP. This allows the estimation of the OLS and PROBIT models, but the standard propensity score models IPW/IPWRA do not allow for an interaction term. Therefore, a multilevel IPW/IPWRA model is estimated. This model introduces an extra level, where GA denotes good access (child resides less than two hours away) and PA denotes poor access (child resides more than two hours away). BSFP/PA is chosen as the base level, and all other configurations are compared to this. Table 25 below reports the results of this analysis.

Table 25: Interaction effect of BSFP and TSFP access (more/less than two hours) on MAM incidence

Variables	(1) OLS-FULL	(2) OLS	(3) PROBIT	(4) IPW	(5) IPWRA
BSFP	-0.0801	-0.115*	-0.0742*	-	-
	(0.0511)	(0.0643)	(0.0443)		
BSFP*HCLessThan2h	0.0743	0.0807	0.0364	-	-
	(0.0455)	(0.0599)	(0.0422)		
HCLessThan2h	-0.115***	-0.166***	-0.121***	-	-
	(0.0416)	(0.0533)	(0.0339)		
BSFP/PA vs n-BSFP/PA	–	–	–	-0.0615	-0. 1437**
				(0.0532)	(0. 0556)
n-BSFP/GA vs n-BSFP/PA	–	–	–	0.2970	-0. 0391
				(0.3253)	(0 . 1143)
BSFP/GA vs n-BSFP/PA	–	–	–	-0.0521	-0. 1341*
				(0.0690)	(0 . 0707)
Observations	1,230	810	810	737	737
R-squared	0.182	0.234	0.278	–	–

Note: Robust standard errors in parentheses. For the OLS and PROBIT models, standard errors are clustered at village level. *** p<0.01, ** p<0.05, * p<0.1. PROBIT model: Coefficient is marginal effect calculated at the mean. The R-squared is Pseudo R-Squared. IPW/IPWRA: The overlapping sample is estimated separately using propensity scores between 0.01 and 0.99.

It should be noted that the effect of the distance to health center or mobile clinic is positive and significant in OLS and PROBIT. Thus, there is again an indication that access to TSFP matters, in that greater distance (less access) increases the probability that the child is MAM at endline. BSFP also remains significant. However, the estimates for the interaction between BSFP and the distance to the nearest health center vary a great deal between the models, and in none of the models is the effect significant.

Considering the IPWRA model, a parameter test on the interaction between BSFP and access to TSFP can be constructed, and this test has a p-value of 0.70. Thus, the null hypothesis that BSFP does not have a significantly different impact in the case when access to TSFP is good and when it is poor cannot be rejected. The adjusted p-value is very high, implying no statistical significance when taking into account the multiple hypotheses testing.

An extra test for this hypothesis, in which distance is analyzed as a continuous variable, has also been constructed. The results are presented in Appendix P: Additional results.

This analysis does not find an interaction effect between BSFP and the distance to the nearest health clinic either.

Conclusion: *The models do not reject the null hypothesis that BSFP reception has the same impact on MAM incidence when access to TSFP is poor and when it is good. That is to say, there is no interaction between the impact of BSFP and access to TSFP.*

Hypothesis 3: Reception of BSFP has a positive spillover effect on the incidence of MAM among siblings

Table 19 in subsection 7.4 considers the raw correlation between BSFP and MAM, and suggests that the MAM incidence for children aged 24–59 months is 4 percentage points lower if a younger sibling receives BSFP than if no younger sibling receives BSFP.

To test this statistically, the sample is set to children aged 24–59 months who are not themselves eligible for BSFP, but who may or may not have a sibling who is eligible. Thus, BSFP now indicates that the child has a younger sibling who received all BSFP distributions, and n-BSFP indicates that the child's younger siblings received no BSFP distributions.

A propensity score model is estimated using children aged 24–59 months and an overlapping sample is constructed.[43] Table 26 below reports the results of these estimations.

Table 26: BSFP impact for siblings aged 24–59 months

VARIABLES	(1) OLS-FULL	(2) OLS	(3) PROBIT	(4) IPW	(5) IPWRA
BSFP	-0.0323	-0.0713	-0.0023	-0.0131	-.0274
	(0.0442)	(0.0507)	(0.00397)	(0.0486)	(0.0373)
Observations	685	336	323	336	336
R-squared	0.312	0.428	0.616	–	–

Note: Robust standard errors in parentheses. For the OLS and PROBIT models, standard errors are clustered around village level. *** p<0.01, ** p<0.05, * p<0.1. PROBIT model: Coefficient is marginal effect calculated at the mean. The R-squared is Pseudo R-Squared. Notice that 13 observations have been dropped due to collinearity.

The effect of BSFP is negative in all models, but varies a great deal and is not significant in any of the models. Furthermore, the adjusted p-value is very high, implying no statistical significance when taking into account the multiple hypotheses testing.

It is possible that the erratic estimates are the result of the small sample. The initial sample for siblings aged 24–59 months is almost half that of the sample for children aged 6–23 months, and the overlapping sample is almost one third the size of that of the younger age group. This is a potential explanation for the lack of significance.

Conclusion: *The models do not reject the null hypothesis that BSFP reception of a younger sibling does not have an effect on MAM incidence of older siblings.*

[43] For consistency, the overlapping sample was constructed using the same thresholds as for children aged 6–23 months.

7.5.3 Heterogeneity and other results

A number of potential heterogeneities in the impact of BSFP were specified in the pre-analysis plan. The variables[44] were chosen because they are determinants of the manifestation of acute malnutrition. However, for specific reasons some were removed from the analysis[45] and others[46] were not initially planned to be tested because of the lack of relevance to the study, and based on findings from the correlations analysis presented in Appendix M.

Adjusted p-values were calculated along with the standard p-values to take account of multiple hypotheses testing, and both sets of results are presented. The detailed analysis is contained in Appendix M.

Table 27 below summarizes the results. Significant effect: A "-" refers to an effect which is not statistically significant, and "+" refers to an effect being statistically significant (either with adjusted or unadjusted p-values).

[44] Partial uptake, gender, age, number of siblings, distance to BSFP distribution point, livelihood conditions (number of revenue sources and main revenue source) and sanitary conditions.

[45] Distance to the BSFP distribution point is included in the instrumental variables analysis of selection bias, therefore no further analysis has been carried out. The analysis of partial reception was dropped, as only 40 children received partial BSFP.

[46] Type of BSFP product, other types of assistance received and sharing of rations.

Table 27: Heterogeneity analysis

Variable	Significant effect	Conclusions
Gender	-	*The models do not reject the null hypothesis that the effect of BSFP on MAM incidence is the same for boys and girls.*
Age	+	*The models provide some evidence to suggest that the impact of BSFP reception on MAM incidence is only significant for children aged 18–23 months. For this age group, the effect of BSFP reception on MAM incidence is estimated to be 5.4–5.6 percentage points. However, the evidence is not significant with adjusted p-values.*
Number of siblings	-	*The models do not reject the null hypothesis that the impact of BSFP reception on MAM incidence does not vary with the number of children in the household.*
Number of revenue sources	-	*The models do not reject the null hypothesis that the effect of BSFP does not depend on the number of revenue sources of the household.*
Main revenue source	+	*The models indicate that BSFP significantly reduces MAM incidence when the household's main revenue source is agriculture, and this effect is estimated at 9.5–10.8 percentage points. The models also indicate that BSFP significantly increases MAM incidence for households whose main revenue source is commerce, however this is not significant with adjusted p-values. For households whose main revenue source is livestock or external or other, the null hypothesis of no effect of BSFP cannot be rejected.*
Water and sanitary conditions	-	*The models suggest that the impact of BSFP reception is greater for households where the water source is far away or unimproved, but this effect is not significant.*
BSFP product	-	*Although BSFP reception reduces MAM significantly when the product is Super Cereal Plus, but not for Plumpy'Doz, we cannot reject that Super Cereal Plus and Plumpy'Doz have the same effect. Furthermore, none of the effects are significant with adjusted p-values.*
Other assistance received	-	*The models do not reject the null hypothesis that the effect of BSFP is not significantly different when a BSFP mother is present, nor is there a significant difference when food or cash is distributed. Furthermore, the effect of BSFP is similar in size and significance to the estimates of the model without the interactions.*
Ration sharing	-	*The models do not reject the null hypothesis that sharing the ration has no impact on MAM incidence for the children receiving the ration.*
Sharing with older siblings	-	*The models do not reject the null hypothesis that sharing the ration with older siblings has no impact on the MAM incidence for older siblings.*

Full regression tables and analysis of other statistically significant variables are presented in Appendix P: Additional results.

7.6 Cost analysis

As explained in section 6.5, the cost effectiveness analysis of seasonal BSFP was originally taken out of the project due to budget constraints. However, a retrospective basic cost analysis of the intervention was conducted six months after the endline field mission, based on data estimates provided by the WFP country office. This analysis does not feed into the conclusions and recommendations of this report, because of the nature and limitations of the data (most of the breakdown came from hard estimations), thus making it difficult to thoroughly engage with an analysis. Details on how the cost analysis was conducted can be found in Appendix Q: Cost analysis.

The country office was requested to provide the information regarding the implementation of the BSFP program for children aged 6–23 months in BEG on: (a) product costs, including all external and internal transport costs as well as shipping and handling; (b) partner costs, including costs for distribution, implementation, vulnerability assessment and training; (c) Moussoro sub-office staff costs; and (d) country office staff costs. All costs were requested for the period June–November 2016, which covers the period of the BSFP intervention.

As the most important intended outcomes of BSFP for children aged 6–23 months during lean season is the prevention of acute malnutrition (MAM/SAM), the actual analysis seeks to estimate the cost of the avoided cases of MAM/SAM through the studied intervention.

Using the information received, it is estimated that the cost of providing BSFP to children aged 6–23 months during lean season and in BEG is US$46.36 per child. According to the results of the comparative study, the endline status of the children in the two study groups was as shown in the Table 28 below.

Table 28: Nutritional status at endline by study group

	Normal		MAM		SAM		Total
BSFP	665	87%	91	12%	10	1,3%	766
n-BSFP	368	79%	80	17%	16	3,4%	464

Using the difference in MAM/SAM cases between the BSFP and n-BSFP group in the sample, it is estimated that BSFP reduces MAM/SAM incidence by 8 percentage points in BEG (87% for BSFP less 79% for n-BSFP). The total number of BSFP beneficiaries in BEG was 10,343. Therefore, applying this 8 per cent difference to the overall BSFP caseload in the region, the estimated number of MAM/SAM cases avoided is 827. This yields an estimated global cost of US$579 per MAM/SAM case avoided.

Table 29 below gives the summary of results obtained. Note that these estimates are based on the assumptions mentioned in the text, and the quality and availability of data, as well as the retrospective cost exercise. They should therefore be interpreted with utmost care.

Table 29: BSFP cost analysis in BEG (June–November 2016)

Cost (USD)	No. of BSFP beneficiaries in BEG	MAM/SAM cases avoided	Cost (USD) per BSFP child beneficiary	Cost (USD) per MAM/SAM case avoided
479,463	10,343	827	46	579

8. Discussion

This section presents (a) a review of the internal validity of the study, and (b) a brief contextual interpretation of the study results.

8.1 Internal validity

Two issues will be discussed in this section: attrition, as well as the sensitivity and specificity of the results. Other issues such as contamination, Hawthorne effects, John Henry effects and interviewer bias have been covered in section 6.2.7 on Evaluation design. These issues are either not relevant or have been dealt with in the analysis.

There was an **attrition rate** of 28 per cent between the baseline and endline study. However, since the baseline sample was not chosen to be representative, attrition is not of great concern. Nevertheless, an analysis was carried out. As described in section 6, attrition occurred either due to mistakes in the anthropometric measurement or because the child was not found at endline.

There was slightly higher attrition in the n-BSFP group (29.7%) than in the BSFP group (26.5%). Some (mostly smaller) differences in baseline characteristics were found between those children who were observed in baseline and endline (the final sample) and those children who were only observed in baseline (the attrition sample). However, these differences do not seem to affect baseline nutritional status, which is virtually the same in the final sample and in the attrition sample. To test whether attrition biases endline nutritional results, a Heckman selection model was employed. The results indicate that the attrition did not introduce a bias in the hypothesis testing. See Appendix H: Attrition for further details.

Two measures were taken to evaluate the sensitivity and specificity of the results. First, adjusted p-values were used to take into account multiple hypotheses testing; and second, power studies were conducted on the sample for each of the main hypotheses. The adjusted p-values and the power study indicate that the results satisfy the initial parameters specified for the statistical testing, but as in any study of this type, the sample size remains a challenge with respect to the avoidance of false negatives.

This is noticeable particularly in Hypothesis 3, where the sample is the smallest, since only the subsample of siblings aged 24–59 months is considered. Similarly, the tests for heterogeneity that consider multiple interactions have less power, since each interaction requires observations to be well identified. The effect of this has been sought to be limited as much as possible by always considering the simplest possible version of the heterogeneities investigated.

8.2 Summary of interpretation of results of the impact analysis

This subsection presents relevant conclusions for the statistical results of the impact analysis, looking at the study hypotheses and research questions. The discussion is supported by the main findings of the comparative analysis, the heterogeneity tests and additional correlations investigated to increase understanding of the impact analysis.

Quantitative data obtained through surveys has been interpreted in the light of qualitative information obtained through formal and informal interviews/meetings with population groups and relevant stakeholders, NGOs and WFP staff and with relevant evidence found in the exhaustive literature review made during the evaluation process.

Out of the three hypotheses tested, Hypothesis 1 is clearly confirmed in the study, whereas the other two hypotheses find, at best, partial support:

1. **Hypothesis 1:** BSFP has a strong effect on MAM incidence among children aged 6–23 months having received full BSFP rations during the WFP intervention. A child will, on average, lower its probability of becoming MAM by 4.7–8.0 percentage points from receiving all BSFP distributions versus receiving none.
2. **Hypothesis 2:** BSFP reception has no interaction with access to TSFP. The effect of BSFP is the same regardless of the distance to TSFP points. However, good access to TSFP reduces MAM incidence regardless of BSFP reception. Thus, although the models consistently estimate that BSFP has a greater effect (as measured by the percentage point reduction in MAM) when access to TSFP is poor than when it is good, this effect is never significant.
3. **Hypothesis 3:** BSFP reception by children aged 6–23 months has no effect on the MAM status of older siblings aged 24–59 months in the same household. Although it is consistently estimated that MAM incidence is lower for children whose younger siblings received all BSFP distributions, this is not significant. The evidence does not therefore suggest that BSFP has effect on siblings, but the lack of effect may be due to the size of the sample of siblings being very much reduced.

As stated for Hypothesis 1, children in the BSFP study group present less MAM incidence after the intervention than those in the n-BSFP group. However, the interpretation of these results must take into consideration that the BSFP intervention under study was accompanied by other forms of seasonal food assistance targeting the same households for the same period of time. While the evaluation of the separate or individual effect of each intervention was not an aim of the study, it cannot be ignored. Initially, during the study design the BSFP intervention was not linked to households targeted for TFA, but funding limitations led WFP to reduce its overall target BSFP group. The study controls for this statistically insofar as it is possible (see the discussion in section 7.6.1).

Regarding the complementary research questions, no interaction is observed between the effect of BSFP and gender: the impact of BSFP in MAM status is the same in girls as in boys. The group of children aged 6–23 months was sub-classified into three age sub-groups: 6–11 months, 12–17 months and 18–23 months. Comparisons by age sub-group show that BSFP has only a significant effect on MAM status for the most recent and oldest sub-group, although the significance disappears when taking into account the multiple hypothesis testing. The effect is likely to be because children aged 18–23 months no longer breastfeed if the mother is pregnant or has a new baby, and are increasingly dependent on the family's three meals a day. This is linked to household caring practices and is a key cause of malnutrition in the region. It also affects children aged 24–36 months, which, however, is not a focus of this study.

The heterogeneity tests and correlations between MAM endline status and study variables were performed and gave the results that are presented below. More details of these tests are in Appendix M.

There is no evidence that the total number of under-fives in the household significantly interacts with MAM incidence of children aged 6–23 months receiving BSFP.

Although there is a reduction of MAM in the BSFP group, the impact of BSFP on MAM incidence of children aged 6–23 months receiving BSFP, is independent of the number of the household revenue sources.

The impact of BSFP on MAM incidence in children aged 6–23 months receiving BSFP is heterogeneous with respect to the main household income source, as all livelihoods in the study area are submitted to marked seasonal variations, and the study design factored this in. This is particularly the case of subsistence farmers and small livestock households, which are the majority of the sample, with only a few relying on petty trade for their livelihood.

For the subsistence farmers, BSFP reception has a statistically significant and large reduction in MAM incidence. For small village sellers and small traders, MAM incidence is higher at endline (although this is not statistically significant when taking multiple hypotheses testing into account). This is likely to be because these households rely on daily commerce and have less productive assets to fall back on in the lean season, such as the sale of eggs and chickens, so are less able to supplement their income sources.

Poor access to clean water and use of inadequate sanitation facilities are classically considered underlying causes of malnutrition. Thus, BSFP may be more effective either when the household has good access to these services, because the effect of the product is greater if the child is otherwise healthy, or when these conditions are precarious because the child benefits more from the product when conditions are otherwise bad. Use of improved sources of water or sanitation facilities seems to reduce the likelihood of MAM, although the number of children sampled for "not improved water source" and "improved latrines" are too small to raise conclusions.

The heterogeneity analysis focused on the distance to the water source, and since almost no households have access to improved sanitation, and almost all of them have access to an improved water source, these two variables were dropped. There is some evidence that the effect of BSFP on MAM incidence of children aged 6–23 months receiving BSFP is greater for those children in households living with more precarious sanitary conditions in terms of less access to water or use of adequate sanitation facilities. Inadequate hygiene practices and water and sanitation facilities are an underlying cause of malnutrition.

No evidence has been found of the different effects of the BSFP products distributed on the incidence of MAM of children aged 6–23 months. Results show inconsistencies because reception of one product or the other (Super Cereal *Plus* or *Plumpy'Doz*, as per the national protocol) is geographically determined and can therefore not be isolated from other geographic contextual factors. The two products have the same nutritional value, but differ in the way they are prepared and consumed by the child, so we cannot discard that these packaging and consumption differences may have an effect on the uptake of the product or the likelihood of sharing. Nonetheless, the findings do not provide any conclusive evidence of this reflected in MAM incidence of children aged 6–23 months receiving BSFP.

Overall, the statistical estimates demonstrate that there does not seem to be an interaction between MAM incidence of children aged 6–23 months receiving BSFP and reception of other types of assistance. The comparative analysis between the two modalities of assistance (in-kind food and/or cash transfers) on MAM incidence of children aged 6–23 months suggests that BSFP is more effective when received with cash than with food.

This result must be interpreted with caution, as households receiving in-kind assistance instead of cash live in more remote areas, with less market access to spend the cash on food, and hence are also less likely to have access to other services and be more remote and rural. These contextual geographic factors may contribute to MAM incidence as well, and were not the focus of the study. On the other hand, no great difference was observed in the effect on MAM incidence of children aged 6–23 months with respect to whether the household also received BSFP for PLW. This suggests that the PLW BSFP ration is not being consumed by the children aged 6–23 months and influencing their MAM status.

The analysis of sharing of BSFP rations with siblings and other relatives shows no impact on MAM status at endline. Consuming the BSFP product 3–5 times per day (as per the national protocol and international recommendations) has a significant effect on MAM status, compared with consumption of the MAM product less than once a day. The frequency of consumption is, however, not an indication of the quantity consumed, so no other conclusions are drawn, and thus this proxy was eliminated from the analysis.

In addition to the tests presented above, regression tests performed for statistically significant variables showed that some of the factors studied increase MAM incidence in children aged 6–23 months and some have a positive effect on MAM incidence, thus reducing the MAM likelihood in children aged 6–23 months. They are listed below, and all of them are significant at the 10 per cent level in their effect on MAM incidence.

The factors that increase MAM incidence in children aged 6–23 months are:

- Nutritional status at baseline has a significant effect: Children being MAM or SAM at baseline significantly increases MAM incidence at endline.
- The overall household size significantly increases MAM incidence.
- Child's morbidity: Having been sick during the two weeks before the endline survey significantly increases MAM incidence.

The factors that reduce MAM incidence of children aged 6–23 months are:

- Owning a productive asset significantly reduces MAM incidence.
- Owning sheep significantly reduces MAM incidence.
- A higher proportion of food being bought significantly reduces MAM incidence.
- Health-seeking behavior: having taken the sick child to a formal healthcare structure significantly reduces MAM at endline. It is notable that for baseline child having been sick significantly reduced MAM incidence and having taken the sick child to formal healthcare increased MAM.
- Access to formal healthcare: Being at a distance which is less than two hours away from the nearest health center or mobile clinic significantly reduces MAM incidence.

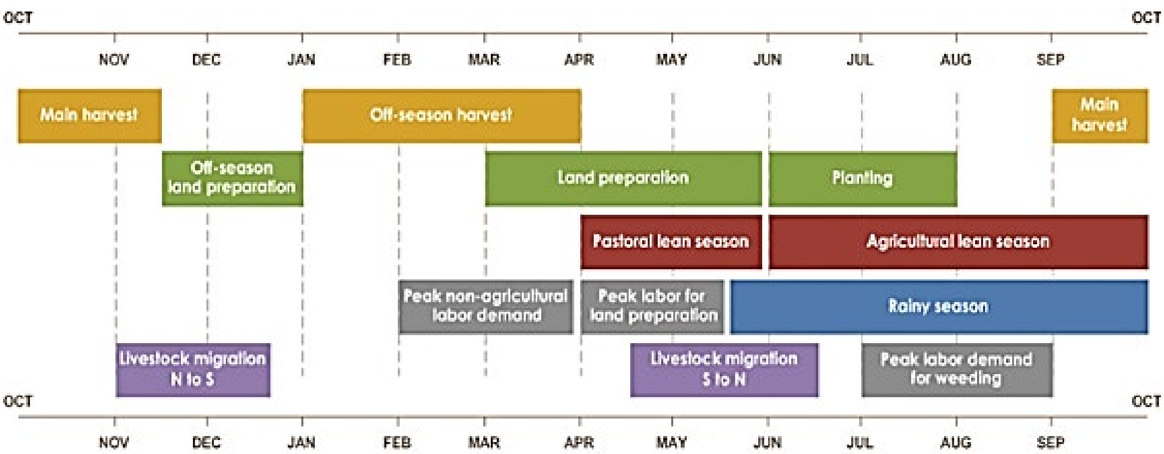
8.3 Seasonality

We present here the outcomes of the comparative analysis of relevant variables, not specifically measured in children but mostly at household level, during both surveys, and support the interpretation of changes on the child's nutritional status. For the most part, these variables represent changes in environmental or individual risk factors for malnutrition because of seasonality.

Differences between baseline and endline presented here are, in most cases, due to the seasonal character of the activities carried out by the household during the period between surveys and also to the potential effect of seasonal food assistance interventions. More detailed data and tables can be found in Appendix Q: Comparative analysis between baseline and endline relevant variables.

Figure 8 below presents Chad's seasonal calendar for a typical year. However, recently, due to the phenomena of climate change, the region has experienced delayed and shorter rainy seasons (theoretically between June and October), which affects seasonal workload and, globally, population activities and habits. This in turn prolongs the difficult lean season (also known as the hungry season) before harvests, and increases household use of negative coping strategies that are damaging to household food security, nutritional status and the environment.

Figure 8: Chad seasonal calendar for a typical year



Source: Famine Early Warning Systems Network webpage on Chad

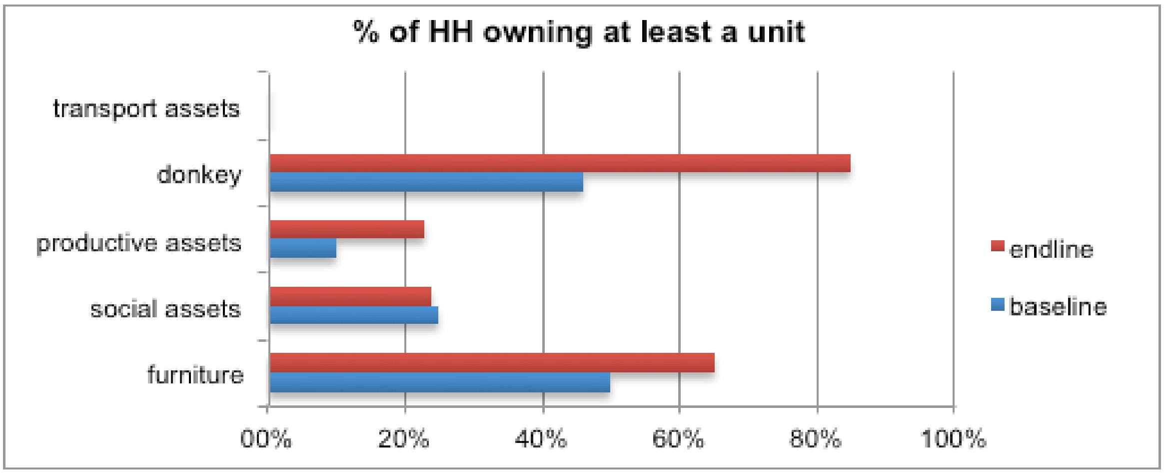
Historically, the lean season for grazing in BEG has been from April to the end of June, resulting in north to south livestock migrations in search of pasture in the less arid south. In November, herds return and move from south to north as the new pasture appears with the rains. This means that children in pastoralist households have less access to animal products, mostly milk, from April to November, while the herds are away from the household. The period between July and September has the highest labor demand for weeding, so some pastoralists will leave their herds with relatives and return for weeding to make the most of daily labor opportunities.

For agricultural populations the lean season is a little later and extends from June to October. During the lean season farmers prepare land (March–June) and plant (July–September) for the main harvests, which begin in mid-October. Off-season cultivation, mainly garden vegetables such as onions and tomatoes, which is an additional household income source, takes place during the dry and cold season, from January to April and only in households that have access to land that is sufficiently moistened by a river bed. Some villages in BEG have no access to off-season farming.

8.3.1 Assets and equipment

Globally, a comparison of household assets at baseline and endline (Figure 9) shows that households have increased their ownership of donkeys and productive assets (carts, plows, wheelbarrows, sewing machines or individual mills) and acquired some furniture (beds or improved stoves); social asset (radios or cellphones) ownership remains the same, as does ownership of other transport means (rickshaw, car, truck or taxi). The investment in assets most closely associated with livelihood activities is not surprising, given the subsistence level of the sample population.

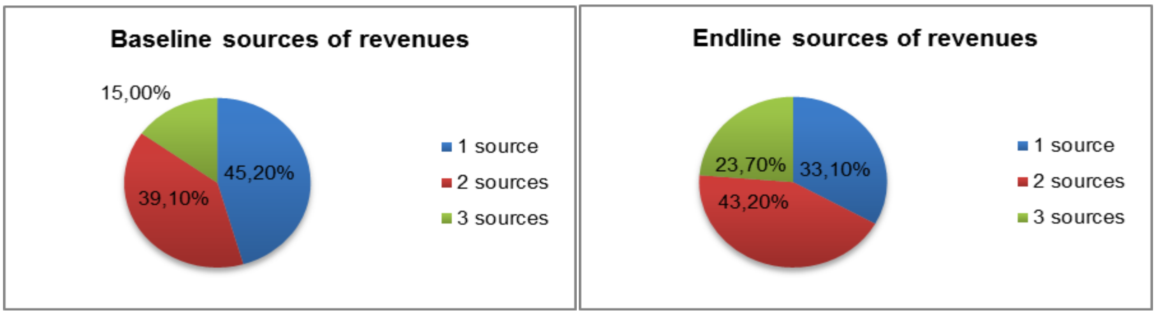
Figure 9: Household asset ownership (endline versus baseline)



8.3.2 Income sources

In June, almost half of the households in the sample have a single source of revenue, while in November there is a shift in household income sources to mainly two sources (Figure 10). This is likely to be because they have depleted their cereal stocks from the previous harvest and are supplementing it with daily agricultural labor and sale of eggs, chickens, firewood and foraged goods, to make ends meet. These are traditional coping strategies. While the cereal stocks or livestock are not yet available for sale, the population has to complete its budget with other and alternative sources of revenue.

Figure 10: Percentage of households with different numbers of revenue sources (baseline versus endline)



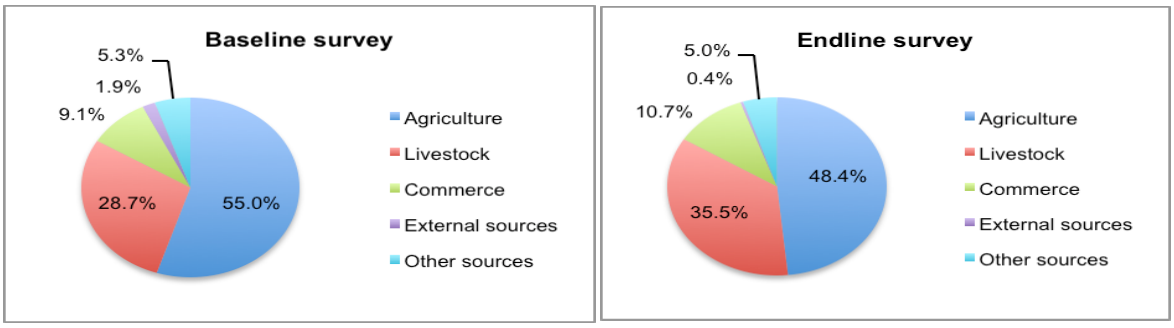
8.3.3 Main livelihood

Due to the seasonality of the most common income activities in the region, agriculture and livestock, the proportion of households considering them as main source of revenue varies before and after the lean season.

As shown in Figure 11, sale of agricultural products remains the most usual revenue source (around 50% of the respondents, but a slightly higher proportion at baseline) and the proportion who have livestock as their revenue source increases between baseline and endline. This situation is consistent with the seasonal calendar presented above: for farmers, harvest is just starting in November and for pastoralists hungry season has almost concluded when herds move north at the beginning of the rainy season and animals and animal products are ready to be sold.

For those getting their livelihood from sources less dependent on seasonal events (small traders and businessmen) the proportion does not change between baseline and endline.

Figure 11: Percentage of households for each main source of income (baseline versus endline)

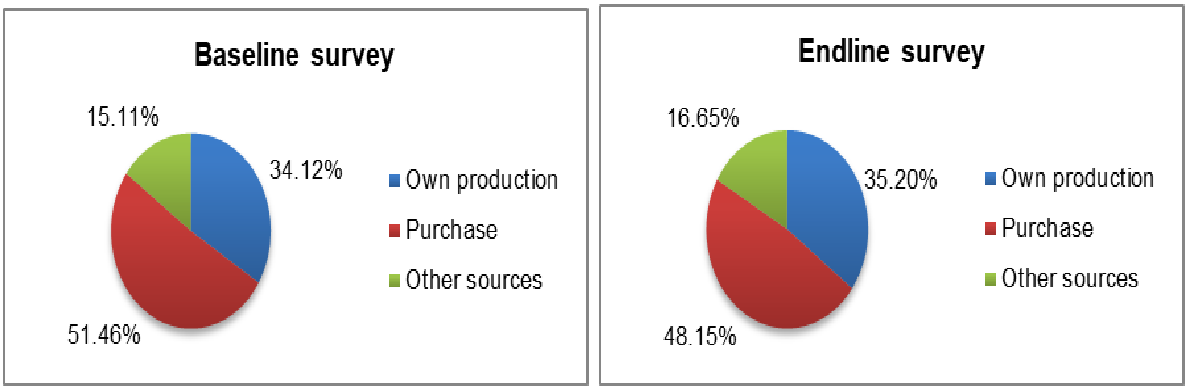


8.3.4 Proportional household expenditures

Proportionally,[47] household expenses for food diminish in November (by 10 percentage points), mainly because the proportion of capital allocated by families to ceremonies increases due to Ramadan that took place during summer and increased expenditures for the Ramadan feast. No changes occurred in household expenditure on health (Figure 12).

[47] The proportional pilling method was used to assess the relative importance respondents gave to each item of a standard list of household expenditures.

Figure 12: Proportion of household expenditures (baseline versus endline)

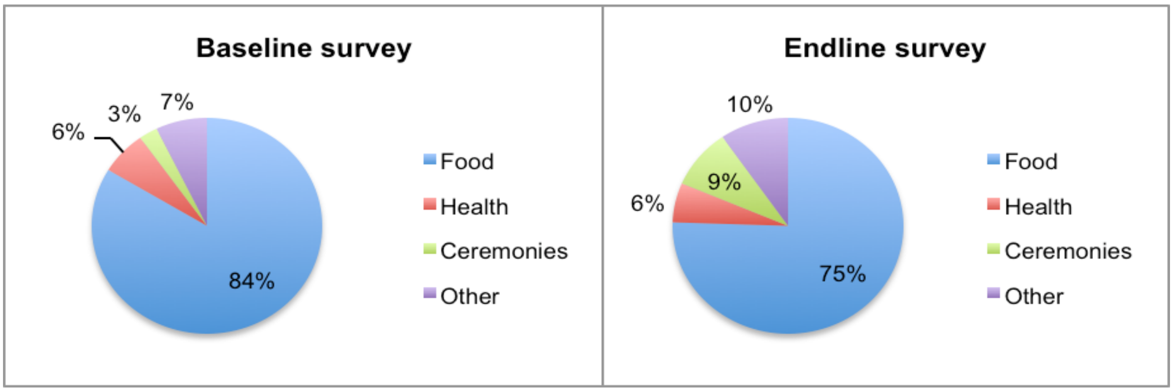


8.3.5 Sources of food

No large differences were observed between the proportion of food consumed by families coming from their own production or from markets (Figure 13). On average, food purchased represents around half of the household meals for both surveys (baseline 51% and endline 48%) and more than one third of the food consumed is produced by the same household. Food products coming from other sources (donations, aid and so forth) represent globally about 15 per cent of the total food consumed by the household.

The little changes between baseline and endline could have a seasonal explanation: in November the harvest was already underway, but had not finished by the time of the survey, and households could start consuming their own production. The seasonal food assistance provided by WFP and its operational partners could have contributed to the increase of "other sources".

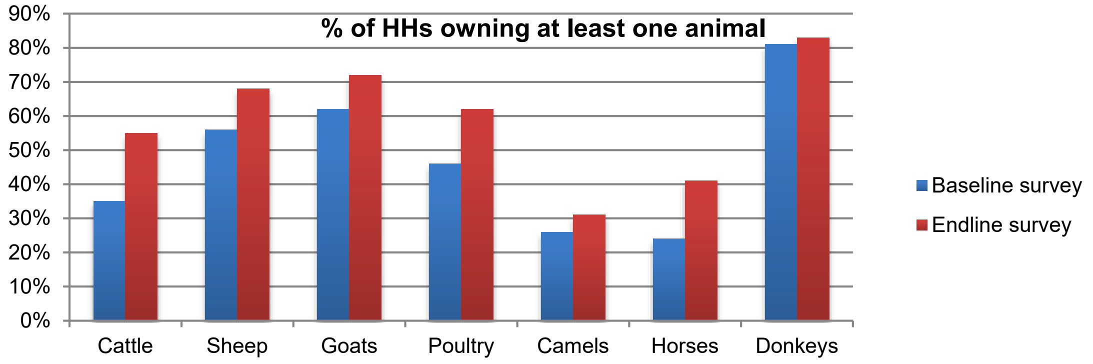
Figure 13: Proportion of food consumed by families from different sources (baseline versus endline)



8.3.6 Livestock

Globally, households have a slight increase of up to 10 per cent in animal ownership for all types of animals (Figure 14). This is likely to include the animals that the household has sent off with the herders during the lean season for grazing. Many subsistence-farming households will entrust their cows, sheep and goats to a herder, who then incorporates these individual households' animals into his own herd during the seasonal migration. Only the proportion of households reporting owning at least a donkey, which is a work animal required for water and firewood collection by women and hence stays in the household all year long, remains similar.

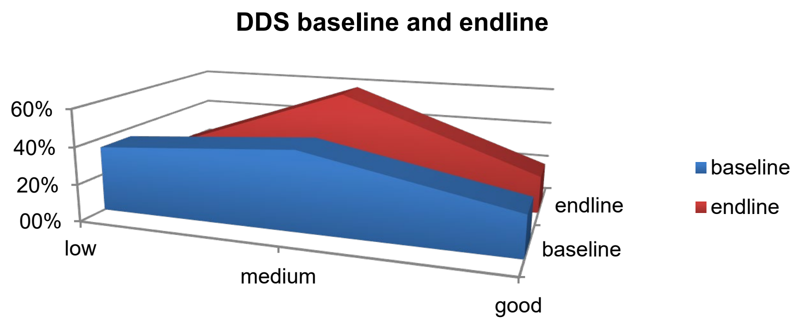
Figure 14: Proportion of households owning at least one animal



8.3.7 Child diet diversity score

The results (Figure 15) indicate that child food consumption is more diverse after the intervention, as the proportion of children with low DDS diminishes and the proportion of children with medium DDS increases. There is no significant variation observed in the percentage of children who have good DDS, although there is a small reduction in the percentage, indicating the overall limited dietary diversity of the sample population.

Figure 15: Child diet diversity score (endline versus baseline)



9. Specific findings for policy and practice

An impact evaluation is an essential tool for measuring the effects that a program has on its target population. It allows one to identify the extent to which a program is achieving its objectives and determines areas of opportunity for improving program quality, efficacy and effectiveness.

This evaluation concludes that BSFP has a positive effect on MAM incidence in children aged 6–23 months during the lean season. In particular, BSFP protects older age groups within that range, as well as those who come from households with greater access to TSFP (closer to health center or mobile clinic) and households engaged in seasonal livelihoods (agriculture and herding).

The key study findings that provide insights into potential evidence-based program design and delivery or policy improvements are described below. The recommendations below stem from the major conclusions and are of concern primarily to WFP, but also to other actors in Chad and globally (NGOs, UN agencies, donors and academic bodies among others) that aim to improve the way MAM is addressed.

Within WFP, recommendations may involve adjustments not only at the highest technical and policymaking levels, but also at stages of country office strategic and programmatic functioning. Although the study did not evaluate WFP, the BSFP intervention as such or a particular operation, but rather BSFP's impact, some of the points listed below refer to programming and to operational aspects of the intervention that, if improved, might increase the impact of BSFP MAM prevention.

9.1 Extended geographical targeting for BSFP, with no beneficiary quotas

BSFP during the lean season has proved to be effective in reducing MAM incidence in children aged 6–23 months. WFP seasonal interventions still have some limitations, mainly due to operational and financial issues, which means the BSFP are not implemented fully as designed.

- Geographical targeting for seasonal assistance is limited and does not provide full coverage of eligible children aged 6–23 months. While the identification of areas for intervention is a consensual bi-yearly exercise[48] that includes all food security country actors, including the government, and uses the harmonized framework approach to determine priority departments and sub-prefectures for food security and food assistance seasonal actions, this leaves out nutritionally vulnerable populations in other geographical areas. Remoteness, difficult access and nomadism make geographical targeting based on cost-efficiency necessary.
- Within the geographically targeted areas, WFP's caseload is adapted to its budget and not to need, so that the final number of beneficiaries is determined by the funds received (or expected). WFP interventions never attempt to cover 100 per cent of the eligible population within selected areas.

In 2016, decisions for programming seasonal assistance were taken by March, once the results of previous year's agricultural campaign had been completely evaluated and the round of Household Economy Approach assessments in the selected zones terminated.

WFP is the main player when it comes to food assistance in Chad. Other initiatives to address food insecurity during the lean season, however, run in parallel, funded by ECHO. While they are smaller in scale, it means that some geographical areas are targeted for two types of intervention and require careful coordination to avoid duplication to maximize targeting according to need. As the targeting calendars and areas are decided at the start of the lean season itself, the planning schedule is very tight for effective coordination of programs in the same areas.

- Recommendation 1: To extend the positive effect of BSFP on MAM incidence to a larger number of population, WFP globally or locally (country office) should establish agreements (memorandums of understanding) with other relevant funding bodies (ECHO) or relevant UN agencies[49] (UNICEF, FAO) for programming food assistance interventions in a more predictable, systematic and

[48] One in November at the start of the agricultural campaign, and the other by March before the lean season.

[49] During the humanitarian emergency response to the 2012 Sahel crisis, UNICEF and WFP, with the MoH and relevant NGOs found a way together to extend BSFP to all the regions of the Sahel belt for six months in the most affected areas, alternating regions and periods. During the 2013 evaluation of the UNICEF regional response to the Sahel crisis, this experience was cited as "good practice", although many coordination issues were raised during its implementation.

collaborative manner; and explore alternative financing mechanisms that allow for extended coverage (geographical and individual) of the interventions.

9.2 Improved timeliness for seasonal food assistance

BSFP is intended to mitigate the negative effects of exhaustion of household stocks. In the Sahel belt regions of Chad, the lean season for farmers is June–October, and can start earlier if there has been a poor harvest the year before. For pastoralists, May–June represents the peak of the hungry season for the animals, when they are taken away to look for pasture and households are left without a milk source until the rains bring the herds back.

Preventive BSFP should cover the whole lean season period to fully reach its potential for mitigating seasonal increases in MAM. Timing BSFP provision to just before the start of the lean season is therefore key and delaying BSFP, or stretching it out once the harvest season begins, minimizes its effect on MAM incidence. Recent trends show that in the Sahel, the lean season can start earlier and last longer, and this needs to be factored into BSFP programming cycles.
In 2016, the year of the study, the first BSFP distributions took place in July and finished in November.[50] The harmonized framework for March–August was prepared in March, as it was the final report for the HEA Outcomes Analysis. Thus, information and political agreements for programming were available soon enough to start timely seasonal assistance. However, slow mobilization of resources and long-lasting negotiations with partners, who were responsible for targeting the beneficiaries, delayed the process.

Both the targeting, which was finalized at the end of June, and the setup of the operation were deferred (section 5.2).

Implementing partners for BSFP and seasonal food assistance tend to be the same year after year in Chad, and usually work in exactly the same geographical areas. This gives them enough expertise and credibility to implement program activities swiftly and to good standards. However, renewal of agreements between the agencies and WFP still causes delays in program implementation, which could be avoided.

- Recommendation 2: Timely engagement and cooperation of WFP country office with implementing partners and key stakeholders can ensure more efficient delivery of programs. Seeking complementarity and improved coordination with other relevant actors, including donors, for an earlier mobilization of resources, might increase in the impact of BSFP and seasonal assistance.

9.3 Grant combined seasonal assistance for the most vulnerable

The combination of interventions for seasonal assistance implemented in 2016 has provided evidence that MAM incidence in children aged 6–23 months is reduced during

[50] This was not an exceptional situation, as delays are reported every year. The PRRO evaluation carried out in 2013 reported that in 2012, during one of the major crises, and even though there was coordination with UNICEF, certain regions received a single distribution for BSFP as late as August or even October. In 2013, BSFP started in June but in BEG it was scheduled between September and December, after the harvest. In 2015, final BSFP distributions took place in December.

the lean season. However, the separate effect of BSFP and the rest of the seasonal food assistance modalities have not been explored in this study.

WFP's choice of pairing TFA and BSFP distributions aims to reduce the risk of redistribution of the child's ration among household members. However, this approach also has some limits as it becomes essentially a product-oriented intervention. It misses essential preventive components aiming to achieve sustained behavioral changes (for example, promotion of breastfeeding, adequate hygiene practices). In addition, it misses out children aged 6–23 months from households that are not classified as food insecure, but which may have nutritionally vulnerable groups whose nutritional status will deteriorate during the lean season and who could have benefitted from a BSFP protection ration if WFP had enough funds (this model was in place in 2015, but BSFP changed from blanket to targeted in 2016).

BSFP does not address the underlying causes of malnutrition and only partially addresses seasonal malnutrition. The intervention does not seek to explore, develop or support multi-sectoral approaches. Instead, it is a short-term solution for addressing acute malnutrition. It needs to be integrated with longer-term prevention interventions and combined with other sector approaches in health, WASH and food security if the incidence of malnutrition is to be reduced in rural Chad in a sustainable manner (Bloss et al. 2004). In the context of Chad, this means ensuring that seasonal food insecurity and other seasonal factors linked to an increase in infections or inadequate caring practices, are taken into consideration to reduce seasonal peaks in wasting (Action Against Hunger 2013).

Furthermore, BSFP is not a strategy adapted to the specificities of particular contexts (in other words, there is no differentiation of specificities of livelihoods survival strategies).

- Recommendation 3: Further research may be needed to better understand particular interactions between BSFP and additional contextual and/or child conditions, or the separate effect of BSFP from the effect of the rest of the seasonal interventions that this year run in parallel. Additional issues to be explored could be the sustainability of the actual seasonal assistance model, or alternative strategies for preventing peaks of MAM incidence after the lean season. The cost-effectiveness of the intervention needs to be studied carefully with the adequate resourcing.

9.4 Better access to TSFP

Although no interaction has been found between BSFP and distance to TSFP, the evaluation concludes that living closer to a health center or mobile clinic reduces MAM incidence.

TSFP is still a uniquely WFP-supported intervention within the MoH primary healthcare system, implemented under very strict criteria (GAM greater than 10%) and without direct supervision beyond the logistical follow-up of activities and outputs. No other implication from WFP on the performance of activities and very little technical capacity building of national care providers exist. WFP is mainly the nutrition product provider, and, as such, has little involvement in technical and practical aspects of the TSFP implementation, leaving the MoH unassisted technically.

WFP TSFP geographical coverage in Chad depends, among other factors, on the geographical distribution of healthcare structures. MoH capacities and means to extend TSFP services is limited or non-existent. Some of the sub-prefectures the study is concerned with benefit from mobile clinics supported by international NGOs during certain periods of the year, but only while external funds allow and continuity is not guaranteed.

To improve access to TSFP, thus preventing excess MAM incidence, the following measures are suggested:

- Recommendation 4: To improve access to TSFP, thus preventing excess MAM incidence, WFP should, globally or locally (regional office/country office), in a collaborative manner with agencies supporting other components of the management of acute malnutrition (UNICEF for SAM), explore alternative approaches for increasing TSFP coverage (for example, community-based initiatives or collaboration with other governmental or civil society instances). It has been already recommended by other evaluations and reviews.[51], [52] Adequate design, testing, validation, promotion and use of locally produced nutritional products could also be an alternative to reducing the cost of treatment, and consequently, if combined with community-based delivery approaches, increase access to treatment.

[51] Community-based initiatives for the management of MAM cases beyond the structures of the national health system were recommended during a recent integrated MAM review in Chad [Revue nationale de la prise en charge intégrée de la malnutrition aiguë (PCIMA) au Tchad, novembre 2015 – DNTA]. The high caseload of MAM cases might also be detrimental for the management of SAM cases, which require closer and more specialized follow-up. Previous evaluations have also recommended seeking ways to collaborate better with other social welfare programmes to integrate MAM prevention and treatment into different policy and operational agendas (FMI 2015).

[52] The CMAM evaluation by UNICEF in 2013 concluded that the cost of ready-to-use therapeutic food is 50 per cent of the recurrent cost of a CMAM program for SAM. No cost for MAM was provided in this evaluation. The cost of treatment for MAM is US$40–80 per child compared with the cost for treatment of SAM (US$200 per episode, per child). Besides, the actual cost of Plumpy'Sup (US$0.33/100g; full treatment of MAM is estimated at US$44 per child) or similar products limits their wider use and therefore the uncontrolled extension of TSFP services.

Online appendices

Note to the reader: These appendices are only available online and have been published as received from the authors. They have not been copy-edited or formatted by 3ie, and can be accessed through the link provided here.

Appendix A: Sample size and power calculations
Appendix B: Further information on Chad and BEG context
Appendix C: Distribution calendar
Appendix D: TSFP access and outcomes
Appendix E: Baseline household questionnaire and data collection template for anthropometric data
Appendix F: Endline household questionnaire
Appendix G: Sample selection
Appendix H: Attrition
Appendix I: Tools for surveys
Appendix J: Anthropometric measurements
Appendix K: Training for survey's teams
Appendix L: Dataset construction
Appendix M: Heterogeneity analysis and correlations between MAM endline status and study variables
Appendix N: Model selection, sample balance and robustness
Appendix O: Variable definitions
Appendix P: Additional results
Appendix Q: Cost analysis
Appendix R: Comparative analysis between baseline and endline for relevant variables
Appendix S: Baseline mission report
Appendix T: Endline mission report

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