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**Vaccination coverage survey after mass vaccination campaign (MVC) against measles in Bongor district, Mayo Kebbi Est province, Chad, May 2022**

**MSF HOLLANDE**

**CHAD**

**Study protocol**

**May 2022**

**First Version** : 01/05/2022

**First review** :

**Study design** : Two-stage cluster sampling

**Study type** : Transversale survey

**Study participants** : Children aged 6 months to 9 years

**Study period** : May 2022

**Study site** : Bongor district

**Study team**

|  |  |  |
| --- | --- | --- |
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| Prince ALFANI | Health Advisor MSF OCA | Co-investigator |

**Collaborating institutions**: Ministry of Health, Chad

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# List of abreviations

ARs Area of Responsibilities

CERU Chad Emergency Response Unit

CI Confidence interval

EPI Extended Program of Immunization

ERB Ethics Review Board

95% CI 95% confidence interval

MOH Ministry of Health

MSF Médecins sans Frontières

MSF-H: Médecins sans Frontières Hollande

WHO World Health Organization

# Context

## Country information

Chad is a large country in north-central Africa, with a population of approximately 13.6 million (2015). The country is divided into 23 regions/provinces; each region is further divided into districts. Based on the 2017 estimates of the Human Development Index, Chad is ranked 186 out of 189 countries. Life expectancy at birth is 53 years for men and 55 years for women. The under-five mortality rate is 123/1,000 live births.



Figure 1 : Map of Chad

## MSF presence

MSF-OCA has been present in Chad since 2003. The mission includes an emergency project, Chad Emergency Response Unit (CERU) which provides rapid response in case of an emergency.

## Measles outbreak in Chad

Despite Chad's efforts in the field of immunization, routine EPI vaccine coverage surveys, Demographic and Health Surveys and Multiple Indicator Surveys in Chad (DHS-MICS), estimates of WHO and UNICEF show that immunization coverage is very low and does not ensure the collective immunity of under 5 years children. This could explain the occurrence of recurrent measles outbreaks that the country does every year.

Measles season generally starts in March (halfway the dry season) but ends usually in June (start of the rainy season). There have been several national mass vaccination campaign in the past years, but target populations and coverage are not well reported[[1]](#footnote-1).

In 2022, we are facing a new epidemic in Bongor district. Bongor is the main town in the Mayo Kebbi Est region and is located 245 km southwest of Ndjamena. It takes about 5.5 hours to reach Bongor from N'Djamena by car. Mayo Kebbi Est is one of Chad's 23 regions and is located on the eastern bank of the Logone River, southwest of N'Djamena, bordering Cameroon. It is subdivided into 25 areas of responsibility. Its population is 203.135, including 73,129 children aged 6 months to 9 years.

Indeed, according to the definition of the MOH, this district had been on alert since the 7th week – 2022. According to the IDS, from W1 to W14 2022, Bongor recorded 59 cases of measles.

An investigation conducted by the CERU reported 194 cases and 0 death of measles from the 1st week to the 14th week with an attack rate of 22.7 / 10,000. The most affected age group is that of 6 months to 9 years. Faced with this worrying situation, the following actions have been decided:

* Improve case management by supporting the MOH through capacity building of healthcare staff, distribution of free measles case management kits in health centers
* Strengthen the surveillance system in the district through active case finding and community sensitization
* Conduct a vaccination campaign targeting children from 6 months to 9 years old (36% of the population) in the district from 29 April to 11 May 2022

## Rationale

A vaccine coverage survey was proposed to estimate the vaccination status of children between 6 months and 9 years after MSF’s mass vaccination campaign for measles in Bongor district from 29 April to 11 May 2022. This survey will also inform the need for mop-up activities.

Based on vaccines given, there is sufficient coverage (> 95%) in the community.

# Objectives

## Primary objective

To estimate VAR vaccination coverage in children aged 6 months to 9 years in Bongor district after the mass vaccination campaign against measles implemented by MSF and MOH

## Secondary Objectives

* To calculate VAR vaccination coverage by age group
* To Describe the reasons for non-vaccination during the vaccination campaign
* To provide recommendations for vaccination strategies and surveillance in this context and similar ones.

# Survey design

This will be a quantitative, cross-sectional study that will focus on children aged 6 months to 9 years living in Bongor district. It will be conducted using two-stage cluster sampling.

The determination of the vaccine status will be done by interview, analysis of the individual vaccination cards, observation of recent ink markings on the fingers and the oral declaration of the vaccination status of the children.

# Target Population

All children between 6 months and 9 years of age living in Bongor district during the time of the survey will be candidates to be included.

## Inclusion criteria

Children will be included in the survey if they satisfy the following criteria:

* Be between 6 months and 9 years old at the time of the vaccination campaign
* Reside in Bongor district during the vaccination campaign
* Belong to randomly selected households
* Have the free and informed oral consent of the parent or legal guardian of the child aged at least 18 years

## Exclusion criteria

will be excluded from the survey:

* Children belonging to a household not drawn by lot
* Any child aged under 6 months and over 9 years old at the time of the vaccination campaign
* Households in which the parents or legal guardian (at least 18 years old) of the children will be absent on the day of the survey
* Refusal of the parents or legal guardian of the child to participate in the survey

# Definitions

## Household

A household is defined as a group of people who are under the responsibility of one person or head of household sleeping under the same roof and sharing meals for at least 2 weeks. All members of the household meeting the age inclusion criteria will be included, no matter the relation with the other members.

## Head of household/caretaker

The head of household is defined as follows:

* Adult household member ≥ 18 years, *and*
* Has authority on the household (husband or the oldest family member)
* Can give accurate information on all demographic issues in his/her  
  household, *and*
* Self-identified as the head of household/caretaker

If the official head of household was absent at the time of the survey, study interviewers will inquire if any other caretaker in the HH, present at the time of the survey and is able to provide consent for the household and give accurate information. A household will be excluded from the survey if none of the household members fulfil all these criteria.

## Vaccination

* **Vaccinated by card**

An individual who received one dose of measles containing vaccine during the vaccination campaign. This is confirmed on interview by a marked finger or presentation of a vaccination card

* **Vaccinated by verbal confirmation**

An individual who received one dose of measles-containing vaccine during the campaign. This is confirmed on interview by verbal history of the participant or his/her parents/guardians/caretakers, but without verification using marked or vaccination card.

* **Not vaccinated**

An individual who did not receive one dose of measles-containing vaccine during the campaign, and does not have a vaccination card demonstrating such, and has no finger marking suggesting vaccination took place. This is confirmed on interview by the participant or his/her parents/guardians/caretakers stating that no measles vaccination was receive.

* **Unknown**

An individual or his/her parents/guardians/caretakers do not recall if the survey participant was vaccinated during the vaccination campaign AND there is no marking of the finger suggesting that the vaccination took place nor any other available proof (i.e. health passport).

# Sample size and sampling

## Sample size calculation

The sample size was calculated using ENA SMART software (SMART, 2019) based on the following inputs:

* Average household size of 6
* 36% of children aged 6 months to 9 years
* Estimated coverage of 80%
* Confidence intervals of 95%
* Precision of 5%
* Design effect of 3
* Non-response rate of 10%

This returns a sample size of 803 children in 459 households (46 clusters of 10 households). To prevent cases where a cluster might not exist or is not identifiable, we choose to have 5 clusters in reserve.

## Sampling procedure

The vaccination coverage survey will use two-stage cluster sampling methodology. The target population for this mass vaccination campaign is approximately 73,129 children aged 6 months to 9 years. Vaccination cards will be given out to children during the campaign.

* **1st stage**: Clusters will be selected based on probability proportional to population size (PPS), using population data from the MOH. This choice will be made using the ENA SMART 2019 software.
* **2nd stage:** Spatial Sampling or systematic sampling will be used to select 10 households in each of 46 clusters.

All eligible children in each selected household will be included in the study. The household head (≥18 years) will be asked about the age and vaccination status of all children in the household aged 6 months to 9 years.

### **Spatial sampling**

This will involve making a simple random choice using a spatial sampling method within the polygons corresponding to the clusters selected in the first stage. GPS points will be randomly generated in the polygons selected in the first stage. These points will be visualized beforehand on Google Earth and the points not corresponding to houses will be eliminated.

### **Systematic sampling**

When geographical data are not available or do not allow simple random spatial sampling, systematic sampling will be used. Concessions will be selected starting with a randomly chosen concession and then applying a regular interval between each concession. The regular interval is the ratio between the number of concessions in the cluster and the number of concessions to be visited in this cluster. The survey team will be helped by the village chiefs to determine the limits of the village, obtain the number of concession and define a path through the village.

**NB**:

* Abandoned or uninhabited houses and churches will be excluded
* If multiple households live in the same compound, a household will be randomly selected by numbering them and generating a random number on the tablet.
* If for unforeseeable reasons the cluster is not accessible, it will be replaced by one of the clusters in reserve.
* If a household has no target children, it is not replaced. The team will indicate on the survey sheet that the household had no eligible children.
* If a selected household will not be available after two visits attempts (morning and afternoon), or is not willing to respond, that household will not be replaced
* Visitors should not be included in the survey

# Data collection

The medical coordinator will inform the Chadian Ministry of Health of the survey. Once approved, the project coordinator will inform the district and zonal officials (for zones with selected clusters).

In each cluster, the survey team will inform the chef de quartier or chef de village or chef de canton (as applicable). They will explain the purpose of the survey. It will be clearly explained to the heads of the neighborhood/village/canton that they are freely allow to decline the participation of their area without any consequences or penalty. In this case, the village or neighborhood will be replaced by selecting the geographically closest village or neighborhood.

In the households selected, the interviewer team will explain the purpose of the survey to the head of the household/survey participant or the parents/guardians/caretakers in the language he or she is familiar with and verbal consent obtained to conduct the interviews and documented on the questionnaire. All refusals will be recorded and those forms retained to document participation rate.

All children in the eligible age range in the identified households are included in the survey, including in the final household of a cluster, even if this exceeds the total target of children for the cluster.

A standardized pre-piloted questionnaire will be used to collect the following data for each child of the cohort at recruitment:

* Demographic data: age, sex, number of children aged 6 months to 9 years in the household.
* Vaccination status: verbal and card confirmation
* Reasons for non-vaccination

# Data entry and analysis

Data will be collected using Kobo Collect on smartphone. Data from the smartphones will be uploaded to the server nightly.

All databases will be automatically generated from the data entry in the tablets at the time of the interview. All data will be anonymized and electronic files stored password-protected by MSF-OCA. The electronic database will be stored at the MSF Headquarters or country management level for 5 years after the survey. Access to the survey data will be restricted to the co-investigators of the study and the Medical Coordinator

Data monitoring will be conducted to check for inconsistencies in data entry and responses. The epidemiologist will review data quality each evening after synchronization. Data cleaning and analysis will be conducted using Stata15.

The main outcome of the analysis will be the overall vaccination coverage. We will present the sample prevalence of vaccination in two age groups (6-59 months and 5-9 years) to inform future planning. All indicators 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.

# Ethical principles

The survey will be conducted in accordance with the Council for International Organizations of Medical Sciences (CIOMS) International Ethical Guidelines for Biomedical Research Involving Human Subjects[[2]](#footnote-2) and International Ethical Guidelines for Epidemiological Studies.[[3]](#footnote-3)

The MSF Ethics Review Board (ERB) approved the standardized survey protocol used in this study. The MSF-OCA Medical Director determined that this particular survey met the ERB’s criteria exempting it from further review by the ERB. The Chadian Ministry of Health approved this survey.

Authorities and communities (such as village heads, religious leaders, opinion makers) in the survey area will be informed about the purpose of the survey, an information sheet will be provided and their endorsement will be sought. Community engagement shows respect to the community and should improve survey content relevance and enhance security for both survey staff and participants.

MSF-OCA commits to sharing survey results with everybody who has participated in the survey. The local community will be involved and informed through providing survey results to officials in all zones surveyed to pass to the chefs de villages and chefs de cantons.

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, and whether to refer unvaccinated participants to a specific health structure to receive missed vaccines or advise them to attend any mop-up campaign that might be offered.

The principal investigator is overall responsible for ethical compliance of the study.

Participant privacy will be respected during the interviewing process. Staff will be trained in how to assess for appropriate conditions to help maintain confidentiality during the interview process, including choosing the optimal location when a setting makes privacy difficult (e.g. single room dwelling).

## Verbal consent form

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, or to individuals regarding their own vaccination status if relevant.

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 survey location, or appear in any report or publication. If used for sptatial sampling, GPS data will be deleted afterward. All participants included in the survey will have the survey activity explained to them in a language with which they are familiar. Everyone will be offered the opportunity to refuse participation in the survey 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.

## Risks and benefits of the study and contingency plans

The vaccination coverage survey does not cause any physical harm to participants. Nevertheless, asking the interviewees about personal information may feel intrusive and in village contexts there may be limited privacy. Using local staff and careful training on interview-techniques can mitigate this.

There are no direct immediate benefits from this survey. However, benefits can be seen at the community level. A better understanding of the vaccination coverage ratios and causes of non-vaccination in the area will allow better tailored programming and more efficient use of resources. Accurate data on vaccination status are of tremendous importance for advocacy on national and international level.

# Collaboration teams

The study will be carried out in collaboration between MSF-OCA and the Ministry of Health of Chad. MSF study team is in discussions with the Ministry of Health to identify the most appropriate collaborator(s) to be included in this team.

MSF-OCA is the study sponsor and is responsible for the funding. It is in charge of the field part of the survey, the analysis and report writing. Permission for publication must be obtained from MSF-OCA and the MOH.Survey results will belong to MSF-OCA and the MOH of Chad.

# Implementation of the survey in the field

## Selection and tasks of the survey teams

The task of the interviewers will be to collect the necessary data for the survey. Each survey team is composed of two interviewers. To finalize the field part in a reasonable time we need six survey teams of two persons.

**General selection criteria for all interviewers**

* Fluent in French, and able to speak and understand Chadian Arabic and Massa fluently, Available for the ENTIRE time of the survey (training and interview days),
* If necessary: Willing and able to work on Saturdays and Sundays during the survey time,
* Motivated to participate in the survey,
* Have no known conflict of interest,
* Experience with surveys and/or community health work would be an advantage
  1. **Supervision**

Survey teams will be supervised by Field Epidemiologist and Ceru’s Data Encoder. The principal investigator is the overall responsible for the final version of the protocol, the quality of the research, the data analysis and report writing.

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

* Preparation of all necessary documents (protocol, questionnaires) for the survey
* Secure the necessary local approvals (including that of the local ethics committee if needed)
* Preparation of the field component of the survey (training of the study teams, logistics, materials) together with the MSF team in the field
* Follow-up of the field component of the survey
* Data entry or training of a data entry clerk
* Data quality checking and analysis
* Report writing
* Ensuring ethical compliance during implementation of the study through supervision and training

## Suggested MSF Support in the field

* Administrative support for survey preparation at the field level and during field part, such as communication with country and local-level authorities.
* Human resources support, such as assistance with hiring of interviewers, payment of interviewers, and administrative tasks related to interviewers.
* Logistic support for survey preparation at the field level and during field part, such as organization of drivers and cars, communication tools, stationary, printing of information forms, coordination of movement planning.
  1. **Training of the survey team and pre-testing of the questionnaires**

We will conduct three days of training for the data collectors. The training will give background on the survey and methodology; practice with tablets, questionnaires, and sampling methodology; and become familiar with the information sheet and informed consent. The training will be conducted in French. It will include an intensive review of the questionnaire and practice with the tablets. As the interviews will be conducted in Chadian Arabic, the team will discuss the survey and agree upon the correct wording for each question. On the third day, surveyors will conduct pilot surveys at points accessible by foot. The principal investigator will supervise all data collection teams at least once during the pilot. This piloting will allow for supervised practice in real-world conditions. If no major issues are noted during the pilot, and no changes to the survey follow the pilot, the pilot surveys will be included in the final data analysis.

Training materials developed specifically for this context will be used, and training methods will be participatory with a focus on practical exercises (e.g. role-play, problem solving, discussion etc.) and provide opportunities for the team to reflect upon and share their existing knowledge and experience. This will be supported with ongoing supervision and support, largely through daily debriefings, to address any issues arising.

## Timeframe in the field

A schedule is planned as follows:

* **Start date :** April 25th, 2022
* **Protocol development:** 5 working days, April 25th – 29th, 2022
* **Ethics review:** Not needed
* **Study preparation:**
* **09 working days** Avril 26th - May 06th, 2022: questionnaire programming, logistical planning (cars/security), photocopies, recruitment of interviewers
* **3 working days**, May 09th - 11st May, 2022 : training of surveyors and pilot survey day
* **Data collection : 6 days,** May 12nd – 17th, 2022
* **Data analysis: 5 working days, May** 18th - 24th, 2022
* **Write up (report): 5 working days,** May 25th – 31st 2022

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| **Tasks** | 25/4 | 26/4 | 27/4 | 28/4 | 29/4 | 30/4 | 1/5 | 2/5 | 3/5 | 4/5 | 5/5 | 6/5 | 7/5 | 8/5 | 9/5 | 10/5 | 11/5 | 12/5 | 13/5 | 14/5 | 15/5 | 16/5 | 17/5 | 18/5 | 19/5 | 20/5 | 21/5 | 22/5 | 23/5 | 24/5 | 25/5 | 26/5 | 27/5 | 28/5 | 29/5 | 30/5 | 31/5 |
| **Protocol development** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Study preparation** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Training of surveyors** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Pilot survey day** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Data collection** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Data analysis** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Reporting** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Logistic

Supplies and transport will been facilitated/supported by CERU.

## Supply needed

Supplies for the conduct of the survey will be purchased at project level. See below for a list of required supplies. The principal investigator will develop vaccination coverage questionnaires. Photocopies of all necessary documents will be done in Bongor.

|  |  |  |
| --- | --- | --- |
| **Item** | **# per team** | **Total** |
| Smartphone | 1 | 6 + 2 reserve |
| Powerbank | 1 | 6 |
| Clipboard or folder | 2 | 12 |
| Notebook (for training) | 2 | 12 |
| Pen | 2 | 12 |
| MSF identification (armband, vest, etc.) | 2 | 12 |
| Bottles of Water | 24 | 144 |

## Transport Needed

Six vehicles for data collection on 6 survey days.

# Knowledge dissemination

A final report will be produced and shared with the study team, the mission, the MSF community, MOH, and other relevant actors. If results are found to be relevant, they may be submitted for publication in a peer-reviewed journal to contribute to the wider research community.

# Impact

This survey will provide an estimate of measles vaccination coverage in Bongor district to inform decision-making and resource allocation for MSF and MOH activities. This will contribute to health programs with a positive impact on the health status of the population of Mayo Kebbi Est province.

# Limitations

There are limitations in planning and conducting this study that may impact the findings. Population estimates used to determine cluster allocation are based on numbers, when available, from the RCS, or on a national census conducted in 2009 with a growth rate applied. Other factors such as movements of populations are not accounted for with this method. Therefore, the accuracy of this data (both sources) is questionable.

There is also a possibility for social desirability bias. The respondents are more likely to respond in a way that they think will be viewed more favorably by the study team, leading to information bias.

There is also a possibility of selection bias. Individuals who are away and cannot be reached on the day of the survey will not be included in the analysis. This is an issue if the individuals who are present have different characteristics than those absent. The absent may have a lower health status than the present such as in the case of women who may have suffered pregnancy complication and are hospitalized or sick children who may have left to visit a health clinic. Alternatively, the absent may be more healthy such as in the case of healthy individuals who have left to work for the day. The team will alert village leaders of the date and time of the visit to avoid any conflicts with market days or other scheduled events.

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2. Council for International Organizations of Medical Sciences (CIOMS). International Ethical Guidelines for Biomedical Research Involving Human Subjects. CIOMS Geneva 2002. http://www.cioms.ch/index.php/publications/printablev3/541/view\_bl/65/bioethics-and-health-policy-guidelines-and-other-normative-documents/19/international-ethical-guidelines-for-biomedical-research-involving-human-subjects?tab=getmybooksTab&is\_show\_data=1. [↑](#footnote-ref-2)
3. Council for International Organizations of Medical Sciences (CIOMS). International Ethical Guidelines for Epidemiological studies. CIOMS Geneva 2009. <http://www.cioms.ch/index.php/publications/printablev3/541/view_bl/65/bioethics-and-health-policy-guidelines-and-other-normative-documents/47/international-ethical-guidelines-for-epidemiological-studies?tab=getmybooksTab&is_show_data=1>. [↑](#footnote-ref-3)