International Journal of Innovation and Applied Studies
ISSN 2028-9324 Vol. 36 No. 1 Apr. 2022, pp. 148-157

http://www.ijias.issr-journals.org/

The effectiveness of social mobilization of households by community health workers on uptake measles vaccine coverage and measles notification among children under five in the Karisimbi and Goma health zone: A Quasi-Experimental Study Led in the Karisimbi and Goma Health zone

Kakule Muhindo Omer, Rosebela Onyango, and Careena Otieno Odawa

Great Lakes University of Kisumu, Department of community health, RD Congo

ABSTRACT: The involvement of health workers is an approach that has contributed greatly to the promotion of the health status of populations, especially in low-income countries. However, this involvement would only be effective if these health workers are adequately trained, regularly monitored and supervised, and linked to health facilities to allow for rapid referral of identified problems in the community. This study is conducted to ensure that health workers are trained to provide better services during vaccination action of children against measles. This is a quasi-experimental study conducted in two urban health zones in the city of Goma. The study population was made up of health workers occasionally taken in the health areas of these two zones. Data were collected and processed using SPSS and Excel. Logistic regression and odd-ratio tests were performed to determine the effect of training the health workers on the vaccination of children against measles. During the intervention, 35 children per month were covered. Routine AVM vaccination estimated at 2065 children before the interventions rose to 5463 AVM vaccinated with an estimated coverage of 80.7% after the interventions, while the health centers notified a total of 128 cases. The training of Community Health Works on social mobilization for vaccination appears to be an important tool in the promotion of the vaccination system. It reminds the mother and allows for recovery of dropout's loss lost to follow-up, especially for the latest vaccines such as the AVM.

KEYWORDS: Ant vaccine measles, vaccination, community health workers, interventions, training.

1 INTRODUCTION

According to estimates on the epidemiological dynamics of measles epidemics, a patient can infect up to 20 people (Cohen et al., n.d.; Wariri et al., 2021). Before the introduction of a AVM vaccine in 1963, measles killed more than thousands of children each year, most of them in developing countries (Wariri et al., 2021). According to WHO data, measles caused approximately 2.6 million deaths in children under 5 years of age before the introduction of the measles-containing vaccine (WHO, 2019),(States et al., 2017).

Given this high incidence and mortality, measles has become a notifiable disease (Salah, 2018) .Thus Surveillance priority in disease control and prevention programs, WHO has made measles eradication an important issue among the AVMious "Millennium Development Goals", (Perry et al., 2020).

According to several weekly WHO weeklies measles progress reports, measles has been declared eliminated in the Americas since 2016 (World Health Organization, 2020), (Gastañaduy et al., 2018) through vaccination and surveillance effort s. However, despite strategies put in place and the progress made in controlling measles, of all vaccine-preventable diseases, measles remained the most morbid and lethal across many low- and middle-income countries (Wariri et al., 2021). It killed more than 200,000 people in 2019, an increase of 50% in three years. Worldwide, currently, they estimate that, more than a 14000 people died from measles in 2018 (Wariri et al., 2021).

According to WHO 2016, Many children remain uncovered by the AVM vaccine worldwide, outbreaks continue to be observed in low- and middle-income countries, as a publication by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) indicates (WHO, 2020), (Meredith G. Dixon, MD1; Matt Ferrari, PhD2; Sebastien Anton et al, 2021).

There were an estimated 869,770 measles cases worldwide in 2019, the highest level since 1996, with the increase occurring in all WHO According to estimates, global measles deaths have increased by nearly 50% since 2016, with 207,500 people dying from the disease in 2019 alone estimates (WHO, 2020), (Minal K. Patel, MD1; James L. Goodson, MPH et al, 2020).

Indeed, many children miss opportunities for measles vaccination due to the lack of a very dynamic community mobilization service that does not remind parents of their 9-month appointment for the AVM, for others due to parental resistance for reasons of ignorance about the role of vaccines or simply for cultural reasons (Jalloh et al., 2020).

A systematic review of more than 158 articles has shown that currently the involvement of community health workers in the process of disease surveillance, such as social mobilization on immunization, is a necessary condition for the success of the elimination process (Holkup et al., 2004; Id & Acharya, 2019; Wariri et al., 2021).

For vaccine-preventable diseases, it reminds mothers of the vaccination schedule, the dates of appointments marked on the vaccination cards, and the importance of the vaccine in preventing diseases (Musoke et al., 2016; Ombeva et al., 2019).

A study in India and Sierra Leone showed that social mobilization had an impact on increasing routine immunization of AVM and easily helped reduce vaccine-preventable diseases(Jalloh et al., 2020).

Nevertheless, this involvement requires the empowerment of these local health workers to strengthen their skills in detection, detection, and reporting capacity for several suspect priority diseases and events (Clara, Ndiaye, et al., 2020). The design and quality of implementing social mobilization for immunization vary across and within countries(Jalloh et al., 2020). In Ethiopia, a study proved in 2013, that social mobilization led by community health workers has increased AVM coverage in two cities describes: measles vaccine coverage increased from 77% to 81% in Assosa, and from 59% to 86% in Bambasi (Demissie et al., 2020).

For decades, the DRC has experienced several measles outbreaks due to low immunization coverage secondary to a weak health system, population movements, and the precarious socioeconomic situation related to multiple wars and internal conflicts.

Despite the presence of an expanded program of immunization (EPI-LMT) set up in 1981, AVM coverage remains among the lowest in low-income countries, followed by outbreaks of generalized epidemics in the country.

In 2004, several epidemics occurred in different health zones of the country, notably in the health zones of Pimu in Equateur (2,697 cases and 105 deaths), Kamwesha (1,319 cases and 55 deaths), Mutena (1,452 cases and 92 deaths), Tshikapa (1,030 cases and 51 deaths) and Kitenda (987 cases and 8 deaths) in Kasai Occidental.

The most affected provinces were Grand Kasai, Equateur, Oriental, and Great Kivu, where the country experienced low MCV1 coverage, with low participation of mothers in supplementary immunization campaigns due to poor mobilization and false rumors against the vaccine.

According to the 2013 Demographic and Health Survey report, many children were not vaccinated by the AVM vaccination program, so the vaccination coverage rate was still estimated at around 47% for the first dose in the Democratic Republic of Congo.

Despite these ambitious elimination targets, since 2019, the world's largest single-nation measles outbreak has persisted in Democratic Republic Congo, with mof more than 310000 suspected cases, and resulted in the death of more than 6000 people as of January 2020 (Wariri et al., 2021).

A AVM vaccination campaign organized by Doctors Without Borders in 2018 ached more than 4,000 children in the Karisismbi health zone thanks to social mobilization by the community relays. Despite these results, in 2019, an epidemic outbreak occurred in the zone due to community health workers' lack of monitoring of activities. In the city of Goma, this state of affairs is at the root of the slowdown in the monitoring of vaccination activities against measles and other preventable diseases. Thus, this study is set to assess existing coverage and the raw parallels with AVM coverage and social mobilization in the health areas of Goma.

2 MATERIALS AND METHODS

A Quasi-Experimental Study and action research, led in the Karisimbi as an experimental Zone and Goma Health zone like a control Zone. This Quasi-experimental study used mixed-method both qualitative and quantitative data collection methods. This study was conducted between December 2022, in Karisimbi and Goma health District in Goma town in North Kivu of DRC it a un urban and rural mixed population District, with a significant part of the population comprising of residents and mobile populations from the wars are the study used non-probability and purposive sampling for community health workers to address questions on social mobilization for measles vaccine uptake and case notification.

For Pre-intervention, the study was descriptive cross-sectional among mothers of children and used probability cluster and purposive sampling for CHWs. The study populations were mothers with children under 5 years of age and CHWs in the two health zones of Karisimbi and Goma in the city of Goma in North Kivu province. The sample size was calculated using the Fisher formula, for a population of 623280 inhabitants or 21753 children from 6 to 23 months, we retained 606 households that we rounded up to 620. The community health workers organized to strengthen the capacity of CHWS on social mobilization in the EPI program.

The sample size was estimated at 100 CHWS in the two health zones of Goma and Karisimbi. Interviewing and FGD techniques were used during monitor and follow-preached research activities and measles case identification.

Structured interview was conducted data collection and Focus Group Discussions (FGDs) were organized in the health areas for qualitative data to collect the opinions of community health workers on non-participation in measles social mobilization activities. A questionnaire grid and a focused discussion guide were used as data collection tools. During the interventions, the study was quasi-experimental at same ti while descriptive and cross-sectional. An or children not affected by AVM and children with measles was done. A structured interview technique and a survey questionnaire were used during this study to collect data from the children's mothers. The data collection was done in Kobo collection while the analysis and processing were SPSS 18 software. To estimate the degree of significance between the effectiveness of the training of community health workers and the administration of the AVM vaccine, the study used the Odds Ratio test t a Confidence interval.

3 RESULTS AND DISCUSSION

3.1 RESULTS

From the two zones of the study, many of the unvaccinated children come from the experimental one. Cumulatively the group under the study that was unvaccinated was about 37.7%. This was displayed printable as .

Table 1. Distribution of results according to the two health sectors

Health zones	Unvaccinated	Vaccinated	Total
Control Zone (Goma)	34.2%	65.8%	100%
Experimental Zone (Karisimbi)	41.3%	58.7%	100%
Total	**37.7%**	**62.3%**	**100%**

ANALYSIS OF SIGNS OF MEASLES IN HEALTH ZONES

The analysis was conducted and respondents were to indicate if in the given health zones children had signs of measles. The results were displayed in table 2.

Table 2. Frequency of children not and measles in the two health zones

Health Zones				Have signs of measles		Total	Khi2 value	DDL	p-value	OR	IC 95 %	
				No	Yes						Low	High
Goma	Has the child been vaccinated against Measles?	no	Frequency	54	177	231	47,135	1	0,00	0,16	0,09	0,28
			%	23.38%	76.62%	100.00%						
		Yes	Frequency	52	27	79						
			%	65.82%	34.18%	100,00%						
	Total		Frequency	106	204	310						
			%	34.19%	65.81%	100.00%						
Karisimbi	Has the child been vaccinated against Measles?	non	Frequency	58	137	195	28,911	1	0,00	0,27	0,17	0,44
			%	29.74%	70.26%	100.00%						
		yes	Frequency	70	45	115						
			%	60.87%	39.13%	100,00%						
	Total		Frequency	128	182	310						
			%	41.29%	58.71%	100.00%						
Total	Has the child been vaccinated against Measles?	non	Frequency	112	314	426	75,972	1	0,00	0,21	0,15	0,3
			%	26.29%	73.71%	100.00%						
		oui	Frequency	122	72	194						
			%	62.89%	37.11%	100.00%						
	Total		Frequency	234	386	620						
			%	**37.74%**	**62.26%**	**100.00%**						

From table 2, we can see that vaccination has a significant influence on the attraction of measles. Since the P-value is strictly below the 5% threshold, we can conclude that there is an association between measles vaccination and measles attraction. In the Goma zone,

OR=0.16 means that the odds ratio of catching measles decreases by 84% when moving from the unvaccinated category to the vaccinated category. In the Karisimbi zone, this ratio decreases by 73% when moving from the unvaccinated category to the vaccinated category.

INFLUENCE OF MOBILIZATION ON MEASLES

The social mobilization frequency on measles was conducted from December 2021 to March 2022 for four months and the results were displayed in figure 1

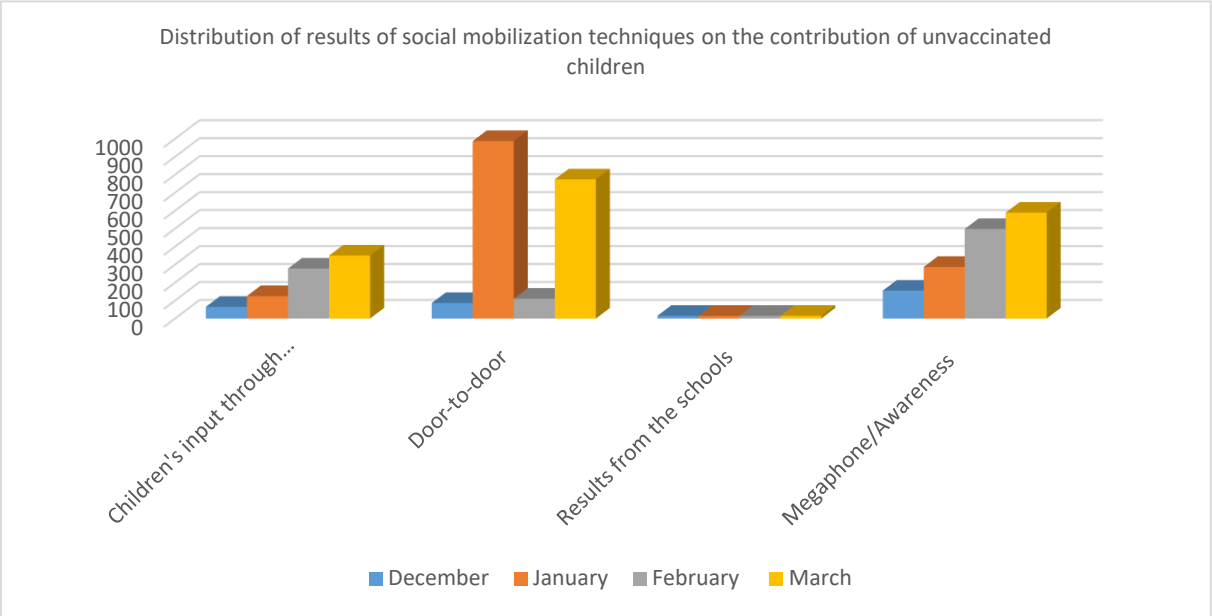

Fig. 1. Frequency of social mobilization intervention

Figure 1, using the bar chart inmates that more social mobilization was conducted on March 22. Furthered, the science of mobilization on measles was analyzed and the results were displayed as shown in table 3.

Table 3. Influence of social mobilization on measles

Heath Zones				Did_he_have_a_sign_of_measles		Total	Khi2 value	Del	p-value	OR	95 % CI	
				non	oui						Low	High
Goma	Have you received the mobilization of the AVM	non	Frequency	124	56	180	7,158	1	0.007	0.48	0.27	0.82
			%	68.89%	31.11%	100.00%						
		Yes	Frequency	107	23	130						
			%	82.31%	17.69%	100.00%						
	Total		Frequency	231	79	310						
			%	74.52%	25.48%	100.00%						
karisimbi	Have you received the mobilization of the AVM quencquench	non	Frequency	90	100	190	50,762	1	0.00	0.13	0.07	0.24
			%	47.37%	52.63%	100.00%						
		Yes	Frequency	105	15	120						
			%	87.50%	12.50%	100.00%						
			Frequency	195	115	310						
			%	62.90%	37.10%	100.00%						
Total	Have you received the mobilization of the AVM	non	Frequency	214	156	370	50,447	1	0,00	0,25	0,16	0,37
			%	57.84%	42.16%	100.00%						
		Yes	Frequency	212	38	250						
			%	84.80%	15.20%	100.00%						
	Total		Frequency	426	194	620						
			%	**68.71%**	**31.29%**	**100.00%**						

Looking at this table, we can see that in both zones, mobilization has a significant influence on the risk of getting measles. For the Goma zone, OR=0.48 means that the risk of catching measles decreases by 52% when one receives mobilization. In the Karisimbi zone, the risk of getting measles decreases by 87% when receiving mobilization.

The impact of the intervention was analyzed using the chart and presented using figures 2 for two months with the two Heath zones.

IMPACT OF SOCIAL MOBILIZATION OF CHWS AND MONITORING OF IMMUNIZATION ACTIVITIES

Table 4. Comparison of the uptake vaccine measles before and during the social mobilization

	Before Interventions			**Total**	**after interventions**				**Total**	**Difference**
	Sept.	*Oct.*	*Nov.*		*December 2021*	*Jan 22*	*February 2022*	*March 2021*		
AMANI	9	35	26	70	54	55	58	53	220	150
ALBERT BARTEL	23	58	57	138	95	98	101	99	393	255
BUJOVU	15	51	45	111	79	85	98	95	357	246
MURARA	0	37	38	75	27	34	35	34	130	55
KAHEMBE	9	16	19	44	16	19	21	23	79	35
KASIKA	8	38	46	92	54	61	59	61	235	143
METHODISTE	7	35	38	80	57	58	63	65	243	163
RESURRECTION	23	44	69	136	98	114	112	113	437	301
RAPHA	0	31	55	86	65	77	83	85	310	224
NDOSHO	0	39	43	82	53	69	65	60	247	165
HEBRON	7	101	133	241	37	87	92	125	341	100
BARAKA	0	31	38	69	45	56	57	55	213	144
MUGUNGA	12	67	78	157	98	112	101	109	420	263
SOLIDARITE	16	26	20	62	28	30	32	29	119	57
VIRUNGA	0	38	26	64	54	56	57	59	226	162
KATOYI	0	101	87	188	115	154	156	150	575	387
LUBANGO	0	59	67	126	89	91	90	93	363	237
MABANGA NORD	0	57	60	117	58	67	65	69	259	142
MAJENGO	0	74	75	149	66	71	73	86	296	147
Total	129	1020	938	2087	1188	1394	1418	1463	5463	3376
Mean Before intervention				109,842105	Mean after interventions				287,526316	177,684211
Standard deviation of the mean				**125,64171**						

The results of this table show a progression in the frequency of children vaccinated during the mobilization interventions by the community health workers. Before the interventions, 2087 children out of 21119 expected children, i.e. 39%, were vaccinated at the AVM and during the mobilization, 5463, i.e. 75.3%, were vaccinated. The difference observed is 3376 children reached during these interventions.

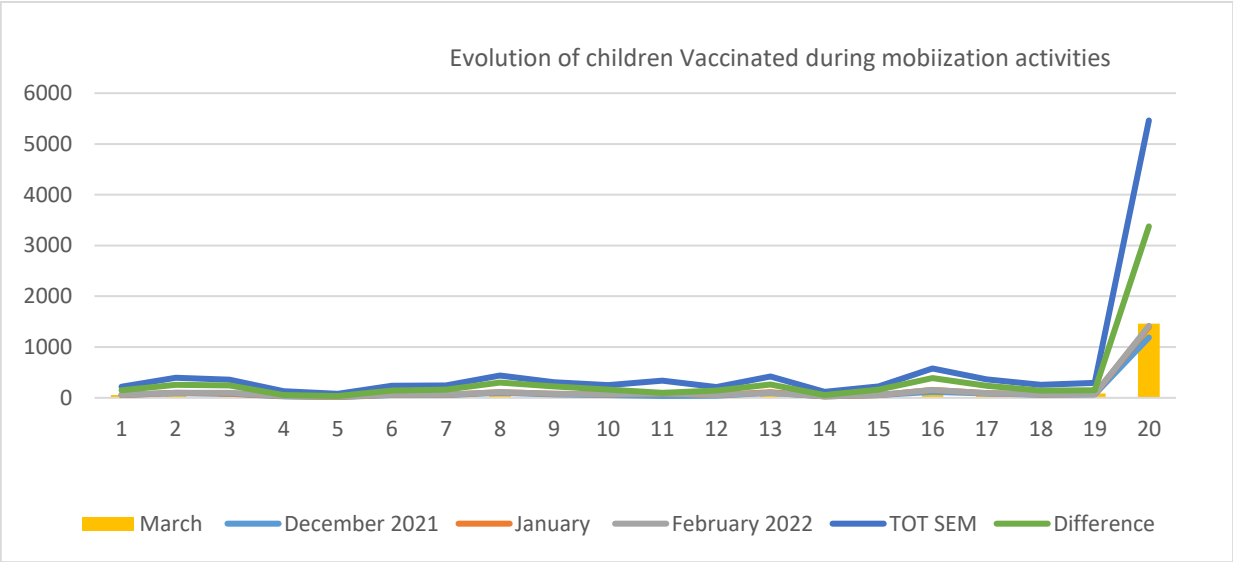

Fig. 2. Frequency of the uptake vaccine measles during the social mobilization activities

Immunization frequency finding

The impact of intervention after was higher than before and hence it indicates that monitoring of immunization activities had an impact

Table 5. Uptake measles vaccine Progress

VACCINE COVERAGE PROGRESS	
DECEMBER 2021	65,53%
JANUARY 2022	76,95%
FEBRUARY 2022	78,22%
MARCH 2022	80,70%
MEAN %	**75,00%**

This table shows the effeteness of social mobilization on the uptake sake the measles vaccine. The average vaccine coverage progress for the four months is 7500. The highest was in march 2022 and the lowest in December 2021 which was 65,53%

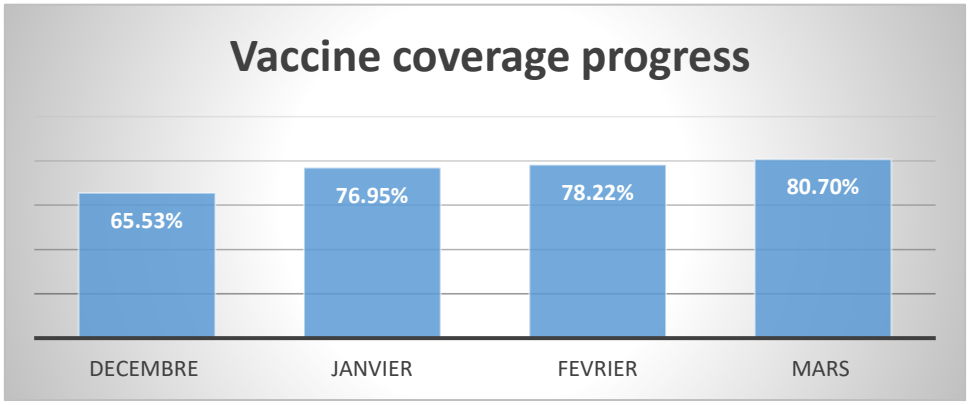

Fig. 3. Measles vaccine coverage

This figure shows the progress of the Measles vaccine during ate during mobilization in cities. The highest vaccine coverage was I march which was about 80,70%.

Table 6. Progression of the frequency of unvaccinated children recovered at the MVA before and during the social mobilization

	Before Health Community Interventions				During Health Community Interventions				
	September 2021	*OCTOBER 2021*	*NOVEMBER 2021*	*Total*	*DECEMBER*	*JANUARY*	*FEBRUARY*	MACH	*Total*
AMANI	5	10	0	15	5	10	10	55	80
ALBERT BARTEL	3	5	3	11	15	30	50	45	150
BUJOVU	0	1	3	4	33	92	90	135	350
MURARA	0	3	3	6	5	7	23	15	50
KAHEMBE	0	3	0	3	4	13	17	24	56
KASIKA	0	5	0	5	13	14	65	63	155
METHODISTE	6	0	0	6	5	15	14	18	52
RESURRECTION	0	4	3	7	200	250	350	400	1200
RAPHA	3	2	2	7	10	15	30	30	85
NDOSHO	0	5	3	8	7	13	27	30	77
HEBRON	3	0	6	9	55	95	100	120	400
BARAKA	0	5	0	5	15	38	75	37	165
MUGUNGA	4	11	9	24	2	3	13	17	35
SOLIDARITE	0	4	3	7	15	15	45	55	130
VIRUNGA	0	0	0	0	10	30	40	65	145
KATOYI	2	0	6	8	35	46	85	93	259
LUBANGO	1	0	5	6	55	85	128	282	550
MABANGA NORD	0	0	3	3	65	75	70	90	300
MAJENGO	0	3	7	10	15	45	40	25	125
Total	**27**	**61**	**56**	**144**	**564**	**891**	**1272**	**1599**	**4364**

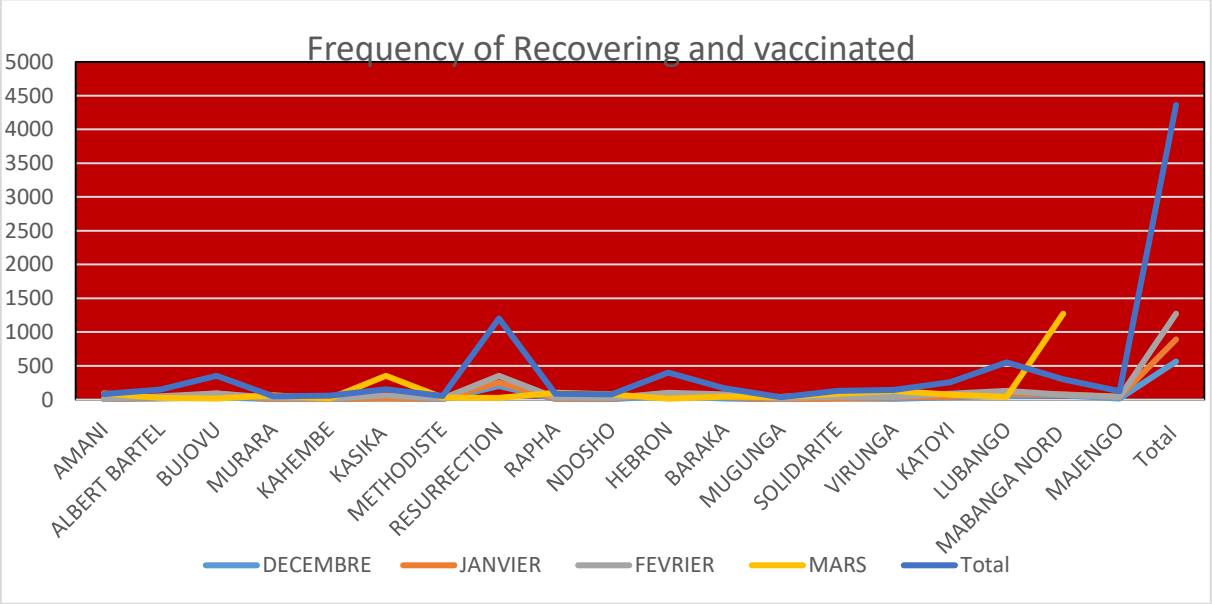

Fig. 4. Frequency of Recovering and vaccinated

The results in this figure show that the number of two children who recovered increased exponentially during the mobilization activities.

Table 7. Frequency of measles cases reported during interventions

Health Area	January 2022	January 2022	February 2022	March 2022	Total
AMANI	0	0	0	0	0
ALBERT BARTEL	0	2	3	1	6
BUJOVU	0	0	0	0	0
MURARA	1	0	1	2	2
KAHEMBE	0	1	1	0	2
KASIKA	1	2	2	3	7
METHODISTE	0	0	0	0	0
RESURRECTION	0	8	8	5	21
RAPHA	1	3	0	0	4
NDOSHO	0	1	0	0	1
HEBRON	8	7	5	1	20
BARAKA	10	8	7	2	27
MUGUNGA	1	0	1	0	2
SOLIDARITE	1	1	0	0	1
VIRUNGA	0	2	6	0	8
KATOYI	4	2	2	0	8
LUBANGO	0	6	13	2	21
MABANGA NORD	0	0	0	2	0
MAJENGO	6	0	2	2	8
Total	**33**	**43**	**51**	**20**	**147**

The results of this figure show that the children to be recovered have increased social mobilizatiocommunity health workersrkers.

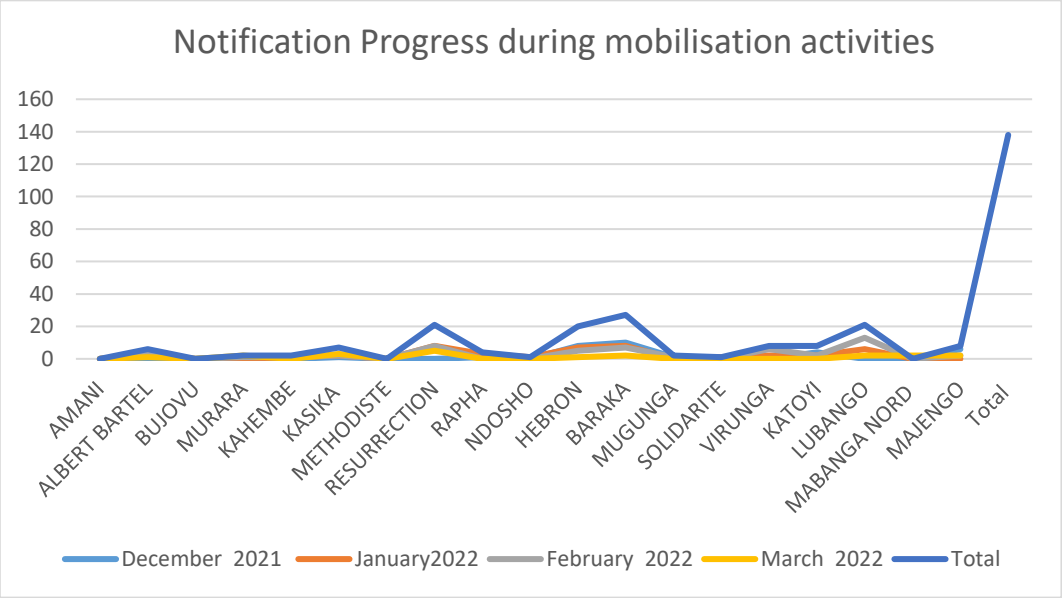

Fig. 5. Evolution of the Notification of Measles cases during the interventions

4 DISCUSSIONS

Social mobilization by community health workers is of fundamental interest in health promotion, especially in low- and middle-income countries. This study demonstrates that increasing AVM coverage through mobilization requires strengthening the knowledge of community health workers through training and monitoring of mobilization techniques and a reminder of measles case definitions.

Table 1, for example, shows low immunization coverage before the interventions: 57.5% in the intervention zone and 65% in the control zone. During the interventions, during which a strong mobilization was made to the households by megaphone, scheduled home visit, visits door-to-door, the vaccination coverage progressively increased in the intervention area until it reached 80.7%. These results

are in line with those obtained in Ethiopia In Ethiopia, a 2013 study proved that social mobilization led by community health workers increased VAM coverage in two cities described: measles vaccination coverage increased from 77% to 81% in Assosa, and from 59% to 86% in Bambasi (Demissie et al., 2020).

Indeed, in our intervention sites, many children are missing AVM vaccines due to the lack of reminders on the calendar and the postponement of the children. The catch-up activities are very punctual. During this study, 3193 children were not vaccinated. In the last quarter of the year 2021, several measles cases were not reported due to a lack of awareness and poor knowledge of the CHWS on case definitions. During the interventions that focused on the recovery of unvaccinated children at the AVM and the identification of measles cases, 2582 children were recovered in the first two months, while more than 127 measles cases were identified by community workers after training during the interventions and referred to the health centers for notification and sampling.

These results are consistent with those of the study conducted in Côte d'Ivoire by Clara et al., who found that community-based surveillance is a very effective public health intervention when community members are first trained before becoming involved in disease surveillance activities (Clara, Ndiaye, et al., 2020),(Clara, Dao, et al., 2020),(Clara et al., 2018).

These findings corroborated the of UNICEF (UNICEF, 2016) and the International Federation of Red Cross and Red Crescent Societies (I.FRCS-Kenya, 2011),(International Federation of Red Cross and Red Crescent Societies, 2020). The study found that social mobilization through door-to-door, house-to-house, and megaphone techniques was an important tool in promoting health in countries where immunization coverage is low and measles and other vaccine-preventable diseases are still a public health problem.

Regarding the Training on Social Mobilization and Promotion of Vaccination AVM and notification, this study showed a very significant difference, the child has more than 3 times the probability of being vaccinated when there is a good social mobilization activity in a health area. With P=0.000, X2 48.785 at 95% CI, the results were highly significant, as was the identification of measles cases in the community when CHWs were involved in the mobilization, where the study showed a highly significant X2 association of 50.4, p=0.00 at 95% CI.

Thus, several systematic reviews currently demonstrate the involvement of CHWs as an essential support to the effectiveness of public health interventions (Wariri et al., 2021).

5 CONCLUSION

Finally, all the results of this study have demonstrated the value of involving community health workers in the promotion of AVM vaccination through social mobilization. However, their involvement will only be effective when they have been well trained in mobilization techniques and monitored by the health zone staff for reasons of motivation and recall.

By proceeding in this way, the involvement of health workers allows for quick recovery of those lost to the AVM vaccine, since in the vaccination calendar, mothers forget the date of the 9-month appointment; the follow-up also allows them to recall the signs of measles as it can be confused with small pruritic scabs in tropical areas and with chickenpox, especially when there is an outbreak in the same period.

ACKNOWLEDGMENT

I acknowledge my supervisors Professor. Roosevelt Onyango and Dr. Careena Otieno Odawa for their guidance during the writing of this paper. They were able to give me proper information and knowledge which translated to wisdom and ownership of these materials in this study.

REFERENCES

[1] Clara, A., Dao, A. T. P., Do, T. T., Tran, P. D., Tran, Q. D., Ngu, N. D., Ngo, T. H., Phan, H. C., Nguyen, T. T. P., Bernadotte-Schmidt, C., Nguyen, H. T., Alroy, K. A., Balajee, S. A., & Mounts, A. W. (2018). Factors Influencing Community Event-based Surveillance: Lessons Learned from Pilot Implementation in Vietnam. *Health Security*, *16*(October), S66–S75. https://doi.org/10.1089/hs.2018.0066

[2] Clara, A., Dao, A. T. P., Mounts, A. W., Bernadotte, C., Nguyen, H. T., Tran, Q. M., Tran, Q. D., Dang, T. Q., Merali, S., Balajee, S. A., & Do, T. T. (2020). Developing monitoring and evaluation tools for event-based surveillance: Experience from Vietnam. *Globalization and Health*, *16*(1), 1–11. https://doi.org/10.1186/s12992-020-00567-2.

[3] Clara, A., Ndiaye, S. M., Joseph, B., Nzogu, M. A., Coulibaly, D., Alroy, K. A., Gourmanon, D. C., Diarrassouba, M., Toure-Adechoubou, R., Houngbedji, K. A., Attiey, H. B., & Balajee, S. A. (2020). Community-Based Surveillance in Côte d'Ivoire. *Health Security*, *18*(S1), S23–S33. https://doi.org/10.1089/hs.2019.0062.

[4] Cohen, R., Thiebault, G., Bakhache, P., & Haas, H. (n.d.). Vaccine contre rougeole, carillons et rubéole Measle, Mumps, Rubella vaccine Measles, immune suppression, and vaccination : direct and indirect on spspecificaccine benefits.

[5] Demissie, S. D., Kozuki, N., Olorunsaiye, C. Z., Gebrekirstos, P., Mohammed, S., Kiapi, L., Chantler, T., Karafillakis, E., & Landegger, J. (2020). Community engagement strategy for increased uptake of routine immunization and select perinatal services in northwest Ethiopia: A descriptive analysis. *PLoS ONE*, *15*(10 October), 1–13. https://doi.org/10.1371/journal.pone.0237319.

[6] Gastañaduy, P. A., Banerjee, E., DeBolt, C., Bravo-Alcántara, P., Samad, S. A., Pastor, D., Rota, P. A., Patel, M., Crowcroft, N. S., & Durrheim, D. N. (2018). Public health responses during measles outbreaks in elimination settings: Strategies and challenges. *Human Vaccines and Immunotherapeutics*, *14*(9), 2222–2238. https://doi.org/10.1080/21645515.2018.1474310.

[7] Holkup, P. A., Tripp-Reimer, T., Salois, E. M., & Weinert, C. (2004). Community-based participatory research: An approach to intervention research with a native aAmericancommunity. *Advances in NursiAmerican community* 162–175. .

[8] https://doi.org/10.1097/00012272-200407000-00002.

[9] I.FRCS-Kenya. (2011). DPDFfinal report Kenya : Kenya Measles outbreak. In *DREF final report* (Vol. 524, Issue December).

[10] Id, G., & Acharya, P. (2019). Community-based surveillance : A scoping review. 1–25.

[11] Internation Federation of Red Cross and Red Crescent Societies. (2020). Social Mobilization Guide for Vaccination Campaign and Routine Immunization. In *International Federation of Red Cross and Red Crescent* (Red Cross). https://media.ifrc.org/ifrc/wp-content/uploads/sites/5/2020/01/1_SM-Guide-RC_version-1.pdf%0Ahttp://pesquisa.bvsalud.org/bvsms/resource/pt/mis-20713.

[12] International Federation of Red Crossinternationall sent societies. (2020). *Democratic Republic of the Congo (DRC): measles outbreaks*. *530*. https://reliefweb.int/sites/reliefweb.int/files/resources/MDRCD028dfr %281%29_0.pdf.

[13] Jalloh, M. F., Wilhelm, E., Abad, N., & Prybylski, D. (2020). Mobilize to vaccinate: lessons learned from social mobilization for immunization in low and middle-income countries. *Human Vaccines and Immunotherapeutics*, *16*(5), 1208–1214. https://doi.org/10.1080/21645515.2019.1661206.

[14] Musoke, D., Gibson, L., Mukama, T., Khalil, Y., & Ssempebwa, J. C. (2016). Nottingham Trent University and Makerere University School of Public Health partnership: Experiences of co-learning and supporting the healthcare system in Uganda. *Globalization and Health*, *12*(1), 1–8. https://doi.org/10.1186/s12992-016-0148-x.

[15] Ombeva, O., Id, M., Id, D. M., Afaayo, R. N., Annet, K., Bodo, B., Bakainaga, A., Ayebare, E., Njunwamukama, S., Mworozi, E. A., & Musyoki, A. M. (2019). *Barriers to effective uptake and provision of immunization in a rural district in Uganda*. 1–15.

[16] Perry, R. T., Murray, J. S., Gacic-dobo, M., & Dabbagh, A. (2020). Progress towards regional measles elimination – worldwide, 2000–2019 – Progrès accomplis dans le monde en vue de l'élimination régionale de la rougeole, 2000-2019. *Weekly Epidemiological Record = Relevé Épidémiologique Hebdomadaire*, *95*(46), 564–572.

[17] Salah, B. A. S. E. et C. (2018). Etude épidémiologique de maladie de la rougeole dans la région d ' El-oued Remerciements. Université Echahid Hamma Lakhdar -El OUED.

[18] UNICEF. (2016). Effective Communication for Measles and Rubella Elimination in the African Region (Teresa Stuart Guida (ed.); Unicef). Unicef.

[19] Wariri, O., Nkereuwem, E., Erondu, N. A., Edem, B., Nkereuwem, O. O., Idoko, O. T., Agogo, E., Enegela, J. E., Sesay, T., Conde, I. S., Kaucley, L., Awuah, A. A. A., Abdullahi, S., Luce, R. R., Banda, R., Nomhwange, T., & Kampmann, B. (2021). A scorecard of progress towards measles elimination in 15 West African countries, 2001–19: a retrospective, multicountry analysis of national immunisation coverage and surveillance data. *The Lancet Global Health*, *9*(3), e280–e290. https://doi.org/10.1016/S2214-109X(20)30481-2.

[20] World Health Organization. (2020). Report of the thirteenth meeting of the International Task Force for Disease Eradication, 22 October 2019. *Weekly Epidemiological Record*, *7*, 61–68.