Severe acute malnutrition and retrospective all-cause mortality in children under 5 years of age in target areas of Zamfara State, Nigeria: a SMART survey.

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Severe acute malnutrition and retrospective all-cause mortality in children under 5 years of age in target areas of Zamfara State, Nigeria: a SMART survey.

Study protocol

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Study site	Randomly selected villages within catchment area of MSF in Zamfara, Nigeria
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Data collection and analysis by	MSF-OCA
Protocol and study design	Suzan Trienekens (Field Epidemiologist, MSF-OCA) Geke Huisman (Medical coordinator, MSF-OCA) Jane Greig (Epidemiology Advisor, MSF-UK)

CONTENTS

List of abbreviations

CI	Confidence Interval
ENA	Emergency Nutrition Assessment
ERB	Ethics Review Board (MSF)
GAM	Global Acute Malnutrition
ITFC	Intensive Therapeutic Feeding Centre
LGA	Local Government Area
MoH	Ministry of Health
MSF	Médecins sans Frontières
MSF-OCA	Médecins sans Frontières – Operational Centre Amsterdam
MUAC	Mid-Upper Arm Circumference
NNHS	National Nutrition and Health Survey
SAM	Severe Acute Malnutrition
SMART	Standardised Monitoring of Relief and Transition
WHO	World Health Organization

1. Introduction

1.1. CONTEXT

Nigeria, bordered by Benin, Niger, Chad and Cameroon, comprises 36 states plus one federal capital territory, and Nigeria consists of 774 Local Government Areas (LGAs) and had an estimated total population of 182,202,000 in 2015,[1] with an estimated annual population growth of 2.4%.[2] The country ranked 152 out of 188 on the Human Development Index in 2015.[3]

Main religions in Nigeria are Islam (50%) and Christianity (40%).Error: Reference source not found The country is composed of more than 250 ethnic groups of which the largest are Hausa and Fulani (both 29%), Yoruba (21%), Igbo (18%) and Ijaw (10%). Almost half (48%) of Nigerians live in urban areas.

Life expectancy at birth is 53 for men and 56 for women.*Error: Reference source not found* In 2015, average fertility rate was 5.1 children per woman, maternal mortality was 814 per 100,000 live births and under five mortality was 109 per 1,000 live births.Error: Reference source not found

The Ministry of Health (MoH) provides three levels of health care: dispensaries (consultations by community health workers and distribution of drugs), primary health centres (consultations with doctors and nurses), and hospitals (surgeries and more complicated procedures).

The ongoing conflict in north eastern Nigeria has resulted in more than 1,770,000 internally displaced people in the country by January 2017.[4]

Figure 1 *Administrative map of Nigeria, 2014*

Source: United Nations[5]

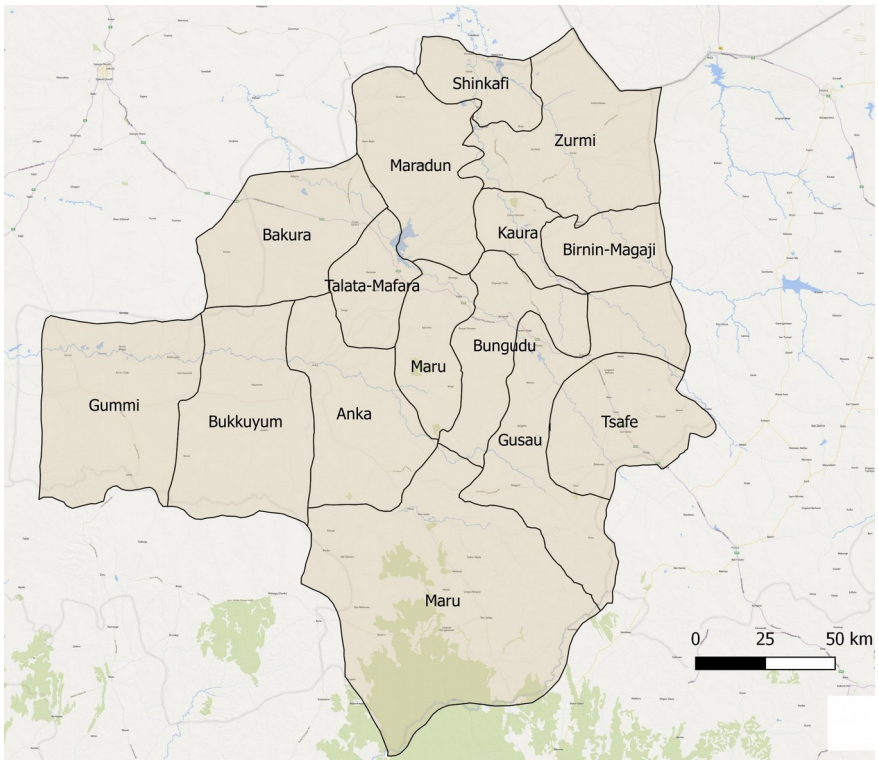
1.2. MSF PRESENCE IN THE COUNTRY

MSF's Operational Centre Amsterdam (OCA) started its activities in Nigeria in 1996. Currently, MSF-OCA has four projects in Nigeria, all in the North-West region: supporting the Noma hospital in Sokoto, the Nigeria Emergency Response Unit based in Sokoto and the heavy metal poisoning projects in Niger state and Zamfara state.

The project in Zamfara was set up in 2010 after MSF investigated a high number of paediatric deaths in Zamfara State, Nigeria; these deaths were found to be caused by heavy metal poisoning. The project, based in Anka LGA, focuses on awareness, active case finding and treatment of cases.

In addition to heavy metal poisoning cases, in recent years Anka General Hospital began seeing increased numbers of children with severe acute malnutrition (SAM). In 2015, the paediatric ward was split into an Intensive Therapeutic Feeding Centre (ITFC) and an Inpatient Department, both supported by MSF. High numbers of admissions for malnutrition remain with 2838 admissions at the ITFC in 2016. Apart from high numbers of SAM children, high numbers of other paediatric disease were also seen, mainly severe malaria cases coming in during late stages of disease as well as acute watery diarrhoea and lower respiratory tract infections.

Figure 2 *Map of LGAs in Zamfara state, Nigeria*



1.3. BACKGROUND - JUSTIFICATION FOR THE STUDY

The National Nutrition and Health Survey (NNHS)[6] carried out in 2015 by the National Bureau of Statistics estimated 58% of children under 5 in Zamfara were stunted (height-for-age Z-score below minus 2 standard deviations from the median of the reference population), 28% years were underweight (<-2 SD for weight-for-age) and 7% were wasted (<-2 SD for weight-for-height). Global acute malnutrition (GAM, MUAC score <115mm) and SAM (<125mm) in Zamfara was found to be 11.2% and 2.3% respectively, a considerable increase from the 6.1% GAM and 1.3% SAM reported in the 2014 NNHS (however this could be at least partly explained by the timing of the surveys and seasonality of malnutrition).[7] With a national average of 7.2% GAM and 1.8% SAM in 2015Error: Reference source not found, Zamfara is among the states with the highest burden of malnutrition.

The Nahuche Health and Demographic Surveillance System, set up in Zamfara in 2010 by MoH, and the Governments of the UK and Norway covers three wards in Bundugu LGA. A survey from 2016 conducted in the target area of this surveillance system found 70% stunting, 37% of children underweight and 15% wasting.[8] In addition, they found half of the children who were stunted were severely stunted (Z-score <-3 SD) and a quarter of underweight children were found to be severely underweight. Results on under 5 mortality showed 225 deaths/1,000 live births in this area in 2012,[9] considerably higher than the national average and the under 5 mortality rate of 185/1,000 reported for the North-West region in 2013.[10]

Current health promotion efforts are supported by several actors. The Working to Improve Nutrition in Northern Nigeria (WINNN) programme started in 2011 and is funded by UK's

governmental Department of International Development and implemented by Save the Children, UNICEF and Action Contre la Faim in five states including Zamfara.[11] This programme focuses on micronutrient supplementation, infant and young child feeding, community management of acute malnutrition and nutrition sector coordination and planning.

Furthermore, in January 2016 Nigerian businessman Aliko Dangote, together with Bill Gates announced plans to decrease malnutrition numbers in Northern Nigeria and allocated 100 million USD for programmes until 2020.[12]

As currently there is no regular assessment of under 5 mortality in the catchment area of MSF's project in Zamfara and no data is available on underlying causes of malnutrition, we propose carrying out a SMART survey. We would like to get more insight into malnutrition and all-cause mortality in the community, including a better understanding of health seeking behaviour, nutritional practices and food security. The results from this survey will contribute to identifying health needs in this community in order to redefine MSF programmatic activities and inform other health actors.

As noma is a high burden in this context and one of the risk factors are malnutrition, depressed immununne system by either not vaccinated, HIV infected, social economic situation, MSF will include a clinical assessment of children under five for the first stage of noma, which is gingivitis. As noma prevelance is not known (WHO 1994 estimate 7/1000 children in Sub Sahara) MSF has the ambition to conduct a prevelance study in 2018 in Sokoto state. With adding the screening of ginigivitis in the nutrition survey MSF might already get a better indication of the prevelance of ginigivitis, which is considered as a first stage in development of noma. These results will guide MSF in the planned noma prevelance study in Sokoto and might determine the precision indicator of this study.

2. OBJECTIVES

2.1. PRIMARY OBJECTIVES

To estimate the all-cause mortality rate and proportion of SAM in children under 5 years of age in target areas in Zamfara State.

2.2. SECONDARY OBJECTIVES

- To determine causes of death
- To assess morbidity
- To assess health seeking behaviour
- To assess food security and nutritional practices
- Estimate the prevalence of gingivitis in children <5 years of age

3. Study design

A Retrospective mortality and nutritional survey using a two-stage cluster sampling methodology as an adaptation of the standardised method recommended by the World Health Organization (WHO)[13] and SMART methodology is applied.[14]

4. Study AREA and period

The study area will be the catchment area of the MSF-OCA Zamfara project. In a preliminary analysis of ITFC admission data of October, November and December 2016, based on self-report of the caretaker, 82% of cases were from three LGAs around the ITFC in Anka: Talata Mafara, Anka and Bukkuyum. As the MSF project has been operational in this region for several years and providing health care free of cost, the organisation is well-known in the community.

The security situation in these three LGAs is relatively stable and collecting data is possible. We aim to broaden the geographical scope of this survey to include other LGAs in Zamfara, however the security situation of these other LGAs can change rapidly. Due to this, main focus will be on Talata Mafara, Anka and Bukkuyum and security in the other LGAs will be assessed closer to the date and included if deemed safe for data collection.

We aim to conduct the survey in September/October 2017.

5. Study population

The study population will consist of all people living in the villages, which are situated in the study area. Information on current population estimates is based on 2006 national census data and an estimated annual growth rate of 2.4%.

The total population of Zamfara state was 3,259,846 in 2006.[15] With an estimated population growth of 2.4% the current study population is estimated at 4,231,522, with 738,722 in the three main LGAs.

5.1. INCLUSION AND EXCLUSION CRITERIA

A person will be included in the study if s/he satisfies all of the following criteria:

- Living in the randomly selected household (see chapter 6.1. for the definition of a household)

and

- Informed consent has been given by the head of the household (see chapter 6.1. for the definition of the head of household and chapter 10.1. for details on the informed consent form)

A household will be excluded from the study if s/he satisfies one of the following criteria:

- Inability to locate the potential participant

or

- Refusal to participate in the study

6. Definitions

6.1. ~~HOUSEHOLD~~ DEFINITIONS

Definition of household

A household will be defined as a group of people who were under the responsibility of one person or head of household, and slept under the same roof the previous night. The whole household will be included, no matter the age of the household members or the relation with the other members.

When a family comprises a husband with multiple wives, a household will include only one wife with children. The husband will be included in the household of his first wife. In case the first wife has departed or died, he will be included in the household of his second wife, and so forth.

Definition of head of household

The head of household is defined as follows:

- Adult household member (≥18 years) *and*
- Can give accurate information on all demographic and mortality issues in his/her household (can describe with reasonable accuracy the events that occurred during the recall period), *and*
- Has lived in the household the entire recall period, *and*
- Is present at the time of the survey

A household will be excluded from the study if none of the household members fulfil all these criteria.

Definition of permanent member of the household

A permanent member of the household is defined as a person who is part of the household according to the household definition and slept in the house the previous evening.

Definition of Gingivitis:

As per MSF Noma Protocol:

A simple gingivitis can be defined as a non-destructive disease that occurs around the teeth with the symptoms as bright red or purple gums, gums that are tender or painful to the touch, bleeding gums or bleeding after brushing and bad breath (halitosis)

.

6.2. RECALL PERIOD FOR REPORTED DEATHS

We want to include both the rainy and the dry season in the recall period, thus we will use a recall period of 12 months.

The exact beginning of the recall period will be discussed with the team in the field, especially taking into account the experience of the national staff. The end of the recall period will be the day before the start of the interviews in the field.

Together with the field team an events calendar will be generated for the chosen recall period in order to determine more accurately the dates the deaths occurred.

7. SAMPLE SIZE and sampling

7.1. SAMPLE SIZE

Sample size was calculated with the help of “Emergency Nutrition Assessment (ENA) for Standardized Monitoring of Relief and Transition (SMART) " software, version 2011.

The criteria listed in Table 1 were taken into consideration for the calculation of the sample size.

Table 1 Criteria for the calculation of the sample size, Zamfara, Nigeria, 2017

Criteria	
Expected <5 years mortality of 10 000/day	1
Precision of 10 000/day	0.7
Estimated prevalence of SAM	2.3
Precision in %	1.5
Design effect	2
Recall period in days	365
Average household size	5
% children under 5	20
% of non-response households	5

For the mortality component the sample size was calculated at 468, and for the nutritional component at 835. To allow for a sufficient sample size for both mortality and malnutrition, the largest sample size will be chosen. To include 835 children under 5 years in the household, 977 households need to be sampled. Therefore we will sample 35 clusters of 28 households.

7.2. SAMPLING

In the first stage, 35 clusters will be selected from all villages situated in the study area. Cluster allocation will be done by systematic sampling with probability of allocation proportional to the respective population size of each village (probability proportional to size).

The GPS based sampling method will be used to select 28 households within a cluster: Conducting a perimeter walk around the selected cluster, an electronic outline of a village will be replicated in QGIS. Using this outline, the software can create random points within this perimeter corresponding to the number of households that need to be visited inside that cluster. Teams using GPS devices visit the households that are identified to be physically closest to randomly generated GPS points and interview these households.

If all households of a selected village are included in the study before completing the required number of households, the cluster will be continued by selecting the geographically closest village. The chosen sampling methodology will again be used in the closest village to select the first household in the village.

The security situation in Zamfara will be assessed by the Project Coordinator before sampling is carried out and villages that cannot be visited due to security restrictions will be removed from the sampling frame.

If for unforeseen reasons a selected village (cluster) cannot be visited during the survey period, it will be replaced by selecting the geographically closest village. The chosen methodology will again be used in the closest village to select the first household in the village.

We aim to complete one cluster per team per survey day.

8. Data collection

Village leaders of selected villages (=clusters) according to the sampling will be informed by the members of the survey team before the survey teams will visit them (see chapter 10).

In the households randomly selected according to the above methodology, the data collectors will explain the purpose of the survey to the head of the household in the language he or she is familiar with and consent obtained to conduct the interviews. If they decline to participate this will be accepted and noted. A household participation rate will be included in the study report.

The household interviews will be based on a questionnaire that consists of the following sections:

- Household size, and arrivals/departures during the recall period
- Age and sex of all children <5 currently living in the household
- Symptoms of morbidities of all children <5 years in the household in the last month
- Cause of deaths and time of year of deaths (e.g. Harmattan, rainy or dry season) for all deceased children <5 years in the household
- Food security
- Nutritional practices for feeding children <5 years in the household
- Health seeking behaviour if child <5 years presents symptoms
- Presence of gingivitis in children <5 years with a clinical assessment

Additionally, anthropometric data will be collected from children <5 years. All eligible children in a household will be measured. Households where children are absent will be revisited again the same day, or reason for absence noted when they did not return that day. Absent children are not to be replaced, rather sample size calculation includes potential non-responses.

Age will be recorded in months and always validated, if possible, with a record on any available card (immunization, food program, etc.). If the age is not recalled by the mother, a local calendar of events for the last 5 years will be used to help find the most accurate age for the child. Also, if the age of a neighbor child is known, the mother will be asked if his child was born before or after. As a last resort, an estimation of the age based on the height will be done (using height sticks) and children measuring <110 cm assumed to be under 5 years will be included in the sample.

The following measurements will be taken:

- Height (all children <5 years)
- Weight (all children <5 years)
- Mid-upper arm circumference (MUAC, for children 6 months - 5 years)

A Salter scale will be used to record the weight of the children to the nearest 0.1kg. When a child is less than 2 years old, he will be weighed in weighing pants or in a bucket. Measure of the weight will be done ideally without clothes. If the mother refuses to take off the clothes of her child, 0.15g will be subtracted from the weight.

Height boards will be used to measure the height of the children in cm to the nearest 0.1 cm. Children under 2 years of age will be measured laying down, while children 2 years or older will be measured standing up.

MUAC will be measured on the left arm of all the sampled children >6 months and recorded to the nearest 0.1cm. Following last WHO recommendations, a MUAC <125mm and <115mm will be used to indicate GAM and SAM, respectively.

A three second moderate pressure will be applied to the anterior surface of both feet. If the depression remains for few seconds, presence of oedema will be considered positive.

The weight-for-height of all measured children will be calculated using the WHO Growth Standards tables in Z-scores. All children that will be diagnosed as moderately or severely malnourished based on weight-for-height, MUAC or oedema will be referred to nearest health facility, using a referral form completed by the survey team.

The determination of gingivitis in children under age of 5 years will be done through a clinical examination by a trained nurse. They will inspect the mouth to identify redness/purple and tender gums, with or without bleeding (according to the above-mentioned case definition). Examination will conducted by nurse wearing gloves and using tongue depressors in order to inspect safely and respect safety precautions.

9. Data entry and AnalysIS

Data will be entered into EpiData 3.1 (Christiansen & Lauritsen, Odense, Denmark) by a data entry clerk. All data files will be stored password-protected by MSF. Only study investigators will have access to these data files. Data cleaning will be done to check for inconsistencies in data entry and responses. Data analysis will be conducted using ENA software and further analysis using Stata 14 (StataCorp, College Station, TX, USA).

No name-related data will be collected during the survey reducing the risk that participants will be identifiable after the survey has been completed. An electronic database will be generated from the paper questionnaires and this database will be password protected. The paper versions of the questionnaires (paper versions) and the electronic database will be stored at the MSF Headquarters or country management level for 5 years after the survey. Access to the electronic and paper version of the survey will be restricted to the Principal Investigator and co-investigators of the survey. After 5 years the paper copies of all the questionnaires will be destroyed.

We will explore the possibility of using electronic data collection using hand-held devices. If this is feasible, hand-held devices will only be handled by the data collectors, and handed over to the study coordinator at the end of each day after which the collected data will be uploaded to a secure server in Excel format and devices will consequently be stored in a locked cabinet within the project. If electronic data collection is possible, data will not have to be entered separately.

All indicators (i.e. sex and age of the survey population) will be calculated as proportions with 95% confidence intervals (95%CI). Estimates of actual design (cluster) effect will also be calculated for each variable and those with effects greater than 1 will be reported. Where appropriate, differences in proportions will be measured using Pearson $\chi 2$ test and p-value will be presented.

Denominators for mortality rates will be determined by calculating the individual contributed time in months for every household member who was present for a proportion of the recall period only due to arrival, departure, birth or death.

Ninety-five percent CI will be calculated and adjusted for the design effect.

Under-five mortality rates will be presented as number of deaths per 1,000 population per year. GAM and SAM will be reported by Z-scores and MUAC classifications. Health seeking behaviour, food security and nutritional practices will be described.

10. Ethical issues

The study will be conducted in accordance with the Council for International Organisations of Medical Sciences (CIOMS) International Ethical Guidelines for Biomedical Research Involving Human Subjects[16] and International Ethical Guidelines for Epidemiological Studies.[17]

The study protocol will be submitted to the Medical Director of MSF-OCA, for determining if the survey meets the MSF Ethics Review Board's (ERB) criteria to exempt it from further review by the ERB. It will also be presented locally to the ethics committee of the Nutritional sector in Nigeria for approval.

Authorities and communities in the study area will be informed about the purpose of the study, an information sheet will be provided and their endorsement will be sought. Meetings will be held with the Emirs and MoH in each LGA, where the Project Coordinator or Medical Team Leader, Assistant Project Coordinator and Health Promotion supervisor inform them about the survey and discuss any issues that may be raised. Village leaders will be invited to Anka for a joint information session, attended by the same MSF staff to discuss the survey and seek approval to conduct the survey in their villages. Community engagement expresses respect to the community and should improve survey content relevance and enhance security for both survey staff and participants.

MSF-OCA commits to sharing study results with everybody who has participated in the study. The local community will be involved and informed of the results through meetings with the Emirs, MoH, village leaders and community by the MSF team.

The MSF medical responsible in the field will advise the study team on the emergency and non-emergency referral practices when finding sick people in the study villages as well as procedure regarding psychosocial issues.

The Principal Investigator is overall responsible for ethical compliance of the study.

10.1. VERBAL CONSENT FORM

A verbal consent will be sought from every household, with the designated head of household answering the questionnaire for all relevant members of the household. He/she may choose to delegate answering the questionnaire to another member of the household.

Privacy and confidentiality in the data collected from the participants will be ensured both during and after the conduct of the survey. Participant names will not be recorded on questionnaires, and individual person records will be linked only to a household number throughout the data entry and analysis process. Any data that could be combined with other data sources to make individual records potentially identifiable will not be distributed outside the study location, or appear in any report or publication. All participants included in the surveys will have the investigations explained to them in a language with which they are familiar. Everyone will be offered the opportunity to refuse participation in the study at any time without penalty and no incentives or inducements will be provided to any respondents. Everyone approached for the survey is completely free to participate or not.

10.2. RISKS AND BENEFITS OF THE STUDY AND CONTINGENCY PLANS

Benefits can be seen both at the study participant level and at the community level. Children who are found to be malnourished or otherwise in need of care will be referred to the MSF supported health facility in Anka for care. Information collected on rates and causes of malnutrition and mortality will be used to redefine MSF's programmatic activities in the area and inform other health actors so that in the future care and prevention activities address the health needs in the community better and resources are more efficiently allocated. Accurate data on mortality and estimates regarding causes of mortality are of tremendous importance for advocacy on national and international level.

The survey does not cause any physical harm to participants. However, asking the heads of households for details of recent deaths of household members or finding a child to be malnourished may be upsetting, relatively intrusive, and even re-traumatising. Additionally, there may be limited privacy in village contexts to conduct the interviews. Recruiting local staff for interviewing and sufficient and appropriate training on interview techniques as well as monitoring this throughout the survey can mitigate these risks. In addition, questions can be skipped or an interview can be terminated at any point if the interviewer observes or the respondent indicates high stress levels during the interview. Psychological first aid should be added to the interviewer training as well as referral procedures for cases of re-traumatisation.

A potential risk to completion of the survey could be non-acceptance by authorities. This will be mitigated by seeking approval from the appropriate federal authorities and informing the local/ state authorities about the survey in advance. In addition, the security situation in the operational area may change during the data collection period. All interview teams will be briefed about the security guidelines and the security situation will be closely monitored and geographical scope might be adjusted if needed.

The benefit for the children who received clinical assessment for gingivitis is that they will receive a further clinical assessment and where needed children will be referred to the hospital to receive treatment of the gingivitis and parents will receive education on oral hygiene in order to prevent a possible further development which might lead to noma disease.

11. COLLABORATION

This study will be carried out by MSF-OCA, with the approval of the MoH. MSF-OCA is the study sponsor and is responsible for the funding. It is in charge of the field part of the study, the analysis and report writing.

12. Implementation of the study in the field

12.1. SELECTION AND TASKS OF THE STUDY TEAMS

The task of the interviewers will be to collect the necessary data for the study.
Each study team is composed of two interviewers. To finalise the field part in a reasonable time we need 5 study teams of two people each (see also chapter 11.5.).

General selection criteria for all interviewers:

- Able to read and write in English *and*
- Fluent in Hausa *and*
- Available for the entire time of the study (training and interview days), *and*
- Motivated to participate in the study, *and*
- Have no known conflict of interest, *and*

- Experience with interviews in difficult settings and study populations would be an advantage

Selection of interviewers will be independent and following MSF recruitment policies.

12.2. SUPERVISION

The principal investigator is the overall responsible for the final version of the protocol, overall quality of the survey and data analysis, and the final report.

The principal investigator will ensure that the following tasks are performed:

- Preparation of all necessary documents (protocol, questionnaires, informed consent forms) for the study
- Secure the necessary approvals to conduct the study
- Preparation of the field component of the study (training of the study teams, logistics, materials) together with the MSF team in the field
- Follow-up of the field component of the study
- Data entry
- Data analysis
- Report writing
- Ensuring ethical compliance during implementation of the study through supervision and training

12.3. SUGGESTED MSF SUPPORT IN THE FIELD

- Administrative support for study preparation at the field level and during field part, such as presentation of the survey protocol to the Nutritional sector and informing local leaders about the survey.
- Human resources support, such as hiring data collection staff, providing mission orders and payment of staff.

- Logistic support for study preparation at the field level and during field part, such as supply of stationary, communication tools and MSF identification, printing of documents and organising cars and drivers during data collection days.

12.4. TRAINING OF THE STUDY TEAM AND PRE-TESTING OF THE QUESTIONNAIRES

Two days training will be given to all interviewers to familiarise them with the background of the study, the questionnaires, the information sheet and the informed consent form. The training will be given in English by the principal investigator. It consists of an intensive review of the questionnaires, interview techniques including handling sensitive topics and the information sheet including role-plays. As the interviews will be held in the national language, the principal investigator will ensure that all interviewers are using the same and correct wording for providing information to the households and for the interviews.

The 2-days training will be finished with a pilot study in a place, which is outside of the study area. The pilot study allows for the testing and possible final adaptation of the questionnaires, information sheet and informed consent to field conditions.

A meeting will be held with associated staff such as logisticians, community liaisons, drivers and data clerks to explain the overall study and their roles and expectations.

An additional training will be conducted for definition of gingivitis and the identification of gingivitis. Further the team will be trained to refer children in need of treatment for their gingivitis.

12.5. TIMEFRAME IN THE FIELD

See table 2 for a preliminary plan of the field part of the study.

Table 2 *Preliminary plan of the field part of the mortality study, Zamfara, Nigeria, 2017*

Day	Nr. of days	To do
1	1	Travel day for arrival
2-3	2	Final preparation of the study
4-5	2	Training including the pilot study
6-12	7	Field part
13-14	2	Buffer days / debriefing
15	1	Travel days to return
	Total: 15 days	

13. LOGISTICS

13.1. SUPPLIES NEEDED

Supplies for the conduction of the study will be purchased through the Zamfara project. See table 3 for a list of required supplies.

Mortality questionnaires, informed consent forms and random number tables will be developed by the principal investigator. Printing of all necessary documents will be done in Sokoto.

A digital data entry form will be prepared by the principal investigator.

Table 3 *Supplies needed for the field part of the mortality study, Zamfara, Nigeria, 2017*

Item	No. needed per team	No. needed for 5 teams
Back pack/shoulder bag	2	10
Clipboard	2	10
Pen	2	10
Bibs, vests, arm bands or similar with MSF identification / logo	2	10
Plastic folder (for protection of questionnaires against rain and dust)	2	10
25 kg Salter scales	1	5
Calibration stone	1	5
Weighing pants	1	5
Bucket	1	5
Height boards	1	5
MUAC band	2	10

13.2. TRANSPORT NEEDED

Security in Zamfara requires a car to be standby for the teams. Therefore, five cars and drivers will be required for the duration of the survey.

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