FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 10 No. 11, June, 2026, pp 333 – 342
DOI: https://doi.org/10.33003/fjs-2026-1011-5529

Mass Drug Administration for Preventive Chemotherapy and Transmission Control of Neglected Tropical Diseases – A Review

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Received: 18 Jun. 2026
Accepted: 15 Jul. 2026
Published: 23 Jul. 2026

ABSTRACT
Mass drug administration (MDA), also known as preventive chemotherapy (PCT), has become a major strategy for controlling and eliminating several Neglected tropical diseases (NTDs). This literature review evaluates the effectiveness of MDA programmes, the challenges affecting implementation, and future strategies for improving outcomes. In endemic countries, repeated rounds of MDA have significantly reduced the prevalence and intensity of several NTDs. Community-based and school-based drug distribution approaches have contributed to improved treatment coverage and compliance, especially when combined with complementary interventions such as water, sanitation and hygiene (WASH), vector control, snail control, and health education. Community engagement and participation are important factors influencing programme success. However, hard-to-reach populations, internally displaced persons, and residents of conflict-affected or peri-urban areas, are frequently excluded from treatment campaigns. Additional challenges include poor community awareness, misconceptions about drug safety, lack of parental consent, inadequate communication, unreliable demographic data, volunteer fatigue, delayed reporting, and insufficient incentives for community drug distributors. These challenges contribute to low treatment coverage, poor compliance, and continued disease transmission in endemic communities. To enhance MDA effectiveness, there is a need for stronger community ownership, culturally appropriate health education, improved training and motivation of community drug distributors, and adaptive delivery strategies tailored to local contexts. Integration of MDA with One Health approaches, WASH interventions, vector control, and improved health systems is essential for sustainable disease control. Future programmes should also incorporate digital technologies, electronic reporting systems, geospatial mapping, and improved diagnostic tools to strengthen surveillance and monitoring.

Keywords: Mass Drug Administration, Preventive Chemotherapy, Neglected Tropical Diseases, WHO NTD Roadmap 2030, School-Age Children

INTRODUCTION

Neglected tropical diseases (NTDs) are a medically diverse group of chronic and debilitating conditions afflicting more than 1.6 billion people worldwide (WHO, 2023). Neglected tropical diseases thrive among resource-poor populations, especially in tropical climates and are concentrated in settings of extreme poverty in remote rural areas, urban slums, and conflict zones in Africa, Asia, and Latin America. Of the world's poorest 2.7 billion people more than 1 billion are affected by one or more NTD (Jannin & Gabrielli, 2013). These NTDs comprise Buruli ulcer, Chagas disease, dengue and chikungunya, dracunculiasis, echinococcosis, foodborne trematode infections, human African trypanosomiasis, leishmaniasis, leprosy, lymphatic filariasis, mycetoma, chromoblastomycosis and other deep fungal infections, noma, onchocerciasis, rabies, scabies and other ectoparasitic infestations, schistosomiasis, soil-transmitted helminth infections, snakebite envenoming, taeniasis/cysticercosis, trachoma, and yaws (WHO, 2026). Africa and South Eastern Asia bear 40% and 54%, respectively, of the global burden of NTDs, with millions suffering from different NTDs with severe debilitating effects and social and economic consequences (Shomuyiwa *et al*., 2023; Yajima *et al*., 2023). Sustained in complex cycles at the interface between human, animal and environmental health, NTDs are intrinsically linked to the state of human livelihoods and can trap affected groups in self-reinforcing poverty dynamics (Grace *et al*., 2017). Furthermore, NTDs cost afflicted households an estimated 20-30% of annual income, trapping generations in poverty (Engels & Zhou, 2026). Their control thus seems essential to achieve several Sustainable Development Goals (SDGs), and in line with these ambitions, the WHO aims to reduce or eliminate the burden of 20 NTDs of infectious and non-infectious aetiologies by 2030, through a set of control measures outlined in its latest roadmap (WHO, 2021).

Control strategies for half of these NTDs include mass drug administration (MDA) (WHO, 2021). MDA, also referred to as 'preventive chemotherapy' (PC), entails the regular large-scale delivery of wide-spectrum drugs to individuals of at-risk communities, irrespective of their health status (WHO, 2026). Drug distribution usually occurs either through teachers at local schools or through volunteers known as community drug distributors (CDDs), at central locations or from door to door in the community. MDA, designed to contribute to the burden reduction of all targeted diseases, serves different purposes and holds differing importance and urgency for affected communities (Hoefle-Bénard & Salloch, 2024).

The complex social environments in which MDA is conducted give rise to numerous ethical issues centred on health equity, beneficence and autonomy. Locally, matters such as the adequate collection of informed consent or mediation of social stigma are essential. On a global level, ethical questions about the judicious use of drugs and the impact of potential drug resistance on future generations arise (Wharam & Lazarou, 2013), along with challenges of country ownership in a context of structural inequalities with donors and international organisations mainly dominated by stakeholders from the Global North.

Building on this context, MDA emerges as a cornerstone of preventive chemotherapy for several NTDs, yet its effectiveness is shaped by how well programmes navigate complex social, ethical, and operational realities. It is therefore important to evaluate the effectiveness of MDA in preventive chemotherapy (PCT) while also revealing persistent gaps in sustained transmission control. These gaps highlight ongoing challenges in MDA implementation, including suboptimal coverage, community mistrust, and ethical concerns around informed consent, volunteer fatigue, and health system limitations. Addressing these barriers requires strategies for enhancing MDA effectiveness, such as strengthening community engagement, improving training and motivation of community drug distributors, integrating MDA with water, sanitation and hygiene (WASH) and vector control interventions, and ensuring ethical, context-sensitive delivery approaches. Looking ahead, future directions must prioritize adaptive, locally driven models that reinforce country ownership, leverage One Health frameworks, harness digital tools for monitoring and evaluation, and anticipate emerging threats such as drug resistance, thereby ensuring that MDA continues to contribute meaningfully to NTD elimination goals and the broader Sustainable Development Agenda.

Effectiveness of MDA in PCT

MDA treatment programs aim to reduce or prevent morbidities from STHs and schistosomiasis and interrupt transmission of LF, trachoma, and onchocerciasis using safe and effective drugs, either alone or in combination. MDA delivery typically involves community distribution, but approaches may vary, such as school-based, faith-based, or health service-organized campaigns, depending on local or national conditions and disease endemicity (Webster *et al*., 2014). These NTDs addressed by MDA vary significantly in their burden, associated morbidity, mortality, and treatment effectiveness. Trachoma and onchocerciasis, for example, are major causes of infectious blindness, whereas lymphatic filariasis leads to severe disability and social stigma due to lymphoedema and hydrocele. Conversely, conditions like soil-transmitted helminthiases (STH) and scabies typically cause less severe morbidity (WHO, 2021).

Urogenital Schistosomiasis

The success of MDA in PCT programs for NTDs has been largely attributed to several key factors. These include high program participation rates, regular treatment intervals, integration with complementary interventions such as snail control, provision of safe water and sanitation, and comprehensive education on disease prevention (Chanhanga *et al*., 2023). However, the overall effectiveness of MDA in reducing the prevalence and morbidity of NTDs has varied across regions and disease types. For instance, Phillips *et al*. (2017) demonstrated the success of MDA in controlling urogenital schistosomiasis through a random cluster study conducted in Mozambique, where multiple rounds of MDA were highly effective. Similarly, Griswold *et al*. (2022) observed a significant reduction in the prevalence of schistosomiasis among schoolchildren in Nigeria, with rates decreasing from 12.9% to 9.0%, indicating the impact of sustained MDA interventions. Bronzan *et al*. (2018) also highlighted the long-term benefits of MDA, noting that after four to five years of treatment in Togo, there was a marked reduction in the prevalence and intensity of schistosomiasis infections when compared to the baseline figures. Other studies, such as those by Njenga *et al*. (2014), Assaré *et al*. (2016), and Adewale *et al*. (2018), reported declines in urogenital schistosomiasis, although the reductions were not as pronounced as those seen with multiple rounds of MDA.

Soil-Transmitted Helminthiases

The effectiveness of MDA in preventive chemotherapy targeting soil-transmitted helminths (STH) is well-established, particularly when employing commonly used anthelmintic drugs such as albendazole and mebendazole. These drugs have proven highly effective in reducing both the prevalence and intensity of STH infections, as demonstrated by large-scale deworming programs. For example, King (2019) highlighted a significant decline in the prevalence of STH and its associated morbidity following these interventions. Additionally, Bronzan *et al*. (2018) observed that after four to five years of MDA in Togo, there was a marked reduction in infection levels compared to baseline data.

However, due to the lack of strong acquired immunity to STH species, repeated rounds of treatment are necessary. This is especially critical in areas with high baseline prevalence, as stopping MDA could lead to a resurgence of infections. Moreover, without significant improvements in water, sanitation, and hygiene (WASH), the untreated adult population continues to act as a reservoir for infection, leading to environmental contamination and rapid re-infection in vulnerable groups (Senecal *et al*., 2020).

To address the challenge of recurring infections, there have been calls to expand MDA efforts beyond school-aged children to include community-wide deworming. This approach, where all individuals, children and adults alike, are treated, has shown promise in interrupting transmission (Pilotte *et al*., 2022). A broader transmission-interruption strategy could allow for the eventual discontinuation of long-term deworming programs, reducing the reliance on drug donations (Anderson *et al*., 2017). Therefore, while MDA has been effective in controlling STH infections, expanding the coverage and integrating improvements in WASH are necessary to achieve long-term control and potentially interrupt transmission entirely.

Scabies

MDA has been a widely adopted strategy in PCT for controlling parasitic diseases, and its effectiveness has been demonstrated in several studies. MDA with ivermectin has shown promising results in reducing the prevalence of scabies, as evidenced by multiple studies (Kearns *et al*., 2015; Romani *et al*., 2019; Lake *et al*., 2022). Romani *et al*. (2019) evaluated the efficacy of MDA that combined ivermectin, albendazole, and diethylcarbamazine citrate in a school-based program targeting both scabies and pediculosis. Their findings indicated that MDA significantly reduced the prevalence of scabies and impetigo among the children. This highlights the potential of integrated PCT to address multiple parasitic infections simultaneously, improving overall health outcomes. Similarly, Kearns *et al*. (2015) demonstrated the short-term success of MDA in reducing scabies prevalence,

with a decline from 4% at baseline to 1% after six months. However, they also noted the challenges in maintaining these gains, particularly in areas where conditions were conducive to the spread of scabies. Factors such as poor living conditions, exposure to severe forms of disease like crusted scabies, and high population mobility hindered long-term reduction. The variability in the long-term success of MDA programs highlights the need for continuous monitoring and supplementary interventions, such as improving living conditions and enhancing health education, to sustain the reductions achieved through PCT.

Lymphatic Filariasis

MDA has proven to be a highly effective strategy in the control and elimination of lymphatic filariasis (LF) through PCT. The primary goal of MDA is to reduce microfilaria (mf) levels in the human population, thereby interrupting transmission. In LF control programs, two-drug regimens, typically combining ivermectin and albendazole (IA) or diethylcarbamazine and albendazole (DA), are administered annually to at-risk populations. Due to safety concerns with diethylcarbamazine in onchocerciasis co-endemic countries, the WHO recommends the IA regimen in such regions (Fimbo *et al*., 2020). Numerous studies have demonstrated the positive impact of MDA in endemic areas. For example, Simonsen *et al*. (2013) reported a remarkable decrease in both microfilaria and circulating filarial antigen (CFA) prevalence in a Tanzanian community after six rounds of MDA, with mf rates dropping from 24.5% to 2.7% and CFA rates from 53.3% to 19.6%. Similarly, Mshana *et al*. (2016) observed a reduction in infection prevalence to as low as 1% in some regions, highlighting the success of MDA programs when properly implemented. Moreover, Aboagye and Addison (2022) emphasized the importance of community engagement and participation in enhancing the effectiveness of MDA. They found that after three years of MDA implementation, microfilaria prevalence reductions ranged from 88.54% to 98.66%. The incorporation of strategies such as community education, incentivization, and training not only increased treatment coverage but also improved compliance rates, contributing to the interruption of parasite transmission and pushing endemic regions closer to the goal of LF elimination. The use of MDA, particularly the IA regimen in areas with onchocerciasis co-endemicity, has shown considerable success in reducing microfilarial prevalence and supporting LF elimination efforts. Community-driven approaches further enhance MDA's effectiveness by ensuring high coverage and compliance, which are critical to achieving long-term disease control.

Trachoma

Through the donation of azithromycin (Zithromax) by Pfizer Inc., MDA programs aim for at least 80% coverage in endemic areas over a span of three years to control and eventually eliminate trachoma. Research, such as that conducted by Rono (2013), emphasizes the importance of community engagement in the success of MDA programs. Understanding the community's health priorities, knowledge, attitudes, and beliefs is essential, as demonstrated by the successful Africa Program for Onchocerciasis Control (APOC) and the Guinea Worm Program (GWP).

Randomized controlled trials further support the efficacy of MDA with azithromycin in reducing active trachoma infection in affected communities (Evans *et al*., 2019). For example, a study by Harding-Esch *et al*. (2019) in Gambia and Senegal found that just one round of MDA resulted in a noticeable decline in active trachoma prevalence. Nevertheless, it is crucial to maintain high treatment coverage, with regular mass treatments reaching over 80% of the population, as this significantly curtails the potential for reinfection within treated communities (Feyisa *et al*., 2022). The data highlights that sustained high coverage is key to achieving long-term elimination of the disease.

Onchocerciasis

Elimination of onchocerciasis has been reported in many endemic countries; namely, Niger and Sudan in sub-Saharan Africa. Colombia, Ecuador, Mexico, Guatemala, reducing at-risk population by 95% (WHO, 2024). Following limited success through parasite vector control, the success of MDA as a control intervention approach for chemotherapy prevention is exemplified by the use of Ivermectin (Mectizan) against onchocerciasis. A safer, yet effective Ivermectin active against only the microfilariae forms of *Onchocerca volvulus*, it supplanted Diethylcarbamazine (DEC). It is made available to all onchocerciasis endemic regions of the world by the pharmaceutical company, MSD or Merck & Co. Inc. since the 1980s (Oyene *et al*., 2025).

Ivermectin produced in concentrations of 3mg and 6mg tablets formulations is administered as 120-200µg/kg dose at intervals of 6-12 months for a duration of 10-12 years in adults. Its use in children under 5 years is contraindicated. Ivermectin is relatively well tolerated, although killed microfilariae can lead to a Mazzotti-like reaction manifesting as intense itching, lymphadenopathy and some degree of ocular inflammation. As a treatment and control choice, it not only disrupts parasite transmission by the reduction of microfilariae in the skin, it is credited with a lower degree of blindness arising from the killing of microfilariae in the eye, preventing punctate keratitis and other ocular lesions (Tekle *et al*., 2012).

Although another anthelminthic drug, Albendazole, is frequently administered in combination with Ivermectin in communities co-endemic for *Onchocerca volvulus* and *Wuchereria bancrofti* (the causative agent of lymphatic filariasis), its effectiveness against the microfilariae of *O. volvulus* has been limited. A recent study evaluating the co-administration of these two drugs reported no significant improvement in therapeutic efficacy, with the primary benefit being their safety when used together and the absence of adverse drug interactions (Awadzi *et al*., 2003; Makunde *et al*., 2003).

Challenges in MDA implementation

To achieve global targets for the control and prevention of NTDs, it is essential that a significant proportion of populations at-risk receive the appropriate doses of preventive chemotherapy each year. However, many countries face difficulties in attaining the required MDA coverage, particularly among hard-to-reach populations (Adams *et al*., 2018). These populations include mobile groups such as nomadic herders, migrant workers, and internally displaced persons (IDPs), as well as remote communities with limited healthcare access, marginalised groups facing cultural barriers, and those residing in conflict-affected areas. Due to their mobility, geographic isolation, or social circumstances, these populations are often challenging to locate and reach consistently for treatment, resulting in systematic exclusion or frequent non-compliance (Sangare *et al*., 2024).

Variations in travel patterns influenced by seasonal and economic factors create significant challenges for both the supply and demand aspects of MDA. Sangare *et al*. (2024) emphasized the dynamic nature of these mobility patterns, indicating that conventional MDA strategies may not

sufficiently accommodate the healthcare needs of mobile populations. Studies have particularly highlighted the reluctance of pastoralist communities to participate in MDA, which remains a major concern (Gammino *et al*., 2020; Kaplan & Wein, 2003). During the implementation of disease elimination and eradication programs in Africa, such as those targeting tuberculosis, polio, and dracunculiasis, mobile populations were identified as potential reservoirs or vectors of disease transmission, necessitating targeted intervention strategies (Gammino *et al*., 2020). In South Sudan, where approximately 67%-70% of the population relies on pastoralism (Muchiri *et al*., 2023), a substantial portion is often excluded from treatment campaigns. Many pastoralists frequently migrate in search of grazing land and water for their livestock, which limits their access to both curative and community-based health services, including preventive chemotherapy through MDA. The delivery of essential healthcare services, including MDA campaigns, is primarily structured around settled populations in villages or semi-permanent communities. Consequently, reaching pastoralist groups who reside in cattle camps or migrate during treatment campaigns remains a significant challenge (Muchiri *et al*., 2023). Addressing these barriers requires adaptive strategies that ensure equitable healthcare access for mobile populations.

In urban environments, ambiguities in the division of responsibilities among national, provincial, and municipal governments are common, and the involvement of multiple stakeholders adds complexity. Political shifts and unclear distinctions between district and municipal jurisdictions can complicate the identification of the appropriate officials to engage in MDA efforts. These challenges are often exacerbated by competition for limited resources (Adams *et al*., 2018). Governance issues may be even more pronounced in peri-urban areas, where rapid urban expansion extends into surrounding rural regions. The administrative structures and capacity to support MDA for specific NTDs vary depending on whether the intervention falls under municipal jurisdiction or a district-level authority. A lack of clarity regarding the roles and responsibilities of different governing bodies, coupled with insufficient coordination among agencies providing services, may undermine the effectiveness of NTD programs (Atkinson & Cheyne, 1994).

The WHO aims to achieve 85% coverage of anthelmintic drug administration in areas where soil-transmitted helminth (STH) infections are prevalent. Control programs primarily focus on the MDA of Albendazole to school-age children (WHO, 2012). However, these initiatives face significant challenges, including concerns about potential side effects, lack of parental consent, and low trust in the distributed drugs, all of which impede the achievement of target coverage. Such concerns may discourage parents or guardians from permitting their children, both school-age and preschool-age, to participate in MDA (Nath *et al*., 2018). Additionally, the availability of accurate demographic data and population dynamics plays a crucial role in determining MDA coverage and acceptability. The absence of reliable data on primary educational institutions and the actual number of target children poses a major obstacle to effective implementation. Many children in endemic areas engage in various forms of labour from an early age, do not attend formal schools, or are enrolled in informal education systems, making them difficult to reach during MDA campaigns. This challenge is further compounded by the lack of clear information on specific community locations, as well as the absence of well-established community identities and health committees to facilitate community engagement and participation (Nath *et al*., 2018).

Effective use and coverage of MDA for STH have also been found to be significantly hampered by gaps in information and communication between community members, educators, and health professionals. There have been allegations of insufficient knowledge among school teachers regarding the provision of drugs to children who are not enrolled, their participation in publicising, and record-keeping. Health professionals' and community members' statements about the drug delivery procedure for out-of-school children have been found to differ (Babu & Satyanarayana, 2003). Clear standards, consistent information transmission, and ongoing engagement with all stakeholders are crucial to ensuring complete community participation in MDA interventions, as poor communication erodes acceptance of control programs.

According to Krentel *et al*. (2013), low compliance and the difficulties of achieving and sustaining high treatment coverage have also been recognised as obstacles to the effectiveness of MDA programs. The likelihood of transmission may rise because of widespread noncompliance as more people may act as infection reservoirs in the community (Aboagye & Addison, 2022). Moreover, a significant obstacle to the successful execution of the MDA program is the lack of community awareness and involvement. Furthermore, it has been reported that insufficient financial incentives, erroneous information (de Souza *et al*., 2016), and delayed data reporting on treatment coverage (Allen & Parker, 2012) make it difficult to retain community health volunteers who participate in training and drug distribution. In view of these difficulties, targeted parasites have the chance to persist in endemic regions, making it challenging to stop their spread.

Strategies for Enhancing MDA Effectiveness

Mass drug administration (MDA) remains a basis of preventive chemotherapy for the control and elimination of several neglected tropical diseases. However, persistent challenges related to coverage, adherence, sustainability, and community acceptance continue to limit its overall impact in many endemic settings. This section highlights key strategies aimed at strengthening the effectiveness of MDA programmes by improving delivery, optimizing community engagement, and addressing contextual barriers that influence treatment uptake and long-term success.

Sustainability and Long-Term Effectiveness of MDA

A recent evaluation of different MDA strategies for scabies control showed that although MDA can achieve notable short- and medium-term reductions in disease prevalence, these gains are often not sustained in the long term. In the absence of broader health system strengthening and lasting behavioural change, prevalence is likely to rebound to pre-MDA levels over time (Tellioglu *et al*., 2023). However, sustainable improvements to control of several NTDs can be achieved when MDAs are coupled with systemic changes that reduce the time it takes for these infestations to be successfully treated. When post-MDA treatment is available in the healthcare system, MDAs may naturally provide an environment for systemic changes by breaking the normalisation cycle and increasing the per capita rate of healthcare access of individuals with scabies (Middleton & Bowen, 2021), which highlights the importance of post-MDA treatment accessibility. Moreover, MDAs are likely to have a higher chance of sustainably maintaining the prevalence of NTDs at a low level when supported by other interventions

such as improved education and health system accessibility (Tellioglu *et al*., 2023).

Community Engagement and Health System Strengthening

Improving the effectiveness of MDA requires a multifaceted approach that addresses not only drug delivery but also social, operational, and health system factors. One of the most critical strategies is strong community engagement and social mobilization. Community trust, perceptions of disease, and understanding of MDA objectives greatly influence participation. Early involvement of community leaders, use of culturally appropriate messaging, and sustained health education can help dispel myths, reduce fear of side effects, and improve acceptance and compliance (Chouaïd *et al*., 2025). Strengthening health system support and monitoring is also essential. Reliable data systems for mapping, coverage assessment, and adverse event surveillance allow programmes to identify gaps, respond quickly to challenges, and refine strategies over time. Post-MDA evaluations and impact assessments help determine whether transmission is being effectively reduced and whether adjustments are needed in drug frequency or targeting (Macpherson *et al*., 2015).

Optimizing Delivery Strategies and Community Participation

Optimizing delivery strategies is equally important. Tailoring MDA approaches to local contexts, such as selecting appropriate distribution points, timing campaigns to avoid peak farming or trading seasons, and ensuring adequate drug supply, can significantly enhance coverage. Training and motivating community drug distributors, along with supportive supervision, improves the quality and consistency of drug delivery. Incentives and recognition may also help sustain distributor commitment, especially in hard-to-reach settings. It has been noted that during MDA delivery, community involvement and participation are restricted to community sensitization and actual drug distribution times. There is a need for more involvement and participation during MDA planning and implementation in order to enhance the spirit of ownership and empowerment. Additionally, there is a need for more community participation in some aspects of delivery of the other key interventions such as case-management, vector management, environmental improvement measures and health promotion, which are recommended by WHO for prevention and control of NTD (WHO, 2013) in order to enhance sustainability of the control programmes. However, for the effective community participation in the prevention and control of schistosomiasis and STH there is a need for proper and better packaging of educational messages about causes and transmission of these diseases for their decision-making processes (Makaula *et al*., 2022).

Cultural and Behavioural Determinants of MDA Uptake

Cultural norms play a significant role in shaping beliefs, behaviours, and healthcare-seeking patterns within communities. Recognizing and understanding these norms is crucial as it enables the design of tailored interventions that can effectively improve health outcomes (Gregory, 2023). Community perceptions of a disease play a critical role in shaping the effectiveness of efforts aimed at its control and elimination. For example, Amanyi-Enegela *et al*. (2024) on a review identified that a particular host community's perception on lymphatic filariasis-related morbidity as a divine punishment led to social exclusion and stigma against affected individuals hindering control efforts. Furthermore, in a study in Indonesia, respondents suggest that traditional medicine protects them from LF, thus excluding themselves from participating in MDA campaigns (Krentel & Aunger, 2012). Such misconceptions about the benefits of LF MDA, cause of LF and its associated morbidity have the potential to hinder self-reporting and acceptance of treatment, thus posing a barrier to achieving LF elimination goals (Abdulmalik *et al*., 2018).

Participatory Approaches and Community Ownership

It has been reported that the use of community based, participatory approach in the development and implementation of data driven strategies has the potential to positively influence MDA coverage in an area that had consistently recorded low uptake. This suggests that the participatory approach is key in involving communities and stakeholders in decision-making process for community-based issues. It is also clear that it is within the community's power to identify reasons that make them ward off from participating in MDA, and it is within their domain to suggest local based solutions that are doable and achievable. Future public health interventions, particularly those targeting NTDs and community-driven health issues, should integrate participatory approaches to ensure long- term success and sustainability (Gichuki *et al*., 2024).

Communication and Information Dissemination

Another important step in implementation of MDA for NTDs is communication, whereby key messages are widely conveyed, such as information on the specific NTDs and accompanying morbidity, how NTDs can be prevented, why an MDA is being undertaken, information on drug safety and possible side effects and the time and location of MDA. Communication campaigns emphasize the importance and benefits of treatment in advance of MDA with the purpose of fostering trust between the community and the campaign (Krentel *et al*., 2013).

Urban Contexts and Communication Adaptation

Particularly in urban areas, where NTDs may not be recognized as a threat, the health benefits of compliance are not always fully understood. NTDs may be 'unseen' if they are relatively uncommon, when infected people are asymptomatic and when outward signs of disease manifest themselves long after infection. Promoting the 'non-health' benefits of compliance is one strategy to overcome this challenge. In Indonesia, for instance, linking urban MDA campaigns with individual aspirations of being perceived as 'modern,' embracing non-traditional medicine, caring about family and community and being a good citizen who is acting on behalf of future generations and their country's economic development, increased compliance (Krentel *et al*., 2016). According to Krentel *et al*., (2013) individuals were motivated to participate in MDA when family, friends and neighbours were also participating, resulting in the recommendation that future MDA messaging focus on the social norm of compliance and the safety of LF drugs globally and in Indonesia (Krentel *et al*., 2016).

Even more so than in rural settings, the heterogeneity and diversity of the urban population, including a mix of highly educated, illiterate, minority and migrant groups who may speak different languages, means that strategies and information, education and communication (IEC) materials may need to be adapted to ensure participation by the entire population (Adams *et al*., 2018). For example, to accommodate large numbers of internal migrants into the Kathmandu Valley, the Nepalese NTD program printed information materials in several local languages and used

community centres to distribute information to specific ethnic groups and castes (Adams *et al*., 2018).

Integrated Approaches and Future Alignment

Addressing co-endemicity and polyparasitism offers another opportunity to improve effectiveness. Integrated MDA for multiple NTDs can reduce operational costs, minimize health worker workload, and decrease community fatigue from repeated campaigns. However, such integration must be guided by robust evidence on safety, acceptability, and feasibility to ensure that combining interventions does not compromise outcomes (Branda *et al*., 2024). Aligning MDA strategies with broader health system strengthening efforts and global frameworks such as the WHO NTD Roadmap 2030 will be crucial for sustaining gains, achieving long-term transmission control, and progressing toward elimination goals.

Future directions

Strengthening Community Ownership

Greater emphasis should be placed on strengthening community ownership of Mass Drug Administration (MDA) programmes to improve uptake and sustainability. Persistent challenges such as systematic non-compliance, treatment fatigue, misconceptions regarding drug safety and sociocultural barriers continue to undermine programme outcomes. Addressing these challenges requires deeper community engagement supported by behavioural research and implementation science. Qualitative and mixed-methods studies can help elucidate community perceptions, gender dynamics, power relations, and levels of trust in health systems. Such insights are essential for designing context-specific strategies that encourage active participation, improve adherence, and foster long-term community commitment to NTD control interventions (Njomo *et al*., 2020).

Employing/Integrating the One Health and Environmental Approach

Future MDA programmes should be integrated with complementary control measures within a One Health and environmental framework. Preventive chemotherapy alone is often insufficient to interrupt transmission in settings characterised by poor sanitation, unsafe water contact, and ecological conditions favourable for vectors or intermediate hosts. Integrating MDA with interventions such as vector control, water, sanitation and hygiene (WASH) improvements, snail control (where relevant), and sustained health education is therefore essential. Such integrated approaches recognize the interconnected roles of human health, environmental conditions, and animal or vector populations in disease transmission. There is need for further research to determine optimal integration models, intervention sequencing, and programmatic synergies in co-endemic areas to maximize the effectiveness of NTD elimination strategies (Adediran *et al*., 2025).

Use of Technology and Electronic Data for Reporting and Tracking

Enhanced surveillance and monitoring systems are critical for optimizing the effectiveness of MDA programmes. Moving beyond traditional reliance on periodic prevalence surveys, future programmes should incorporate digital technologies and electronic data platforms that enable real-time reporting, monitoring of drug uptake, and rapid identification of coverage gaps. The use of molecular diagnostics, serological markers, and geospatial mapping tools can improve the detection of low-intensity infections and help identify persistent transmission hotspots. Such innovations would allow programmes to transition from uniform, resource-intensive strategies to targeted, evidence-driven interventions. Real-time data systems can also support adaptive decision-making, improve accountability, and enhance programme efficiency as countries progress toward elimination targets (Bun *et al*., 2025).

Devolution and Launch of Simpler Diagnostic Tools and Acceptable Drug Formulations

Another priority is the decentralization of programme implementation and the development of simpler diagnostic tools and more acceptable drug formulations to support large-scale interventions. As MDA programmes advance toward elimination goals, accessible and sensitive diagnostic methods will be required to detect low-level infections, monitor treatment impact, and identify potential recrudescence. Alongside improved diagnostics, efforts should also focus on optimizing drug delivery through formulations that are easier to administer and more acceptable to communities, particularly for vulnerable populations such as children.

Furthermore, repeated rounds of MDA raise concerns about reduced drug efficacy and the potential emergence of resistance. Long-term pharmacovigilance, routine drug efficacy monitoring, and genetic surveillance of parasites should therefore be incorporated into national NTD programmes (Smith, 2009; Albonico *et al*., 2015; Barry *et al*., 2021). Investment in new therapeutics, alternative drug combinations, and vaccine development will be crucial to safeguard future MDA strategies.

In addition, addressing co-endemicity and polyparasitism remains an important consideration, as multiple neglected tropical diseases simultaneously affect many communities. Integrated delivery of preventive chemotherapy for several diseases could reduce operational costs, lessen the burden on health workers, and minimize community fatigue while maximizing overall health benefits. However, robust evaluations are needed to assess the safety, acceptability, and programmatic effectiveness of such integrated strategies.

Finally, future studies should prioritize comprehensive impact assessments, economic evaluations, and equity-focused analyses. Understanding the cost-effectiveness of different delivery strategies, their implications for vulnerable populations, and their broader development outcomes will be essential for guiding policy decisions. Ensuring alignment with global targets such as the World Health Organization NTD Roadmap 2030 will remain crucial for sustaining progress toward long-term transmission control and eventual disease elimination.

CONCLUSION

Mass drug administration (MDA) has proven to be an effective preventive chemotherapy strategy for reducing the prevalence, intensity, morbidity, and transmission of several neglected tropical diseases (NTDs), including schistosomiasis, soil-transmitted helminthiases, lymphatic filariasis, trachoma, scabies, and onchocerciasis. Its success has largely depended on sustained treatment coverage, strong community participation, effective drug distribution systems, and integration with complementary interventions such as water, sanitation and hygiene (WASH), vector control, snail control, and health education. However, several challenges continue to limit programme effectiveness, including poor treatment coverage among hard-to-reach populations, misconceptions about drug safety, low compliance,

inadequate communication, volunteer fatigue, weak health systems, and concerns about possible drug resistance. Addressing these barriers requires stronger community ownership, culturally sensitive health education, improved support for community drug distributors, and adaptive delivery strategies tailored to local contexts. Future MDA programmes should also integrate One Health and environmental approaches, strengthen surveillance through digital technologies and improved diagnostics, and promote integrated management of co-endemic diseases. Achieving the targets of the World Health Organization NTD Roadmap 2030 will require sustained political commitment, stronger health systems, continued research, and integrated, community-driven interventions that address the broader social and environmental determinants of NTD transmission.

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