Evaluation of the Integrated Measles and Meningitis A Vaccination Campaign in the Meningitis Belt of Guinea in 2022

The Fondation Santé et Développement Durable, the Centre d’Excellence de Formation et Recherche sur les Maladies Prioritaires en Guinée, and the Health Campaign Effectiveness Program at The Task Force for Global Health

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Key Messages

To reduce the impact of epidemic-prone diseases on children’s health, the Ministry of Health and Sanitation of Guinea organized, with the support of its partners, an integrated vaccination campaign against measles and meningitis A from May 9 to May 14, 2022. This study aimed to document the vaccination campaign by identifying challenges, obstacles, and promising practices related to integrating two antigens in the health districts of Kankan and Siguiri. A cross-sectional evaluation study with a mixed-methods approach (qualitative and quantitative) was carried out from May 12 to May 20, 2022, in these health districts.

- Vaccination coverage in the survey for children aged 6 months to 7 years was 82.4% [CI 79.8-84.8] in Kankan and 54.9% [CI 44.6-64.7] in Siguiri. Challenges inherent in the integrated campaign resulted in 56.1% of infants (6-11 months), 66.2% of young children (12-59 months) and 14.3% of older children (5-7 years) being vaccinated as intended. These results were obtained with the involvement of local authorities, social mobilizers, community outreach workers, media, religious leaders, and town criers who contributed by informing and mobilizing populations. Two types of challenges were experienced at the field level: (1) within the immunization system and among vaccinators (insufficient logistical means and inputs, storage of vaccines, vaccinators teams’ incentives, and vaccination competing with other activities); and (2) populations migrating out of the area (unavailability both in mining and agro-pastoral areas).

- Although generally satisfied with the conduct of the integrated campaign, stakeholders who were interviewed recommended that solutions include a focus on adapting collaborative planning to the realities in the field and improving the availability, organization, and working environment of those who are involved in the campaign.
Introduction and Background

In Guinea, epidemics of meningitis and measles overlap in high-risk areas known as the meningitis belt. Children under 5 years old are the focus of vaccination against both diseases [1]. In 2015, the World Health Organization (WHO) updated recommendations and emphasized the importance of completing mass vaccination campaigns in individuals aged 1–29 years in all countries in the African meningitis belt. In addition, WHO recommended that countries completing mass vaccination campaigns introduce meningococcal A conjugate vaccine into the routine Expanded Programme on Immunization (EPI) within 1–5 years following campaign completion, along with a one-time catch-up campaign for birth cohorts born since the initial mass vaccination, which would not be within the age range targeted by the routine immunization program.

However, a new challenge has emerged in vaccination campaigns, surveillance, and control measures: COVID-19. In June 2020, interruptions in the normal operation of vaccination programs increased. In 55 countries, previously planned supplemental immunization activities of measles and other vaccines were postponed [2]. With COVID-19, it was more difficult to reach zero-dose children as budgets shrank and the already limited health system capacity was devoted to the pandemic. It is more urgent and important than ever to reach the communities of which these children are a part [3].

To reduce the impact of these diseases with epidemic potential on the health of children, the Ministry of Health and Sanitation organized, with the support of its partners, an integrated vaccination campaign against measles and meningococcal A meningitis from May 9 to May 14, 2022, in 17 out of 38 high-risk health districts in the country [4], with a focus on children aged 6 months to 5 years for measles and aged 1 to 7 years for meningitis.

In Guinea, after a mass reactive meningitis A catch-up campaign, as recommended by WHO, the new vaccine was introduced into the routine EPI schedule at the age of 15 months, with a follow-up vaccination that should be carried out 3 months later. This integrated campaign is considered a meningitis A follow-up campaign, preparation for the introduction of the second dose of measles vaccine, and a response to the measles epidemic.

Kankan, the largest of eight administrative regions in Guinea, is one of the regions most exposed to the risk of both meningitis and measles epidemics. This is due, among other factors, to the dry Sahelian climate, the harmattan winds, and the cross-border migration of West African populations attracted by mining activities [5]. The only way to reach the targeted population is to adapt the strategies to mothers’ availability to include vaccination of children in the evening. This project study follows a 2021 case study of the Fondation Santé et Développement Durable (FOSAD) and the Centre d’Excellence de Formation et Recherche sur les Maladies Prioritaires en Guinée (CEFORPAG) in Kankan Health District titled, Improving the effectiveness of an integrated vaccination campaign against measles and meningitis A: Collaborative planning of an integrated campaign in the context of multiple epidemics [6].

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1 An area in sub-Saharan Africa from Senegal to Ethiopia with a high incidence rate of meningitis.
The objective of this study is to better document the process of planning, implementing, and evaluating the integrated measles-meningitis A campaign and contribute to the improvement of future integrated campaigns by identifying promising practices, challenges, and barriers related to integration [7].

Research Questions and Objectives

Research questions: What is the effectiveness and what are the main challenges as well as lessons learned and promising practices related to the integration of the measles and meningitis A campaign?

General objective: to document and evaluate the measles-meningitis A integrated vaccination campaign with children aged 6 months to 7 years by identifying challenges, obstacles, and promising practices in the health districts of Kankan and Siguiri in Guinea in 2022.

Specific objectives:

1. Describe the implementation process (e.g., micro-planning, logistical aspects, communication, social mobilization, and resource management) of the integrated measles-meningitis A campaign.
2. Assess the perception of the community, health workers/vaccinators, and managers on the integration of the measles-meningitis A campaign.
3. Estimate vaccination coverage and indications of effectiveness of the integrated measles-meningitis A campaign.
4. Identify promising practices and make recommendations to the various stakeholders for the effectiveness of forthcoming campaigns and identification of research gaps.

Methods

A cross-sectional evaluation study was conducted using a mixed-methods approach (qualitative and quantitative) in two health districts (Kankan and Siguiri) from May 12 to May 20, 2022. The data collection period for the qualitative study took place during and after the campaign (May 12-20) and data collection for the quantitative study took place after the vaccination campaign (May 15-20). The quantitative approach used probability-based sampling. This study used a two-stage cluster sampling stratified by the health district according to the WHO 2018 recommendations [8]. The sample size calculation parameters were used for each stratum according to the data available at the National Institute of Statistics. Thus, 24 clusters were obtained per stratum and 14 households were surveyed in each cluster. A two-stage sampling design was used; all children aged 6-59 months for measles and 12-84 months for meningitis A and residing in one of the two health districts at the time of the vaccination campaign in May 2022 were included in this study.

The qualitative component consisted of interviewing stakeholders involved in the campaign—those stakeholders in charge of planning the integrated immunization campaign at the regional health inspectorate and the two prefectural health departments (Table 3). In addition, a total of five clusters were randomly selected from the clusters planned for the quantitative study at the level of each stratum.
in separate health areas. People involved in the immunization campaign from each of the five clusters were interviewed: the head of the health center, the EPI manager of the health centers, two local elected officials, and two vaccinators.

In the analysis, quantitative survey data were described by their position and dispersion parameters using STATA version 16 software. A probability sampling proportional to the size of the population and a weighting of the observations was carried out, taking into account the weight of each eligible person. Sphinx software was used for qualitative data management and analysis. Data were coded using an inductive content analysis approach.

Participants were interviewed by physicians and sociologists and unstructured conversations were recorded after informed consent was obtained. Electronic forms were also used in the household survey and data collection using the Open Data Kit software. Local authorities, social mobilizers, community outreach workers, media, religious leaders, and town criers were involved in social mobilization and communication, particularly in the door-to-door outreach strategy.

Results

Quantitative Study

In the post-campaign survey, over 70% of the clusters were rural. Of the 672 households included per the sampling plan, 336 each were in Kankan and Siguiri health districts. Of the 672 households, 80.5% were eligible for the survey, having a total of 1,700 children (Table 1).

Table 1: Characteristics of the population in the quantitative study

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Kankan Health District (%)</th>
<th>Siguiri Health District (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of clusters</td>
<td>24 (100%)</td>
<td>24 (100%)</td>
<td>48 (100%)</td>
</tr>
<tr>
<td>Urban</td>
<td>7 (29.2%)</td>
<td>6 (25.0%)</td>
<td>13 (27.1%)</td>
</tr>
<tr>
<td>Rural</td>
<td>17 (70.8%)</td>
<td>18 (75.0%)</td>
<td>35 (72.9%)</td>
</tr>
<tr>
<td>Total number of households planned to be visited per stratum</td>
<td>336 (100%)</td>
<td>336 (100%)</td>
<td>672 (100%)</td>
</tr>
<tr>
<td>Eligible</td>
<td>285 (84.8%)</td>
<td>257 (76.5%)</td>
<td>542 (80.5%)</td>
</tr>
<tr>
<td>Non-eligible</td>
<td>44 (13.1%)</td>
<td>50 (14.9%)</td>
<td>94 (14.0%)</td>
</tr>
<tr>
<td>Refused</td>
<td>5 (1.5%)</td>
<td>4 (1.2%)</td>
<td>9 (1.3%)</td>
</tr>
<tr>
<td>Absent</td>
<td>2 (0.6%)</td>
<td>25 (7.4%)</td>
<td>27 (4.0%)</td>
</tr>
<tr>
<td>Total number of children (age 6 to 84 months) met in the household</td>
<td>953</td>
<td>747</td>
<td>1,700</td>
</tr>
</tbody>
</table>

Coverage
The integrated vaccination campaign had been undertaken in two health districts in the northeast of Guinea—Kankan and Siguiri. According to the post-campaign survey, vaccination coverage was 82.4% (95% CI, 79.8-84.8) in Kankan and 54.9% (95% CI, 44.6-64.7) in Siguiri (Figure 1).

**Figure 1: Map of Guinea and Coverage of Measles and Meningitis A vaccination in Two Districts**

![Map of Guinea and Coverage of Measles and Meningitis A vaccination in Two Districts](image)

The vaccines administered in the integrated campaign were recommended for different, but overlapping, age groups. Infants aged 6-11 months were eligible for the measles vaccine alone. Children aged 12-59 months were eligible for both vaccines, and children aged 60-84 months were eligible to receive only the meningitis A vaccine. Table 2 shows the vaccines administered by age groups. Among the youngest age group (6-11 months), 56.1% were appropriately vaccinated with measles vaccine only. Among the age group of 12-59 months, 66.2% were appropriately vaccinated with measles and meningitis A vaccines. Among the older age group (60-84 months), 14.3% were vaccinated appropriately with meningitis A vaccine only. Some children received an inappropriate vaccine (19.5% among 6-11 months, 63.5% among 60-84 months), were insufficiently vaccinated (12.8% among 12-59 months), or did not receive a vaccine during the campaign (24.4% in the infants, 21.0% among ages 12-59 months, and 22.2% in the older age group) (Table 2).
Table 2: Vaccine coverage achieved for measles and meningitis A by eligible age group in the post-campaign survey

<table>
<thead>
<tr>
<th>Antigens</th>
<th>Age Groups by Vaccine Eligibility (month)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-11 months; eligible for measles (%)</td>
<td>12-59 months; eligible for measles and meningitis A (%)</td>
</tr>
<tr>
<td>Measles</td>
<td>69 (56.1%)</td>
<td>129 (10.8%)</td>
</tr>
<tr>
<td>Measles and meningitis A</td>
<td>22 (17.9%)</td>
<td>794 (66.2%)</td>
</tr>
<tr>
<td>Meningitis A</td>
<td>2 (1.6%)</td>
<td>24 (2.0%)</td>
</tr>
<tr>
<td>Non-vaccinated</td>
<td>30 (24.4%)</td>
<td>252 (21.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>123 (100%)</td>
<td>1,199 (100%)</td>
</tr>
</tbody>
</table>

Notes: Yellow = inappropriate vaccination; Orange = insufficient vaccination; Red = unvaccinated.

Zero Dose

The integrated campaign encountered 138 zero-dose children (8.1% of 1700) who had not received any EPI vaccines after birth; of these, 79 were from Kankan and 59 were from Siguiri. This represents 8.3% of all children encountered in Kankan and 7.9% of children encountered in Siguiri.

The proportion of zero-dose children was higher in the younger age groups. Prior to the campaign, no vaccines had been received by 23.6% (29/123) of all infants encountered from 6-11 months, 8.1% (97/1,199) of all children aged 12-59 months, and 3.2% (12/378) of all children 5 years and older. Table 3 shows which vaccines were administered to the children who were zero dose in each age group.

Table 3: Post-campaign vaccination status of zero-dose children encountered by age group

<table>
<thead>
<tr>
<th>Age Group (months)</th>
<th>6-11</th>
<th>12-59</th>
<th>60-84</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received Measles Vaccine Alone</td>
<td>14 (48.3%)</td>
<td>8 (8.2%)</td>
<td>0 (0%)</td>
<td>22 (15.9%)</td>
</tr>
<tr>
<td>Received Both Measles and Meningitis A Vaccines</td>
<td>7 (24.1%)</td>
<td>51 (52.6%)</td>
<td>3 (25.0%)</td>
<td>61 (44.2%)</td>
</tr>
<tr>
<td>Received Meningitis A Vaccine Alone</td>
<td>0 (0%)</td>
<td>1 (1.0%)</td>
<td>0 (0.0%)</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>Not Vaccinated</td>
<td>8 (27.6%)</td>
<td>37 (38.1%)</td>
<td>9 (75.0%)</td>
<td>54 (39.1%)</td>
</tr>
<tr>
<td>Total Zero-Dose Encountered</td>
<td>29 (100%)</td>
<td>97 (100%)</td>
<td>12 (100%)</td>
<td>138 (100%)</td>
</tr>
</tbody>
</table>

Notes: Yellow = inappropriate vaccination; Orange = insufficient vaccination; Red = unvaccinated.

Overall, 60.9% (84/138) of the children who had been found to be zero dose were vaccinated during the campaign (Figure 2). Some children remained unvaccinated after the integrated campaign: 27.6% (8/29)

2 Zero-dose children: children who have not received any EPI vaccine.
of infants aged 6-11 months, 38.1% (37/97) of children aged 12-59 months, and 75% (9/12) of children aged 60-84 months (Table 3).

**Figure 2: Proportion of zero-dose children encountered during the 2022 measles and meningitis vaccination campaign (N=138) that received at least one vaccine.**

**Demand Creation and Communication**

A variety of communication channels were used to disseminate information to the parents of the children during the campaign (Figure 3). These methods varied by health districts. In Kankan, the three main ways that the surveyed household’s received information about the integrated vaccination campaign were from local authorities, health officer, and the radio. In Siguiri, the radio was the dominant means of information, followed by town criers and health officer.

**Figure 3: Distribution of parents’ information sources on the integrated vaccination campaign**
Qualitative study

The interviews for the qualitative section of the study included stakeholders in the health campaign who filled a variety of roles related to the integrated vaccination campaign (Table 4). They included a variety of roles in the health system, heads of health centers, EPI managers, elected officials and vaccinators.

*Table 4: Participant characteristics in the qualitative study*

<table>
<thead>
<tr>
<th>Qualitative Study Respondents</th>
<th>Roles</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional health inspector, prefectural health directors, infectious disease doctors, data managers, statistician district technical assistants, training and research planner, and regional WHO representative</td>
<td>Plan and implement the integrated immunization campaign at the regional and prefectural levels</td>
<td>12</td>
</tr>
<tr>
<td>Head of center</td>
<td>Plans and implementations the integrated campaign at the level of a health area</td>
<td>10</td>
</tr>
<tr>
<td>EPI manager at the health center level</td>
<td>Manages the vaccines and the cold chain of the integrated campaign</td>
<td>10</td>
</tr>
<tr>
<td>Local elected officials</td>
<td>Offers information and mobilization of the community for the integrated immunization campaign</td>
<td>20</td>
</tr>
<tr>
<td>Vaccinators</td>
<td>Administers vaccines to various targets of the integrated campaign</td>
<td>20</td>
</tr>
</tbody>
</table>

*Views on the integrated campaign*

Participants interviewed at the health district and health center level were generally in favor of the integration of the two vaccines. Interviewees used expressions such as “This campaign is timely welcome,” “It is a good initiative,” “It pleases me,” “It was such a long awaited thing!” to show support for this integration. One of the regional leaders stated:

“It is a very good thing for the population insofar as meningitis is truly a very dangerous disease which ravages rural areas and the same goes for measles. Measles really tires children and this campaign is welcome.”

*Challenges*

However, a few of the participants did not support the integration of the two vaccines. Several reasons and obstacles were identified:
1. The impossibility of knowing which of the two vaccines causes adverse events following immunization, if any.

2. Some vaccinators felt that with the integration of the two vaccines, their workload increases (“the work of the vaccinators is doubled”). They are even more critical of this integration because they feel that the remuneration is not proportional with the work done in the field.

3. The actors at the grassroots level who are dissatisfied believe that the validation of micro-plans was done either at the regional level or at the national level (central EPI), without taking into account their demands at the grassroots level in terms of resources (human, material, and financial).

4. Due to the remoteness of certain areas, some vaccinators deplored the lack of logistical means to ensure the delivery of vaccines and other inputs to the field, as one underscored:

   “There were supply difficulties here in Bougouroun. The village is located 7 km from Franwalia. We deserve to have a cold chain facility. We don’t have a fridge. Every morning, we have to move and go to Franwalia to stock up on vaccines and come back in the evening. In addition, you have to pick up the vaccines in Franwalia every day.”

Despite existing logistical problems due to inadequate cold storage, the integration of the two vaccines during this campaign has exacerbated these shortcomings because of the increased vaccine storage load.

5. Some parents or caregivers were concerned that their children would not be able to handle a double vaccination during this integrated campaign. Parents needed to be “convinced and reassured about the two simultaneous injections.” Several communication channels were used to disseminate information during the campaign. Radio, social mobilizers, community relays, the media, religious leaders, town criers and local authorities (neighborhood, district and sector leaders) were the main means of communication to inform, communicate, and raise awareness. The following statement from a campaign manager illustrates this well:

   “The challenge was first to raise awareness, to inform the community about the organization of this integrated immunization campaign, so that as many people as possible could join, with the intervention of the media and community leaders; this made it possible to strengthen the adherence of the beneficiaries to a double immunization.”

6. Some interviewees stated that it was difficult to achieve the campaign objectives in a very short time for a very large geographic vaccination area. One health center manager noted:

   “The number of vaccinator teams per health center was small and that gave us a lot of difficulty in covering the health area.”

Faced with this shortage of staff, the vaccinators have seen their workload increase.
The most cited challenge would affect both single antigen and multi-antigen campaigns but would have greater consequences in multi-antigen campaigns: the lack of availability of the population due to their livelihoods of mining or agriculture. In the case of mining and agro-pastoral areas, the lack of availability of populations (who can only be reached mainly in the evening) prevents vaccinators from completing their tasks. A vaccinator stated:

“Vaccination coverage is a serious problem in Siguiri. People are often in search of gold; so when you go to the households, it is not easy to find the children because they are often with their parents in the mining sites for gold panning.”

The second most cited challenge relates to managing other competing activities during the campaign and the administrative census of the workforce.

Overall, participants were satisfied with the implementation of the integrated campaign against measles and meningitis and believe that the vaccines administered will provide protection to children in the covered localities. However, a few respondents reported that they were very unsatisfied, or even not at all satisfied. The reasons for dissatisfaction cited were twofold: (1) they deplored the unreasonable workload. In addition, they believed the compensation offered was not commensurate with the workload. Others also deplored the delays in payment of the fees of vaccinators and supervisors; (2) some denounced that the locally developed micro-plan was not taken into account.

How challenges were addressed

Interviewees in this study believe that future integrated campaigns can only be successful when the ways to mitigate the challenges are taken into account:

- **Do good planning:** This involves ensuring that it is collaborative, responsive to the realities on the ground. They suggest that there is a match between vaccine needs and goals. In addition, some recommended that planning should take into account the costs associated with transporting vaccines and supplies from health districts to health centers and posts. Finally, they recommend that the duration of the campaign be increased to ensure better vaccine coverage due to the integration of vaccines. The stakeholders also suggest that the integrated campaign be planned in a timely manner and that information be shared with all stakeholders because of the challenges associated with the integration of the two vaccines.

- **Improve the working environment of the personnel involved:** To improve future integrated campaigns, respondents recommend that incentives be increased and paid on time. In addition, they recommend that an incentive be given to community leaders.

Discussion

A mixed-methods study was conducted in two health districts from May 12 to 20, 2022, to document and evaluate the measles-meningitis A integrated immunization campaign in Guinea among children aged 6 months to 7 years by identifying challenges, barriers, and promising practices.
Vaccination coverage in the survey was 82.4% (95% CI, 79.8-84.8) in Kankan Health District and 54.9% (95% CI, 44.6-64.7) in Siguiri with a target set in the country’s multi-year plan (2016-2020) of 90% vaccination coverage (Figure 1). These coverage rates are comparable to those reported by WHO during the Rapid Monitoring of National Immunization Days in May 2022; 18% of children were not vaccinated against measles in the prefecture of Kankan and 32% in Siguiri. The administrative vaccination coverage for this campaign was much higher, ranging from 93% to 99.9% for measles and meningitis in the two health districts [9].

The 2016 post-campaign measles vaccination coverage survey among children aged 9-59 months in Guinea found administrative vaccination coverage of 85.0% (95% CI, 80.2-89.8) in Kankan and 95.2% (95% CI, 92.4-98.1) in Siguiri. These results were comparable to those found in this study in the Kankan Health District but different for the Siguiri Health District. This difference can be explained by the better representativeness of the sample within the population of respondents, thanks to the application of the new recommendations of the 2015 WHO immunization coverage manual [10]. Lower coverage in the post-campaign coverage survey in Siguiri is related to the greater reliance on informal mining as an economic activity that prevents households from being available for the integrated campaign.

In both districts, for the children ages 12-59 months who were eligible for both measles and meningitis A vaccinations, 66.2% received both vaccines as planned, while 12.8% received only one vaccine and 21% remained unvaccinated, representing missed opportunities in this age group. Among infants aged 6 to 11 months of age eligible only for measles vaccination, 56.1% received the measles vaccine alone as planned. However, 19.5% received the meningitis A vaccine alone or in combination with the measles vaccine (by mistake) and 24.4% remained unvaccinated, representing missed opportunities in this age group. Among older children aged 60 to 84 months who were eligible only for the meningitis A vaccine, only 14.3% received this vaccine as planned. It was found that 63.5% of these children received the measles vaccine alone or in combination with the meningitis A vaccine (in error), and 22.2% were not vaccinated, which are missed opportunities in this age group. Efforts are needed to improve the quality of campaigns such that children receive the vaccines for which they are eligible.

This study of the integrated vaccination campaign identified 138 children (8.1%) who had not received any EPI vaccine after birth, called “zero-dose” children. This proportion varies according to the age of the children, from 23.58% for children aged 6-11 months, 8.09% for children aged 12-59 months, and 3.17% for children aged 5 years and older. This result could be explained by the multiple interruptions in the normal operation of immunization programs during the COVID-19 pandemic. The integrated immunization campaign made it possible to reach 60.87% of zero-dose children.

The integration of vaccination campaigns allows for efficiency by managing the campaign economically and rationally with regards to the budget and time allocated to the campaign. From a temporal point of view, integration makes it possible to “speed up the work.” Moreover, by coupling the two vaccines,

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Administrative immunization coverage is the proportion of the number of children routinely reported as campaign vaccinated divided by the total number of target children in the area. Since the number of children to be vaccinated is not known exactly, this target population is obtained by extrapolating data from the 2014 general population and housing census by the National Institute of Statistics, to which an annual growth rate (1.027) is applied uniformly.
there is a high probability of reaching more targets. By separating the two campaigns, some may be reached by the first without being reached by the second and vice versa. This is because some people may come to the first vaccination and refuse to come to the second. In such a situation, immunity is no longer complete. By combining the two, we can be sure that populations have received vaccines for which they are eligible. With such immunity, parents will spend less and less time on their children’s health problems related to measles and meningitis. However, as observed in the varying coverage among the vaccinated children, there remain some problems hindering integrated campaigns from achieving this goal. Most notable is ensuring that the correct vaccines, and only those vaccines, are administered to the intended population when interventions targeting different age groups are integrated.

There were also some missed opportunities for the integration of the distribution of mosquito nets. Indeed, the vaccination campaign coincided with enumeration activities related to the distribution of mosquito nets. While the agents were in the field to vaccinate, training for the enumeration was scheduled.

The main limitations and challenges in this study were related to the refusal of some households to participate in the study, the absence of respondents in the households when the interviewers came to the houses, and the absence of a vaccination card and vital documents for the exact age of the child.

**Promising Practices**

Several overall promising practices were identified at the community and local district level and at the operational level.

**Community and Local District Level**

- Door-to-door outreach conducted in previous polio campaigns is a useful strategy in improving the effectiveness of integrated immunization campaigns and addressing the challenges of more complex integrated campaigns, especially when combined with other immunization strategies.

- Community meetings involving local authorities and leaders are critical for sharing information on the integrated campaign, participation in micro-planning, involvement in the organization of the integrated campaign, and monitoring of combined immunization strategies. These meetings helped to increase the population’s adherence to immunization during the campaign.

- Involvement of officials and leaders of informal mining areas in the organization of the integrated campaign and adaptation to women’s schedules in specific areas for evening vaccinations (informal mining and agro-pastoral activities) allowed for better social mobilization since the women and children are moving from place to place in areas in which the gold mining is occurring.

**Operational Level**

- Flexibility of vaccination actors during the integrated campaign was key to success. In the supply, storage, and management of vaccines and inputs, taking into account the local realities
of the districts (storage in other safe and accessible places) can facilitate daily logistics to vaccination centers.

- Operational adaptation of the vaccination teams in the micro-planning process can take into account the workload faced by integrating two vaccines. Some vaccinators needed to have extended working hours (8am to 8pm), since the micro-plans allocated insufficient staff with regard to the increased workload. Other vaccinators requested additional days to catch up in order to reach the maximum number of people to be vaccinated.

**Lessons Learned**

- The staff and the community health workers need to be better trained, supervised, and motivated to face the complex demands of an integrated campaign. This could distort administrative vaccination coverage by increasing it. Improved planning, training, supervision, and communication are essential for an integrated campaign that combines vaccinations for different age groups. This would ensure understanding of the relevant information for integrated vaccinations, increase population adherence, and reduce vaccine wastage. In addition, it will help decrease the vaccination of children who are ineligible for one of the antigens in an integrated vaccination campaign (19.5% of children eligible only for measles vaccination were incorrectly vaccinated against meningitis). Among the 294 children aged 5 years and older who were vaccinated, only 54 (18.36%) received the vaccine indicated for their age (meningitis A).

- The COVID-19 pandemic has had a strong impact on routine vaccination. This must be taken into account for the effectiveness of all campaigns, including integrated campaigns.

- The integrated vaccination campaign made it possible to vaccinate un- and under-vaccinated children with two vaccines during the same session and to increase vaccination coverage.

- The cluster sample vaccine coverage survey was more accurate (82.4% for the health districts of Kankan and 54.9% for Siguiri) than the administrative vaccination coverage, ranging from 93% to 99.9% for measles and meningitis A in the two health districts [7]. This difference is especially notable when considering the complexity of integrated campaigns.

**Implication for Future Policies, Practices, and Research**

Future studies will be useful to illuminate:

- Cost-effectiveness to document the average (operational) cost per person vaccinated in integrated vaccine campaigns versus single campaigns.

- Opportunities for integration with other interventions (e.g., insecticide-treated nets, malaria chemoprophylaxis, mass campaigns to prevent neglected tropical diseases) in the same geographic area.
● Adverse events following immunization in integrated vaccine campaigns versus single campaigns.

● Mechanisms for obtaining community input that could be implemented more routinely and effectively.

In the Immunization Agenda 2030, studies could also take into account the following aspects:

● Combination or integration of follow-up campaigns and routine EPI in order to significantly reduce the number of zero-dose and under-immunized children and missed communities.

● Effects of a synchronized inter-country and cross-border campaign between neighboring countries in the meningitis belt.

● Advocating to policy-makers to encourage vaccine producers to make available multivalent vaccines for multiple antigens (e.g., *Neisseria meningitidis*, W135 meningococcal disease, *Streptococcus pneumoniae*, Hib).
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