

A multi-state evaluation of health system opportunities and challenges facing community-wide mass drug
administration for the elimination of parasitic worms in India

Kimberly Baker

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Committee:

Jamie Cowan

Arianna Rubin Means

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Abstract

A multi-state evaluation of health system opportunities and challenges facing community-wide mass drug administration for the elimination of parasitic worms in India

Kimberly Baker

Chair of the Supervisory Committee:

Jamie Cowan

Department of Global Health

An estimated 1.45 billion people are infected with Soil Transmitted Helminths (STH) globally, with a large proportion of the burden in India. At moderate to high infection intensity, STH is associated with a number of morbidities that disproportionately affect children, including, malnutrition, impaired cognitive development and anemia. The World Health Organization Neglected Tropical Disease (NTD) guidelines recommends controlling STH-associated morbidity via mass drug administration (MDA) to treat school-aged children. Recent evidence suggests however, that it may be possible to interrupt STH transmission, therefore preventing infection, by expanding MDA to a community-wide program. Similar NTDs, such as Lymphatic Filariasis (LF) already operate on a community-wide scale. This research assesses government stakeholder readiness for transitioning from school-based to community-wide MDA for STH, as well as identifies strategic opportunities to leverage existing LF infrastructure. Findings from this study are intended to proactively support government decision making, prioritization, and program planning across heterogenous implementation contexts in India in order to speed the translation of research findings into practice.

Background

Soil-transmitted helminths (STH) are a group of parasitic worms that infect an estimated 1.45 billion people globally.¹ India has the highest burden of STH²⁻⁴, with approximately 25% of all global cases.⁵ STH is associated with inadequate access to water, sanitation, and safe living conditions.⁶ At moderate to high infection intensity, STH causes a number of morbidities that disproportionately affect children, including diarrhea, malnutrition, chronic malaise, impaired cognitive development, disrupted linear growth, chronic inflammation and anemia.¹ STH infections are also associated with intrauterine growth retardation and low birth weight in pregnant women.⁷⁻⁹

World Health Organization (WHO) Neglected Tropical Disease (NTD) guidelines recommend controlling STH-associated morbidity via mass drug administration (MDA) of albendazole or mebendazole for pre-school (PSAC) and school-age children (SAC), women of child bearing age, or people with high risk occupations (e.g., agriculture).¹⁰ In India, deworming of children occurs biannually, where teachers, Accredited Social Health Activists (ASHAs), and Anganwadi Workers (AWWs) administer deworming treatments in schools during National Deworming Days (NDDs).

There are three main challenges impacting the sustainability and effectiveness of school-based deworming programs, including coverage of school-based MDA, the time scale of the programs, and resources available. Equitable coverage is a concern considering the national coverage for treatment of SAC in India is only 59.56%.¹¹ Additionally, routine school-based MDA may need to endure indefinitely in order to continue to suppress morbidity amongst pediatric populations. This is due in part because adults are not broadly treated for STH and thus serve as reservoirs of infection in the community.^{12 13} Lastly, there is uncertainty about the availability of drug donation programs needed to support school-based MDA. In 2012, the London Declaration inspired a cross-sectoral collaboration for supplying drug donations to STH-endemic countries.¹⁴ However, this commitment expires in 2020, and compromises the sustainability of NDD programs.¹⁵

New evidence suggests that transitioning from school-based MDA to community-wide MDA (cMDA) may address challenges related to coverage and sustainability of effective school-based programs.^{13 16-18} Mathematical models demonstrate that in low to medium transmission settings, broadening MDA to treat individuals of all ages could interrupt STH transmission by treating ongoing reservoirs of disease in the community, provided cMDA treatment coverage is high.¹⁶ Programs for other NTDs, such as lymphatic filariasis (LF), have successfully interrupted transmission by achieving high treatment coverage of cMDA.¹³ In fact, of the 72 countries endemic for LF in 2017, 21 have successfully interrupted transmission, and no longer require MDA. These countries are in a state of post-MDA surveillance, where MDA has stopped and monitoring for infection recrudescence is ongoing.¹⁹ In India, a policy of LF elimination has been adopted and approximately 40% of LF-endemic districts have successfully entered a post-MDA surveillance phase.¹⁹

STH and LF programs share several key commonalities, including frequent co-endemicity and drug combinations that both include albendazole. However, LF programs target individuals of all ages and STH programs have reaped concomitant reduction of infections.¹⁵ However, as LF programs transition from routine MDA to post-MDA surveillance, rebounds in STH infections are expected. Rather than build new programs for STH cMDA, there is opportunity to leverage existing infrastructure from LF in a strategic de-implementation approach. New cMDA STH programs may benefit from access to established LF platform resources including trained health workers, supply chains, and community engagement mechanisms. An STH cMDA platform may also provide infrastructure necessary for ongoing LF surveillance and completion of WHO elimination dossiers.¹⁵

In 2018, we launched the India STH Elimination Landscape Project to assess government stakeholder readiness for transitioning to cMDA for STH, as well as identify strategic opportunities to leverage existing

LF infrastructure. Findings from this study are intended to proactively support government decision making, prioritization, and program planning across heterogenous implementation contexts in order to speed the translation of research findings into practice.

Methods

Study design

This mixed methods study was conducted in three Indian States: Goa, Sikkim, and Odisha. The states were selected using a systematic process to identify states across regions with a high probability of interrupting STH transmission, and which might be prime candidates for a transition to cMDA. State-level Ministry of Health (MOH) NTD stakeholders participated in three primary methods of data collection, including organizational readiness surveys, key informant interviews, and program mapping exercises. This study triangulates all three data sources to assess readiness for transition to cMDA in India.

State selection tool (212)

A state selection tool was developed in collaboration between the Ministry of Health, Christian Medical College (CMC) Vellore, and the University of Washington School of Public Health (UWSPH), using a multi-criteria decision analysis approach (MCDA).²⁰ The purpose of designing and utilizing this tool was to select three states from diverse Indian regions with a high probability of transmission interruption. The MCDA included the following six categories: state characteristics, STH epidemiologic profiles, helminth-associated morbidity, presence of helminth transmission risk factors, community-wide public health coverage indicators, and human resource capacity to engage in intensified STH programming. After all states and territories were scored, they were then grouped into regional areas (North/East, Northeast, South, West/Central) based on national administrative boundary divisions to ensure geographic diversity in state selection. As a result, the three States selected as exhibiting high probabilities of STH transmission interruption include Goa (West/Central), Odisha (North/East), and Sikkim (Northeast). Goa and Odisha are also endemic for LF, with a mix of districts either actively conducting MDA for LF or already in post-MDA surveillance stage.

Figure 1 - Indian States Selected for STH Elimination Landscape Project



Study population

This study focuses on scalability of cMDA for STH at the state level, due to the high degree of power held by state-level governments in India for health policy decision-making. Study participants include 17 government stakeholders from Goa (n=6), Sikkim (n=5), and Odisha (n=6) who participated in each of the three data collection streams (organizational readiness surveys, key informant interviews, and program

mapping). All participants were purposefully selected as persons responsible for State-level NTD decision-making at the level of Program Officer or higher. The sampling method is exhaustive, being that all relevant stakeholders were invited to participate in the study.

Organizational Readiness Survey

An organizational readiness survey was used to determine readiness to transition to community-wide MDA for STH at a state level. Organizational readiness refers to the extent to which organizational members are behaviorally prepared to implement organizational change.²¹ Measuring organizational readiness is important because when readiness is high, members are more likely to initiate, and provide more persistent support to the proposed change.²² Lower readiness is more common when organizational members view a change as undesirable, resulting in possible resistance to implementing the needed change.²²

The survey consists of 44 questions scored on a 5-point Likert scale, with a response option for “not enough information to answer” (Annex 1). The survey items are structured by health system domains, influenced by the WHO’s health system building blocks.²³ Health system domains include: policy environment, leadership structure, human resources, technical capacity, material resources, financial resources, and community delivery infrastructure. Median and interquartile ranges were calculated for each survey item and domain, by state. Responses of “not enough information to answer” were coded as missing and not included in median estimates.

Qualitative Interviews (WC:257)

Individual key informant interviews were conducted with stakeholders after they completed readiness surveys, to avoid biasing survey responses. Interviews were audio-recorded with written consent of interviewees. Interviews were conducted in English and were approximately 45-50 minutes in length.

A semi-structured interview guide consisting of 12 questions and 5 probes (Annex 2) was informed by the Consolidated Framework for Implementation Research (CFIR). The CFIR is a determinants framework consisting of five domains (intervention characteristics, outer setting, inner setting, characteristics of individuals, and process) that can be used to systematically assess potential barriers and facilitators when preparing to implement an innovation.²⁴ Questions focused on perceived readiness to transition from school-based to cMDA, as well as how cMDA for STH might leverage existing community-wide programs, such as LF.

The transcripts were coded using a mix of *a priori* thematic coding from a CFIR-informed start-list codebook and *in vivo* open coding. All CFIR domains and 24 of the 39 constructs were utilized in the codebook. Additionally, six non-CFIR codes were added by the team during the coding process. Interviews were independently coded by two coders using ATLAS.ti software. Consensus meetings were conducted to finalize coded transcripts, and a third coder was consulted when necessary.

Program mapping

Program mapping is a systems analysis tool that visually depicts the cascade of activities and resources needed to implement a process. The technique prompts users to walk through a process and map main activities, information flows, and interconnections in their entirety.^{25,26} In this study, three stakeholders from each state (n=9) participated in a program mapping exercise to map standard-of-care for STH programs, NDD, and LF MDA programs in each state. The mapping tool solicited information on: (1) key activities

involved in MDA delivery in each state and their timing, (2) material resources and/or infrastructure needed to support activities, (3) personnel involved within each activity, and (4) unique state-level characteristics that facilitate or challenge implementation of that activity (Annex 3). Each state's map was digitized using Miro, a web-based platform, wherein qualitative responses were translated into a visual flowchart (Annex 4). Visualizations were used to identify and understand what changes to standard of care NDD program activities, personnel, and resources may be needed if the state were to transition to a cMDA model. Additionally, analysis includes descriptive statistics of the following: proportion of activities conducted at each level of government, where concentration of activities occurs, and categorization of activities (Annex 5).

Results

Results encapsulate findings from all three data collection streams and are organized by the health system domains. Key findings suggest that policy makers readily support the transition from NDD standard of care to cMDA for STH. There are perceived challenges, most notably with having sufficient human and financial resources for the transition to cMDA, however many of these challenges may be mitigated with the leveraging of existing LF community deliver infrastructure. Lastly, community resistance must be addressed with robust IEC, higher-capacity treatment compliance monitoring, and management of adverse events.

Policy Environment

Across all three Indian states there was strong belief that STH elimination is necessary. Stakeholders supported the implementation of community-wide deworming for STH (median readiness survey score:5, IQR:0-1) and indicated MDA was in line with India's national neglected tropical disease (NTD) policy (median readiness survey score:4.5-5, IQR:0.5-1.5) (Table 1). India's National NTD Implementation Plan was thought to already provide sufficient evidence for implementing community-wide MDA programs, such as lymphatic filariasis (LF). Additionally, stakeholders indicated that the Ministry of Health and Family Welfare (MOHFW) in their respective states can deliver cMDA with high coverage. Despite support for cMDA, there was mixed sentiment regarding whether cMDA could effectively interrupt transmission of STH; individual interviews indicated that most stakeholders do not believe that STH can be fully eliminated from the environment due to high rates of migration, and the belief that deworming must be accompanied by other water, sanitation, and hygiene (WASH) programming to fully address environmental reservoirs. However, even if stakeholders doubted the efficacy of cMDA for STH transmission interruption, they were enthusiastic for cMDA policies due to the effects of mass deworming on morbidity outcomes such as anemia.

There is unified support for the transition to cMDA, however stakeholders explained varying policy processes to institute the transition. In key informant interviews, the majority of Goa stakeholders reported that new STH policy is not necessary, as cMDA is considered a "natural extension" or scale-up of existing NDD programs. Most stakeholders in Sikkim noted that some small changes to existing policy would be needed. Several stakeholders indicated that having a national policy in writing for transitioning to cMDA strengthened legitimacy of the intervention. In key informant interviews and program mapping exercises, state representatives described similar processes for soliciting approval from various key decision-making bodies, including but not limited to the Secretary of Health, Principal Director, Cabinet members, Ministers and Chief Minister. Generally, these processes were similar across states and health programs, however a

stakeholder from Goa explained that policy processes can differ depending on how the intervention is proposed to be funded. Stakeholders explained that evidence can play an important role in policy decision-making. For example, one stakeholder from Sikkim shared that strong, positive research findings from clinical trials can influence more rapid action and increased funding. Similarly, a stakeholder from Odisha explained that sharing results of a promising pilot study can more quickly garner political buy-in.

Leadership Structure

Stakeholders from all states generally reported that there is effective leadership in place for the transition to cMDA for STH. In readiness surveys, stakeholders indicated that MOHFW leadership at the national level are generally receptive to new ideas or pilot projects (median readiness survey score:5, IQR:0-1). Additionally, at the state level, personnel feel generally comfortable presenting new ideas or giving their supervisors feedback on how to improve program implementation (Table 1). In qualitative interviews, respondents also stated that government at both the state and national level are generally supportive and open to starting new programs.

In readiness surveys, stakeholders indicated that the NTD program leadership at both national and state levels were effectively implementing community-wide MDA programs (including but not exclusively LF), with median readiness survey scores between 4.5-5 (IQR:0-1). However, stakeholders from Odisha reported lower readiness for district- level leadership (median readiness survey score:2.5, IQR:1.5). In program mapping, stakeholders identified that the greatest concentration of activities related to both the NDD and LF program were at the state-level (Table 2). Maps also highlighted that a majority of coordination committees are formed at the state level. Key informant interviews further expanded on the importance of effective state-level leadership, particularly in India where power is decentralized and heavily resides with the states. While state-level leadership was emphasized, stakeholders in key informant interviews described the balance between the top-down nature of large-scale MDA programs, and the necessary engagement of Gram Pradhan and panchayats (local leaders). While some described a very hierarchical approach, others indicated that programs must first be approved at the local level. There was a strong emphasis on engaging local elected leaders, religious leaders, and prominent community groups.

“I need to involve the community leaders first. Ok... religious leaders, panchayat members. I need them to give the talks before the health person comes and just go on doing, I need to convince first these people. So, I have to have a sort of an advocacy with these people first, ok. Involve the ministers and higher-ups, ok.” (Participant #2, Goa)

So, when you enter a new village you have to talk to the leaders, the Gram Pradhan (village president), and mukhiya (Village Head). When they are convinced, they will take it... then, you can make a village-level meeting. (Participant #1, Odisha)

Table 2 – Proportion of activities by level for National Deworming Day (NDD) and LF MDA

NDD	Goa		Odisha		Sikkim	
	% of activities	# of activities	% of activities	# of activities	% of activities	# of activities
Level						
National	5.1%	0	9.7%	1	3.9%	2
State	59.0%	23	50.0%	23	47.1%	24
District	0.0%	0	9.5%	4	17.6%	9

Block	23.1%	9	21.4%	9	17.6%	9
Community	12.8%	5	9.5%	4	11.8%	6
Other	Not used	Not used	0.0%	0	2.0%	1

LF MDA	Goa		Odisha	
	% of activities	# of activities	% of activities	# of activities
National	6.5%	3	0.0%	0
State	54.8%	16	43.2%	19
District	0.0%	-	18.2%	8
Block	19.4%	6	20.5%	9
Community	19.4%	6	9.1%	4
Other	Not used	Not used	9.1%	4

Human Resources

India's NDD program is primarily administered by the Ministry of Human Resource Development (formerly Ministry of Education) and relies on teachers to deliver drugs in schools. However, transitioning to cMDA may require close coordination with other or additional ministries/partners. In readiness surveys, the human resource domain was the lowest scoring health system domain for all three states (Figure 2). Overall this composite readiness domain was brought down by lower scoring readiness in key areas such as not having sufficient number of supervisors at the state level (median readiness survey score:0-1, IQR: 0-0.25), and all states needing additional training of NTD personnel to effectively deliver cMDA for STH (median readiness survey score:0-1, IQR: 0-3). Stakeholders from Sikkim and Goa had stronger confidence in their state having the skills needed to implement a new community-wide deworming program, however Odisha stakeholders indicated lower readiness (median readiness survey score:3.5, IQR:1.25). Motivation of NTD personnel to implement cMDA was also addressed in the survey and yielded low median readiness scores in Odisha and Sikkim (median readiness survey scores:2, 2.5 respectively). However, while indicating higher median readiness (median:4), Goa had a larger range of responses (IQR:3). Program maps revealed that both LF and NDD programs have about 30 positions working to support them (note, this does not consider the number of personnel needed) and that these positions have considerable overlap between both programs. In qualitative interviews and program mapping activities, stakeholders discussed coordinating with the Ministry of Health to engage community drug distributors (CDDs), Multi-Purpose Health Workers, Auxiliary Nurse Midwives (ANMs), and Accredited Social Health Activists (ASHAs) for MDA and community sensitization in both school-based STH MDA, as well as LF cMDA. In Odisha, ASHAs are in charge of community sensitization for the LF program. ASHAs, with CDDs, collect drugs from ANMs to distribute drugs house-to-house. Goa stakeholders noted that their state does not have ASHAs and instead LF treatment is administered by pairs of Multi-Purpose Health Workers who conduct supervised house-to-house drug administration. Multi-Purpose Health workers may also facilitate group drug administration within schools or offices. Sikkim does not have an LF program, however the NDD program has similar elements to both Goa and Odisha's programs, in that health workers conduct community sensitization (specifically ANMs).

In interviews, human resource shortages, high workload, and low motivation levels were commonly discussed. Stakeholders indicated that community health workers and CDDs would likely take on the additional tasks to distribute deworming treatments for STH, however, they already manage many programs and are likely overburdened. Stakeholders noted this was of particular concern for workers who are not salaried and are paid only by incentives. STH cMDA was thought to require more work for CDDs not only due to the expanding of target population, but also the added activities surrounding monitoring treatment compliance.

“Government of India has come up with so many programs, my staff is really overloaded. It starts with... in June we have the ‘Intensive Diarrhoea Control Fortnight’ then comes the NDD then there is a Pulse Polio then there is... other programs are there like the non-communicable diseases, it is coming up with other programs. So, round the year there is something or the other. So, there is nothing like a separate staff, it is multi-tasking... that is one more reason why the coverage is not achieved because we miss on things because we have to do many things at a time” (Participant #1, Goa)

Qualitative interviews also revealed that the gender composition of CDD workforces may influence the success of newly launched cMDA for STH. Stakeholders from Odisha explained that NTD work is divided by male staff working in vector-borne diseases (VBD), and females working in Maternal and Child Health (MCH). Stakeholders were unsure if STH should be considered a VBD (handled by male staff) or MCH (handled by female staff), but that there were already shortages for having enough male staff to fill VBD positions. In Goa, stakeholders discussed gender composition of MDA human resources as a safety and security issue. Stakeholders here indicated that if house-to-house administration was needed for STH, then more male staff should be hired to work odd hours when residents were more likely to be home, particularly in urban areas.

“Secondly, if you go to the urban areas, you will find most of the houses closed. You can get them only after 6 (pm) so if you are employing some staff, they will have to work at odd hours and they have to be preferably male because in Goa, no lady works after 6. We don’t allow them, at least our staff... after six... not safe. It’s not safe, especially in flats we don’t expose our ANMs to such dangers. (Participant #2, Goa)

Technical capacity

States varied in their perceived degree of technical capacity for delivering cMDA for STH. In readiness surveys, the majority of each state’s stakeholder reported having an effective drug distributor training program. Differences arose however when asked if state NTD personnel had demonstrated ability to deliver cMDA programs with high coverage. Stakeholders in Goa and Sikkim stakeholders more often indicated their states had this ability (median readiness survey score:5, IQR:0, 0.25 respectively) while Odisha stakeholders reported less readiness (median readiness survey score:2, IQR:1.5).

In both readiness surveys and qualitative interviews, stakeholders stressed that CDDs will need training and technical capacity building to conduct monitoring and reporting of cMDA treatment compliance. Currently, stakeholders in all states are concerned about treatment data being incorrectly recorded during implementation of community-wide MDA programs (median readiness survey scores:2.5-3, IQR:1-1.25). Within the NDD platform, teachers have greater authority and students typically take the deworming tablet under direct observation, making documentation of treatment a simpler data collection activity. While transitioning to cMDA presents concerns for ensuring that all individuals, especially children, are treated, it also presents challenges for accurate coverage monitoring. Program mapping activities revealed that both LF and NDD programs utilize state-level supervision during treatment distribution. State M&E personnel make monitoring visits to verify coverage. Stakeholders in Odisha mentioned these M&E personnel additionally assess knowledge of ASHAs and CDDs. Something that differs between the LF and NDD

program is the number of mop-up days. Typically, stakeholders described mop-up for NDD lasting just one day, while LF mop-up was described as 2-3 days.

Material resources (422)

Readiness surveys and qualitative interviews indicate that more materials are expected to be needed for STH cMDA, as compared to school-based NDD. A list of materials required for NDD and LF was compiled during program mapping. Common materials include resources needed for effective supply chains, IEC materials, training materials, and informational databases/reporting systems. In readiness surveys, stakeholders from all states reported that they have the key resources necessary to effectively implement cMDA for STH, with the exception of resources needed for effective implementation of supply chains.

“There are challenges because we have to depend upon the Government of India for drug supply.. Suppose, we say a date that December 1st we will conduct. The Government of India might not provide the adequate drugs, then we have to shift that. So, these are the problems and the challenges is the procurement... so, at least six months before there should the procurement process should start and at least two months before, the drugs should be in the state or district or somewhere else (Participant #2, Odisha).”

In both individual interviews and readiness surveys, stakeholders from Odisha and Sikkim indicated that they have observed delays in the arrival of drugs from MDA programs due to supply chain issues (median readiness survey score:3, IQR:0-1). While Goa stakeholders reported a higher median readiness survey score (4), IQR was also greater (2). In qualitative interviews, stakeholders discussed that delays can be due to traveling difficult terrain, particularly in Sikkim. Stakeholders also discussed the difficulty of estimating the proper amount of drugs to procure without reliable data for how many residents live in their state and migration patterns. Inaccurate demand estimations and added strain on the supply chain resulted in greater concern for the likelihood of stockouts of albendazole following a transition to cMDA. Additionally, stakeholders in all states were concerned about where additional drugs could be stored since cMDA requires a much larger drug supply.

“Of course, getting the logistics will be a challenge. Getting those tablets on time and storing them; distribution on the time... Sufficient space will not be there. So much of stock will arrive for the whole community.” (Participant #3, Goa)

Another key material resource discussed was sensitization and education materials, of which Odisha stakeholders indicated low readiness for having the tools in place to develop high-quality IEC for STH cMDA (median readiness survey score:2, IQR:2.25). However, it is worth noting that while Goa and Sikkim stakeholders reported higher median readiness survey scores (4.5, 4) they also both had considerable IQR (1.75, 2).

Financial Resources

Stakeholders from all states indicated that cMDA would be more expensive than NDD. In qualitative interviews, stakeholders discussed the cost of hiring more CDDs, purchasing more drugs, using more vehicles and fuel to reach all communities, and costs associated with developing and distributing IEC materials beyond school settings.

“Cost-wise... as it is... I think procurements will go up at least four times (laughing). There would be lot cost involvement. I would not be able to say specifically this much but then – having workshops, trainings, transportations... transport here and there; supervision will become more expensive... monitoring itself. So, there will be a substantial I think cost involved, apart from procuring the medicines.” (Participant #4, Sikkim)

“Ah naturally it will be cost for this community mobilization and all lot more... lot more cost is there. When your target increases... expands, the cost must expand. We do lot of IEC works, BCC, social mobilization so cost is required, you have to give them their honorarium and other things..” (Participant #1, Odisha)

Following closely after human resources, financial resources was the second lowest scoring readiness domain, particularly for Odisha and Sikkim (Figure 2). Odisha and Sikkim report low readiness for having sufficient future funding for cMDA programs (median readiness survey score:1.5, 2). Goa stakeholders report a higher median readiness survey score (3.5), however IQR is high (3.25). Additionally, Odisha stakeholders report concerns that CDDs may not have sufficient financial and/or non-financial incentives to engage in cMDA (median readiness survey score:1, IQR:0). While Goa and Sikkim stakeholders reported higher readiness to provide CDDs with incentives (median readiness survey scores:4, 3.5), but with greater IQRs (2.5,1.5). In qualitative interviews, almost every stakeholder discussed the urgent need to pay and/or incentivize CDDs, including suggestions for increased funding for cMDA from the national level.

“They are over-burdened. They will do it but... we will have to motivate them. That’s why I say funding ... some incentive has to be there for them otherwise program will not function. I mean, we won’t be able to achieve the results.” (Participant #4, Goa)

All state’s stakeholders report similar low-to-medium readiness for having enough funding from the national level to support implementation of community-based programs (median readiness survey score:3-3.5, IQR:1-1.75). Sikkim and Odisha particularly report low funding availability at the district level (median readiness survey score:2, IQR:1). Lastly, all states indicate similar low-to-medium readiness in ability to move funds within the state level for community-based programming (median readiness survey score:2-3.5, IQR:1-2.25).

Community Delivery Infrastructure

In readiness surveys, stakeholders were asked if they knew at least one community health program that could be used to deliver community-wide deworming for STH. Sikkim and Goa stakeholders responded more confidently with median readiness scores of 5 (IQR:0.25 and 0 respectively), while Odisha stakeholders were less confident with a median readiness survey score of 3 (IQR:3). When asked to list the health program stakeholders believed STH cMDA could be mapped onto, LF was mentioned by one participant each in Goa and Odisha. While post-MDA surveillance still constitutes an active program, some Goa stakeholders referred to the LF program as “discontinued” in qualitative interviews. Additionally, given that LF is endemic in smaller sub-units of districts and MDA is not required uniformly across a state, some stakeholders indicated that STH cMDA would be difficult to map onto LF MDA given the heterogenous landscape. Other commonly listed community health programs for STH cMDA to be integrated into were Pulse Polio and other immunization sessions, Intensified Diarrhoea Control Fortnight (IDCF), Village Health Nutrition Days, and MCH programs. While a majority of stakeholders discussed integration with existing community-wide programs, some stakeholders from Odisha and Goa indicated that STH cMDA should be standalone and not build off an existing program.

Another consideration for community delivery infrastructure is how drugs should be administered. While some indicated MDA could be executed by fixed point treatment (out of schools, health centers, or community meeting spaces), an overwhelming majority expressed that household distribution was more likely to be effective. Others distinguished that even if household distribution were taking place, they would prefer to still have distribution in schools, and make deworming tablets available at health centers and other locations.

“Best method is house-to-house. Booth approach was appropriate for Polio. It was a very long program and people already know the benefit. We tried booth approach one to two times for our LF, we totally failed, no one came.” (Participant #1, Odisha)

Another key issue revealed in readiness surveys and qualitative interviews was the potential for community mistrust and resistance to a new community-wide program, such as STH cMDA. In readiness surveys, stakeholders across states indicated that readiness to launch cMDA might be compromised by community member resistance to mass deworming (median readiness survey score: 3.0-3.5, IQR:1.0-1.25). This topic was further discussed in qualitative interviews, in which stakeholders explained that communities can be very skeptical of government interventions, thinking they are substandard. Stakeholders provided recommendations to address community member concerns about drug quality and deliver delivery prior to launching cMDA for STH, including requiring drug distributors to wear gloves for improved sanitation and using brand name drugs with consistent packaging. Additionally, stakeholders reported that misinformation and misconceptions can be harbored in the community, with some of the most commonly discussed misconceptions being the need to take albendazole on a full stomach, that STH infections originate from eating sweets and meat, that deworming treatment is only needed when worms are visible in the stool, and that albendazole is contraindicated when taking other drugs. Policymakers also described community member concern about side effects and the need for sufficient adverse event response management.

“There are also rumors... person suffering from diabetes, hypertension, they will not take drugs. So, there is a major miscommunication. Now fifty percent people are suffering from diabetes, blood pressure... They can also take albendazole and DEC but people are giving such... that they will not take. So, some misconceptions are also there (Participant #2, Odisha)

While misinformation was a key issue in all states, the types of misconception can vary by state. For example, stakeholders from Goa discussed their state’s high literacy, leading to individuals seeking out deworming information on the internet, with varying levels of accuracy. Additionally, Goa residents may be independently taking deworming medications and resistant to participating in government-sponsored cMDA. In qualitative interviews, stakeholders from all states shared ideas on a wide array of IEC activities to combat misinformation (Annex 7).

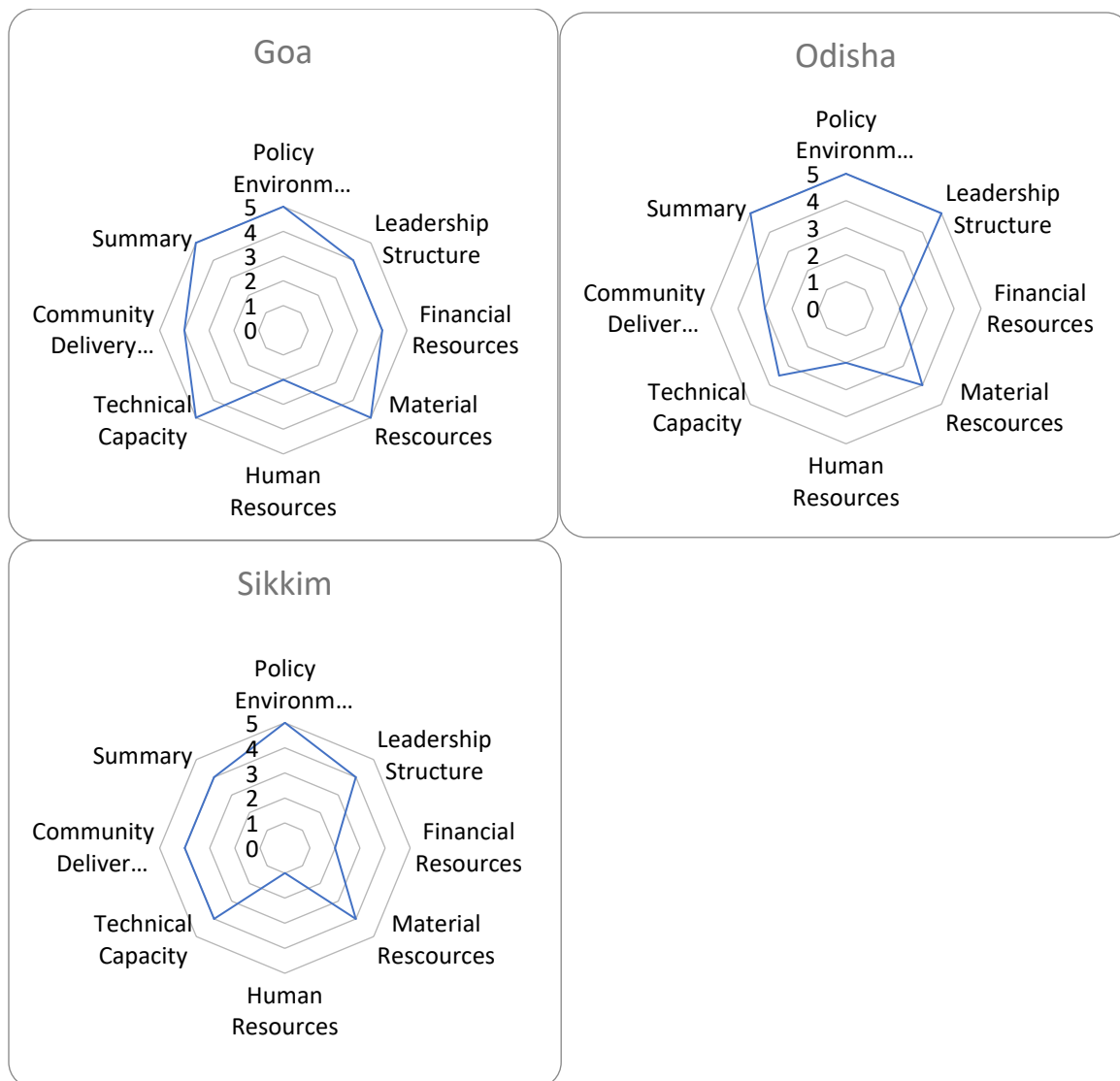
Table 1 – Median and interquartile range for responses to organizational readiness survey

Question	Goa (n=6)		Odisha (n=6)		Sikkim (n=5)	
	Median	IQR	Median	IQR	Median	IQR
In my experience, India's national neglected tropical disease (NTD) policy supports implementation of community-wide mass drug administration (MDA).	5	1.5	5	1	4.5	0.5
In my experience, the National NTD Implementation Plan is currently being implemented in my state as intended.	5	0.75	5	0	3.5	1.5
I have observed that India's National NTD Implementation Plan provides sufficient guidance for implementing community-wide MDA programmes, such as lymphatic filariasis (LF).	5	0	4	1	4.5	1
I have observed that there is a collaborative network of external stakeholders (e.g. NGOs or technical/ financial partners) that would support community-wide deworming for STH in my state.	4	2	5	1	5	0
I believe that my state needs to eliminate the transmission of STH.	5	0	5	0.5	5	0
I have observed that my co-workers generally believe that my state needs to eliminate the transmission of STH.	5	0.75	3	2	5	0.25

I believe that community-wide deworming can eliminate the transmission of STH in my state.	4	0.75	4	0.5	5	1
I have observed that my co-workers generally believe that community-wide deworming can eliminate STH transmission in my state.	4	1	3	2	5	0.5
I am supportive of implementing community-wide deworming for STH in my state.	5	0	5	0.25	5	1
In my opinion, my co-workers will be supportive of implementing community-wide deworming for STH.	5	1	5	2	5	1
Community-wide deworming for STH is not necessary for my state	5	0.75	5	0	5	0
Community-wide deworming will not be able to stop transmission of worms in my state.	4.5	1.75	4	1	4	3
I believe that MOHFW personnel within my state are capable of delivering community-wide deworming with high coverage.	5	0	5	0	5	0
I believe that my state can adapt the existing school deworming programme (NDD) for community-wide deworming without too much difficulty.	4.5	1.5	5	0	5	0.25
<i>Composite policy environment score</i>	5	1	5	1	5	1
Leadership Structure	Goa		Odisha		Sikkim	
In my experience, the NTD programme leadership at the National level is effectively implementing community-wide MDA programmes in India.	4.5	1	5	0	4.5	1
In my experience, the NTD programme leadership at the State level is effectively implementing community-wide MDA programmes.	5	0.75	5	0	4.5	1
In my experience, the NTD programme leadership at the District level is effectively implementing community-wide deworming programmes in India.	5	1	2.5	1.25	4.5	1.5
In my experience, MOHFW leadership at the National level are generally receptive to new ideas or pilot projects.	5	1	5	0	5	0
How often do your supervisors generally feel comfortable receiving feedback and recommendations from you or your colleagues on how to improve program implementation?	4	0.75	4	2	4	1
How often do you present new ideas to your supervisor?	5	0.75	4	1	4	1
It is challenging to present new ideas to my supervisor.	3	0.75	3	0	3	0.25
How often do your subordinates generally feel comfortable providing feedback and recommendations to you or your colleagues on how to improve program implementation?	4	0.75	4	0	4	0
Ministry of Education personnel that I work with on school or child interventions will likely support community-wide deworming for STH.	5	0	5	2	5	0
The current implementation context within my state would negatively affect the ability of the state NTD programme to deliver community-wide deworming for STH	5	1	5	0	4	0.25
<i>Composite leadership structure score</i>	4	1	5	2	4	1
Human Resources	Goa		Odisha		Sikkim	
My state will need additional training of NTD personnel to effectively deliver community-wide deworming for STH.	1	0	1	0.25	1	0
Additional supervisors are needed within the State to coordinate the delivery of community-wide deworming for STH.	1	0	1	3	1	0
There is low motivation amongst state NTD personnel to implement community-wide deworming for STH.	4	3	2	1	2.5	1.5

I believe that NTD personnel in my state have the skills needed to implement a new community-wide deworming programme.	4.5	1	3.5	1.25	5	1
<i>Composite human resources score</i>	2	3	2	3	1	2.5
Technical Capacity	Goa		Odisha		Sikkim	
In my experience, there is an effective programme in my state for training drug distributors on how to deliver community-wide deworming.	5	0.75	5	0.5	5	1
In my experience, NTD personnel within the State have demonstrated that they can deliver other community-wide MDA programmes (e.g. lymphatic filariasis, LF) with high coverage.	5	0	2	1.5	5	0.25
How often are treatment data incorrectly recorded during implementation of community-wide MDA programmes?	3	1	3	1	2.5	1.25
<i>Composite technical capacity score</i>	5	2	3.5	2.75	4	2
Material Resources	Goa		Odisha		Sikkim	
My state has the key resources necessary to effectively implement community-wide deworming for STH.	5	0	4	0.5	5	0
I have observed that deworming medicines are distributed from the State-level to local levels without too much difficulty.	5	0	5	1	5	0
How often have you observed delays in the arrival of drugs for MDA programmes due to supply chain problems?	4	2	3	1	3	0
My state currently has the resources and tools needed to develop high-quality sensitization and education materials for community-wide deworming for STH.	4.5	1.75	2	2.25	4	2
<i>Composite material resources score</i>	5	1	4	1	4	2
Financial Resources	Goa		Odisha		Sikkim	
How often have you encountered difficulty in moving funds within the State level for a community-based programme?	3	2.25	3.5	1.25	2	1
How often have you observed difficulties with having enough funding from the National level to support implementation of community-based programmes in your state?	3.5	1.75	3.5	1	3	1
How often do you encounter difficulties with having enough funding at the district level to implement community-based programmes?	4	1	2	0	2	1
In my experience, drug distributors are given sufficient financial and/or non-financial incentives for administering community-wide MDA.	4	2.5	1	0	3.5	1.5
I am not worried about whether my state has sufficient future funding for community-wide MDA programmes.	3.5	3.25	1.5	0.5	2	0
<i>Composite financial resources score</i>	4	2	2	1.75	2	1
Community Delivery Infrastructure	Goa		Odisha		Sikkim	
I know of at least one community health programme that could be used to deliver community-wide deworming for STH.	5	0	3	3	5	0.25
In my experience, local drug distributors have the skills to effectively implement community-wide deworming for STH.	2	3	4	1	5	1
How often are community members in your state resistant to community-wide MDA programmes?	3	1	3	1	3.5	1.25
<i>Composite community delivery infrastructure score</i>	4	2.25	3	2	4	1

Figure 2 – Composite health system domain readiness by state



Discussion

STH morbidity control policies have not changed significantly since the initial WHO guidelines were established in 2002.¹⁰ However, growing evidence demonstrates that transmission interruption may be achieved if MDA is expanded community-wide to target all age groups, not just children.^{13,17-19} The transition from a national morbidity control strategy to one of transmission interruption may require systems redesign, including updating country-level NTD Master plans, government budgets, partnership agreements, supply chains, and human resource plans.¹⁵ While ongoing cluster randomized trials continue to assess the feasibility of STH transmission interruption, it is important for implementation research to simultaneously be conducted, in order to speed the translation of research findings into practice.

With LF programs transitioning to post-MDA surveillance status in many areas, there is opportunity to leverage existing infrastructure from LF in a strategic “de-implementation” approach to deliver cMDA for STH. Strategic de-implementation requires adapting existing LF infrastructure to support STH cMDA so as to limit redundancies across NTD programs and facilitate the scale-up of cMDA for STH. An organization’s readiness and capacity for de-implementation is influenced by culture and climate, leadership, resources and structure.²⁸ Our study assessed many of these factors to determine organizational

readiness to transition from NDD standard of care to cMDA for STH, including specific opportunities to leverage existing LF infrastructure for cMDA delivery within STH transmission interruption programs.

We used a mixed methods approach including readiness assessments, individual interviews, and process mapping to identify opportunities and challenges to updating STH policy in India. Findings are organized by WHO health system building blocks.¹⁰ Within the policy environment domain, our study found that political leaders support transitioning to cMDA for STH, however many do not believe that cMDA will result in STH elimination. A commitment to cMDA for STH is driven primarily by prioritization of community anemia reduction (an associated morbidity of STH). We recommend further aligning STH goals and operational guidelines with co-morbidities (such as anemia and sanitation related diseases) to strengthen existing synergies and maintain high political priority. Stakeholder's uncertainty about the feasibility of transmission interruption in India may also be driven by the perceived dearth of evidence supporting cMDA for STH. We recommend proactive dissemination of evidence from ongoing cMDA trials in India and elsewhere when available.¹³ Although policymakers differ in their perceived need for policy to support a transition to cMDA, most indicated that adapting policy would not be a barrier to implementation since it could be framed as scale-up of an existing program.

We found that most stakeholders, with the exception of some in Odisha, consider the leadership and management of current NTD programs to be effective, indicating strong likelihood of STH cMDA to also be implemented under strong leadership if a transition were to occur. Many stakeholders stressed the importance of getting approval first from Panchayats (local leaders) and religious leaders prior to cMDA. Existing literature demonstrates that decentralization, and the design of shared ownership is complex. Indian researchers argue that mechanisms need to be built to cut across levels of leadership to ensure that local leaders are not only consulted for approval of interventions, but are further engaged in their planning as a whole.²⁹⁻³⁰ In program mapping, we found that all states form "coordination committees" within both LF and NDD programs however it is unclear if local leaders are being engaged in these committees. We recommend designing committees and other mechanisms that cross-cut leadership levels to foster accountability and shared ownership.

Most barriers to scaling-up cMDA were linked to the human resources domain. Policymakers noted challenges such as workforce shortages, heavy workloads, and low motivation. CDDs engaged in India's LF program are non-salaried volunteers, receiving monetary or non-monetary incentives (e.g. community recognition).³¹ In a qualitative study with CDDs in Odisha's LF MDA program, CDDs reported a lack of time to reach and follow-up with households, and the predominant reason a household did not receive deworming medication was due to the distributor not visiting the house.³² Evidence from LF MDA programs in Mali, Nigeria, and Sierra Leone also indicate that treatment coverage is compromised when there is low motivation and an insufficient number of drug distributors.³³ The same study found that LF MDA coverage increased after paying drug distributors in urban settings.³³ Decisions regarding whether and how to incentivize CDDs is further complicated by criticisms of vertical incentive structures. Differentials between incentives of different disease programs, may lead to low morale in the lower-incentivized position, or shift in human resource to better-incentivized programs.³³ Other literature demonstrates that CDDs motivation may have less to do with financial incentives, and instead be more greatly influenced by cultural, health system, financial, and community-related barriers.³⁴ These researchers promote the integration of NTD programs into existing health systems and fostering of community engagement related to the MDA program to provide a supportive working environment for NTD volunteers.³⁴⁻³⁶ Based upon evidence from this study, we recommend actively seeking out opportunities to boost CDD morale, particularly by fostering a supportive environment for CDDs within the communities where they distribute household treatment. We recommend utilizing the existing LF workforce to distribute STH drugs, as to not add to workforce shortages by creating new STH positions. However, proper attention must be paid to the increasing workloads of CDDs. While efficiencies are maximized under this integrated approach, more must be done to eliminate redundancies on the part of CDDs who may become responsible

for delivering multiple drug combinations, maintaining different data collection forms and reporting out at different time intervals.³⁴

Evidence within the technical capacity domain highlighted that incorrect recording of treatment data can be common and that training of CDDs on data collection is needed. Policymakers highlighted that training CDDs about monitoring MDA coverage and treatment compliance is particularly important when transitioning to cMDA, since the target population is no longer solely children treated under direct observation of a teacher. While data collection and analysis is a vital part of elimination and control campaigns, technical capacity in this area remains a challenge in India.^{36 37} A study in Odisha found that LF treatment was distributed to 99% of the target population, however follow-up surveys indicated that less than a third had actually consumed the drug.³² Equipping CDDs with the technical capacity to collect monitoring data has promising utility for both LF and STH as STH programs seek to build strong transmission interruption platforms and LF programs require ongoing inexpensive surveillance platforms. Building technical capacity for monitoring coverage and treatment compliance has the potential to mutually benefit both programs.

Within the material resources domain, stakeholders indicated that the most prevailing resource challenge for transitioning to cMDA for STH would be driven by supply chain challenges, including drug storage, stock outs, and transport of drugs to remote areas that may require traveling difficult terrain. While not unique to India, a technical report by JSI acknowledges that temporary supply chain solutions (be it for storage, transport, etc.) ultimately threaten the NTD management and progress toward elimination goals.³⁸ At times LF programs in various settings have utilized the private sector for storage or distribution support. However, this is likely to incur greater cost and builds reliance outside of the existing health system.³⁷ These issues must be thoughtfully considered and proactively mitigated. Additionally, stakeholders reported mixed levels of readiness for having high-quality sensitization and education material resources for cMDA. This is a key issue considering the vital role of IEC and information sharing. In fact, literature demonstrates that providing information about the disease, and the schedule of distribution activities generates demand and can increase probability of individual participation up to five-fold.³⁹ IEC should be contextually relevant and address community specific information gaps. When possible, co-developing IEC content with communities can ensure the information disseminated is appropriate, consistent and culturally sensitive.³³ For a Nigerian study, this meant first conducting knowledge, attitude and practices surveys to inform IEC materials for the LF program.⁴⁰ IEC activities should be repeated with each round of distribution³⁹, and more innovative approaches can result in greater reach of IEC messaging.³³

The financial resources domain highlighted that stakeholders consider cMDA to be more expensive than school-based, and that states differ on funding availability with Goa presenting as the most financially secure. Leveraging LF platforms for STH cMDA may more efficiently utilize financial resources. Increasingly, NTD programs are integrating service distribution to streamline delivery of a variety of services and reduce costs.³⁹ A systematic review found that integrating NTD programs (such as onchocerciasis, schistosomiasis and trachoma) with LF cMDA created a platform where coordination and distribution of resources were streamlined, as well as harmonized the incentives provided to community drug distributors across programs. Additionally, costing studies demonstrate that rapid scale-up with expanded coverage for LF MDA programs are projected to have the greatest financial and economic savings compared to more gradual scale-ups with smaller targets.⁴¹

Lastly, within the community delivery infrastructure domain, stakeholders were asked to identify promising platforms that could be leveraged for cMDA for STH. Very few stakeholders mentioned LF programs, which may be due to the fact that LF platforms have largely already transitioned to post-MDA surveillance status, leading policymakers to think of the program as inactive. Some stakeholders advocated for STH cMDA to be a standalone program independent of other community-wide programs, as to have greater control on service delivery schedule and perhaps have greater community awareness as a unique program.

However, this contradicts evidenced-based practice that integration of NTD programs leads to overall higher coverage³⁹

Other key considerations raised by stakeholders for the launching of cMDA included the importance of delivery strategies (door-to-door versus fixed point) and community sensitization. A study in Odisha found that low compliance to deworming medications was driven by fear of side effects, concern for adverse event management, and beliefs that they were not at risk for the disease.³² Addressing misconceptions as well as providing robust adverse response management is important considering news about both “real and rumored [events] can spread rapidly.”³⁵ Medical and media response plans should be established in advance to reduce the potential for increased mistrust.³⁵ When MDA programs are designed to address community resistance and promote treatment compliance, treatment coverage can improve greatly.^{34 42}

Finally, CDDs can play a major role in community participation, but only when properly equipped. Literature demonstrates that adequate training of CDDs for LF campaigns facilitated implementation, while ineffective training garnered more community mistrust of CDDs.⁴³ A study in Kenya showed that drug distributor training and workshop attendance not only prepared drug distributors with necessary knowledge, but also motivated them to confidently respond to community members questions about LF treatment.⁴³ Studies have also found that having a locally-based selection process of drug distributors, and CDDs societal standing, as well as level of education influenced community participation in MDA for LF.³³

Conclusion

Stakeholders from all three Indian states demonstrate that there is moderate to high readiness to transition to cMDA for STH, depending on Health System Domain. The transition of LF programs into a post-MDA surveillance phase offers an opportunity to leverage existing infrastructure to mutually benefit LF and STH programs. While integration has many benefits, it is important to recognize that there can be heterogeneities depending on setting that influence the impact of integration. Integration cannot simply be considered “co-delivery” and should instead be designed just as thoughtfully as a novel program being introduced.³⁹ In embracing a de-implementation approach, LF infrastructure can be leveraged to optimize synergies between two NTD programs. More research is needed to better understand heterogeneities that exist within the LF implementation climate, and how that might impact the ability of STH cMDA to be mapped on these existing platforms. This research has implications for policy development surrounding India’s potential transition from school-based to community-wide MDA. Considering the level of readiness, and the need to test how heterogeneities within the LF setting may impact mapping on STH programs, a pilot demonstration project approach offers promising next steps. Instead of focusing on additional trials, we advocate for the testing of cMDA outside of a randomized study to understand if and how cMDA for STH works in practice. Given observed synergies between STH and LF platforms, we suggest that the pilot project be specifically targeted in areas where LF programs are expected to soon transition to post-MDA surveillance status.

Acronyms

Disability Adjusted Life Years (DALYs)
Drug Administrator (DA)
Information, Education & Communication (IEC)
Implementation Science (IS)
Lymphatic filariasis (LF).
Low- and middle-income countries (LMICs)
Mass drug administration (MDA)
Maternal and Child Health (MCH)
Multi-criteria decision analysis approach (MCDA)
Neglected tropical diseases (NTD)
Non-governmental organization (NGO)

Pre-school (PSAC)
Preventative Chemotherapy (PC)
School-age children (SAC)
Soil-transmitted helminths (STH)
Vector-borne disease (VBD)
World Health Organization (WHO)

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Annex

Annex 1 – State Organizational Readiness Survey

Instructions: Please complete each question (do not skip any question). **All responses will be anonymous and confidential.**

- I consent to participate in this survey.

Survey Item	Survey Response					
1. In my experience, India's national neglected tropical disease (NTD) policy supports implementation of community-wide mass drug administration (MDA).	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
2. In my experience, the NTD programme leadership at the National level is effectively implementing community-wide MDA programmes in India.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
3. In my experience, the National NTD Implementation Plan is currently being implemented in my state as intended.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
4. In my experience, the NTD programme leadership at the State level is effectively implementing community-wide MDA programmes.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
5. In my experience, the NTD programme leadership at the District level is effectively implementing community-wide deworming programmes in India.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
6. I have observed that India's National NTD Implementation Plan provides sufficient guidance for implementing community-wide MDA programmes, such as lymphatic filariasis (LF).	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
7. I have observed that there is a collaborative network of external stakeholders (e.g. NGOs or technical/ financial partners) that would support community-wide deworming for STH in my state.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
8. I believe that my state needs to eliminate the transmission of STH.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
9. I have observed that my co-workers generally believe that my state needs to eliminate the transmission of STH.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
10. My state has the key resources necessary to effectively implement community-wide deworming for STH.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
11. I believe that community-wide deworming can eliminate the transmission of STH in my state.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
Please explain your answer for the above question (#10)						
12. I have observed that my co-workers generally believe that community-wide deworming can eliminate STH transmission in my state.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
13. I am supportive of implementing community-wide deworming for STH in my state.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
14. In my opinion, my co-workers will be supportive of implementing community-wide deworming for STH.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
15. In my experience, MOHFW leadership at the National level are generally receptive to new ideas or pilot projects.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
16. How often do your supervisors generally feel comfortable receiving feedback and recommendations from you or your colleagues on how to improve program implementation?	<input type="checkbox"/> Never	<input type="checkbox"/> Rarely	<input type="checkbox"/> Occasionally	<input type="checkbox"/> Often	<input type="checkbox"/> Always	<input type="checkbox"/> Not enough information to answer

Survey Item	Survey Response					
to effectively deliver community-wide deworming for STH.	Disagree	Somewhat disagree	Unsure	Somewhat agree	Agree	Not enough information to answer
35. Additional supervisors are needed within the State to coordinate the delivery of community-wide deworming for STH.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
36. There is low motivation amongst state NTD personnel to implement community-wide deworming for STH.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
37. I believe that NTD personnel in my state have the skills needed to implement a new community-wide deworming programme.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
38. In my experience, there is an effective programme in my state for training drug distributors on how to deliver community-wide deworming.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
39. In my experience, NTD personnel within the State have demonstrated that they can deliver other community-wide MDA programmes (e.g. lymphatic filariasis, LF) with high coverage.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
40. How often are treatment data incorrectly recorded during implementation of community-wide MDA programmes?	<input type="checkbox"/> Never	<input type="checkbox"/> Rarely	<input type="checkbox"/> Occasionally	<input type="checkbox"/> Often	<input type="checkbox"/> Always	<input type="checkbox"/> Not enough information to answer
41. I know of at least one community health programme that could be used to deliver community-wide deworming for STH.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
If yes, please list the community health programmes that can be used to implement community wide deworming for STH. 1. 2. 3. 4. 5.						
42. In my experience, local drug distributors have the skills to effectively implement community-wide deworming for STH.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer
43. How often are community members in your state resistant to community-wide MDA programmes?	<input type="checkbox"/> Never	<input type="checkbox"/> Rarely	<input type="checkbox"/> Occasionally	<input type="checkbox"/> Often	<input type="checkbox"/> Always	<input type="checkbox"/> Not enough information to answer
44. If the National government changes the policy to implement community-wide deworming for STH, I believe that my state is ready to implement it for the first time.	<input type="checkbox"/> Disagree	<input type="checkbox"/> Somewhat disagree	<input type="checkbox"/> Unsure	<input type="checkbox"/> Somewhat agree	<input type="checkbox"/> Agree	<input type="checkbox"/> Not enough information to answer

Annex 2 – State Qualitative Research In-Depth Interview Guide

Facilitator Instructions:

Please familiarize yourself with the questions below prior to consenting the interview participant. Review **SOP 100** for information on how to consent participants and **SOP 101** on how to facilitate the interviews, manage the audio recorder, and other key details.

Once you have consented the participant and turned on the audio recorder, please welcome the individual, thank them for their participation, and make them feel comfortable.

Please use the question guide below and ensure that all questions are answered, however the order of questions can be varied to ensure the interview conversation is more natural. If answers are brief or not sufficient to answer the question asked, some follow-up question prompts are provided in italics.

Please take notes as appropriate if there are important details that you want to follow-up on.

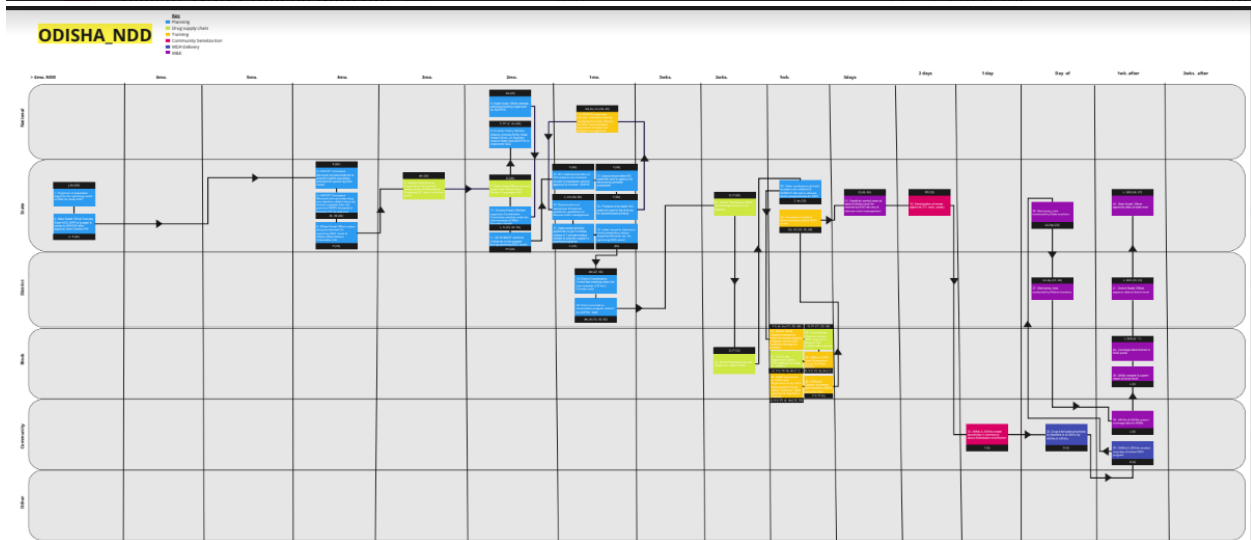
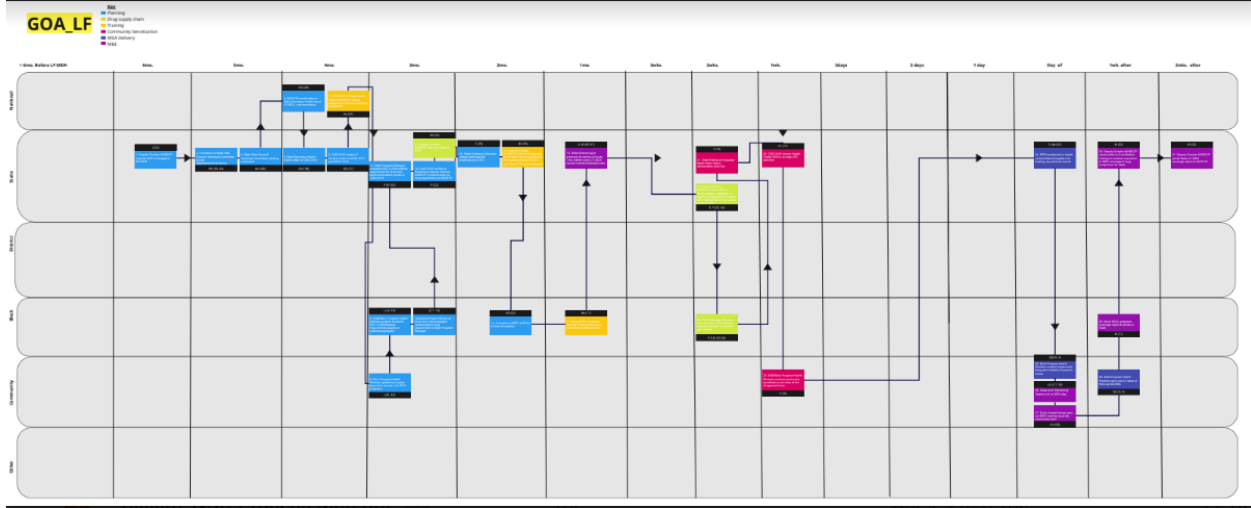
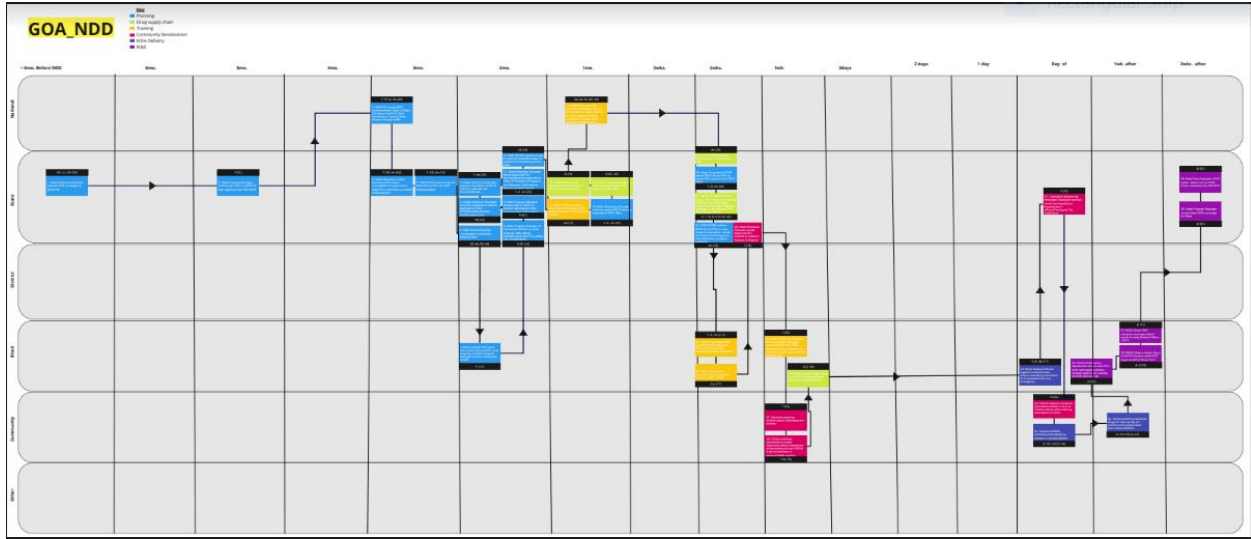
#	Question
1	<input type="checkbox"/> What advantages does community-wide deworming for soil-transmitted helminths (STH) have compared to school-age deworming programs? What disadvantages?
	<input type="checkbox"/> What kind of information or evidence is available that shows whether or not community-wide deworming for interrupting transmission of STH will work in your state?
	<input type="checkbox"/> Is this evidence strong or weak?
2	<i>Follow-up questions:</i> <i>What evidence are available from your state?</i>
	<input type="checkbox"/> If you were to implement a community deworming programme in your state, what adaptations to the existing NDD programme would be needed to achieve high coverage of community members of all ages? Do you think you will be able to make these adaptations? Why or why not?
	<input type="checkbox"/> What aspects of the NDD programme should not be adapted?
3	<i>Follow-up question:</i> <i>Are there any current challenges related to the drug supply chain for NDD in your state that would need to be addressed before adaptation of NDD?</i>
	<input type="checkbox"/> How challenging would it be to deliver community-wide deworming for STH in your State? Why?
	<input type="checkbox"/> What challenges might community members face in participating in community-wide deworming for STH?
4	<i>Follow-up question:</i> <i>What could be done to overcome these barriers?</i>
	<input type="checkbox"/> What are some key strategies to achieve high treatment coverage for community-wide deworming?
5	<input type="checkbox"/> How important do you think it is to verify coverage in an STH elimination campaign?
	<input type="checkbox"/> How would a process for verifying coverage be incorporated into a routine community-wide deworming programme?
	<input type="checkbox"/> What are the linkages between LF staff and NDD staff at different levels of the health system? How effective are these linkages?
6	
	<input type="checkbox"/> What LF programme activities could be leveraged for community-wide deworming for STH?
7	<input type="checkbox"/> Are there any other routine community-based programmes that can be leveraged to deliver community-wide deworming for STH?
	<input type="checkbox"/> How might integration of community-wide deworming affect these other existing programs?
	<input type="checkbox"/> How important do you think it is to implement community-wide deworming for STH compared to the other health priorities in your State?
8	<i>Follow-up question if there is time:</i> <i>Specifically, how important do you think it is to implement community-wide deworming compared to open defecation project by Swachh Bharat?</i>

#	Question
9	<input type="checkbox"/> What are other ministries or departments outside of Ministry of Health and Family Welfare that you think may need to coordinate in order to effectively implement a community-wide deworming programme for STH? <input type="checkbox"/> What role will they play? <input type="checkbox"/> What kind of support will the State need from National government to effectively implement a community-wide deworming programme for STH?
	<p><i>Follow-up question</i></p> <p><i>How supportive do you think government leadership, within any Ministry, will be if community-wide deworming for STH is implemented in your State?</i></p>
10	<input type="checkbox"/> If you want to implement community-wide deworming for STH in your State, what changes in formal policies or guidelines will need to take place? <input type="checkbox"/> Can you describe the process that will be needed to make these changes?
11	<input type="checkbox"/> From your perspective, what are the unique costs of implementing community-wide deworming programme for STH as compared to a school deworming programme?
12	<input type="checkbox"/> Do you think that community-wide deworming could interrupt the transmission of STH (i.e. stop the spread of intestinal worms) in your State? Why or why not?

Annex 3 – Example of program mapping data collection sheet

Process mapping – Sikkim: School National Deworming Day						
Unique characteristics of Sikkim:						
<ol style="list-style-type: none"> Sikkim is a hilly area and the road conditions worsen during rainy season which makes it difficult to reach schools for any activities There is high absenteeism in schools and Anganwadi centers during rainy season School NDD program is held in March instead of February because schools are closed for winter vacation in February. This reduces the gap between the two rounds of school NDD programs to five months Initially parents were concerned about deworming at a gap of five months instead of 6 months. They were sensitized as per global evidence that it is safe to take albendazole tablet at a minimum gap of three months People believe that meat and sweets should not be consumed after taking albendazole tablet so it can be difficult to convince people to take albendazole tablet Sikkim is a tourist spot so in urban areas a lot of migration takes place but in the rural areas there is no or less migration 						
S.No	Activity	Category	Timing	Resources needed	Level of action	Personnel responsible
1.	District Reproductive Child Health Officer compiles eligible population for drug requirement, and IEC, community mobilization and other related NDD activities for the district and send to the state	Planning	9 months before NDD	<ul style="list-style-type: none"> Eligible population for NDD and IEC, community mobilization and other related NDD activities of all the blocks List of number of schools, Anganwadi centers and ASHAs (Accredited Social Health Activists) of the blocks 	District	District Reproductive Child Health Officer
2.	State Health Education Officer, Joint Director-RCH, and Additional Director-RCH prepare	Planning	8 months before	<ul style="list-style-type: none"> District-wise eligible population, and IEC, 	State	State Health Education Officer

Annex 4 – Program maps (digitalized from data collection sheets in Miro)



LF MDA	Goa		Odisha	
	% of activities	# of activities	% of activities	# of activities
Level				
National	6.5%	3	0.0%	0
State	54.8%	16	43.2%	19
District	0.0%	-	18.2%	8
Block	19.4%	6	20.5%	9
Community	19.4%	6	9.1%	4
Other	Not used	Not used	9.1%	4

b. Proportion of activities by category for National Deworming Day (NDD) and LF MDA

NDD	Goa		Odisha		Sikkim	
	% of activities	# of activities	% of activities	# of activities	% of activities	# of activities
Category						
Planning	41.0%	16	42.9%	18	41.2%	21
Drug Supply Chain	12.8%	5	14.3%	6	9.8%	5
Training	12.8%	5	14.3%	6	13.7%	7
Community Sensitization	12.8%	5	4.8%	2	7.8%	4
MDA Delivery	7.7%	3	4.8%	2	15.7%	8
M&E	12.80%	5	19.0%	8	11.8%	6

LF MDA	Goa		Odisha	
	% of activities	# of activities	% of activities	# of activities
Category				
Planning	41.9%	13	38.1%	16
Drug Supply Chain	9.7%	3	19.0%	8
Training	9.7%	3	7.1%	3
Community Sensitization	9.7%	3	4.8%	2
MDA Delivery	9.7%	3	11.9%	5
M&E	19.40%	6	19.0%	8

c. Proportion of activities by timing for National Deworming Day (NDD) and LF MDA

NDD	Goa		Odisha		Sikkim	
	% of activities	# of activities	% of activities	# of activities	% of activities	# of activities
Timing						
>6 mo.	2.6%	1	4.8%	2	5.9%	3
6mo.	0.0%	0	0.0%	0	0.0%	0

5mo.	2.6%	1	0.0%	0	0.0%	0
4mo.	0.0%	0	7.1%	3	0.0%	0
3mo.	7.7%	2	2.4%	1	25.5%	13
2mo.	20.5%	8	11.9%	5	0.0%	0
1 mo.	12.8%	4	21.6%	8	9.8%	5
3wks.	Not used	0	0.0%	0	2.0%	1
2wks.	17.9%	7	4.8%	2	29.4%	15
1 wk.	10.3%	4	19.0%	8	0.0%	0
3 days	Not used	Not used	2.4%	1	Not used	Not used
2 days	Not used	Not used	2.4%	1	Not used	Not used
1 day	Not used	Not used	2.4%	1	Not used	Not used
Day of	10.3%	4	7.1%	3	17.6%	9
1 wk. after	10.3%	4	14.3%	6	7.8%	4
2 wks. After.	5.1%	2	0.0%	0	2.0%	1

LF MDA	Goa		Odisha	
	% of activities	# of activities	% of activities	# of activities
>6 mo.	Not used	Not used	13.6%	6
6mo.	3.0%	1	2.3%	1
5mo.	6.0%	2	0.0%	0
4mo.	13.0%	4	4.5%	2
3mo.	19.0%	6	4.5%	2
2mo.	10.0%	3	4.5%	2
1 mo.	6.0%	2	9.1%	4
3wks.	Not used	Not used	11.4%	5
2wks.	10.0%	3	9.1%	4
1 wk.	6.0%	2	4.5%	2
3 days	Not used	Not used	0.0%	0
2 days	Not used	Not used	0.0%	0
1 day	Not used	Not used	2.3%	1
Day of	13.0%	4	11.4%	5
1 wk. after	10.0%	3	15.9%	7
2 wks. After.	3.0%	1	6.8%	3

	Urban Nutrition Committee
	Zila Parishad (District council)
Village-level	Community-based organizations
	Municipal bodies
	Panchayati Raj Institutes
	Teachers
	Village Health & Sanitation Committee (Gaon Kalyan Samiti)
Other	Medical doctors (private & public)
	Non-governmental organizations
	Private sector/ corporations
	Religious institutions

Annex 7 – IEC activities brainstormed by stakeholders in qualitative interview

IEC recommendations	
Important persons for sensitization	Leaders: Panchayat, religious, community
	Active community members, self-help groups, community groups
	Teachers and children in school
Important persons for endorsement	Celebrities; Collaboration with Department of Sports to have key messages communicated by famous athletes
	Private medical doctors, Chief Medical Officers
	Public officials, public figures
	Media
Key messages to communicate	What the medication is, the health benefits of taking medication, disadvantages associated with not taking it, impacts on self, family, and greater society
IEC methods	IPC (Interpersonal Communication) via one-on-one counseling, household counselling, focus-group discussions
	Promotion at events, such as Village Health and Nutrition Day
	Posting flyers/ health messaging on Village bulletin boards
	NDD phone messages

	IEC decorated vans
	Folk theater, songs, cartoons
	state-specific videos
	Mass media (TV, radio, community radio channels, newspapers, social media)
Equity & accessibility	Content that can be communicated to persons at all levels of literacy
	Communicating content in multiple languages and preferably the population's primary language
	Partnering with Social Security of Empowerment of Person with Disabilities to make sure messaging is accessible