



Rapid meningitis vaccination coverage survey

**Magaria, Matamaye and Mirrhia district,
Zinder region, Niger**

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Summary

Background

Zinder region in Niger was experiencing major meningitis outbreak in 2009. 4444 cases and 92 deaths were reported through national surveillance system between weeks 1 and 19 2009. MSF assisted Ministry of health in organizing mass vaccination campaign in all districts of Zinder region. 1'316'855 people in the age group of 2-30 years were vaccinated by MSF during the mass vaccination campaign. Overall, vaccination coverage in health areas vaccinated based on administrative population figures, was of 87%, ranging from 120% in some districts to less than 70% in others. MSF conducted vaccination coverage survey to be able to correctly evaluate the intervention.

Methods

Cluster survey was conducted in 3 districts of Zinder region (Magaria, Matamaye and Mirrhia). Thirty clusters were chosen from exhaustive list of villages in each district. Systematic random sampling was conducted at cluster level. Simple questionnaire was administered to head of household.

Results

Coverage differed between districts – it was over 80% in Magaria (88%, 95% CI 84-91%), and lower in Matamaye (74%, 95% CI 64-84%) and Mirrhia (79%, 95% CI 72-87%). In all districts coverage in the age group 2-15 years was higher, while coverage in age group 15-30 years was much lower (about 20% lower in each district). The coverage in the age group above 30 years, not targeted by vaccination campaign, was around 50%. Coverage was higher among women. Main reason for not being vaccinated was absence or not being informed.

Conclusion

Overall, the results of the 3 surveys show vaccination coverage around 80%, thus more or less reaching the target of 80% meningitis vaccine coverage in rural area. Vaccination coverage in age group of 2-15 years, which had highest attack rates of meningitis, was higher compared to 15-30 years. Conducting mass vaccination in remote rural areas is difficult, especially in an area where population is mobile and decentralized vaccination strategies have to be used to achieve satisfactory vaccination coverage.

Acknowledgments

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Background

Zinder region is located in the south of Niger and is neighboring Maradi, Diffa and Agadez regions and Nigeria in the south. According to the administrative figures the region has 2'692'145 inhabitants. Administratively it is divided into 6 districts: Goure, Magaria, Matamaye, Mirrhia, Tanout and Zinder urban.

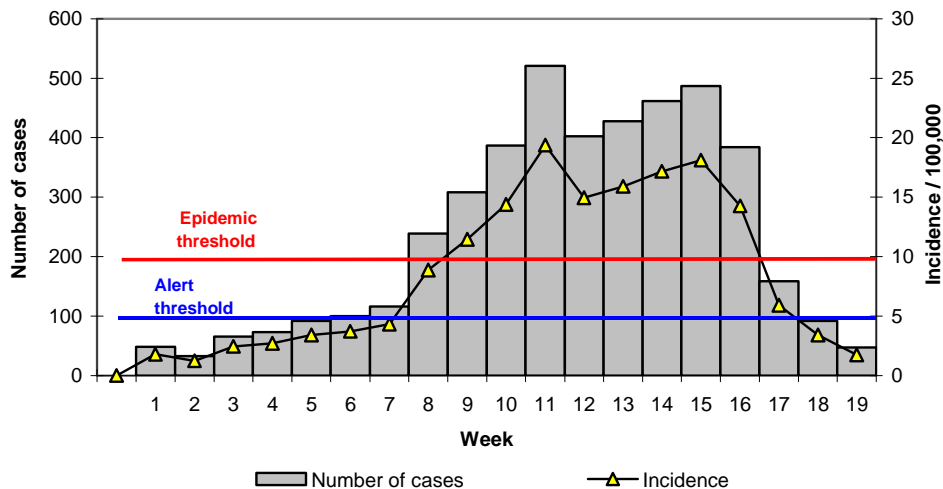
Different ethnic groups are living in the region. Hausa and Beri-Beri are sedentary and are mainly living of agriculture and trading especially cross border between Niger and Nigeria. Peul and Tuareg are nomadic or semi-nomadic pastorals, Peul inhabit mainly southern part of Magaria district and Tuareg are mainly living in Tanout and north of Goure districts.

Meningitis epidemic

Zinder region is lying in inside meningitis belt and is experiencing regular seasonal outbreaks. The biggest recent outbreak occurred between 1995 and 1996.

First meningitis cases during 2009 outbreak were reported in December 2008, with certain health areas in Magaria and Mirrhia already crossing the epidemic thresholds. Vaccination campaigns were organized by Ministry of health in each health area as soon as the epidemic threshold has been crossed (10 meningitis cases per 100'000 inhabitants per week). By the end of February, meningitis cases were reported and confirmed from all districts in the region; epidemic threshold at regional level was crossed in week 9 (Figure 2). 4444 cases and 92 deaths were reported through national surveillance system between weeks 1 and 19 2009.

Figure 2. Number of meningitis cases per week and incidence per 100,000. Zinder region, 2009.



MSF assisted Ministry of health in organizing mass vaccination campaign throughout Zinder region. Zinder urban, Matamaye and Magaria districts were targeted as whole, while in Mirrhia, Tanout and Goure vaccinations were organized per health area once the epidemic threshold has been crossed (or in an area in alert threshold that was neighboring area in the epidemic). The age group of 2-30 years was targeted for vaccination because of the highest

attack rates in this age group. A total of 1'316'855 people in the age group of 2-30 years were vaccinated by MSF during the mass vaccination campaign in the 6 districts.

Vaccination strategy employed in different districts differed slightly, due to differences in population structure and previous experience of teams in charge. In most of the districts strategy was mostly decentralized. Planning of the sites was done together with health authorities, and in some places with community leaders. Mobilization was done either via health authorities and/or paid mobilizers, or via village leaders. Different mobilization means were used in addition: radio in towns, *crieur public*, schools and mosques. Differences per district:

In Goure, vaccination strategy decentralized. Mobilization via mobilizers.

In Magaria, vaccinations strategy completely decentralized. Planning was based on planning prepared during 2008 mass measles vaccination campaign. Mobilization by informing village or settlement leader who transmitted information.

In Matamaye, vaccination strategy centralized, with several teams working at the same time in bigger villages and in Matamaye town; smaller villages were invited to the central vaccination sites. Mobile teams were organized to cover villages not coming to the central points. Planning and mobilization was done mainly through local health authorities.

In Mirrhia, vaccination strategy mixed, centralized as much as possible and decentralized when not. Mobilization via all levels of health and community authorities.

In Zinder town, vaccination strategy was centralized, few fixed points were organized. In rural part, strategy was decentralized, teams passing through all the villages. Planning was done with health authorities and mobilization through community leaders.

In Tanout, town was vaccinated in centralized manner, fixed sites were set in bigger villages, and all other villages were vaccinated by mobile teams. Circuit for mobile teams was designed with the help of health authorities. Mobile teams passed through each location on 2 consecutive days to allow more time for nomadic population to be informed. Mobilization was done either through community leaders the day before or only during first vaccination day.

Table 1. Number of people vaccinated by MSF and in total by MSF and Ministry of health (MOH) and vaccination coverage based on administrative data.

	Target	Vaccinated by MSF	Vaccinated by MSF+MOH	Coverage
Goure	99775	82413	97227	103%
Magaria	374674	380086	450086	120%
Matamaye	202014	80683	143430	71%
Mirrhia	488592	381044	424823	87%
Tanout	249036	223395	237531	95%
Zinder	143097	129020	160525	112%

Justification

A total of 1'316'855 people in the age group of 2-30 years were vaccinated by MSF during the mass vaccination campaign. For MSF-CH this was the biggest vaccination campaign ever organized. Vaccination coverage calculated based on administrative population numbers seemed not completely reliable, as it was ranging from 70% in Matamaye district to 120% in Magaria.

It seemed necessary to evaluate correctly the intervention done, to confirm that strategies used were effective and to understand reasons why not, if so. Districts of Magaria, Matamaye and Mirrhia were chosen for survey. Tanout and Goure are more remote and difficult accessible, and less health areas were vaccinated compared to other districts. In Zinder district number of people vaccinated corresponded to last year measles vaccination campaign numbers.

Objectives

General objective

- Estimate vaccination coverage following mass meningitis vaccination campaign in 3 districts of Zinder region

Specific objectives

- Describe surveyed population in each of 3 districts
- Describe vaccination coverage per age groups, sex and ethnic group in each of 3 districts
- Describe reasons for not being vaccinated in each of 3 districts

Methods

Cluster survey was conducted in 3 districts among 6 in Zinder region. In each district 30 clusters were selected from an exhaustive list of villages with known population numbers. This list was provided by MOH, used for planning of the vaccination campaign and was completed with villages identified by the teams during vaccination campaign, which were not listed previously.

At the cluster level, households were selected using systematic random sampling. Sampling interval (i) was determined for each cluster by dividing the number of estimated households by 17. Household number was estimated by dividing total population number by 7 (average household number as estimated in previous surveys). Sampling interval was adapted at village level after discussing with village chief and rapidly re-assessing the size of the village. First household was chosen by drawing a random number between 1 and i. Interviewers selected subsequent household by walking through all the village, including all sub-villages and settlements belonging to it and visiting each ith household.

“Household” was defined as people sleeping under the same roof the night before, either in the house or hut. Simple questionnaire was administered to head of the family or his/her representative about all people sleeping in the hut. There was no attempt to return if the household was empty and next closest household was chosen instead.

Sample size was calculated assuming 80% of coverage with 5% precision and cluster effect of 2 – 30 clusters of 17 individuals. Information about all household members was collected and analysed.

Survey was conducted with 10 teams of one MSF interviewer and translator. One day training was organized for the teams, which included testing the questionnaire and methodology.

Data were entered and analysed using Stata 9.2. All indicators were calculated using proportions or means with 95% confidence intervals taking into account cluster design.

Survey was conducted with approval of regional health director in Zinder and by district medical authorities in each district surveyed. Permission was asked to the village leader in each selected cluster, and at each household level, oral consent was asked to head of family or his/her representative.

Results

Survey was conducted between 7th and 13th of May in the 3 districts of Zinder region. During this time 1584 households were visited and the information was collected about 10'497 people, 6729 of those (64%) in the target age group for meningitis vaccination (2-30 years). The information about number of empty households was not systematically collected and is not presented here. Details are shown in table 1.

Average household size was 6.6 (ranging from 7.3 in Magaria to 6.3 in Matamaye and Mirrhia).

Table 2. Description of the sample size in 3 districts. HH – household. Magaria, Matamaye and Mirrhia district, Zinder region, Niger, May 2009.

	Magaria	Matamaye	Mirrhia	Total
Number of clusters	31	30	30	91
Interval between HH	9.8	10.6	9.6	10
Number of HH visited	499	526	559	1584
Number of HH/cluster	16.1	17.5	18.6	17.4
Number of people included	3665	3331	3501	10497
Number in target age group	2397	2128	2204	6729

Demography

Age and sex distribution in the surveyed sample was similar across 3 districts. The population surveyed was young – the median age was 12 years in Mirrhia and Matamaye and 13 in Magaria district. The under 5 age group presented on average 22% of total population (ranging from 21% in Mirrhia to 23% in Matamaye).

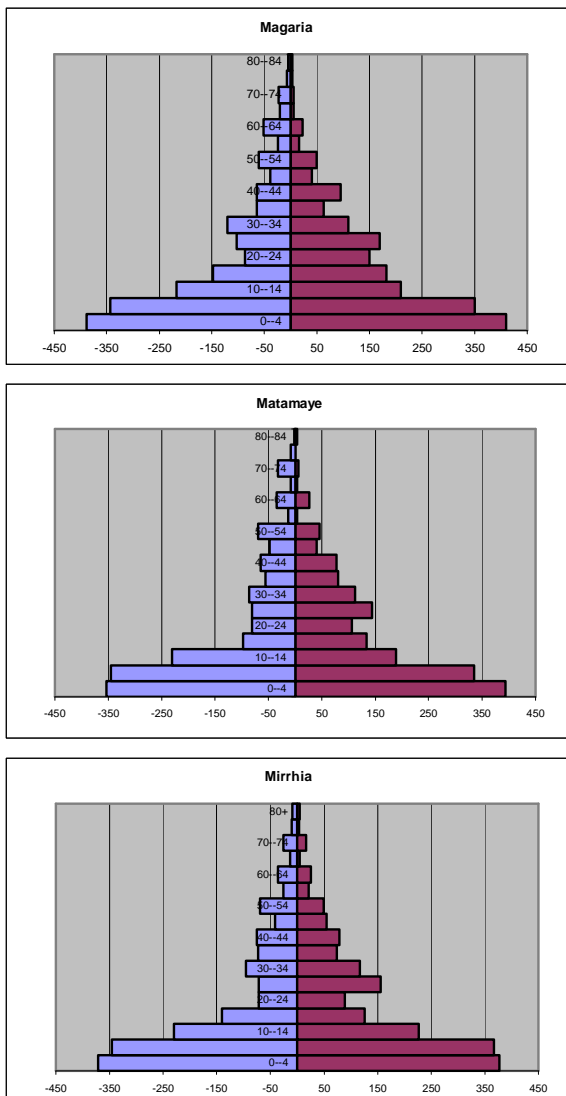
There were slightly more women in the surveyed sample compared to men (men to female ratio 0.95). However while the men to female ratio was close to one in young and older age groups, in the age group of 15-30 years it is around 0.7 (Table 2, Figure 1).

Table 3. Age group distribution in 3 districts. M/F – male to female ratio. Magaria, Matamaye and Mirrhia district, Zinder region, Niger, May 2009.

Age group	Magaria		Matamaye		Mirrhia	
	Number (%)	M/F ratio	Number (%)	M/F ratio	Number (%)	M/F ratio
0--5	798 (22%)	0.95	747 (23%)	0.9	748 (21%)	0.98
5--15	1122 (31%)	1	1099 (33%)	1.1	1170 (33%)	0.97
15--30	839 (23%)	0.67	643 (19%)	0.67	655 (19%)	0.77
30+	896 (25%)	1.15	824 (25%)	1.05	926 (26%)	1.05
Total	3655	0.94	3313	0.95	3499	0.95

Age pyramids for all 3 districts have a wide base for 0-10 years old, following by marked narrowing. There is clear gap in male population in age group of 15-30 years old.

Figure 2. Age pyramids for 3 districts. Blue – male, red – female. Magaria, Matamaye and Mirrhia district, Zinder region, Niger, May 2009.



Vaccination

Only data for interviewees of the age between 2 and 30 years were included in the analysis of the coverage. The vaccination status was not known for less than 1% of sample in each district. The vaccination coverage was different for the 3 districts – ranging from 88% in Magaria (95% CI 84-91%), to 74% in Matamaye (95% CI 64-84%) and 79% Mirrhia (95% CI 72-87%). Details in Table 3.

Table 4. Number and proportion of people vaccinated per district. CI – confidence interval. Magaria, Matamaye and Mirrhia district, Zinder region, Niger, May 2009.

	Magaria		Matamaye		Mirrhia	
	Vaccinated	95% CI	Vaccinated	95% CI	Vaccinated	95% CI
Yes	2094 (87%)	84-91%	1576 (74%)	64-84%	1750 (79%)	72-87%
No	289 (12%)	8-15%	530 (25%)	15-35%	444 (20%)	12-28%
Unknown	14 (1%)	0-1%	22 (1%)	0-1%	14 (1%)	0-1%

Vaccination coverage differed significantly ($p < 0.001$) among the age groups in all districts. In all districts more than 80% of children aged 2-15 years old were vaccinated. Vaccination coverage in the age group 15-30 years was around 20% lower compared to 2-15 years in all 3 districts. In the age groups out of target population, few children under the age of 2 years were vaccinated, however in the age group over 30 years over 50% of people received vaccine.

Vaccination coverage also differed between men and women – it was significantly lower among men in all 3 districts. Most of the difference in coverage was in the age group 15-30 years, with coverage in men and women similar in age group 2-15 years (results not shown).

Vaccination coverage also differed among ethnic groups, but it was different in each district. In Magaria, with significant Peul population, coverage was higher among Hausa. In Matamaye coverage was similar among different ethnic groups. In Mirrhia, coverage was very good among Tuareg, not so good among Hausa and even lower for Beri-Beri. Number of Peul in both Matamaye and Mirrhia was small.

Table 5. Number and proportion of people vaccinated per different age groups and per tribe, per each district. Magaria, Matamaye and Mirrhia district, Zinder region, Niger, May 2009.

	Magaria	Matamaye	Mirrhia
Age			
<2	21 (11%)	24 (12%)	18 (11%)
2-14	1609 (93%)	1334 (81%)	1486 (85%)
15-30	651 (77%)	379 (59%)	431 (66%)
30+	509 (56%)	251 (56%)	434 (47%)
P value	$P < 0.001$	$P < 0.001$	$P < 0.001$
Sex			
Male	928 (86%)	711 (70%)	789 (76%)
Female	1162 (91%)	856 (78%)	961 (83%)
P value	$P < 0.001$	$P < 0.001$	$P < 0.001$
Ethnic group			
Hausa	1597 (89%)	1208 (75%)	985 (80%)
Peul	241 (73%)	37 (90%)	35 (55%)
Beri-beri	172 (94%)	301 (69%)	335 (67%)
Tuareg	84 (92%)	30 (71%)	395 (96%)
P value	$P < 0.001$	$P = 0.004$	$P < 0.001$

Reasons for not being vaccinated also differed between districts. In Magaria and Mirrhia the main reason was that people were absent. In Matamaye, the main reason was that people were not informed.

Table 6. Reasons for not being vaccinated. Magaria, Matamaye and Mirrhia district, Zinder region, Niger, May 2009.

Reason	Magaria	Matamaye	Mirrhia
Not informed	21 (7%)	219 (49%)	134 (33%)
Absent	209 (74%)	183 (41%)	211 (50%)
Too late at the site	18 (6%)	22 (5%)	50 (12%)
Refused	6 (2%)	12 (3%)	19 (5%)
Not enough vaccines	4 (1%)	74 (14%)	0
Others	25 (9%)	18 (3%)	24 (5%)
Reason missing	8	2	9
Total non-vaccinated	289	447	447

Discussion

Findings from the vaccination coverage survey show that around 80% of target population currently residing in Magaria, Matamaye and Mirrhia districts were reached by meningitis vaccination campaign.

Demography

Our sample shows a very young population, with median age of 12 years. The under 5 population presented more around 22% of the population surveyed in 3 districts. This is similar as it was shown in several nutritional surveys conducted by MSF in the region, and it is above 16% expected in the developing countries.

The age group 2-30 years presented 64% of our sample, which is similar to 63%, which was used to calculate population-based coverage (MSF meningitis guidelines).

The age group 15-30 years is under-represented, especially among male (male to female ratio 0.7). This is probably explained by the “exodus” of young men during the dry season looking for work in neighbouring Nigeria.

Vaccination

Vaccination coverage was around 80% in the 3 districts (80% being the objective of meningitis vaccination campaign in rural setting). Coverage differed between districts – it was over 80% (88%) in Magaria, and less than 80% in Matamaye (74%) and Mirrhia (79%). In all districts coverage in the age group 2-15 years was over 80% (this age group had much higher attack rates compared to 15-30 years), while coverage in age group 15-30 years was much lower (about 20% in each district). The coverage in the age group above 30 years, not targeted by vaccination campaign, was around 50%. In the vaccination tally sheets, 98% of individuals vaccinated were recorded in target age group. The vaccination coverage based on administrative data was therefore overestimating real coverage in the target age group. It is often difficult to assess the exact age of people at the vaccination site, or to prevent them from coming to vaccination without creating conflict. On the other hand, it is important to record vaccination data correctly to be able to calculate coverage based on administrative data.

The most common reason for not being vaccinated was being absent. Population in Zinder region is mobile, and people are constantly moving in the area and across the border to Nigeria. The category of “absent” includes both people who were actually travelling for a period of time and were unaware of the campaign, as well as those absent only during the day of vaccination. They might not have been informed about vaccination, or they were informed but thought it not important enough to postpone the travel.

Not being informed was the second most common reason, 50% of those non-vaccinated were not informed in Matamaye, 33% in Mirrhia, and 7% in Magaria. The objective of less than 10% of target population not vaccinated because of not being informed was reached in Magaria and Mirrhia, but not in Matamaye. In one cluster in Matamaye most of the population was not vaccinated because of vaccine shortage. This is unfortunate, but it was due to the fact that campaign in Matamaye had to be stopped during polio campaign, and the mop-up activities were not possible until after polio campaign. As the number of meningitis cases dropped below epidemic levels, this was not done.

In Magaria, MSF conducted mass vaccination campaign against measles in 2008 and detailed planning of this campaign was still available. In addition, campaign was coordinated by same team as last year. This facilitated the conduct of the campaign and probably contributed to a good coverage.

Matamaye, in addition to limited duration of the campaign due to imposed break in the activities before and during polio campaign, it was the first district where MSF implemented meningitis vaccination, and teams reported problems with mobilisation at the beginning (confirmed by the high proportion of people not being informed about vaccination).

In Mirrhia, the fact that health areas were vaccinated as they were crossing epidemic or alert thresholds (if neighbouring area in epidemic threshold), so teams were spread in several different areas of the district, made the campaign more difficult and time consuming.

In terms of strategy, it seems that in this particular context it is more time efficient to systematically pass through all the villages with vaccination teams (example of Magaria), rather than trying to gather people in central places (example of Matamaye and partially Mirrhia) and send mobile teams later to places with presumed lower coverage. Even if at the end teams passed through all the villages, population was not informed about their arrival, and only those present at the moment when mobile team passed through could be vaccinated. The rivalries between neighbouring villages and different ethnic group are enough that people are not willing to come to neighbouring village for vaccination, even if distance is very short.

The administrative data is slightly overestimating population number in Matamaye, but underestimating in Mirrhia and Magaria.

Limitations of the survey

The list of villages used for the coverage survey was same as the list used for vaccination campaign. This could lead to selection bias – if the village was missed during the planning, it was also not included in the survey.

The systematic random sample done at the second stage assured that all households in the village, including its sub-villages and settlements around, had equal chance to be selected. However due to non-reliable population data at village level, the number of households

selected differed between 10 and 32 per cluster (17 households were supposed to be selected). All the households were included in the final analysis.

Heavy rains started in the region at the time of survey, and people immediately started planting the fields. During the first few days of survey in Magaria, several households were found empty because of that. Unfortunately, the empty households were not systematically recorded, and each empty household was replaced by the nearest occupied.

The confidence intervals around the estimate for Matamaye and Mirrhia are wide due to unexpectedly high clustering of non-vaccinated individuals.

Coverage survey was not conducted in 3 other districts of Zinder region, where vaccination has been organized (urban district Zinder, and 2 remote districts of Tanout and Goure), mainly for logistic and security reasons. Findings in this survey might not apply for more nomad population of Tanout and Goure, or town setting of Zinder.

Conclusion

The vaccination coverage estimates were around 80% for the 3 districts surveyed, ranging from between 74% in Matamaye and 88% in Magaria. Coverage in the age group with highest attack rates of meningitis (2-15 years) was over 80% in all 3 districts, but was lower in the older age group.

Recommendations

- Continue following the surveillance data to see the impact of vaccination campaign and assess the need for further assistance in case management. Surveillance should be carefully monitored next year in the areas of Niger not affected by the epidemic this year, as the circulation of the bacteria might be still high.
- To MSF for future campaigns in similar areas:
 - o Vaccination strategy in the region of Zinder has to be as much as possible decentralized if good coverage is to be achieved. Enough time has to be given for social mobilisation (ideally 2 days before the vaccination day in rural area).
 - o To improve coverage in the target age group and decrease numbers vaccinated outside of it, more effort has to be put in mobilisation and explanations why this target age group was chosen
 - o At the same time, recorders should be instructed to tally people in exact age groups, even if they are outside the target group
 - o Leaving small amounts of vaccines at the health centres could improve coverage among people who were absent during vaccination day

