INVITED REVIEW

Optimizing school-based intestinal helminth control interventions in the Philippines

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ABSTRACT
Intestinal helminth infections caused by soil-transmitted helminths and schistosomes bring about the greatest burden of disease in poverty-stricken areas in the developing world. The most vulnerable group and the most significant contributors to disease transmission are the school-age children. While awaiting major improvements on sanitation, the recommended strategy for helminth control is school-based, teacher-assisted, mass drug administration (MDA). However, millions of individuals worldwide remain afflicted with these diseases, and the Philippines is no different from many of the developing countries. The overall objective of this paper is to review current Philippine control programs and initiatives and offer evidence-based recommendations for improvement. Discrepancies between parasitologic parameters and drug coverage rates pose significant challenges in the control and prevention of helminth infections in the country. School-based MDA may be scaled up after successful local initiatives, where teachers have direct participation in drug administration. There is also a need to involve the social science sector to help address the behavioral aspects of helminth control. Moreover, monitoring and evaluation of interventions through identification of success parameters will contribute to the optimization of school-based helminth control, and to strategies towards effective control of intestinal helminth infections as a public health problem in the country.

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INTRODUCTION

Neglected tropical diseases (NTDs) are diseases of poverty that are among the most common infections that plague developing countries. The most common NTDs are of parasitic etiology, brought about by helminthiasis caused by soil-transmitted helminths (STHs), schistosomes, lymphatic filariae, and food-borne trematodes.[1] Helminth infections caused by STHs and schistosomes bring about the greatest burden of disease in poverty-stricken areas in the developing world.[2] Recent worldwide estimates suggest that 2 billion individuals are infected with soil-transmitted helminthiasis and 200 million with schistosomiasis. Moreover, the chronic and insidious clinical course of these infections demonstrates the heavy burden of disease as shown by disability-adjusted life years (DALYs) lost of those infected (Table 1).[3]

Table 1. Estimates of global morbidity in disability-adjusted life years (DALYs) and mortality due to schistosomiasis and STH infections[3]

Parasite infections and diseases caused by:	No. Infected (millions)	DALYs lost (millions)	Mortality (thousands)
Soil-transmitted helminths			
Ascaris lumbricoides	800	1.2-10.5	3-60
Hookworms (*Ancylostoma duodenale, Necator americanus)*	600	1.8-22.1	3-65
Trichuris trichiura	600	1.6-6.4	3-10
Schistosomes	200	1.7-4.5	15-280

The objective of this paper is to review the current situation of control programs and initiatives in the Philippines and offer evidence-based recommendations for further improvement of strategies used in these large-scale health interventions in the school setting. Epidemiologic and morbidity data were collected from published scientific papers. Control strategies for STH infections and schistosomiasis were gathered from journal articles and the World Health Organization. Philippine control programs and initiatives were obtained from local scientific publications and reports. Recommendations for optimizing school-based control interventions were formulated based on evidence and feasibility.

Soil-Transmitted Helminth Infections

STH infections refer to a group of parasitic diseases caused by nematodes of major concern to humans: the roundworm, *Ascaris lumbricoides;* the whipworm, *Trichuris trichiura;* and the hookworms, *Necator americanus* and *Ancylostoma duodenale.* Transmission is through ingestion of fecally-contaminated soil or water, and/or skin penetration of larvae.[2,3] STH infections persist in developing countries like the Philippines where poverty, inadequate sanitary facilities, indiscriminate defecation, unhygienic eating practices, and lack of awareness predominate.

Epidemiology

Prevalence of STH infections in the Philippines has been investigated as early as the 1960s. Extensive biomedical studies on the prevalence of human parasitic infections were conducted from 1967 to 1983 by the former Philippine Ministry of Health through two research laboratories, the US Naval Medical Research Unit No. 2 (NAMRU-2) and the Philippine Bureau of Research and Laboratories (BRL). The highest prevalence of STH infection recorded in the studies was caused by *Trichuris trichiura*, with a prevalence of 94.5% in Sorsogon, 90% in Northern Samar, and 80.5% in Surigao del Sur and Misamis Oriental.[4]

Two parasitologic surveys conducted in 2000 and 2006 demonstrated that STH infections still persist in the Philippines. In 2000, a baseline survey among public school children in selected areas showed a cumulative prevalence of STH infections from 51.6% in Quezon to City to 77% in Nueva Ecija. The highest rates of heavy intensity STH infections were from Cavite (22%) and Nueva

Ecija (11.3%). The most prevalent STHs, *Ascaris* and *Trichuris*, account for most of the heavy intensity infections.[5]

A baseline survey was also done in 2006 for the Integrated Helminth Control Program (IHCP) of the Department of Health (DOH). Among the public elementary students in six sentinel sites, namely, Bulacan, Camarines Sur, Negros Occidental, Leyte, Compostela Valley, and Surigao del Norte, 54% were positive for STH infections. Cumulative prevalence ranged from 33.2% in Compostela Valley to 67.4% in Negros Occidental. The overall proportion of heavy intensity infections was 23.1%. Only Compostela Valley and Bulacan had prevalence below 50% and heavy intensity infections below 10%. However, prevalence of STH infections may be higher than the estimated numbers due to overall false negative rate of 13.2%.[6]

Morbidity and Public Health Implications on School-age Children

Severe *Ascaris* infection could lead to lung infiltration, appendicitis, obstructive cholecystitis, pancreatitis, peritonitis, volvulus, and intestinal obstruction.[7-10] A meta-analysis revealed that obstruction is the most common clinical complication of ascariasis.[11] Infection with *Trichuris* could lead to dysentery, rectal prolapse, clubbing of fingers, and anemia.[12] Hookworm infection may cause diarrhea, anemia, hypoalbuminemia, and pneumonitis.[11,13]

Of the three high-risk groups (pre-school age children, school-age children, and women of childbearing age), school-age children (SAC) bear the highest burden of STH infections because of their increased nutritional needs, intense developmental and learning capacities, and lack of awareness in hygiene. As a result, heavy intensity infections impair physical growth and cognitive development, induce micronutrient deficiencies, and lead to poor school performance and absenteeism.[3,14] In the previously mentioned baseline study for the DOH-IHCP in 2006, available data on nutritional status showed that 14.8% of the school children were underweight while 19% were stunted. Furthermore, the average National Achievement Test score per subject was below the competency level of 75%, with the exception of students in Loreto, Surigao del Norte.[6] Thus, treatment of STH infections has been shown to significantly improve physical development of SAC in the short-term and also produced a slight reduction in anemia in populations with relatively high prevalence of STH infections.[15]

Control Strategies

In 2001, the Fifty-fourth World Health Assembly (WHA) drafted the WHA resolution 54.19 which targeted SAC (6-15 years) and endorsed school-based MDA as the main strategy in the short-term control of STH infections in endemic areas, with the overall aim of reducing the number of heavily infected individuals. The recommended drugs for STH infections in school-based MDA are albendazole 400 mg or mebendazole 500 mg. It is important to note that improvements in sanitation, access to safe water, and behavioral changes are still considered key factors to achieving long-term control. While improvements in environmental and behavioral conditions are not yet in place, the World Health Organization (WHO) recommends that school-based MDA should take place twice a year because the prevalence of infections tends to return to the original pre-treatment levels.[16]

In the Philippines, the DOH in partnership with the Department of Education (DepEd) implemented the IHCP according to Administrative Order 2006-0028, with overall goals of: (1) reducing the prevalence of STH infections in children age 1 to 12 years to less than 50% by 2010, and (2) lowering STH infections among adolescent females, pregnant women, and other special population groups. For control of STH infections, the DOH recommends MDA with albendazole or mebendazole twice a year for three consecutive years, then yearly thereafter for children age 1 to 12 years. The target drug coverage of the IHCP is at least 85%. Aside from the targeted mass treatment, other components of the IHCP include health education and provision of safe water, environmental sanitation, and personal hygiene (WASH).[17]

Schistosomiasis

Schistosomiasis is caused by five major trematodes that infect humans: *Schistosoma haematobium*, *Schistosoma intercalatum*, *Schistosoma japonicum*, *Schistosoma mansoni*, and *Schistosoma mekongi*. The life cycle of schistosomiasis involves an intermediate snail host that releases larval forms (cercariae) in the water. Transmission occurs through contact with infected water and subsequent penetration of cercariae into the skin. Similar to STH infections, schistosomiasis is also associated with poverty, inadequate sanitation and water supply, and poor health awareness. In the Philippines, schistosomiasis is caused by *Schistosoma japonicum*, and its distribution is primarily determined by the snail *Oncomelania hupensis quadrasi*.[2,3]

Epidemiology

The first case of schistosomiasis in the Philippines was reported in 1906. It was only in 1932, however, that the freshwater snail *Oncomelania hupensis quadrasi* was discovered in the municipality of Palo in Leyte. Extensive research on schistosomiasis then followed throughout the early 1960s to the 1970s.[18] The prevalence of schistosomiasis in the Philippines averaged 10.4% in 1981 to 1985, with significant reduction among at risk population from 7.4% in 1986 to 4.5% in 1997. Control interventions including mass chemotherapy along with provision of safe water, health education, and snail control contributed to the reduction in prevalence.[19]

As of 2010, however, schistosomiasis remains endemic in 190 municipalities in 28 provinces of 12 regions in the Philippines.[20] Results of a national survey conducted from 2005 to 2007 revealed that Mindanao had the highest endemicity (60%), followed by Visayas (45%), and Luzon (37.5%). By region, the Caraga Region (Agusan del Norte, Agusan del Sur, Surigao del Norte, and Surigao del Sur) had the highest prevalence rate at 1.63%, followed by Region 8 (Northern Samar, Southern Samar, Northern Leyte, and Southern Leyte) at 1.5%. The provinces with the highest prevalence rates were Agusan del Sur (3.95%), Northern Samar (2.4%), and Eastern Samar (1.79%).[21]

Currently available statistics on the prevalence of *S. japonicum* may be significantly underestimated; several studies suggest that prevalence are actually higher than previous or current estimates. In a local survey done in two towns of Agusan del Sur in 2005, the overall prevalence of schistosomiasis among public school children was 31.8%, a significantly higher rate than the previously recorded prevalence of 4%.[22] In a cross-sectional study done in Western Samar, 98% of the participants were positive for schistosomiasis.[23] In the two municipalities most recently identified as endemic for schistosomiasis (Gonzaga in Cagayan and Calatrava in Negros Occidental), prevalence were as high as 10% and 69%, respectively.[20,24] Moreover, poor stool examination technique and limited capacity of laboratory staff may contribute to underreporting, leading to inadequate monitoring and evaluation of health programs and limitations in the updating of program guidelines.[22]

Morbidity and Public Health Implications

Clinical schistosomiasis could be severe and tends to involve several systems. Dysentery, diarrhea, and mucosal ulcerations can occur when there is colonic involvement. Hepatic and portal invasion could result in hepatosplenomegaly, portal hypertension, and ascites.[25,26] Cor pulmonale and pulmonary hypertension may occur if there is severe lung involvement.[27] Cerebral schistosomiasis may also develop, with complications of decreased sensorium, motor and sensory deficits, and meningoencephalitis.[28]

Schistosomiasis is also linked to subtle morbidities such as anemia, growth stunting, undernutrition, predisposition to and exacerbation of co-infections, cognitive underdevelopment, decreased work capacity, and chronic pain.[14] In a study done on children, adolescents, and young adults in Leyte, results showed that high intensity infections of *S. japonicum* may be related to iron-deficiency anemia.[29] Results of a cross-sectional study done on SAC and adolescents in Leyte suggested that infection with *S. japonicum* may also have effects on intelligence.[30] Hence, treatment of schistosomiasis is important to prevent the onset of severe clinical complications and could have positive effects on the nutritional status and quality of life of children.[31]

Control Strategies

The WHA resolution 54.19 also targeted schistosomiasis and recommended praziquantel 40-60 mg/kg to be given once a year, with added emphasis on improvements in sanitation, access to safe water, and behavioral changes.[16,32] In the Philippines, the DOH created the Schistosomiasis Control Program (SCP) according to Administrative Order 2007-0015, with the goal of reducing the prevalence rate of schistosomiasis to less than 1% by 2010. In areas with prevalence greater than 10%, the target drug coverage is at least 85%. Strategies of the SCP include mass administration of praziquantel to exposed population, active case finding and treatment of infected individuals, improvements in sanitation, environmental modification and snail control, health promotion, and health education.

WHO RECOMMENDATIONS FOR CONTROL OF STH INFECTIONS AND SCHISTOSOMIASIS

The WHO strategy for the control of STH infections and schistosomiasis includes school-based, teacher-assisted periodic MDA without prior screening of SAC. SAC have the highest prevalence and heavy intensity infection rates of intestinal helminths among all age groups, making them the most vulnerable group and the most significant contributors to the transmission of STH infections and helminthiasis. The intervention strategy is based on the principle of preventive chemotherapy (PC), with emphasis on the integrated and coordinated use of available drugs rather than on specific forms of helminthiasis. In areas endemic for STH infections, the recommended anthelminthics are albendazole or mebendazole. In areas endemic for STH and schistosomiasis, the recommended drugs are albendazole or mebendazole with praziquantel. These anthelminthics possess broad-spectrum activity and have the capability to address several parasitic diseases simultaneously. The goal of school-based control programs is to offer periodic MDA to cover at least 75% of all SAC living in highly endemic areas.[32]

Safety Profile of Anthelminthics

The key justification of MDA is safety of anthelminthics.[32] The adverse events related to anthelminthic drugs are rare and generally mild and transient when given in appropriate dosages and with proper precautions.[33] Most anthelminthic drugs, the benzimidazoles (albendazole, mebendazole) in particular, are very safe and there is no known harm in treating uninfected individuals.[13] The most common adverse event that needs immediate intervention is allergic skin reaction, which could be treated with antihistamines.[16] Heavily infected individuals are also more likely to experience allergic reactions due to degeneration of eradicated worms.[34] As such, the incidence of adverse drug reactions is highest during the first round of treatment and decreases in subsequent doses.[35]

Studies have also shown that majority of the adverse events of praziquantel are mild and transient. In fact, the most common adverse event of praziquantel is mild abdominal pain, which requires no treatment and could be prevented by administration on a full stomach.[16] In a double blind, randomized control trial on school children in Agusan del Sur, it was established that the 40 mg/kg regimen of praziquantel had significantly less incidence of adverse events, while having the same effectivity, compared to the 60 mg/kg regimen.[36] In addition, praziquantel can also be safely co-administered with either albendazole or mebendazole.[37,38] Aside from administration of chemotherapy for STH infections and schistosomiasis, school-based programs could also offer other interventions like health education, food and micronutrient supplementation, and co-administration of ivermectin for co-infection with filariasis.[39]

Cost-effectiveness of School-based, Teacher-assisted Helminth Control Programs

School-based, teacher-assisted helminth control programs are among the most cost-effective public health interventions (Table 2). Involving teachers in MDA activities is logical, strategic, and advantageous since the existing infrastructures used are schools and the target population are the SAC. Drug administration does not require complex skills because of their safety profile. Trained teachers and other non-medical personnel should therefore be more than capable to ensure precautions and to identify and appropriately respond to adverse events.[32] The cost of treatment administration and program monitoring is reduced to almost zero because there is no additional workload for teachers and school administrators during MDA events. Teachers also generally outnumber the school paramedical and medical personnel, and their assistance in drug administration and monitoring increases the efficiency of the implementation of school-based MDA. Furthermore, teachers are in the best strategic position to deliver health education to school children, secure consent for treatment from parents, interact with the community through parent-teacher-community assembly (PTCA), correct community misconceptions regarding MDA, and facilitate other community actions.[43]

Table 2. Cost-effectiveness of school-based, teacher-assisted helminth control programs[13, 40-42]

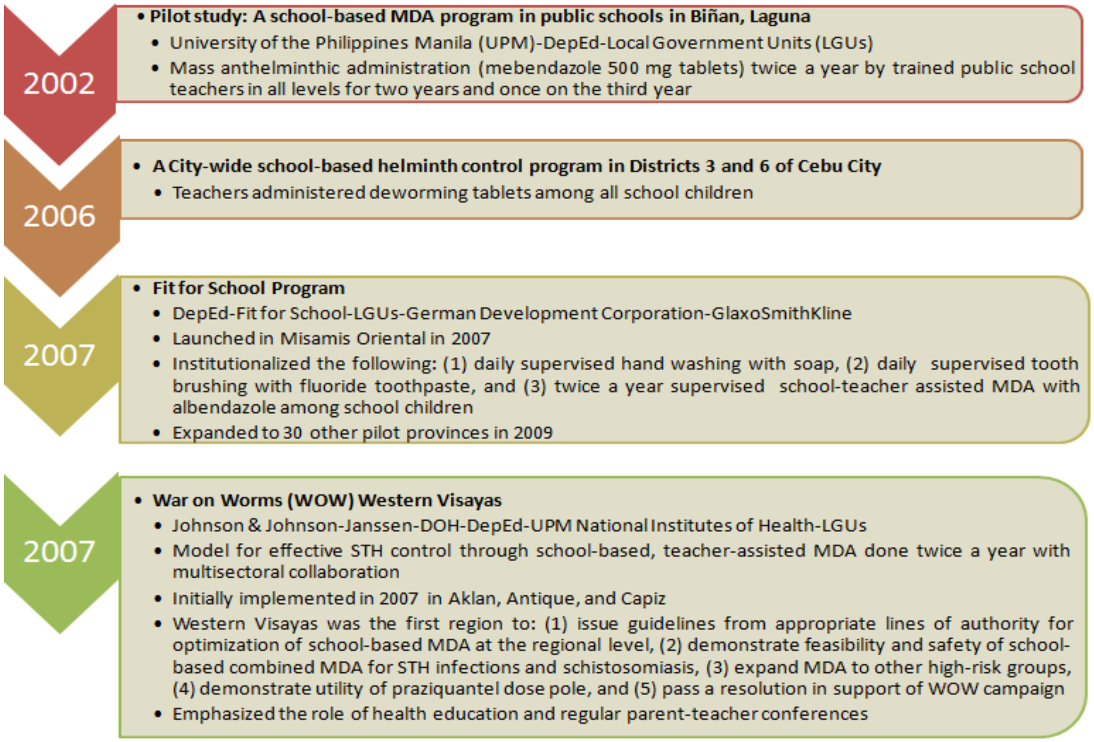
- ✓ Minimal budget (existing educational infrastructures and manpower)
- ✓ Use of inexpensive, safe and effective drugs
  - less than ¢5 a tablet (albendazole and mebendazole when bought in large quantities)
  - $0.03 per child (in Vietnam, 2.7 million SAC, at a high drug coverage rate of 97%)
- ✓ Minimal skill required for teachers (organization of drug administration, dissemination of health education)
- ✓ Reduction of the intensity of infection in SAC → overall reduction of prevalence of worm infection in the community
- ✓ Treatment of children = treatment of the community
- ✓ Strengthen health awareness
- ✓ Opportunity for wider health education in the community

Successful Models in Other Countries

Several countries have already implemented school-based, teacher-assisted MDA as part of their national control programs for STH infections and schistosomiasis. Significant reductions in prevalence and high intensity STH infections and schistosomiasis were observed as a result of the implemented programs. In Seychelles, the MDA program achieved a drug coverage rate of 99.4%. After two years of treatment, overall prevalence of *Ascaris*, *Trichuris*, and hookworm infections among school children were significantly reduced by 75%, 49% and 33% respectively; heavy intensity infections with *Ascaris*, *Trichuris*, and hookworms were significantly reduced by 85%, 53% and 33% respectively.[44]

In Uganda, mass treatment significantly reduced the overall prevalence of schistosomiasis in children by 57.8%; the heavy intensity infection rate was also reduced significantly by 83%. The overall prevalence of hookworms was reduced by 79% with significant reductions in heavy intensity infection rates of hookworms and *Ascaris* by 92.9% and 83%, respectively.[45] There were also significant reductions in the overall prevalence of

Figure 1. School-based, teacher-assisted control models for STH infections in the Philippines[60-63]



Ascaris and hookworms in Cambodia by 86.6% and 30%, respectively.[46] The overall prevalence of schistosomiasis was also reduced significantly by 86% with no reported cases of severe morbidity from the disease since 2005.[47]

Japan and Korea have successfully eliminated STH infections and schistosomiasis as major public health concerns by involving teachers in the extensive case-finding and treatment of school children.[48-50] School-based, teacher-assisted control programs for STH infections and schistosomiasis were also implemented in West Africa, Guinea, Kenya, Tanzania, Zambia, Zanzibari, Zimbabwe, Laos, Myanmar, Vietnam, Turkey, and Mexico.[40,51-59]

School-based MDA Models in the Philippines

There are existing school-based, teacher-assisted MDA models in the Philippines that have demonstrated potential in achieving reduction of STH infections in the municipal, city, and provincial levels (Figure 1). Follow-up parasitologic monitoring in Biñan, Laguna and Districts 3 and 6 of Cebu City showed a significant rapid decline of the proportion of heavy intensity infections and overall cumulative prevalence. The overall drug coverage achieved in Laguna was 78.9%, which is above the WHO recommended drug coverage. The drug coverage in Cebu City was 86.2% in District 3 and 92.8% in District 6.[60,61]

In the four MDA rounds of the WOW Western Visayas (Figure 1) in 2008 and 2009, the drug coverage rates were consistently above 80%. After two years of implementation, the prevalence of heavy intensity infections was significantly reduced by 90.4%, from a baseline of 40.5% to 3.9%. The overall cumulative prevalence of STH infections also decreased significantly by 40.1%, from a baseline of 71.1% to 42.6%. Data at the regional level reflected the overall trend as well. Heavy intensity infections were significantly reduced by 93.1% in Aklan, 94.6% in Antique, and 85.3% in Capiz. There were also significant reductions in the cumulative prevalence of STH infections in Aklan (25.3%), Antique (47.4%), and Capiz (47.8%). The WOW Western Visayas was well accepted by the local population and local governments in Aklan, Antique, and Capiz. This led to the drafting of resolutions on prioritization and continuation of school-based control strategies in the program.[62]

Current Situation of Helminth Control Programs in the Philippines

School-based MDA programs address the control of STH infections in the Philippines. School-based control interventions for schistosomiasis are also being done in some areas of the country. The DOH National Center for Disease Prevention and Control (NCDPC) integrated the STH Control Program, *Garantisadong Pambata*, and the Filariasis and Schistosomiasis Control Programs into the IHCP in recognition of the factors that contributed to the low levels of intestinal helminths, the disparity of parasite infections among regions, and in consideration of the prohibitive cost of interventions for local governments. The aim of this integrated program is to permit nationwide coordination of all mass deworming strategies: planning, implementation, integrated delivery schemes, advocacy, networking, health promotion, monitoring, and evaluation. The IHCP is a nationwide parasitic disease control program that utilizes mass targeted and selective deworming for several target populations. Different agencies are involved with the implementation of MDA in IHCP areas: the DOH and Local Government Units (LGUs) in *Garantisadong Pambata*, the DepEd in school-based STH infection control programs, and the DOH in filariasis and schistosomiasis control programs.[17]

Follow-up monitoring of IHCP was conducted in Bulacan, Camarines Sur, Negros Occidental, Leyte, Compostela Valley, and Surigao del Norte in November 2009. Significant reductions in heavy intensity infections were observed in Compostela Valley (85.2%) and Surigao del Norte (63%). On the other hand, Bulacan and Leyte had increased heavy intensity infection rates. Only four out of six provinces had significant reductions in the overall cumulative prevalence; and only Bulacan and Compostela Valley had prevalence below 50%. There were also increases in prevalence of STH infections in some districts in Camarines Sur and Leyte. According to the DepEd, the drug coverage rate in four of the six sentinel sites in July 2009 was 82.3%, greater than the WHO target MDA coverage.[64] A local study, however, revealed that there could be discrepancies between the reported and actual coverage rates and validation of results is recommended.[65] In the 2008 accomplishment report from NCDPC, the overall drug coverage rate of the IHCP was at 43%, which is below the WHO recommended coverage of 75% or the IHCP target of 85%.[17,66]

In continuing support of the IHCP, the DOH recently published a guidebook for a disease prevention and control program of STH infections. Although the guidebook emphasizes greater collaboration with local and international partners and provides a description of the roles and responsibilities of identified stakeholders (Table 3), the national program for helminth control does not currently require teachers to participate in drug administration. As a result, teachers do not participate in school-based MDA in some IHCP areas. The reasons behind this lack of assistance from teachers are still subject to further monitoring and research.

RECOMMENDATIONS FOR OPTIMIZING SCHOOL-BASED CONTROL INTERVENTIONS IN THE PHILIPPINES

Discrepancies between recent parasitologic parameters and drug coverage rates among surveyed IHCP sentinel sites signify the need for improving the national program for helminth control in the country. In addition, persistence of poverty, poor sanitation, open defecation, poor health seeking behavior and widespread misconceptions still pose a challenge in the control and prevention of helminth infections in the country.

Table 3. Roles and Responsibilities of stakeholders in support of the disease prevention and control program for STH infections in the Philippines[67]

STAKEHOLDER	ROLES AND RESPONSIBILITIES
DOH	• Formulate policies and control programs • Provide opportunity for capacity building (LGU and school health staff)
LGU	• Capacity building (BHWs, local health unit and hospital staff, local officials) for implementation, surveillance, and monitoring of policies and control programs at the local level • Forge partnerships and spearhead advocacy, social mobilization, program marketing at the local level
DepEd	• Capacity building (direct involvement of trained teachers in drug distribution and administration) for implementation of control programs in the school setting • Advocacy (advocacy meetings through parent-teacher assemblies, health education, and information dissemination)
DSWD*	• Capacity building (assistance of day care workers in drug distribution and administration) • Advocacy (health education and information dissemination to parents)
International agencies (SIDA†, WB-WSP‡) Academic institutions	• Technical assistance • Logistical support • Research for policy generation • Monitoring and evaluation of control programs and initiatives • Capacity building • Advocacy
Private sector (media, socio-civic groups, NGOs)	• Technical assistance • Logistical support • Advocacy (program marketing) • Social mobilization • Research (NGOs)

* Department of Social Welfare and Development

† Swedish International Development Cooperation Agency

‡ World Bank - Water and Sanitation Program

Given the continuing efforts and initiatives in the country, in spite of limitations in resources and manpower, policy makers should all the more be encouraged to provide creative and innovative ways of formulating solutions. Successful models in the local setting should be utilized and adapted for establishing sustainable helminth control interventions. School-based MDA in the IHCP may be scaled up after successful local initiatives such as the WOW Western Visayas, where teachers have direct participation in drug administration among elementary school children. Moreover, a memorandum involving the DOH and the DepEd requiring teachers to assist as drug administrators and program monitors will contribute to institutionalizing and sustaining school-based MDA. Other venues for MDA may also be explored, such as high schools and day care centers.

Existing collaboration with different sectors and local and international agencies should be strengthened by involving untapped agencies and resources in research, planning, and implementation of helminth control programs. To address the behavioral aspect of helminth control, participation of the social science sector may be considered to investigate the health seeking behavior and misconceptions regarding helminthiasis and its diagnosis and treatment. This will address questions regarding compliance to MDA strategies and knowledge, attitudes, and practices of elementary school teachers in MDA programs. Religious and media groups may also be tapped to provide support for advocacy and implementation of school-based helminth control interventions. Technology may also be tapped as a valuable resource for improving health education and advocacy efforts.

Furthermore, monitoring and evaluation of the different sentinel sites can also help identify challenges that need to be addressed, and good practices that may improve the DOH-IHCP. An efficient way of monitoring and evaluation is to identify parameters of success– the presence of national guidelines for school-based helminth control intervention and a declining prevalence of helminth infections in endemic areas, to name a few. The absence of such parameters indicates that there are gaps that need to be addressed. Only after these challenges are confronted head-on and parameters for success are properly identified and evaluated, can we achieve optimization of school-based helminth control interventions and move on towards more effective control of intestinal helminth infections and possibly their elimination as a public health problem in the Philippines.

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