Co-Delivery of Preventive Chemotherapies Against Onchocerciasis and Soil-Transmitted Helminths Along With Complementary Social and Behavioral Change Communication Interventions in Ethiopia

Jimma University and the Health Campaign Effectiveness Program at The Task Force for Global Health

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Key Messages

Jimma University conducted a mixed-methods study to better understand the implications of co-delivering campaigns for controlling onchocerciasis and soil-transmitted helminths (STH) and partially integrating additional health campaigns with this effort in Ethiopia's Oromia region. The partially integrated campaigns addressed social and behavioral change communication around COVID-19 and water, sanitation, and hygiene, as well as the identification of children under one year of age who were not fully vaccinated. Through this study, researchers assessed community attitudes and views around co-delivery and facilitated stakeholder development and implementation of a co-delivery approach.

- The co-delivery of onchocerciasis and STH interventions proved feasible and resulted in positive outcomes, including strong treatment coverage. Co-delivery appears to be a viable approach for strengthening neglected tropical disease (NTD) interventions in Ethiopia.
- Stakeholders in Ethiopia are receptive to implementing co-delivered NTD campaigns.
- Key components of successful co-delivery of NTD interventions include:
    - Locally tailored social and behavioral change communication
    - Well-aligned co-delivery tools, formats, and protocols
    - Engagement and empowerment of frontline health care workers
    - Support from stakeholders, including volunteers and policymakers
    - Training to strengthen capacity among campaign personnel
    - Focused efforts to establish a common understanding across stakeholders
    - Collaborative micro-plan development at the community level
    - A clear strategy for engaging and orienting volunteers
    - Ongoing education and mobilization at the community level

Abstract

Background: Increased global attention is focused on learning health campaign integration effectiveness, acceptability, and feasibility. This study assessed the effectiveness and acceptability of co-delivered mass drug administrations (MDAs) for onchocerciasis chemotherapy and deworming of children and women of reproductive age, complemented by social and behavioral change communication (SBCC) interventions to promote appropriate knowledge and practices related to water, sanitation, and hygiene, COVID-19, onchocerciasis and soil-transmitted helminths, and on identification and referral of unvaccinated and under-vaccinated children under one year of age.

Methods: A mixed-method implementation study with a pre-posttest design was conducted in 10 villages of Jimma zone, Oromia, Ethiopia, between June 2021 and September 2022. A formative qualitative assessment was conducted to explore communities' perceptions, enablers, and barriers for the co-delivery. Then, a household survey involving 732 households was conducted to assess communities' knowledge, attitudes, and practices (KAP). Informed by the formative results, a detailed co-delivery strategy was co-developed through a participatory process. Health extension workers (HEWs) supported by community volunteers co-administered the MDAs in villages in May 2022. A KAP-integrated post-campaign coverage validation survey was conducted on 776 sampled households and qualitatively through focus group discussions with beneficiaries and key informant interviews and expert group discussion at different levels. The data were analyzed for themes using SPSS version 22.0 and ATLAS.ti version 7.5.

Results: The co-delivery strategy achieved treatment coverage of 89.5%, 84.1%, and 83.2% for onchocerciasis, soil-transmitted helminths (STH), and combination therapy, respectively, with reported adverse events close to zero. Communities' overall satisfaction with the co-administration of medicines (91.6%) and intention to receive co-administration in the future (96.3%) were quite high. Compared to the baseline, communities' knowledge of onchocerciasis STH and their prevention methods improved substantially. For example, the knowledge that a blackfly causes onchocerciasis increased by 20%; contact with soil/feces transmits STH (by 13%); and appropriate hand-washing practices before handling/eating food (by 32.8%), and after toilet (by 31.7%). Communities and stakeholders perceived that the co-delivery strategy is effective, acceptable, and feasible. Reasons for acceptability include direct engagement of HEWs in the co-administration, which is believed to have resulted in fairness, access, and transparency in the distribution and provision of adequate information. Similarly, stakeholders believed the co-delivery had advantages over the single-campaign approach as a result of improved access and equity (effectiveness); higher efficiency (reduced misuse/abuse of drugs); and improved quality (proper dosage and management of activities).

Conclusions: The co-delivery led by the HEWs and supported by community volunteers produced good treatment coverage. Moreover, the approach was found to be appropriate, acceptable, and feasible. Thus, it is worthy of adoption, continuation, and scaling up with further evaluation in other contexts and settings of Ethiopia. Reorientation of community volunteers' role from drug distributors to "community mobilizers" is recommended for their effective engagement in the co-delivery. The study findings can inform policy and practice toward the goals of eliminating onchocerciasis, STH, and neglected tropical diseases.

Keywords: Health campaign effectiveness, neglected tropical diseases, soil-transmitted helminths, onchocerciasis, health campaigns, albendazole/mebendazole, ivermectin, co-delivery, integration, treatment coverage, acceptability, feasibility.

Background

The World Health Organization (WHO) roadmap for ending neglected tropical diseases (NTD) pays greater attention to integrated approaches to facilitate co-delivery of NTD interventions, such as preventive chemotherapy [1]. Ethiopia envisioned accelerating the control and elimination of NTDs through equitable and sustainable strategies using an integrated platform for the co-delivery of NTD services [2]. To this end, the national NTD strategic plan is committed to integrating co-administration of mass drug administration (MDA) and mainstreaming of NTDs into the routine health care delivery system, supported by effective social and behavioral change communication (SBCC) interventions and promotion of water, sanitation, and hygiene (WaSH) interventions [2]. Yet, multiple NTD campaigns are occurring in parallel with little coordination [2]. This can lead to the overuse of scarce logistics, supplies, and human resources and creating a burden on the health system, community members, and frontline health workers [2,3].

To achieve the elimination of onchocerciasis and soil-transmitted helminths (STH) by 2030, Ethiopia largely relies on MDA [2]. Onchocerciasis chemotherapy with ivermectin (IVM) (for people >5 years of age) has been conducted at the community level twice a year, administered by community volunteers called community drug distributors [4]. At the same time, the national deworming program for STH (treatment of children 5-19 years with albendazole/mebendazole) has been conducted twice a year through a school-based approach; it is administered by frontline health workers called health extension workers (HEWs) [2,5] with support from school teachers. As of 2022, the STH deworming program has been expanded for the first time to include women of reproductive age with a single dose of albendazole—an approach that has yet to be studied in Ethiopia. At the service delivery point, these two MDAs have been conducted with little or no coordination, often at different times, in different settings, and with different actors/implementers [2]. In this study, these two MDAs were co-delivered at village level by frontline health workers through full integration (i.e., all campaign components including micro-planning, registration, logistics, and implementation were conducted simultaneously at the point of service delivery) [6]. Three other health interventions were partially integrated (i.e., the interventions were complementary to the MDAs), namely SBCC to create awareness and promote prevention practices related to COVID-19 and WaSH (in addition to STH and onchocerciasis), WaSH; as well as identification and linkage of unvaccinated and under-vaccinated children under one year of age in the community. The considerations of identifications and linkage of such children are important given the negative impact of COVID-19 on vaccination coverage [7].

Study Objective

We evaluated the effectiveness of the co-administration of onchocerciasis chemotherapy and deworming of STH along with complementary health interventions (e.g., education on WaSH and COVID-19, and identification and linkage of unvaccinated children less than one year of age). In addition, the study assessed the acceptability and feasibility of the co-delivery strategy from the perspectives of beneficiaries and stakeholders. WHO approved the combination for the co-administration during MDA [1,8], which is safe [8,9,10].

Methods

Implementation Setting and Population

The study was implemented in 10 *gandas* (lowest administrative unit in Oromia) selected from five MDA target districts of the Jimma zone, Oromia, Ethiopia, between June 2021 and September 2022. In each ganda, all eligible populations for the MDA treatment were included [1,2,4,10] whereas caretakers, families, and households were targeted for SBCC on WaSH and COVID-19, and unvaccinated child identification and referral.

Implementation Research Design

The implementation research was guided by the RE-AIM framework consisting of five constructs: Reach, Effectiveness, Adoption, Implementation, and Maintenance [11-13]. Detailed definitions of each construct are in Annex 2, Box 1. The implementation process and activities are organized into four interlinked phases: 1) formative assessment, 2) co-delivery design and intervention development, 3) implementation, and 4) post-implementation evaluation. In the formative assessment (July-September 2021), an exploratory assessment was conducted through 6 focus group discussions (FGDs), 11 key informant interviews (KIIs), and 11 expert group discussions (EGDs) involving diverse groups of communities and stakeholders. We explored communities' and stakeholders' views regarding potential barriers, and facilitating and enabling factors on the planned co-delivery. Participants were selected purposively considering relevance and experiences in NTD program and related activities. Informed by the qualitative explorations, a household knowledge, attitudes, and practices (KAP) survey among representative 732 households (selected through systematic random sampling method) in 10 target villages established baseline KAP indicators (October - November 2021).

Prior to the MDA, trained volunteers did a complete household registration to enroll eligible populations (Annex 1, Table 1). The volunteers also 1) identified and referred to HEW the unvaccinated infants and/or those infants (under one year of age) who had not received all vaccinations; and 2) provided health education to households on the target NTDs, the importance of the planned co-delivery, and awareness about COVID-19 and WaSH. The health education was aided by locally appropriate SBCC materials (e.g., posters, brochures, information card, and flipchart) and a harmonized training manual that were co-developed through a participatory and collaborative process informed by the formative assessment and existing resources (Annex 4).

In the co-design phase, a detailed co-delivery strategy was co-developed through a participatory training workshop in March 2022 (see Annex 4 training schedule). The training facilitators were regional and zonal NTD experts supported by the research team. The trainees were engaged in developing co-delivery micro-plans specific to target villages, making decisions on service delivery settings, and forming a co-delivery team. The data from the formative assessment helped to adapt the co-delivery according to the local health system's needs and community preferences. The point of service (called a treatment post) was made at the sub-village level (locally called the *gare*, which is a grouping of on average 28 households) in which two or three gares were called at a fixed site to receive the co-delivered services but were flexible enough to meet local needs and preferences.

The co-administration (implementation) was led by HEWs (trained and salaried female community health extension workers) according to national and WHO guidelines (Annex 1, Table 2). Both drugs

(IVM and albendazole/mebendazole) were co-administered at the same time through direct observation therapy. The community volunteers, ganda and sub-ganda leaders, women's and men's groups, and religious leaders participated in community mobilization. In addition, school communities (teachers and students) facilitated and mobilized in-school boys and girls for participation in the treatment. Health workers (one to two people) from the nearby health center and district health staff supported the HEWs in providing continuous supportive supervision and coordination. The actual co-administration was conducted for seven to eight days (in March 2022) with a one-day catch-up or mop-up in each village. Following the MDA, a one-day review meeting was conducted with implementers and stakeholders in which the co-delivery team presented their performance, challenges, and solutions.

For evaluation of the effectiveness and acceptability of the co-delivery, a mixed-method KAP-integrated coverage survey was conducted on 776 randomly selected households with a population of 4,343. We evaluated the co-delivery effectiveness (treatment coverage, as evidenced by validation survey, and compared that to the reported coverage analyzed from the co-administration registration book) (Annex 3, Box 2). In addition, we analyzed changes in community KAPs. For measurement of implementation metrics (acceptability, fidelity/adherence, and feasibility, perceived sustainability, perceived scalability), all stakeholders (n=42; HEWs, health workers, and campaign managers) who engaged in the co-delivery process filled out a structured questionnaire (see Annex 3, Box 3, scales and definitions). Stakeholders' and beneficiaries' implementation experiences were qualitatively explored through 6 FGDs, 5 EGDs, and 10 KIIs.

Ethical Considerations

The study was approved by Jimma University Institutional Review Board.

Study Limitations

The research has no comparator, and this might affect the strength of the evidence. Post-campaign validation survey result was triangulated with the reported coverage. Recall bias might have affected responses to the survey tool.

Results

Therapeutic Coverage

The survey revealed that overall treatment coverage for onchocerciasis chemotherapy (IVM) was 89.5%, whereas the reported coverage was 78.6% (Figure 1). For STH deworming by albendazole/mebendazole, the overall treatment coverage was 84.1% (see Annex 1, Table 3 for details). The survey indicated an overall coverage of 83.2% (n=2610 eligible sample) for combination therapy (albendazole/mebendazole + IVM), whereas the reported coverage was estimated at 64.9% (see Annex 1, Table 4 for details). The main reasons for discrepancy between the survey and reported coverage was attributed to the difficulty of recording every activity during the actual campaign due to overcrowding at co-delivery points and limited human resources. One HEW participating in co-administration explained:

> *"In my team when many people come at the same time, there were times when the registration process is affected to some extent because of the overcrowding."* —HEW

Villages with weak supervision and/or weak staff commitment (at the district and health center level) experienced more challenges related to recording of activities and engaging the community.

Experience of Adverse Drug Events

There were no reported adverse drug events (side effects that remained for 2+ hours) during the co-administration. However, in the validation survey three cases reported adverse drug events (nausea, vomiting, and abdominal pain). Beneficiaries and health workers also reported that the co-administration was safe. A HEW asserted:

> *"We haven't heard of any side effects. We rather received positive feedback from the community that their appetite increased after taking these drugs."* —HEW, KII

A FGD participant also reported:

> *"No side effects occurred. The community is very happy for receiving the two drugs at once."* —40-year-old male participant, FGD

Effects of SBCC on Community Awareness and Behavioral Changes

Overall 88.5% of the survey respondents reported exposure to SBCC information during the co-delivery campaign. Most of them received education on the benefits of IVM (67.4%) and co-administration (44.6%), with the major source of information being HEWs (66.7%) and volunteer youths (64.7%). In FGDs, a female participant said:

> *"Health extension workers were teaching us about drugs, latrine usage, and ways to keep our environment clean."* —43-year-old female participant, FGD

However, the findings indicated that SBCC activities were among the challenging components of co-delivery due to inadequate time for health education during drug administration and crowding of people waiting. A HEW mentioned:

> *"It seems too difficult to provide health education concurrently with administering the medications when there are many people waiting."* —HEW, KII

Awareness and Perceptions Toward Onchocerciasis

Changes in community awareness on onchocerciasis is shown in Annex 2, Figure 2. Accordingly, the proportion of people who attributed onchocerciasis to the bite by a blackfly increased from the baseline (16.1% to 52.1%). Similarly, knowledge of using onchocerciasis chemotherapy for the prevention of onchocerciasis increased to 78.0%. Qualitative evidence revealed positive changes in community perceptions toward onchocerciasis, prevention, and its medication. Many participants across FGDs were able to correctly mention that onchocerciasis is a disease caused by the bite of black flies.

> *"Onchocerciasis is a disease. It is transmitted to individuals when a blackfly bites people. Even though I am not sure, I think the disease may catch any individual regardless of their age. We can prevent the disease by taking oncho drugs."* —Woman, FGD

Awareness About STH and Sanitation Practices

There were multiple positive changes in awareness and perceptions about STH at the endline. The changes reached as high as 20% for the perceived risk of STH attributed to poor environmental sanitation (from 39.2% to 59.5%) and poor personal hygiene (from 41.8% to 53.9%). At the endline, 95.2% of people in most households reported that they washed hands always after using the toilet (Annex 1, Table 5). Qualitative data also indicated improvements in community understanding and accurate perceptions of STH and its prevention.

> *"The intestinal parasite is caused by drinking water that has no sanitation and hygiene. It can also be caused by eating contaminated food. Indeed, the intestinal parasite is also caused when individuals defecate in the bush."* —Adolescent girl, FGD

Awareness of COVID-19 and Acceptance of Vaccine

There were many positive changes in awareness related to COVID-19 and its vaccine. The recognition of common symptoms of COVID-19 increased (e.g., fever from 45.5% to 68.8%); knowledge of the spread of COVID-19 through air droplets also increased to 88.0%, with substantial improvements in knowledge of self-protective practices. Similarly, willingness to accept the COVID-19 vaccine increased by 36.3% (see Annex 1, Table 6 for details).

Identification and Referral of Unvaccinated/Under-Vaccinated Children

During the community registration process, a total of 2,617 infants younger than one year of age were identified, and 332 (12.7%) of them were not vaccinated or incompletely vaccinated and referred for vaccination to the nearest health facility. Later on, in the post-MDA survey, 40 (5.2%) households reported that they had sent their children to the nearby clinic for vaccination, and of these, 31 households (77.5%) reported that an infant was vaccinated (confirmed with vaccination card and referral slip prepared for this study).

Implementation Effectiveness of the Co-Delivery

Descriptive results of the measures of implementation outcomes are shown Annex 1, Table 7. Perceived acceptability, feasibility, adoption, sustainability, scalability, self-efficacy to implement, and management of side effects of the co-administration were rated at a range of 4.5 to 4.8 (on a 5-point scale). Qualitative reports also confirmed that the co-delivery strategy was perceived to be effective, acceptable, and feasible to the beneficiaries and stakeholders. The major reasons for acceptance by the beneficiaries included direct engagement of HEWs, perceived fairness, and adequate access to drugs, transparency, and impartiality in the distribution; perceived quality of drug administration (e.g., dosage determination and handling of medicines); and provision of health education along with medication. An FGD participant said:

> *"The community is really happy to take the drugs from HEWs rather than from gare leaders as the HEWs have a good understanding of the drugs. The HEWs also advise the community very well. They also have a very good relationship with the community.* —46 year-old male, FGD

Similarly, stakeholders including frontline implementers stated the following advantages of co-delivery: improved access and equity (effectiveness), higher efficiency (e.g., reducing wastage, misuse/abuse of drugs); and improved quality of the co-administration (e.g., proper dosage determinations, management and handling of drugs such as leftovers, and direct observation therapy practice) and documentation and reporting qualities. A health extension worker said:

> *"It has reduced the existing waste by 100 percent. The program is very interesting; the people have acknowledged us very much. They liked it very much because, when the gares distribute the drug, they won't give it to those individuals with whom they have a grudge. We loved it, even we wish we could expand it in the upcoming round of health campaign.* —HEW, KII

The major challenge was that community drug distributors in a few villages were reluctant to engage in community mobilization because they perceived that their role as a community drug distributor was negated. They were interested in owning distribution of the drug without help from anyone.

> *"They [community drug distributors] were resisting mobilizing the communities. They were saying, 'we know this drug [IVM] and we could distribute it.'"* —HEW, KII

Another KII said:

> *"Some of the CDDs [community drug distributors] were not interested as they want to misuse the drug. They have the desire to distribute the drug to some people and store the rest for themselves. The community is saying that 'It is only this time we started to get these drugs.'"* —HEW, KII

In a focus group, it was noted:

> *"Some gare leaders [community drug distributors] didn't want the distribution of the drugs by HEW. They want to distribute the drug by themselves as they want to use the leftover drugs for other purposes."* —43-year-old woman, FGD

Beneficiaries' Experiences and Satisfaction With the Co-Delivery Services

Findings on beneficiaries' experience and satisfaction is shown in Annex 2, Figure 3. The co-delivery was convenient for 89.0% of the surveyed households and 84.8% of them perceived the distribution was fair. Overall satisfaction with the co-administration was 91.4%, and 96.3% of the respondents would like to get the drugs in the same manner in the future.

Promising Practices

Promising practices identified during the co-delivery process were:

- **Effectively engaging and empowering health campaign co-delivery actors,** particularly the frontline health workers and community volunteers and leaders at multiple levels, is vital for co-delivery effectiveness and acceptance.
- **Direct engagement of frontline health workers** in the co-administration demonstrated major benefits: increased acceptance and participation by beneficiaries; improved transparency and

fairness, quality of the drug administration (e.g., proper dosage), and management (handling leftover drugs, direct observation therapy); and proper documentation.

- **Strong district leadership,** follow-up and timely feedback, and supportive supervision by the health staff contributed to achieving greater treatment coverage and effective fidelity of the co-delivery.
- **Integration of SBCC**: co-administration of MDA needs SBCC activities. The development of locally appropriate educational messages should be guided by the findings of the formative study.
- **Co-creating harmonized co-delivery tools**, and a service delivery protocol through engaging key stakeholders (mainly frontline health workers) and representatives of community/beneficiaries, is crucial for the smooth implementation of co-delivery. The MDA coverage validation survey should integrate the KAP element.
- **Prior community registration** was found to improve the qualities of MDA including proper planning, dosage and drug determination, recording, and documentation. Being registered for the treatment was seen as a sign of respect, concern, and care by the communities.

Lessons Learned

Lessons learned during the co-delivery process were:

- The co-delivery of MDAs for onchocerciasis and STH is well accepted by the communities and adoptable to Ethiopian health systems; it should be complemented by behavioral change interventions that promote appropriate hygiene and sanitation, COVID-19 awareness and practices, and identifications and referral of unvaccinated and under-vaccinated infants less than one year of age.
- Health campaigns involve multiple stakeholders at multiple levels with different program foci, philosophical approach, and funding schemes. Thus, the health campaign integration efforts must start by bringing together the key partners and stakeholders, with an effort to establish a common understanding and common platform on issues such as supply chain integrations, coordination, and collaborative planning.
- Health campaign integration affects multiple interests at multiple levels and thus, managing conflict of interest is essential for the success of the co-delivery program. Frontline workers wanted to assume more power over the onchocerciasis MDA while some community drug distributors wanted to keep their previously held role as drug distributors. The direct engagement of frontline health workers in co-administration might have led the volunteers to develop a perception that their role was negated. Thus, in a co-delivery approach where frontline health workers have to manage the co-administration of drugs, the role of volunteers should be re-oriented toward being a mobilizing agent rather than drug administrator agent. It should be done in a participatory process so that they accept the integration and collaboratively work with health workers.
- Collaborative and participatory campaign micro-plan development at the community level is essential to creating a suitable co-delivery strategy. Tailored training for community-level implementers is an effective strategy for the empowerment of community workers through hands-on training with close mentoring and support.

- Ongoing strong community mobilization and education, and high-level engagement of ganda structures, with its chain of leaders and command, are fundamental to ensure community participation for service uptake.

Implications for Policy, Practice, and Future Research

The co-delivery strategy with full integration of preventive chemotherapies against STH and onchocerciasis with partial integration of complementary health intervention, such as promotion of WaSH behaviors, COVD-19 self-care and identification, and referral of unvaccinated children was found to be effective with positive health campaign effectiveness characteristics. Hence, the regional and national NTD programs can adopt and sustain the co-delivery approach as a viable strategy, and expand it to new districts through the phase-in process with further evaluations and testing in rural and urban areas of Ethiopia. The co-delivery strategy needs further research regarding cost-effectiveness analysis and burden of diseases.

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Annex 1: Tables

Table 1: Summary of population age groups by districts and gandas, February 2022

Districts by ganda		Age groups and eligibility				
		<5	5-15	16-19	20-49	>49
Kersa	Awey Sebo	1051	2755	1134	2580	830
	Kitimbille	742	1824	815	1832	516
	Total	2380	5586	2566	8277	2679
Gomma	Balfe Koche	593	1299	620	2284	705
	Yachi	1787	4287	1946	5993	1974
	Total	2380	5586	2566	8277	2679
Manna	Gudeta Bula	260	736	413	1080	292
	Horo	635	1670	855	3050	910
	Total	895	2406	1268	4130	1202
Omobeyam	MetiSegada	942	2131	723	1933	521
	Odabuli	623	1473	521	1693	478
	Total	1565	3604	1244	3626	999
Omonada	Nadachala	1555	3107	1167	3028	822
	ToliSebeta	1553	3524	1284	3489	1016
	Total	3108	6631	2451	6517	1838
Overall Total		9741	22806	9478	26962	8064

Table 2: Eligibility and dosage for co-administration of IVM + albendazole/mebendazole during the co-delivery, Jimma, May 2022

Types of drugs	Person's Height (person's height, measured by measuring stick)	Dosage
Ivermectin 3 mg	< 90 cm	No TABLET
	90- 119 cm	1 TABLET
	120- 139 cm	2 TABLET
	140- 159 cm	3 TABLET
	>159 cm	4 TABLET
Mebendazole 500 mg	5-14 years old (both sexes)	1 TABLET
Albendazole 400 mg	15-19 years (male)	1 TABLET
	15-49 years (female)	1 TABLET
Co-administration (IVM + albendazole/mebendazole)	All 5-14 years and based on height	1 MEB +(1-4 IVM) TABLET
	All 15-19 years and based on height	1 ALB +(1-4 IVM) TABLET
	Females, 20-49 years and based on height	1 ALB +(1-4 IVM) TABLET

Table 3: Age-specific albendazole/mebendazole treatment coverage by co-delivery strategy (Jimma, 2022)

Age in years	Male		Female		Overall (Male + Female)	
	Survey coverage	Reported coverage	Survey coverage	Reported coverage	Survey coverage	Reported coverage
5-14	610/681(89.6)	8510/11531 (73.8)	574/665 (86.3	7349/11077 (73.1)	1346/1184 (87.9)	16603/22608 (73.4)
15-19	220/260 (84.6)	4746/32450 (68.5)	213/255(83.5)	3097/4474 (69.2)	433/515 (84.1)	6347/9220 (68.8)
20-29	--	--	241/323 (74.6)	3920/5873 (66.7)	241/323 (74.6)	3920/5873 (66.7)
30-39	--	--	220/265 (83)	3145/4600 (68.4)	220/265(83)	3145/4600 (68.4)
40-49	--	--	117/161 (72.7)	1736/2804 (61.9)	117/161 (72.7)	1736/2804 (61.9)
Total	830/941/(88.2)	10996/15118 (72.7)	1669/1365 (81.7)	19242/27644 (69.6)	2195/2610 (84.1)	31751/45105 (70.4)

Table 4: Treatment coverage for the combination therapy disaggregated by age and sex, Jimma 2022

	Male			Female			Overall		
Age	Eligible	Received	%	Eligible	Received	%	Eligible	Received	%
5-14	681	602	88.4	665	569	85.6	1346	1171	86.9
15-19	260	220	84.6	255	211	82.7	515	431	83.6
Total	941	822	87.3	920	780	84.7	1861	1602	86.08
20-29	--	--	--	323	236	73.1	323	236	73.1
30-39	--	--	--	265	217	81.9	265	217	81.9
40-49	--	--	--	161	117	72.7	161	117	72.7
Total	941	822	87.3	1669	1350	80.8	2610	2172	83.2

Table 5: Changes in awareness and practices related to STH, May 2022

Knowledge/perceptions of STH	Baseline (%)	Endline (%)
Symptoms of having STH		
Abdominal pain	84.0	86.9
Nausea and vomiting	45.2	25.0
Diarrhea	40.4	46.3
Abdominal distention	33.3	49.0
Perceived risk factors for STH		
Poor environmental sanitation	39.2	59.5
Poor personal hygiene	41.8	53.9
Lack of using the toilet	5.7	31.2
Contact with soil	8.5	21.5
Contact with human feces	1.2%	16.2
Handing washing behavior		
Washed hands always after the toilet	88.5	95.2
Washed hands after cleaning faces	52.7	83.2
Washed hands after touching/cleaning cow dung	57.2	69.4
Washed hands after touching soil	44.6	60.5
Washed hands after touching animals such as dogs/cats	19.3	30.1

Table 6: Changes in COVID-19 awareness and vaccine acceptance, May 2022

Knowledge/perceptions of COVID-19	Baseline (%)	Endline (%)
Symptoms of COVID-19		
Fever	45.5	68.8
Dry cough	66.0	78.3
Shortness of breath	31.1	50.7
Knowledge spread and prevention		
Knowledge of the spread of COVID-19 through air droplet	82.2	88.0
Wearing a face mask	79.1	94.3
Avoiding hand shaking	62.2	68.7
use of alcohol/sanitizer	9.7	22.0
COVID-19 vaccine		
Aware of the presence of COVID-19 vaccine	52.5	89.0
Willing to receive the vaccine	92.8	96.9
Concerns that COVID-19 might be harmful.	10.7	40.1

Table 7: Measures of implementation outcomes dimensions for the co-delivery of MDA (post-intervention), Jimma, 2022

IR outcomes dimensions of the co-delivery	Low* Freq. (%)	High* Freq. (%)	Scale mean (SD)	Total (%)
Acceptability	2.0 (4.80)	40 (95.20)	4.70 (0.47)	42 (100)
Feasibility	3.0 (7.10)	39 (92.90)	4.56 (0.52)	42 (100)
Adoption	4.0 (9.50)	38 (90.50)	4.55 (0.52)	42 (100)
Perceived sustainability/continuity	6.0 (14.30)	36 (85.70)	4.50 (0.64)	42 (100)
Perceived scalability of the co-delivery	1.0 (2.40)	41 (97.60)	4.64 (0.45)	42 (100)
Self-efficacy to implement co-delivery	0.0 (0.0)	42 (100)	4.80 (0.32)	42 (100)
Perceived side effects	38 (90.50)	4.0 (9.50)	1.80 (0.92)	42 (100)
Perceived manageability of the side effects	2.0 (4.80)	40 (95.20)	4.55 (0.74)	42 (100)

Note: *Low= Responses <3, *High= Responses >3 on scale mean measured on a five-point Likert scale

Annex 2: Figures

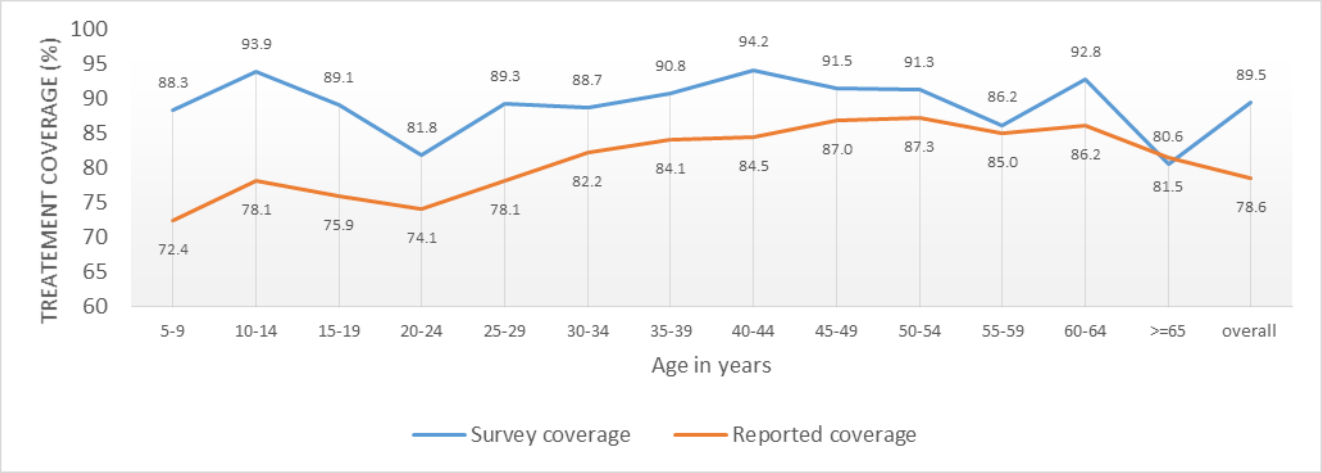

Fig 1: Age-specific IVM treatment coverage by co-delivery strategy (Jimma, 2022)

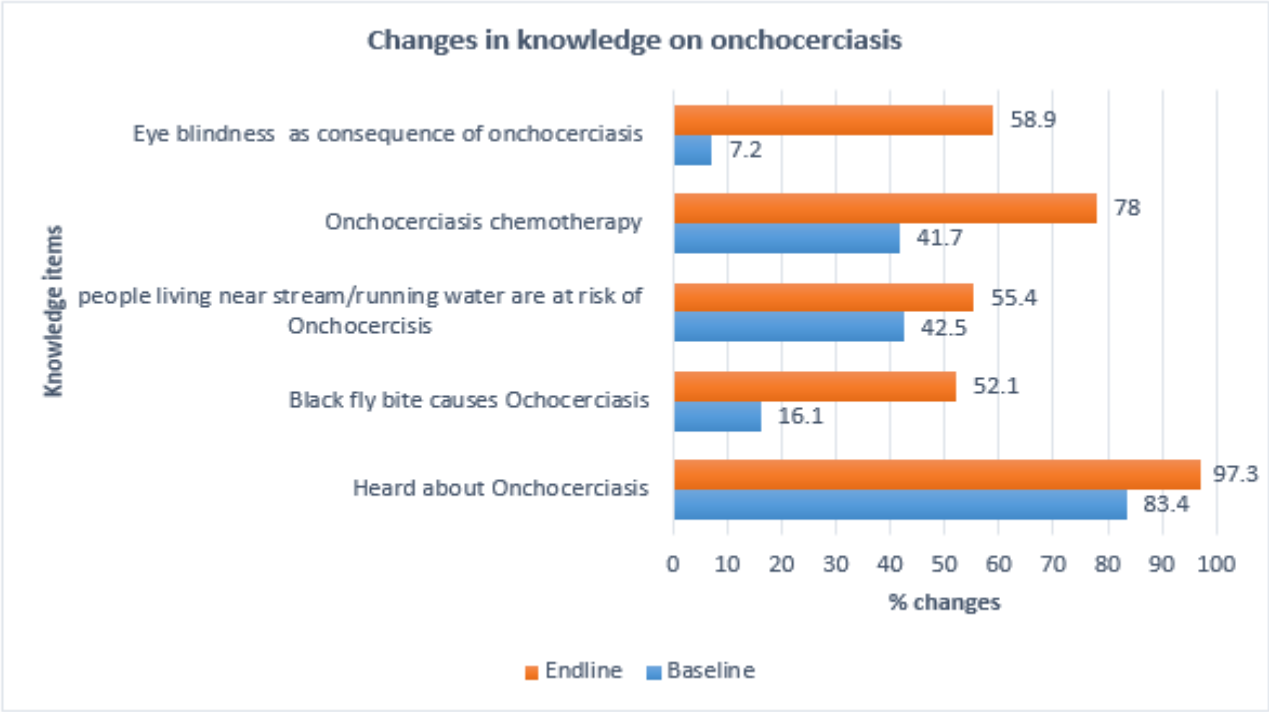

Fig 2: Changes in community/beneficiaries awareness related to onchocerciasis, May 2022

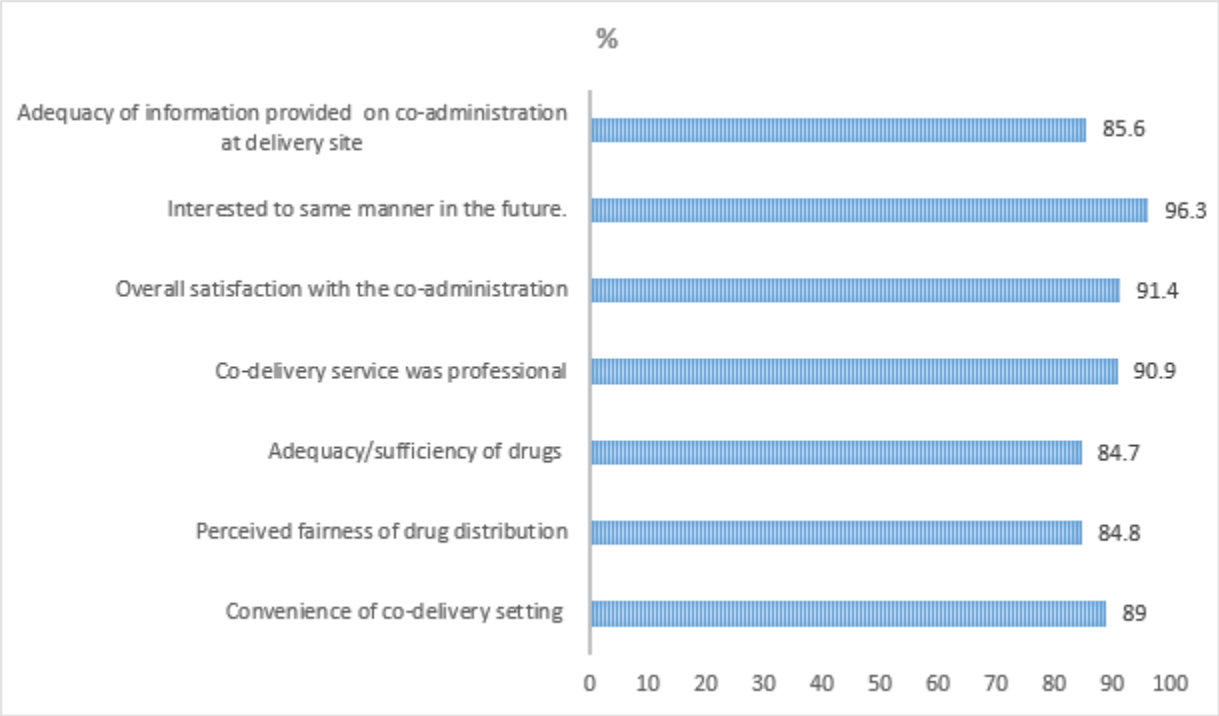

Fig 3: Beneficiaries experience/satisfactions with the co-delivery

Annex 3: Text Boxes

Box 1: Definition of RE-AIM framework constructs:

Reach is the target population reached (offered co-delivered chemotherapy medicines).

Effectiveness is two-fold: the proportions of eligible populations that received (chewed or swallowed the medication) (national target: 75% for STH and 80% for Onchocerciasis) and changes in community KAPs.

Adoption represents characteristics of the co-delivery procedures, and resources including human capital involved in the program adopted by the system (e.g. willingness to participate in the program, and readiness to use the approach).

The **implementation** component refers to the extent to which the co delivery and collaboration activities were delivered with fidelity to the established protocols acceptability, and appropriateness.

Maintenance refers to organizational decisions to sustain the co-delivery approach. This was assessed by two indicators: 1) **sustainability**, the perceived likelihood of continued use of program components and activities for the continued achievement of desirable health campaign outcomes and 2) scalability, the perceived potential of co-delivery implementation expansion so that the intervention is more widely available.

Box 2: Operational definitions for therapeutic (reported/administrative and surveyed) coverage

Reported coverage for Onchocerciasis chemotherapy: Percentage of the eligible population for onchocerciasis chemotherapy (age >5 years) who swallowed the medicine as recorded on the registration book. For the survey coverage, the denominator is the total eligible population surveyed.

Reported coverage for STH chemotherapy: Percentage of the eligible population for STH therapy (age 5-19 years for males and 5-49 years for females) who chewed/ingested the medicine (albendazole/mebendazole) as recorded on the registration book. For the survey coverage, the denominator will be the total eligible population surveyed.

Reported combination therapy coverage: Percentage of the eligible population for combination therapy (age 5-19 for males and age 5-49 years for females) who swallowed/chewed both medicines as recorded on the registration book. For the survey coverage, the denominator will be the total eligible population surveyed.

Box 3: Measurement and operational definition of implementation metrics

Acceptability: the beliefs about whether the integrated health campaigns agreeable or satisfactory by communities, frontline/community health workers, and campaign managers. This construct was measured using five items such that; *the co-delivery of anti-ONCHO and STH drugs campaign was appealing to me (so much interesting, so much compelling), The co-delivery of mass drug distribution for (STH and Oncho) is a good solution to alleviate the problem and I like the co-delivery of anti-ONCHO and STH drugs campaign intervention.* The items were designed using five-point Likert scale format such that 1) strongly disagree to 5) strongly agree. Items were added up to create composite score on scale mean such that higher score on scale mean interpreted as high acceptability.

Feasibility-the level of operational, technical, and perceived financial feasibility of co-delivery approach among health staff, decision/policy makers, campaign managers communities, frontline/community health workers. *Three items including; the co-delivery of anti-ONCHO and STH drugs seems possible (to achieve high coverage), the co-delivery of anti-ONCHO and STH drugs seems easy to use/implement in this community and the co-delivery of anti-ONCHO and STH drugs seems implementable* were designed using five-point Likert scale format having 1) strongly disagree to 5) strongly agree. The items were added up to create composite score on scale mean such that higher score on scale mean interpreted as high feasibility.

Adoption: this construct captured the willingness, and motivations of stakeholders and frontline and community members who will deliver the campaign, are willing to initiate a program, participate, and why. Adoption was measured by six items that include; *All stakeholders will agree to implement the co-delivery, We are interested in the co-delivery of the anti-ONCHO and STH drugs as effective means of achieving our program, and We are leaning in the direction of adopting or committed to adopt this practice (of the anti-ONCHO and STH drugs) in our programs/system* were designed using five-point Likert scale format. The items were added up to create composite score on scale mean such that higher score on scale mean interpreted as high adoption.

Perceived sustainability of a program (SOP): Perceived sustainability: is defined as the perceived likelihood of continued use of program components and activities for the continued achievement of desirable program and population outcomes. Three items such that the extent to which the program; *Continues to operate as piloted (in the initial delivery), Continues to deliver the desired integrated MDA intervention to its intended population. The implementation of the co-delivery of MDA intervention (campaign) would be monitored* were employed to measure the perceived SOP. Five-point Likert Scale format was designed to tap the perceived SOP with 1) strongly disagree to 5) strongly agree. The items were added up to create composite score on scale mean such that higher score on scale mean interpreted as high perceived SOP.

P**erceived** s**calability: is** the level of scalability (i.e. the perceived potential of 2MDA^{+3} implementation expansion so that the intervention is available across wider geographic or practice settings). Five item were used to capture the stakeholders perception that to what extent the campaign; *would have successful implementation fidelity (as adherence to protocol) after scaling up, the organizational/staff would be receptive or acceptable if scaled up and would generally be scalable to other settings.* Five-point Likert Scale format was designed to tap the perceived scalability such that 1) strongly disagree to 5) strongly agree. The items were added up to create composite score on scale mean such that higher score on scale mean interpreted as high perceived scalability.

Perceived side effects and consequences: is the perception about the potential side effects and consequences associated with taking the combined drugs. Three items were used to measure the p*erceived side effects: I am concerned about taking two different drugs at time as it might cause some health discomfort or side effect, I am concerned about taking a too much pills (of the combined drugs) at a time can cause some health discomfort or side effects and Many people who received the combined drugs encountered severe adverse effects due to taking the combined drugs. Similarly, t*he perceived side consequence was measured by three items including; *the risks or side effects associated with the co-administration drugs can easily be managed, Drug providers/administrators were knowledgeable and skillful to identify and manage the side effects. Since health workers engaged in the co-administration, it made easier monitor and ensure safety of the drugs.* The items were added up to create composite score on scale mean such that higher score on scale mean interpreted as high perceived side effects or consequences.

Self-efficacy: is the perception of confidence of the individuals who have participated in the co-delivery campaign. It was measured using items adapted from the *psychological empowerment scale;* such that; *I can utilize guidelines available to teach the public regarding Onco and STH and I can utilize available resources to accomplish the tasks, etc.* It was measured using five-point Likert Scale format ranging 1) strongly disagree to 5) strongly agree. The items were added up to create composite score on scale mean such that higher score on scale mean interpreted as high confidence.

Annex 4: Images of Screen SBCC Material and Formats

Image 1: Posters

Image 2: Information, education, and communication card

Image 3: Flip chart

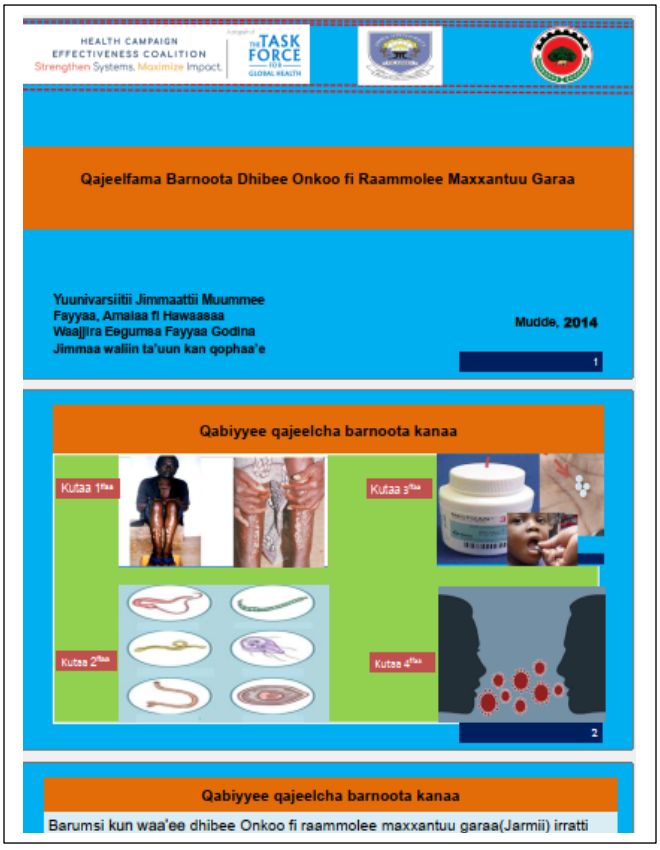

Image 4: Harmonized co-delivery training manual

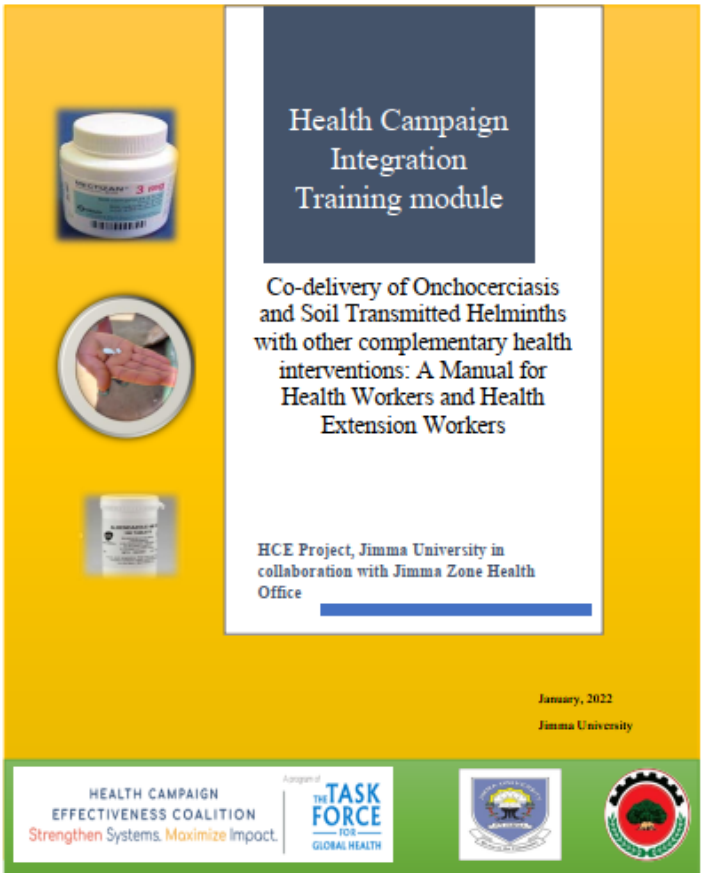

Image 5: Brochure

Image 6: Harmonized MDA Registration book

Guca A1: Galmee qindaawaa raabsaa goricha Onkoo fi raammolee maxxantuu garaa

Aanaa _____ **Buufata fayyaa**_____ **Keellaa fayyaa** _____ **Ganda** _____

Zoonii _____ **Garee** _____ **Maqaa Abbaa warraa** _____ **Lakk. Addaa Abbaa warraa (HH.ID)** _____

Miseensota maatii abbaa warraa irraa jalqabii hanga daa'ima xiqqaatti galmeessi. Itti aansuun odeeffannoo gabatee keessa jiran tokko tokkoon gaafadhuu guuti.

s/n	Maqaa guutuu miseensota maatii	Umuri	Saala Dhi=1 Dha=2	Mana barumsaa 1.Keessa (enrolled) 2.Ala (non-enrolled)	Haala Talaalii (waggaa 1 gadii) 1.Talaalame 2.Hin talaalamne 3. Adda kute 4.Hin beekamu (unknown) 5. Referred 6. Not referred	Enrolled (Y/N)	Height in CM Category 1. < 90 2. 90- 119 3. 120- 139 4. 140- 159 5. >159	Chemotherapy: Ivermectin 3mg (DOTs) For age above 5 yrs old				Albendazole 400mg /Mebendazole 500mg (DOTs) Male:For age 5-19 yrs only Female:For age 5-49 yrs only				Severe Adverse Events (SAEs) Including side effects persisting > 2 hours		
								Offered dosage (#tablet)	Reasons for not offered[a]	#Tablets swallowed	Reason not swallowing[b]	Offered dosage (#)	Reason for not offered[a]	#Tablets chewed	Reason for not chewed[b]	Type of SAE[c]	Refer to HC (Y/N)	Outcome
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
	Ida'ama																	

Maqaa nama galmee hawaasa
guutee:_____
Guyyaa_____
Mallattoo:_____
_____

Maqaa nama qoricha
laatee:_____
guyyaa:_____
Mallattoo:_____

[a]**Reason drug was not offered (goricha maalif hin kennamne):** 1=Underage/height (hin geenye); 2=Pregnant (Ulfa); 3=Breastfeeding (harma hoosisuu); 4=Sick (ni dhukkuba); 5=death (kan du'e); 6=Absent (hin dhufne); 7=Didn't hear about the MDA (MDA hin dhageenye); 8=Ran out of the medicine (goricharu dhume); 9=Other (Kan biroo).

[b]**Reasons drug was not swallowed (Goricha hin fudhanne):** 1=Fear of side-effects (miidhaa sodaachuu); 2=Bad taste (dhandhama jibbisiisaa); 3=Not sick (hin dhukkubsanne); 4=Not enough information given (odeeffannoo gahaa hin arganne); 5=Other (kan biroo)

[c]**SEA CODES (miidhaa cimaa):** 1 = Abdominal Pain (garaa dhukkubbii). 2 = Nausea (ol-guuruu). 3 = Vomiting (ol-deebisuu). 4 = Diarrhea (garaa kaasaa). 5 = Malaise/ Fatigue (dadhabbii). 6 = Dizziness (joonja'uu). 7 = Rash (shiffee). 8 = Feve (gubaa)r. 9 = Itching (hooqsisuu). 10 = Wheezing (korrisuu). 11 = Seizure (hurgufinu/marsuu). 12 = Shock/ Unconsciousness (gagabsuu). 13=other (kan biroo)

Image 7: Referral slip for unvaccinated or incompletely vaccinated <1-years old age children

HEALTH CAMPAIGN EFFECTIVENESS COALITION
Strengthen Systems. Maximize Impact.

Unvaccinated and dropout child referral form (waggaa tokkoo gadiif)

Ganda:_____Zoonii_____Garee_____

Maqaa Abbaa:_____Maqaa haadhaa:_____

Maqaaa daa'imaa:_____

Umurii (ji'a):_____saala:_____haala talaalli (addan kute,

hin jalqabne):_____Lakk. Bilibila maatii:_____

Mana yaalaa itti ergame/te: _____

Maqaa nama ergee: _____Mallattoo:_____Guyyaa_____

Maqaa fi mallattoo Ekisteenshiinii fayyaa_____

HEALTH CAMPAIGN EFFECTIVENESS COALITION
Strengthen Systems. Maximize Impact.

Unvaccinated and dropout child referral form (waggaa tokkoo gadif)

Ganda:_____Zoni_____Gare_____

Maqaa Abbaa:_____Maqaa haadhaa:_____

Maqaaa daa'imaa:_____

Umurii (ji'a):_____saala:_____haala talaalli (addan kute,

hin jalqabne):_____Lakk. Bilibila maatii:_____

Mana yaalaa itti ergame: _____

Maqaa nama ergee: _____Mallattoo:_____Guyyaa_____

Maqaa fi mallattoo Eksiteenshiinii fayyaa_____

HEALTH CAMPAIGN EFFECTIVENESS COALITION
Strengthen Systems. Maximize Impact.

Unvaccinated and dropout child referral form (waggaa tokkoo gadif)

Ganda:_____Zoni_____Gare_____

Maqaa Abbaa:_____Maqaa haadhaa:_____

_____

Maqaaa daa'imaa:_____

Umurii (ji'a):_____saala:_____haala talaalli (addan kute,

hin jalqabne):_____Lakk. Bilibila maatii:_____

Mana yaalaa itti ergame: _____

Maqaa nama ergee: _____Mallattoo:_____Guyyaa_____

Maqaa fi mallattoo Eksiteenshiinii fayyaa_____

HEALTH CAMPAIGN EFFECTIVENESS COALITION
Strengthen Systems. Maximize Impact.

Unvaccinated and dropout child referral form (waggaa tokkoo gadif)

Ganda:_____Zoni_____Gare_____

Maqaa Abbaa:_____Maqaa haadhaa:_____

Maqaaa daa'imaa:_____

Umurii (ji'a):_____saala:_____haala talaalli (addan kute,

hin jalqabne):_____Lakk. Bilibila maatii:_____

Mana yaalaa itti ergame: _____

Maqaa nama ergee: _____Mallattoo:_____Guyyaa_____

Maqaa fi mallattoo Eksiteenshiinii fayyaa_____

Annex 5: Training Schedule

Training program for co-delivery implementers and actors
Stakeholder Meeting & Micro planning training for the HCE - Jimma University Project:
An Implementation Study of Health Campaign Effectiveness in
Jimma Zone, Ethiopia

VENUE: CENTRAL JIMMA HOTEL
DATE: 06 MARCH 6-8, 2022
March 06, 2022 – Stakeholder Meeting
March 07-08, 2022 – Micro planning training Jimma University, Jimma, Ethiopia
AGENDA

Time (Local)	Content	Responsible /Facilitators
Day 1 [March 6, 2022]		
2.30 – 3.00	Registration	Firenbon and Nimona
3.00 – 3.15	Welcome and Introduction of participants	Prof. Morankar
3.15 – 3.25	Inaugural speech	Dr. Jemal (President JU) or Dr. Netsanet (Vice President, JU)
3.25 – 4.20	NTDs and health camping national (Ethiopia) and regional (Oromia) overview and Health Campaign integration perspectives and policy	Oromia regional Health Bureau representative
4:20 – 4:40	**Health Break**	**Organizers**
4.40 – 5.05	HCE Project overview and methodology	Prof. Zewdie Birhanu
5.05 – 6.30	Progress up to date & preliminary findings	Dr. Yohannes Kebede
6.30 -8:00	**Lunch**	**Organizers**
8.00 – 9.30	Proposed implementation planning and process: Planned co-delivery strategies	Prof. Zewdie and Jimma Zonal health representatives
9.30 – 10.30	Discussions, Q&A	Prof. Morankar and presenters
Day 2 [March 7, 2022]		
2:30-2:45	Participant registration	Jimma University
2:45-3:00	Welcoming and introductions	Prof. Sudhakar Moranker
3:00-3:20	Opening remarking	Mr. Fuad Sabit, Jimma Zonal Health Office Head
3:20-4:45	HCE Project overview-Health campaign integration	Prof. Zewdie Berhanu
4:45-5:00	**Tea break**	**Organizers**

5:00-5:45	Preliminary findings from HCE formative studies	Dr.Yohannes Kebede
5:45-6:30	Overview of onchocerciasis and STH, MDAs and integration issues	Mr. Hirpa Meicha (Oromia regional Health Bureau NTD team leader)
6:30-8:00	**Lunch**	**Organizers**
8:00-9:45	Organization and co-delivery of MDA for Onchocerciasis and STH ● Presentation and discussion on pre-campaign activities	Mr. Gebeyehu Bulcha (Jimma Zonal department)
9:45-10:00	**Health break**	**Organizers**
10:00-11:30	● Presentation and discussion on intra-campaign activities	Mr. Teshome Shiferaw (Jimma Zonal health department NTD focal)
Day 3, [March 8, 2022]		
2:30:3:45	● Presentation and discussion post campaign activities	Mr. Gebeyehu Bulcha
3:45-4:45	● Presentation and discussion on integrating SBCC into campaign activities	Dr. Yohannes Kebede
4:45-5:00	**Health Break**	**Organizers**
5:00-5:45	Discussions on co-delivery formats and IEC use	Dr. Yohannes Kebede
5:45-6:30	Developing micro-plan, presentation, discussions and feedback	Participants (and zonal , and regional experts and research team)
6:30-8:00	**Lunch**	**Organizers**
8:00-11:00	Micro-plan development continued: exercise, presentation and feedback	Participants
11:00-11:30	Closing remark and way forward	Jimma Zonal NTD team leader/representative/partner/JU

NB:

- Moderators : Prof. Morankar Sudhakar and Gebeyehu Bulcha
- Notes takers - Minute: Mohammed and Gelila A
- Housekeeping – Mintamir