



Effectiveness and Impact of Preventive Chemotherapy for Soil-Transmitted Helminth Control in the Philippines: A Systematic Review

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ABSTRACT

Background: Soil-transmitted helminthiasis remains a public-health concern in the Philippines despite the longstanding implementation of preventive chemotherapy. This systematic review evaluated the effectiveness, implementation, accessibility, sustainability, and economic implications of preventive chemotherapy programs for STH control in the country.

Methods: PubMed/MEDLINE, Scopus, Web of Science, Embase, the Cochrane Library, ScienceDirect, Google Scholar, HERDIN Plus, Philippine E-Journals, and relevant grey-literature sources were searched from inception to August 22, 2026. Eligible studies evaluated an organized STH deworming program in the Philippines and reported parasitological, clinical, behavioral, programmatic, accessibility, surveillance, or economic outcomes. Methodological quality was assessed using design-appropriate Joanna Briggs Institute appraisal domains. Because of substantial methodological and outcome heterogeneity, findings were synthesized narratively.

Results: Of 271 identified records, 47 full-text reports were assessed, and 13 reports representing 12 independent studies were included. Linked sentinel-surveillance reports showed significant reductions in STH prevalence and intensity after approximately three years of mass drug administration, although prevalence remained high among preschool-aged and school-aged children. Another program evaluation reported initial parasitological improvements followed by significant increases between 2009 and 2011 despite continued treatment. Program effectiveness was constrained by medicine-delivery delays, inadequate staffing, irregular surveillance, inaccurate coverage reporting, fear of adverse effects, limited confidence in teacher-assisted administration, geographical isolation, and persistent deficiencies in water, sanitation, and hygiene. Community-wide mass drug administration required greater total expenditure than expanded school-based treatment but had a lower cost per targeted person. One study had low methodological concern, nine had moderate concern, and two had great concern.

Conclusion: Preventive chemotherapy has reduced STH burden in the Philippines, but its effects have been incomplete and difficult to sustain. Durable control requires reliable surveillance, validated treatment coverage, community engagement, trained personnel, effective adverse-event management, equitable service delivery, and sustained integration with health education and WASH interventions.

Keywords: soil-transmitted helminthiasis, preventive chemotherapy, mass drug administration, deworming, Philippines, systematic review, WASH.

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INTRODUCTION

Soil-transmitted helminthiasis (STH) refers to intestinal parasitic infections caused primarily by *Ascaris lumbricoides*, *Trichuris trichiura*, and the hookworms *Necator americanus* and *Ancylostoma duodenale* [1]. These parasites are transmitted through soil contaminated with human feces: *A. lumbricoides* and *T. trichiura* infections result mainly from ingesting embryonated eggs, whereas hookworm infection usually occurs through skin penetration by infective larvae [2]. Infections may be classified by species, single or multiple infection, and intensity, light, moderate, or heavy, based on fecal egg counts [3].

Moderate- and heavy-intensity infections are associated with abdominal symptoms, anemia, malnutrition, impaired growth, and reduced physical and cognitive development, particularly among children [4].

Preventive chemotherapy involves periodically administering antihelmintic medicines to at-risk populations without prior individual diagnosis [5, 6]. It may be delivered to specific groups, particularly preschool- and school-aged children, or to entire eligible communities through mass drug administration [7]. Common preventive-chemotherapy regimens for soil-transmitted helminthiasis use a single oral dose of albendazole 400 mg or mebendazole 500 mg, administered annually or biannually according to local baseline prevalence [8].

The World Health Organization recommends annual treatment where prevalence is at least 20% but below 50%, and biannual treatment where baseline prevalence exceeds 50% [9]. Effectiveness is primarily assessed through changes in infection prevalence, intensity, cure rate, and egg reduction rate, commonly using the Kato–Katz stool examination [10]. Program impact may also be evaluated through treatment coverage, adherence, reinfection, anemia, nutritional outcomes, adverse events, acceptability, and cost [5]. Because treatment alone does not prevent environmental contamination or reinfection, it should be combined with safe water, sanitation, hygiene education, and proper fecal disposal [9, 11].

Soil-transmitted helminthiasis remains a population-level public-health concern because it disproportionately affects poor and marginalized communities, especially where safe water, sanitation, and hygiene (WASH) services are inadequate [12]. Poor sanitation enables fecal contamination of soil, sustaining transmission and increasing exposure among affected populations [13]. In the Philippines, soil-transmitted helminth (STH) transmission is sustained by interacting environmental and social determinants, including climatic conditions, poverty, and persistent gaps in water, sanitation, and hygiene. The national Integrated Helminth Control Program (IHCP) introduced large-scale, biannual preventive chemotherapy for preschool- and primary school-aged children in 2006; in 2016, school-based deworming was expanded to include secondary-school students up to 18 years of age. [14, 15].

Evidence suggests that preventive chemotherapy has reduced severe infection but has not achieved consistent control throughout the Philippines [16]. Following its introduction, the pooled prevalence of moderate- to heavy-intensity *A. lumbricoides* infection declined from 23.6% to 6.6%, while *T. trichiura* infection decreased from 12.2% to 2.7%. However, substantial residual infection remained, particularly for *T. trichiura*, against which single-dose albendazole and mebendazole have comparatively low efficacy. Program effectiveness may also be limited by reinfection, inadequate sanitation, missed treatment rounds, exclusion of out-of-school children and adults, concerns about adverse events, misinformation, and uneven community acceptance. Although community-wide treatment could reach untreated reservoirs, it requires greater financial and operational resources than school-based delivery [17–20].

Existing Philippine studies vary considerably in geographic coverage, populations, treatment schedules, diagnostic methods, follow-up periods, and outcome measures. Most have focused on prevalence among schoolchildren, with limited synthesis of infection intensity, reinfection, adherence, nutritional outcomes, community acceptability, implementation barriers, costs, and sustainability. This systematic review therefore aims to evaluate the effectiveness and population-level impact of preventive chemotherapy for STH control in the Philippines. Specifically, it will assess changes in infection prevalence and intensity; examine health, coverage, adherence, safety, and acceptability outcomes; compare effectiveness across species, populations, locations, and treatment strategies; evaluate available economic and sustainability evidence; and identify research and policy gaps relevant to strengthening national STH control.

METHODOLOGY

Study Design and Reporting Framework

This systematic review evaluated the effectiveness and population-level impact of preventive chemotherapy for the control of soil-transmitted helminthiasis (STH) in the Philippines. The review considered parasitological effectiveness together with program implementation, surveillance, acceptability, accessibility, water, sanitation, and hygiene (WASH), economic outcomes, and sustainability. The review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 statement [21]. A PRISMA 2020 flow diagram and checklist were used to document study identification, screening, eligibility assessment, and final inclusion.

Protocol and Registration

The review methods, eligibility criteria, outcomes, and planned synthesis were specified before the final study-selection and data-extraction stages. However, the protocol was not prospectively registered in the International Prospective Register of Systematic Reviews. Methodological decisions made during the review, including the decision not to conduct a meta-analysis because of insufficiently comparable evidence, were documented in the final manuscript.

Review Question and Eligibility Framework

The review addressed the following question: How effective has preventive chemotherapy been in reducing the prevalence, intensity, morbidity, and broader population-level impact of STH infections in the Philippines?

Eligibility was structured using the Population, Intervention, Comparator, Outcomes, and Study Design framework. The population comprised people residing in the Philippines who were at risk of or treated for STH infection, including preschool-aged children, school-aged children, adolescents, adults, parents, teachers, community members, health workers, program personnel, and other stakeholders involved in preventive-chemotherapy delivery. Eligible interventions included school-based deworming, targeted preventive chemotherapy, community-based treatment, and mass drug administration using albendazole, mebendazole, or another recognized antihelmintic regimen. Integrated programs combining preventive chemotherapy with health education, surveillance, or WASH interventions were also eligible. Comparators included pretreatment or baseline measurements, no treatment, another treatment regimen or frequency, an alternative delivery strategy, or another relevant programmatic approach. Studies without a formal comparator were eligible for the narrative synthesis when they reported acceptability, adherence, accessibility, surveillance, implementation, or economic outcomes directly related to an organized STH deworming program.

The primary outcomes were changes in overall and species-specific STH prevalence, infection intensity, moderate-to-heavy-intensity infection, cure rate, and egg-reduction rate. Secondary outcomes included reinfection, treatment coverage, actual drug ingestion, adherence, adverse events, anemia, nutritional status, growth, educational outcomes, knowledge and attitudes, community acceptability, implementation barriers, surveillance quality, accessibility, program costs, budget impact, cost-effectiveness, and sustainability.

Eligible designs included randomized and nonrandomized trials, quasi-experimental and before-and-after studies, cohort studies, repeated cross-sectional surveys, sentinel-surveillance reports, program evaluations, analytical cross-sectional studies, qualitative and mixed-methods studies, and economic evaluations.

Eligibility Criteria

Studies were included when they: (1) were conducted entirely or partly in the Philippines; (2) evaluated preventive chemotherapy or an organized deworming program for STH control; (3) reported at least one eligible parasitological, clinical, nutritional, educational, behavioral, programmatic, accessibility, surveillance, or economic outcome; and (4) provided sufficient information about the population, program, or intervention. Multicountry studies were eligible only when Philippine findings were reported separately. Studies of integrated helminth-control programs were included when findings relating to STH or shared implementation processes could be distinguished from those concerning schistosomiasis, lymphatic filariasis, or other infections.

Peer-reviewed articles, government and institutional reports, theses, dissertations, and other relevant grey literature were considered. Reviews, systematic reviews, meta-analyses, protocols without outcome data, policy or strategic frameworks without empirical findings, editorials, commentaries, case reports, small case series without program-level outcomes, laboratory-only studies, animal studies, and mathematical or spatial models without empirical evaluation of preventive chemotherapy were excluded. Studies reporting only STH prevalence, diagnostic accuracy, risk factors, or geographical distribution without describing exposure to or implementation of an organized preventive-chemotherapy program were also excluded from the effectiveness synthesis. No publication-date restriction was imposed. Eligible reports were required to be available in English or in a reliable English translation.

Information Sources and Search Period

Systematic searches were conducted in PubMed/MEDLINE, Scopus, Web of Science, Embase, the Cochrane Library, ScienceDirect, Google Scholar, HERDIN Plus, and Philippine E-Journals. Grey literature was sought from the websites and repositories of the Philippine Department of Health, Department of Education, World Health Organization, universities, and organizations involved in helminth-control programs. Reference lists of eligible studies and relevant reviews were examined manually, and forward and backward citation searching was undertaken for key publications. Searches covered each source from inception to August 22, 2026.

Search Strategy

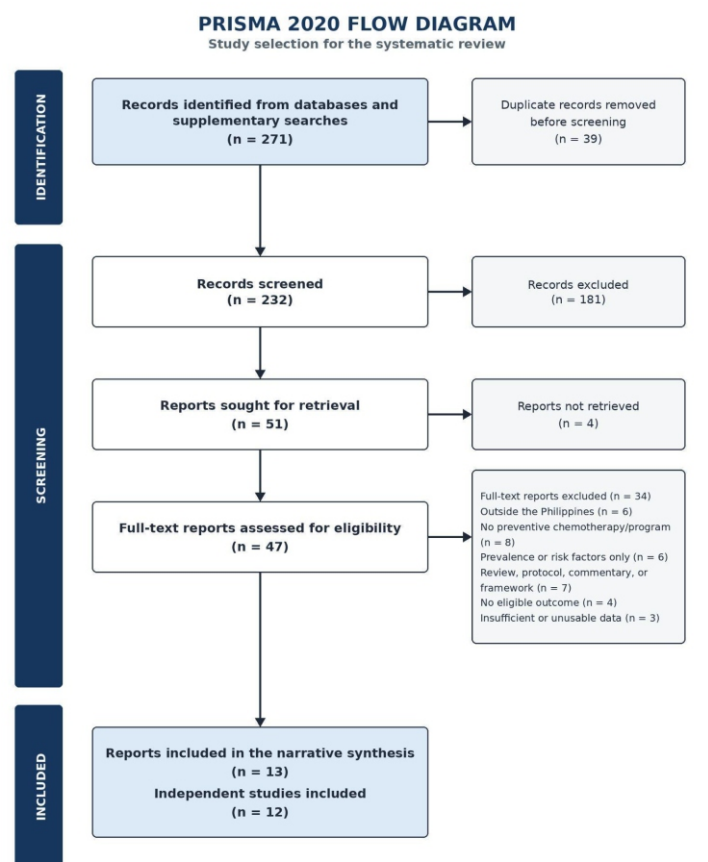
The search combined controlled vocabulary, including Medical Subject Headings where applicable, with free-text terms related to STH, preventive chemotherapy, and the Philippines. Search terms included combinations of “soil-transmitted helminth,” “soil-transmitted helminthiasis,” “STH,” “ascariasis,” “*Ascaris lumbricoides*,” “trichuriasis,” “*Trichuris trichiura*,” “hookworm,” “*Necator americanus*,” “*Ancylostoma duodenale*,” “preventive chemotherapy,” “deworming,” “mass drug administration,” “school-based deworming,” “albendazole,” “mebendazole,” “anthelmintic,” “Philippines,” “Filipino,” “Luzon,” “Visayas,” and “Mindanao.”

Boolean operators AND and OR were used to combine concepts, and syntax was adapted to the requirements of each database. Search dates, filters, complete database-specific strategies, and retrieval totals should be presented in a supplementary search-strategy table.

Study Selection

All identified records were compiled in a screening log, and duplicate records were removed before screening. Titles and abstracts were assessed against the eligibility criteria, after which potentially relevant full-text reports were retrieved and evaluated. Reasons for exclusion at the full-text stage were documented. Disagreements between reviewers were resolved through discussion, with consultation of another reviewer when consensus was not achieved.

A total of 271 records were identified. After 39 duplicates were removed, 232 records underwent title-and-abstract screening, of which 181 were excluded. The full texts of 51 reports were sought, but four could not be retrieved. Forty-seven full-text reports were assessed for eligibility, and 34 were excluded: six were conducted outside the Philippines, eight did not evaluate preventive chemotherapy or an organized deworming program, six reported prevalence or risk factors only, seven were reviews, protocols, commentaries, or frameworks, four did not report an eligible outcome, and three contained insufficient or unusable data. Thirteen reports representing 12 independent studies were included in the narrative synthesis. The baseline report by Belizario et al. [22] and its follow-up assessment (Belizario et al., [23] were linked and treated as one independent sentinel-surveillance study.



Data Extraction

A standardized extraction framework was used to record the author, publication year, study period, location, design, population, sample size, STH species, diagnostic method, baseline prevalence and infection intensity, antihelmintic medicine and dose, treatment frequency, delivery strategy, coverage, comparator, follow-up period, post-treatment prevalence and intensity, cure rate, egg-reduction rate, reinfection, health and educational outcomes, adverse events, adherence, acceptability, implementation barriers, surveillance findings, accessibility, WASH components, economic outcomes, funding, and reported conflicts of interest. Data were extracted from each eligible report and organized in structured evidence tables. When information was unclear or not reported, it was recorded as such rather than inferred. Multiple reports describing the same study population or program were linked to prevent double counting. For the linked Belizario reports, baseline and follow-up information was synthesized as one study while the separate report identities were retained.

Methodological Quality and Risk-of-Bias Assessment

Methodological quality was assessed using design-appropriate Joanna Briggs Institute critical-appraisal domains [24, 25]. Prevalence and sentinel-surveillance studies were examined for sampling, participant coverage, measurement validity, statistical analysis, and response adequacy. Repeated cross-sectional program evaluations were additionally assessed for temporal ambiguity, comparability of survey samples, the presence of a concurrent comparator, and potential confounding. Analytical cross-sectional studies were evaluated for participant selection, exposure and outcome measurement, identification and control of confounding, and appropriateness of analysis. Qualitative studies were examined for congruity between the research question, methodology, data collection, analysis, interpretation, researcher positioning, representation of participants' voices, and ethical conduct. Economic studies were assessed for clarity of perspective, identification and measurement of costs and consequences, appropriateness of assumptions, uncertainty analysis, and transferability. Relevant appraisal items were recorded as "yes," "no," "unclear," or "not applicable." Overall concern was classified as low when most applicable criteria were satisfied and no major limitation was identified, moderate when the study remained informative but had notable limitations or unclear methodological details, and high when major limitations substantially restricted causal interpretation or generalizability. One study was assessed as having low concern, nine as having moderate concern, and two as having great concern. No study was excluded solely because of methodological quality; the appraisal instead informed the weight given to each finding in the narrative synthesis.

Data Synthesis

Study characteristics and findings were summarized in evidence tables and synthesized narratively. The synthesis was organized into the following themes: (1) effectiveness and sustainability of preventive chemotherapy; (2) program monitoring, evaluation, and surveillance; (3) knowledge, acceptability, and participation; (4) implementation barriers, WASH integration, and equity; and (5) economic costs and budget impact.

Parasitological findings were interpreted separately from perceived effectiveness and programmatic outcomes. Studies reporting parental, teacher, community, or stakeholder perceptions were not treated as evidence of objective reductions in infection. Economic findings were also synthesized separately because they assessed costs and budget impact rather than parasitological effectiveness. Meta-analysis was not undertaken. Only a small number of studies directly evaluated changes in STH prevalence or intensity after preventive chemotherapy, and these differed in population, location, survey design, sampling, treatment program, follow-up period, diagnostic approach, and outcome reporting. The remaining evidence consisted primarily of qualitative studies, cross-sectional surveys, surveillance assessments, and economic evaluations. Statistical pooling would therefore have produced an unreliable summary estimate. For the same reasons, subgroup analysis, meta-regression, statistical heterogeneity testing, leave-one-out analysis, funnel-plot assessment, and tests for publication bias were not performed.

Certainty and Interpretation of the Evidence

A formal Grading of Recommendations Assessment, Development and Evaluation rating was not undertaken because the evidence comprised diverse study designs and outcomes and no pooled comparative effect estimates were generated. Certainty was instead considered narratively, taking account of methodological quality, consistency, directness, precision, and applicability to Philippine preventive-chemotherapy programs. Greater interpretive weight was assigned to objective parasitological findings and well-conducted economic or qualitative evaluations, while findings from small, purposively selected, self-reported, or perception-based studies were interpreted cautiously.

Ethical Considerations

Ethical approval was not required because the review used previously published studies and publicly available reports and did not involve participant recruitment or collection of identifiable personal information. Research integrity was maintained through accurate citation, transparent eligibility decisions, linkage of companion reports, avoidance of duplicate counting, faithful representation of study findings, documentation of methodological decisions, and disclosure of funding sources and potential conflicts of interest.

RESULTS

Overview of Included Studies

Thirteen eligible primary reports representing 12 independent studies were included in the narrative synthesis. Two reports described the baseline and follow-up phases of the same national sentinel-surveillance study and were therefore linked and treated as one study. The evidence evaluated parasitological trends following mass drug administration (MDA), program monitoring and surveillance, community knowledge and acceptability, implementation barriers, accessibility among vulnerable populations, and the economic implications of alternative preventive-chemotherapy strategies. Owing to substantial variation in study designs, populations, interventions, and outcomes, the findings were organized thematically. The characteristics of the included studies are summarized in Table 1.

Table 1: Characteristics of the Included Studies

Study	Location	Study design	Population and sample	Intervention or program assessed	Comparator/follow-up	Outcomes assessed	Evidence category
Belizario et al. (2009, 2015)	Six sentinel provinces, Philippines	Linked baseline and follow-up cross-sectional sentinel surveillance	Preschool-aged and Grade 3 school-aged children; sample size NR in the extracted information	MDA under the Philippine Integrated Helminth Control Program	Baseline versus follow-up after approximately three years of MDA	STH prevalence, infection intensity, heavy-intensity infection, and nutritional status	Parasitological effectiveness
Sanza et al. (2013)	Western Visayas	Repeated cross-sectional program evaluation	Three independent samples of Grade 3 pupils surveyed in 2007, 2009, and 2011; sample size NR	School-based mebendazole MDA through the War on Worms–Western Visayas program	2007 baseline compared with 2009 and 2011 surveys	Prevalence, infection intensity, parasite density, MDA coverage, nutritional status, and achievement-test scores	Effectiveness and sustainability
Parikh et al. (2013)	Guimaras Province	Cross-sectional KAP survey	531 parents and 105 teachers from 11 elementary schools	School-based MDA and teacher-assisted deworming	No comparator; cross-sectional assessment	Knowledge, attitudes, MDA acceptability, teacher confidence, adverse-event concerns, hygiene, and sanitation	Acceptability and participation
Garcia et al. (2017)	Selected LGUs in Luzon, Visayas, and Mindanao	Economic cost-estimation study	National, regional, and purposively selected local-government program data	Mass annual, mass biannual, targeted annual, and targeted biannual treatment	Comparison of four delivery and frequency strategies	Financial and nonfinancial costs, geographical cost variation, and implementation responsibilities	Economic evaluation
Lorenzo et al. (2019)	Northern Samar and Sorsogon	Qualitative study using focus-group discussions	Separate groups of parents and children; sample size NR	MDA for STH and schistosomiasis	No comparator; data collected in 2017 and 2018	Knowledge, perceptions, treatment acceptance, confidence in medicines, information gaps, and fear of adverse effects	Acceptability and implementation
Labana et al. (2019)	Cagayan Valley	Qualitative cross-sectional SWOT assessment	Teachers and staff from 20 elementary schools; participant number NR	MDA, health education, and school sanitation interventions	No comparator	Perceived program delivery, health education, sanitation, hygiene policies, monitoring, and surveillance needs	School-level implementation
Gallego and Abdullah (2021)	Marawi City	Descriptive-correlational study	50 parents or guardians of children who received deworming	National school-based deworming program	No comparator; cross-sectional assessment	Assessment, evaluation, monitoring, and perceived program effectiveness	Monitoring and perceived effectiveness
Ladia et al. (2023)	Eastern and Western Samar	Qualitative program evaluation	20 key informant interviews and eight focus-group discussions	School- and community-based MDA, <i>Garantisadong Pambata</i> , and WASH interventions after Typhoon Haiyan	No comparator	MDA delivery, coverage validation, surveillance, compliance, drug supply, adverse implementation conditions, and WASH	Implementation and integrated control
Ladia et al. (2024)	Aeta communities in Pampanga and Ata-Manobo communities in Davao del Norte	Qualitative accessibility study	11 government/education personnel, two Indigenous leaders, and three focus-group discussions	MDA, health education, and WASH services for Indigenous school-aged children	No comparator	Accessibility, medicine availability, staffing, cultural beliefs, stigma, geographical isolation, safety concerns, and sanitation	Equity and accessibility
Delos Trinos et al. (2024)	Zamboanga Peninsula	Cost survey and budget-impact analysis	Government program and cost data; sample size not applicable	Community-wide MDA versus expanded school-based targeted preventive chemotherapy	Annual comparison and five-year budget projection	Total economic cost, cost per targeted person, financial cost, and budget impact	Economic evaluation
Belizario et al. (2024)	National, regional, provincial, and municipal levels, Philippines	Policy review with qualitative key informant interviews	10 STH and schistosomiasis control-program personnel	National surveillance supporting STH-control and preventive-chemotherapy programs	No comparator	Surveillance processes, quality assurance, diagnostic capacity, workforce, data management, and digital-tool adoption	Surveillance and monitoring
Vasquez (2026)	Rural barangays in Tagkawayan, Quezon	Quantitative correlational study	90 purposively selected community residents	Participation in deworming, clinic consultation, and STH health-education activities	No comparator; cross-sectional assessment	Knowledge, attitudes, preventive practices, deworming participation, and associated demographic factors	Participation and preventive practices

Abbreviations: KAP, knowledge, attitudes, and practices; LGU, local government unit; MDA, mass drug administration; NR, not reported in the available extracted information; STH, soil-transmitted helminthiasis; SWOT, strengths, weaknesses, opportunities, and threats; WASH, water, sanitation, and hygiene.

Effectiveness and Sustainability of Preventive Chemotherapy

Belizario et al. [22, 23] reported the baseline and follow-up phases of sentinel surveillance in six Philippine provinces. At baseline, stratified cluster sampling among Grade 3 pupils showed a cumulative soil-transmitted helminth (STH) prevalence of 54.0%, with heavy-intensity infection affecting 23.1% of the children; worm burden was also associated with nutritional status. The follow-up assessment compared preschool-aged and school-aged children with the earlier measurements after approximately three years of MDA under the Philippine Integrated Helminth Control Program. Parasitological indicators declined significantly, but cumulative prevalence remained high at approximately 43.7% among preschool-aged children and 44.7% among school-aged children. Thus, the linked reports showed that MDA reduced STH prevalence and intensity at the population level but did not achieve adequate morbidity control, as a substantial residual burden persisted.

Sanza et al. [26] evaluated the War on Worms–Western Visayas program, a school-based mebendazole MDA initiative introduced in 2007. Repeated cross-sectional parasitological surveys were conducted using independent samples of Grade 3 pupils in 2007, 2009, and 2011, with supporting aggregate data on MDA coverage, nutritional status, and National Achievement Test scores. Cumulative STH prevalence, infection intensity, and parasite density initially declined after program implementation. However, all three parasitological indicators increased significantly between 2009 and 2011 despite continued MDA. Declining achievement-test scores and worsening nutritional status were also reported. The findings indicated an important initial program effect but raised concerns about the long-term sustainability of repeated mebendazole MDA when sanitation, hygiene, health education, and program monitoring remained insufficient. The key findings on the effectiveness and sustainability of preventive chemotherapy are summarized in Table 2.

Table 2: Effectiveness and Sustainability of Preventive Chemotherapy

Study	Population and setting	Preventive-chemotherapy strategy	Assessment period	Baseline findings	Follow-up findings	Other outcomes	Interpretation
Belizario et al. (2009, 2013)	Preschool-aged and school-aged children in six Philippine sentinel provinces	Mass drug administration (MDA) under the Philippine Integrated Helminth Control Program	Baseline assessment followed by evaluation after approximately three years of MDA	Cumulative STH prevalence among Grade 3 pupils was 54.0%, while heavy-intensity infection was 23.1%. Worm burden was associated with nutritional status.	Parasitological indicators decreased significantly, but cumulative prevalence remained approximately 43.7% among preschool-aged children and 44.7% among school-aged children.	Infection intensity and nutritional status were assessed.	MDA reduced STH prevalence and intensity, but the remaining burden was high, and morbidity-control targets were not fully achieved.
Sanza et al. (2013)	Independent samples of Grade 3 pupils in Western Visayas	School-based mebendazole MDA through the War on Worms–Western Visayas program	Repeated cross-sectional surveys in 2007, 2009, and 2011	Baseline parasitological indicators were measured in 2007. Exact values were not available in the extracted information.	Cumulative prevalence, infection intensity, and parasite density initially declined but increased significantly between 2009 and 2011 despite continued MDA.	MDA coverage, nutritional status, and National Achievement Test scores were examined. Worsening nutritional status and declining test scores were reported.	School-based MDA produced an initial benefit, but the improvement was not sustained, indicating continuing transmission, reinfection, or program-implementation limitations.

Note: Only these studies directly evaluated population-level parasitological changes associated with preventive chemotherapy. Studies measuring perceived effectiveness, acceptability, implementation barriers, surveillance, or costs are presented separately.

Abbreviations: MDA, mass drug administration; STH, soil-transmitted helminthiasis.

Program Monitoring, Evaluation, and Surveillance

Gallego and Abdullah [27] examined the perceived effectiveness of the national school-based deworming program among 50 parents or guardians in Marawi City. Assessment, evaluation, and monitoring before and after deworming were significantly associated with perceived program effectiveness, with reported chi-square values of 108.494 and 42.957 ($p < .001$). Because the outcomes reflected parental perceptions rather than parasitologically confirmed changes, the findings primarily demonstrated the importance of clearly defined procedures for pretreatment assessment, post-treatment monitoring, and recognition of adverse reactions.

Belizario et al. [28] combined a review of surveillance policies with key informant interviews involving 10 STH and schistosomiasis control-program personnel working at national, regional, provincial, and municipal levels. The study identified weaknesses in quality assurance, limitations in diagnostic procedures and data management, and insufficiently trained health personnel.

Participants also expressed interest in adopting improved diagnostic and digital surveillance tools. The findings demonstrated the need for stronger quality-assurance systems, workforce capacity, and standardized data collection, recording, and reporting to support reliable evaluation of preventive-chemotherapy programs.

Similar monitoring challenges were documented by Ladia et al. [30] in selected Haiyan-affected communities in Eastern and Western Samar. Based on 20 key informant interviews and eight focus-group discussions, STH preventive chemotherapy for preschool-aged children was delivered through the *Garantisadong Pambata* program, while school-aged children received treatment through a teacher-assisted approach. However, STH surveillance was irregular, and MDA coverage reports contained discrepancies arising from typographical errors and the inclusion of teachers and transient migrants. Rapid Coverage Assessments were used to validate the submitted figures.

These findings showed that weaknesses in surveillance and reporting could limit the accurate assessment of program reach and impact.

Knowledge, Acceptability, and Participation

Parikh et al. [31] surveyed 531 parents and 105 teachers from 11 elementary schools in Guimaras Province. More than 90% of both groups expressed favorable attitudes toward MDA. Nevertheless, 69.0% of parents and 75.5% of teachers believed that stool examination was required before treatment. In addition, 37.0% of parents would not permit teachers to administer deworming tablets, and 91.5% feared that teachers would be unable to recognize adverse effects. Only 48.0% of teachers believed that they could administer the medicines safely, while 81.4% were concerned about managing adverse reactions. Open defecation was reported by 47.8% of parents and 42.2% of teachers. Thus, favorable attitudes coexisted with misconceptions about MDA, limited confidence in teacher-assisted drug administration, fear of adverse events, and inadequate sanitation. Lorenzo et al. [19] similarly identified barriers to MDA participation through separate focus-group discussions with parents and children in Northern Samar and Sorsogon. Participants generally demonstrated appropriate biomedical knowledge and expressed willingness to participate in MDA. However, inadequate information dissemination, lack of confidence in deworming medicines, and fear of adverse effects reduced acceptance. The findings showed that willingness to participate could be undermined when communities received insufficient information or lacked confidence in program implementation and adverse-event management.

Vasquez [32] assessed knowledge, attitudes, and preventive practices among 90 purposively selected residents of rural barangays in Tagkawayan, Quezon. Respondents had an overall knowledge score of 7.74 and a strongly favorable attitude score, with a weighted mean of 3.74. Despite generally positive knowledge and attitudes, participation in clinic consultations, deworming, and health-education activities remained low. Sex and educational attainment were significantly associated with attitudes, while sex and occupation were associated with preventive practices. These findings further demonstrated that adequate knowledge and favorable attitudes did not necessarily translate into participation in organized STH-control activities. However, the small purposively selected sample limits the generalizability of the results.

Implementation Barriers, WASH Integration, and Equity

Labana et al. [33] conducted a qualitative cross-sectional assessment in 20 elementary schools in an STH-endemic area of Cagayan Valley. Teachers and school staff generally regarded MDA as a well-delivered program. Nevertheless, weaknesses remained in health education, hygiene-related school policies, sanitation practices, and the monitoring of program outcomes. Participants emphasized the need for current local prevalence data and consistent monitoring to guide school-level control activities. The findings indicated that successful delivery of preventive chemotherapy did not eliminate the need for stronger health education, sanitation, hygiene policies, and surveillance.

Ladia et al. [30] also documented operational barriers in Haiyan-affected communities. MDA implementation was affected by delayed drug delivery, insufficient personnel, participant noncompliance, and poor drug palatability.

Water, sanitation, and hygiene interventions were constrained by inadequate handwashing facilities, limited access to safe water, and the non-use of available sanitary toilets. Local governments, private organizations, and Plan International Philippines supported sanitation facilities, Community-Led Total Sanitation, and health-advocacy activities, illustrating the importance of multisectoral participation in integrated STH control.

Equity-related barriers were particularly evident in the qualitative study of selected Aeta communities in Pampanga and Ata-Manobo communities in Davao del Norte by Ladia et al. [29]. Key informant interviews and focus-group discussions identified inadequate staffing, drug shortages, poor inventory management, and delayed medicine delivery as barriers to MDA accessibility. Participation was further affected by concerns about treatment safety and efficacy, fear of adverse events, stigma, cultural beliefs, and limited understanding of the similarity between school- and community-based MDA. Geographic isolation, peace-and-order conditions, inadequate water supplies, and poor sanitation created additional constraints. These findings demonstrated that program accessibility depended on both health-system capacity and the cultural, geographical, and infrastructural circumstances of Indigenous communities.

Economic Costs and Budget Impact

Garcia et al. [34] estimated the economic costs of four STH-control strategies: mass annual, mass biannual, targeted annual, and targeted biannual treatment. Financial and nonfinancial resource inputs were collected from purposively selected local government units in Luzon, the Visayas, and Mindanao between June and October 2013, with national-level costs obtained through Department of Health regional offices. Mass biannual treatment was the most expensive strategy, whereas targeted annual treatment was the least expensive. Costs and implementation responsibilities varied across island groups and levels of government, demonstrating the influence of the devolved health system on program financing and delivery. Because some estimates were extrapolated using assumptions from other costing studies, they should be interpreted with appropriate caution. Delos Trinos et al. [18] compared community-wide MDA with expanded school-based targeted preventive chemotherapy in the Zamboanga Peninsula from a government-payer perspective. Based on 2021 costs, the estimated annual economic cost of MDA was US\$ 809,000 (95% CI: US\$679,000–US\$950,000), or US\$0.22 per targeted person (95% CI: US\$0.19–US\$0.26). Expanded school-based preventive chemotherapy had a lower annual cost of US\$625,000 (95% CI: US\$549,000–US\$706,000), but a higher per-person cost of US\$0.57 (95% CI: US\$0.54–US\$0.64). The cost per targeted person can be expressed as: $\text{Cost per targeted person} = \frac{\text{Total annual economic cost}}{\text{Number of persons targeted}}$. Accordingly, the reported estimates indicate that although community-wide MDA had a higher total annual economic cost than expanded school-based preventive chemotherapy, its broader target population resulted in a lower economic cost per targeted person (US\$0.22 versus US\$0.57). Over five years, MDA was projected to cost US\$3.113 million (95% CI: US\$2.475–US\$3.810 million), approximately US\$740,000 more than expanded school-based treatment (95% CI: US\$486,000–US\$1.019 million). Community-wide MDA would increase economic and financial costs by 29% and 31%, respectively, while requiring an estimated 0.2% increase in the Department of Health's total STH-control expenditure.

Thus, MDA required a larger overall budget but achieved a lower cost per targeted person because of its broader population reach.

Holistic integration

The eligible evidence showed that preventive chemotherapy produced an initial reduction in STH prevalence and infection intensity, but maintaining these gains was difficult. Program effectiveness was influenced by the quality of surveillance and monitoring, drug availability, workforce capacity, community information, confidence in medicines, management of adverse events, and teacher preparedness. Persistent sanitation deficiencies, geographical isolation, cultural considerations, and inconsistent participation further limited program reach. Economic evidence indicated that community-wide MDA would require greater total expenditure than school-based preventive chemotherapy, although its cost per targeted person was lower. Collectively, the findings support an integrated approach in which preventive chemotherapy is accompanied by reliable surveillance, health education, WASH improvements, community engagement, and context-sensitive delivery strategies. The methodological strengths, principal limitations, and overall risk-of-bias judgments for the included studies are summarized in Table 4.

Table 4: Methodological Quality and Risk-of-Bias Assessment of Included Studies

Study	Design/appraisal approach	Methodological strengths	Principal limitations or risk-of-bias concerns	Overall concern
Belizario et al. (2009, 2015)	Linked prevalence and repeated cross-sectional sentinel surveillance; JBI Prevalence and Quasi-Experimental domains	Stratified cluster sampling at baseline; six sentinel provinces; standardized parasitological outcomes; baseline–follow-up comparison	Different cross-sectional samples rather than longitudinal follow-up; no concurrent untreated comparator; possible changes in population composition, coverage, diagnostic implementation, and other contextual factors	Moderate
Sanza et al. (2013)	Repeated cross-sectional program evaluation; JBI Quasi-Experimental domains	Three survey periods; objective parasitological measurements; assessment of prevalence, intensity, parasite density, coverage, nutrition, and educational outcomes	Independent samples at each survey; no concurrent control group; aggregate coverage and educational data; possible confounding by secular, environmental, diagnostic, and implementation changes	Moderate
Parikh et al. (2013)	Cross-sectional KAP survey; JBI Analytical Cross-Sectional domains	Large sample of parents and teachers from 11 schools; directly assessed MDA attitudes, misconceptions, and teacher confidence	Self-reported outcomes; sampling and nonresponse details require verification; social-desirability bias; cross-sectional design prevents causal inference	Moderate
Garcia et al. (2017)	Economic cost-estimation study; JBI Economic Evaluation domains	Included financial and nonfinancial inputs from national, regional, and local levels; compared four treatment strategies; considered geographical variation	Purposively selected LGUs; some strategies and costs were extrapolated using external assumptions; findings may not represent all regions or current costs	Moderate
Lorenzo et al. (2019)	Qualitative focus-group study; JBI Qualitative Research domains	Included separate parent and child perspectives in two high-burden provinces; directly explored MDA acceptance and barriers	Participant selection, researcher reflexivity, and data-saturation procedures require full-text verification; group discussions may be affected by social-desirability and dominant-participant bias; STH and schistosomiasis findings may overlap	Moderate
Labana et al. (2019)	Qualitative cross-sectional SWOT assessment; JBI Qualitative Research domains	Included personnel from 20 schools; examined MDA, health education, sanitation, and monitoring within the school setting	Participant-selection procedures and reflexivity require verification; reliance on stakeholder perceptions; no objective program or parasitological outcome measurement; limited transferability beyond the selected area	Moderate
Gallego and Abdullah (2021)	Descriptive-correlational survey; JBI Analytical Cross-Sectional domains	Used a tested questionnaire and examined monitoring practices from the perspective of parents or guardians	Small sample of 50 participants; perceived rather than objectively measured effectiveness; unclear control of confounding; limited statistical detail and generalizability; cross-sectional association cannot establish program effectiveness	High
Ladia et al. (2023)	Qualitative program evaluation; JBI Qualitative Research domains	Used 20 key informant interviews and eight focus groups; included multiple stakeholder perspectives; examined MDA, surveillance, coverage validation, and WASH	Manual analysis and researcher reflexivity require verification; findings are context-specific to selected post-Haiyan communities; combined STH and schistosomiasis program information may not always be separable	Moderate
Ladia et al. (2024)	Qualitative accessibility study; JBI Qualitative Research domains	Included government, education, health, and Indigenous community perspectives; used interviews and separate focus groups; applied an accessibility framework	Selected communities and relatively small stakeholder sample limit transferability; researcher influence and saturation require verification; findings primarily reflect reported experiences rather than measured coverage effects	Moderate
Delos Trinos et al. (2024)	Cost survey and budget-impact analysis; JBI Economic Evaluation domains	Clear government-payer perspective; direct comparison of delivery strategies; uncertainty addressed through Monte Carlo simulation; costs and confidence intervals reported	Conducted in one region; projections depend on assumptions about implementation and coverage; did not incorporate measured infection outcomes or estimate comparative cost-effectiveness	Low

Belizario et al. (2024)	Policy review with qualitative key informant interviews; JBI Qualitative Research domains	Included personnel across national, regional, provincial, and municipal levels; examined surveillance processes, quality assurance, workforce, and data systems	Only 10 informants; recruitment, reflexivity, and saturation require verification; combined STH and schistosomiasis surveillance findings; policy-review and interview evidence may differ in methodological quality	Moderate
Vasquez (2026)	Quantitative correlational survey; JBI Analytical Cross-Sectional domains	Used a structured questionnaire and assessed knowledge, attitudes, practices, and participation in an underserved rural setting	Small purposively selected sample of 90 residents; substantial selection bias and limited generalizability; self-reported behavior; possible residual confounding; cross-sectional design prevents causal inference	High

Interpretation: Low concern indicates that most relevant methodological criteria were adequately addressed and no major limitation was identified. Moderate concern indicates that the study remained informative but contained design limitations or methodological information requiring clarification. High concern indicates major limitations that substantially restrict causal interpretation or generalizability. Studies were not excluded solely because of methodological limitations; the appraisal was used to guide the weight given to their findings in the narrative synthesis.

Important note: These judgments are preliminary because the supplied material contained summarized study information rather than complete articles and item-level JBI responses. The ratings should be confirmed against the full texts before journal submission.

Abbreviations: JBI, Joanna Briggs Institute; KAP, knowledge, attitudes, and practices; LGU, local government unit; MDA, mass drug administration; STH, soil-transmitted helminthiasis; SWOT, strengths, weaknesses, opportunities, and threats; WASH, water, sanitation, and hygiene.

DISCUSSION

Principal Findings

This systematic review synthesized 13 reports representing 12 independent studies on the effectiveness and broader implementation of preventive chemotherapy for soil-transmitted helminthiasis (STH) in the Philippines. The evidence indicates that mass drug administration (MDA) can reduce infection prevalence and intensity, but these gains have not been consistently sustained. The available studies also show that the impact of preventive chemotherapy depends on more than drug delivery alone. Surveillance quality, treatment coverage, medicine availability, workforce capacity, community confidence, teacher preparedness, health education, water, sanitation, and hygiene (WASH), and the accessibility of services all influenced program performance. Economic evidence further demonstrated that expanding treatment from school-based delivery to community-wide MDA would require a larger overall budget, although it could reduce the cost per person targeted and reach untreated population reservoirs.

The strongest direct evidence of program impact came from the linked sentinel-surveillance reports and the War on Worms–Western Visayas evaluation. Belizario et al. [22, 23] documented significant reductions in parasitological indicators after approximately three years of MDA, but cumulative prevalence remained high among both preschool-aged and school-aged children. Similarly, Sanza et al. [26] observed an initial decline in cumulative prevalence, infection intensity, and parasite density after the introduction of school-based mebendazole MDA, followed by a significant increase between 2009 and 2011 despite continued treatment. Taken together, these findings suggest that preventive chemotherapy can reduce morbidity in the short term but may be insufficient to maintain control when reinfection, incomplete participation, operational weaknesses, and continuing environmental transmission are not adequately addressed.

Effectiveness and Sustainability of Preventive Chemotherapy

The reduction in infection prevalence and intensity reported following MDA supports the continued use of preventive chemotherapy as a central component of Philippine STH-control policy. However, the persistence and subsequent rebound of infection demonstrate an important distinction between temporarily reducing worm burden and interrupting transmission.

Albendazole and mebendazole remove susceptible infections from treated individuals, but they do not prevent renewed exposure to infective eggs or larvae in contaminated environments. Where open defecation, inadequate sanitation, unsafe water, and inconsistent hygiene practices continue, treated children may become reinfected after returning to the same environmental conditions.

The resurgence observed by Sanza et al. [26] also raises questions about program continuity, actual drug ingestion, population coverage, treatment frequency, and the suitability of repeated reliance on a single benzimidazole regimen. Administrative reports showing that medicines were distributed may not accurately represent the proportion of eligible individuals who swallowed the medicine. Furthermore, school-based programs may miss children who are absent, not enrolled, or unable to attend treatment activities, as well as infected adults who can contribute to continuing community transmission. Consequently, high reported coverage among enrolled schoolchildren may coexist with persistent infection at the population level.

The findings do not establish that preventive chemotherapy is ineffective. Rather, they indicate that its effectiveness is conditional upon sustained implementation, high treatment uptake, reliable monitoring, and complementary measures that reduce reinfection. The linked baseline and follow-up surveillance reports are particularly important because they demonstrate meaningful population-level reductions while also showing that the remaining burden was still substantial [22, 23]. Preventive chemotherapy should therefore be viewed as an essential morbidity-control intervention rather than a stand-alone strategy capable of eliminating transmission under all conditions.

Monitoring, Evaluation, and Surveillance

The review identified surveillance and monitoring as major determinants of program effectiveness. Belizario et al. [28] reported weaknesses in quality assurance, diagnostic capacity, workforce preparation, and data collection and reporting. Ladia et al. [30] similarly found irregular STH surveillance and discrepancies in MDA coverage reports caused by typographical errors and the inclusion of teachers and transient migrants. Such problems can distort estimates of treatment coverage and make it difficult to determine whether persistent infection results from inadequate treatment uptake, rapid reinfection, diagnostic limitations, or other implementation failures.

The use of Rapid Coverage Assessments in Haiyan-affected communities illustrates a practical method for validating routinely reported coverage [30]. Nevertheless, coverage indicators should distinguish between tablets distributed and tablets actually ingested. Monitoring should also document eligible populations, absentees, refusals, contraindications, adverse events, medicine shortages, and delayed treatment rounds. These indicators would provide a more accurate picture of program reach and help identify groups that are systematically missed. Gallego and Abdullah [27] found that assessment, evaluation, and monitoring were associated with parents' perceptions of program effectiveness. Although this study did not establish objective reductions in infection, it demonstrated that visible monitoring practices may influence public confidence. Communities are more likely to trust deworming programs when they understand how children are assessed, how adverse reactions will be managed, and how program outcomes are evaluated. Strengthening monitoring may therefore improve both technical program performance and community acceptance.

Diagnostic methods also influence the apparent effectiveness of preventive chemotherapy. As infection intensity declines, less-sensitive diagnostic methods may fail to detect low-intensity infections, producing an overly favorable impression of program success. Surveillance systems consequently require standardized procedures, consistent quality assurance, and diagnostic approaches appropriate to the transmission setting. Digital data systems, strengthened workforce training, and external quality-assurance mechanisms may improve the timeliness, completeness, and reliability of surveillance data [28].

Community Knowledge, Acceptability, and Treatment Participation

Community attitudes toward MDA were generally favorable, but willingness did not consistently translate into treatment participation. Parikh et al. [31]

found that more than 90% of parents and teachers supported MDA; nevertheless, misconceptions about the need for stool examinations, low confidence in teacher-assisted administration, and fear of adverse events remained common. Only about half of teachers believed that they could administer deworming medicines safely, while most expressed concern about managing possible reactions. Lorenzo et al. [19] similarly identified inadequate information, limited confidence in medicines, and fear of adverse effects as barriers despite generally correct knowledge and willingness to participate.

These findings suggest that information campaigns should go beyond general messages encouraging deworming. Communication should explain why preventive chemotherapy is administered without individual diagnostic testing, identify common and usually transient adverse effects, clarify when medical evaluation is required, and describe the safeguards used during treatment. Parents should be informed before each treatment round, and teachers should receive practical training on eligibility screening, medicine administration, documentation, observation, first response, and referral procedures. The presence or availability of health personnel during school-based treatment may further improve confidence among parents and teachers.

Vasquez [32] found that residents could demonstrate adequate knowledge and favorable attitudes while participation in deworming, clinic consultation, and health-education activities remained low. This knowledge–practice gap indicates that educational interventions alone may be insufficient when logistical, cultural, occupational, or service-access barriers are present. Programs must therefore identify why informed individuals do not participate and tailor delivery to the needs of specific communities. However, the small purposefully selected sample in that study limits the extent to which its findings can be generalized. The principal findings relating to community acceptability, program implementation, surveillance, WASH, and equity are summarized in Table 3.

Table 3: Acceptability, Implementation, Surveillance, WASH, and Equity Findings

Study	Participants and methods	Main domain	Key findings	Program implication
Parikh et al. (2013)	KAP survey of 531 parents and 105 teachers from 11 elementary schools in Guimarães	MDA acceptability and teacher participation	More than 90% held favorable attitudes toward MDA. However, 69.0% of parents and 75.5% of teachers believed stool examination was required before MDA. Approximately 37.0% of parents opposed teacher administration; 91.5% feared teachers could not detect adverse effects. Only 48.0% of teachers felt able to administer treatment safely, while 81.4% feared managing adverse effects. Open defecation was reported by 47.8% of parents and 42.2% of teachers.	Correct MDA misconceptions, train teachers in administration and adverse-event management, strengthen parental communication, and improve sanitation.
Lorenzo et al. (2019)	Separate focus-group discussions with parents and children in Northern Samar and Sorsogon	Community perceptions and participation	Participants generally had appropriate knowledge and expressed willingness to join MDA. Participation was limited by inadequate information, lack of confidence in deworming medicines, and fear of adverse effects.	Improve information dissemination, community consultation, confidence-building, and adverse-event preparedness.
Labana et al. (2019)	Qualitative SWOT assessment involving teachers and staff from 20 elementary schools in Cagayan Valley	School-level implementation	MDA was generally perceived as well delivered. Weaknesses remained in health education, sanitation, hygiene-related school policies, and program monitoring.	Combine MDA with stronger school health education, enforceable hygiene policies, sanitation, and current local surveillance data.
Gallego and Abdullah (2021)	Descriptive-correlational survey of 50 parents or guardians in Marawi City	Monitoring and perceived effectiveness	Assessment, evaluation, and monitoring before and after deworming were significantly associated with perceived program effectiveness ($p < .001$). No objective parasitological effect was measured.	Establish clear procedures for pretreatment assessment, post-treatment monitoring, documentation, and adverse-reaction recognition.
Ladia et al. (2023)	20 key informant interviews and eight focus-group discussions in Eastern and Western Samar	Post-Haiyan implementation and WASH	STH treatment was delivered through <i>Garantisadong Pambata</i> and teacher-assisted school-based MDA. Barriers included delayed medicine delivery, insufficient personnel, noncompliance, poor drug palatability, irregular surveillance, and inaccurate coverage reports. WASH limitations included inadequate handwashing facilities, unsafe water, and non-use of toilets.	Strengthen medicine logistics, staffing, coverage validation, surveillance, health education, and multisectoral WASH implementation.

Ladia et al. (2024)	Interviews with 11 government or education personnel and two Indigenous leaders, plus three focus-group discussions in Aeta and Ata-Manobo communities	Equity and accessibility	MDA access was limited by staffing shortages, inadequate medicine supplies, inventory problems, delivery delays, geographical isolation, insecurity, cultural beliefs, stigma, safety concerns, inadequate water, and poor sanitation.	Adapt program delivery and communication to Indigenous communities and geographically isolated settings, with community-leader participation.
Belizario et al. (2024)	Policy review and interviews with 10 control-program personnel at different administrative levels	Surveillance and quality assurance	Weaknesses were found in diagnostic quality assurance, workforce capacity, data collection, recording, and reporting. Participants supported improved diagnostic and digital surveillance tools.	Standardize surveillance procedures, strengthen laboratory quality assurance and workforce training, and introduce reliable digital reporting systems.
Vasquez (2026)	Correlational survey of 90 purposively selected residents in rural Tagkawayan, Quezon	Knowledge and preventive participation	Respondents had generally adequate knowledge and strongly favorable attitudes, but participation in deworming, clinic consultation, and health-education activities remained low. Sex and education were associated with attitudes, while sex and occupation were associated with preventive practices.	Use community-based, gender-responsive, and occupation-sensitive interventions to convert favorable attitudes into participation.

Abbreviations: KAP, knowledge, attitudes, and practices; MDA, mass drug administration; STH, soil-transmitted helminthiasis; SWOT, strengths, weaknesses, opportunities, and threats; WASH, water, sanitation, and hygiene.

WASH, Health Education, and Integrated Control

The included studies consistently demonstrated that preventive chemotherapy operates within a broader environmental and behavioral context. Labana et al. [33] found that teachers and school personnel generally regarded MDA as well delivered, but identified weaknesses in health education, sanitation, school hygiene policies, and outcome monitoring. Parikh et al. [31] also documented continuing open defecation in communities. In Haiyan-affected areas, inadequate handwashing facilities, limited safe-water access, and non-use of sanitary toilets weakened the environmental components of STH control [30]. These findings help explain why infection may rebound after initially successful treatment. MDA reduces worm burden in treated people, whereas WASH and health education aim to reduce exposure and environmental contamination. These interventions are therefore complementary rather than interchangeable. Toilets must be accessible, acceptable, functional, and consistently used; safe water must be reliably available; handwashing facilities require water and soap; and health education must be culturally understandable and linked to feasible preventive practices. Infrastructure construction without sustained use, maintenance, and behavior change is unlikely to produce the intended reduction in transmission. Schools provide an important platform for integrating deworming, hygiene education, handwashing, sanitation monitoring, and community engagement. However, school-based control should be coordinated with local health authorities and community programs so that preschool-aged children, out-of-school children, and other untreated groups are not overlooked. The involvement of local governments, private organizations, and development partners in post-Haiyan communities demonstrates the potential value of multisectoral collaboration [30].

Equity and Accessibility

The findings among Aeta and Ata-Manobo communities demonstrate that national programs may not be equally accessible to all populations. Ladia et al. [29] identified medicine shortages, inadequate staffing, delivery delays, geographic isolation, insecurity, poor water access, cultural beliefs, stigma, and concerns regarding treatment safety and efficacy. These barriers interact: medicine availability alone does not guarantee participation when communities face difficult travel conditions, lack adequate information, or distrust the intervention.

Improving equity requires more than applying a uniform national delivery model. Treatment schedules, communication strategies, distribution points, and monitoring procedures should be adapted to local circumstances and developed with community leaders. Indigenous health workers, teachers, parents, and local organizations can help ensure that information is culturally appropriate and that implementation respects community practices. Coverage reports should also be disaggregated by age, sex, location, school attendance, ethnicity or Indigenous status where ethically appropriate, and other indicators of vulnerability. Without such data, apparently high overall coverage may conceal systematically underserved populations.

Economic and Policy Implications

The economic findings illustrate the trade-off between the affordability and reach of different treatment strategies. Garcia et al. [34] found that mass biannual treatment was the most expensive of the four assessed strategies, whereas targeted annual treatment was the least expensive. Costs varied across island groups and levels of government, reflecting differences in responsibilities within the devolved Philippine health system. This decentralization means that national policy may not be implemented uniformly when local governments have unequal resources, workforce capacity, and logistical systems. Delos Trinos et al. [18] estimated that community-wide MDA in the Zamboanga Peninsula would cost more in total than expanded school-based preventive chemotherapy but less per targeted person. The annual economic cost of community-wide MDA was estimated at US\$809,000, compared with US\$625,000 for expanded school-based treatment; however, the corresponding costs per targeted person were US\$0.22 and US\$0.57, respectively. Over five years, community-wide MDA was projected to require approximately US\$740,000 in additional government expenditure. These findings indicate that expansion would require deliberate budget allocation but could achieve economies of scale and reach adults who may contribute to continuing transmission.

The economic studies evaluated costs and budget impact rather than directly linking expenditure to measured reductions in infection, disability, or quality-adjusted health outcomes. They therefore cannot determine whether community-wide MDA is more cost-effective than school-based treatment. Future economic evaluations should integrate program costs with epidemiological outcomes, reinfection, coverage, equity, and the potential longer-term benefits of reduced transmission.

Decision-makers should also consider whether investing in WASH, surveillance, and health education alongside preventive chemotherapy produces more sustainable value than increasing treatment frequency alone.

Strengths and Limitations of the Evidence

This review brought together parasitological, programmatic, behavioral, qualitative, equity, surveillance, and economic evidence, allowing preventive chemotherapy to be assessed as both a biomedical intervention and a public-health delivery system. The inclusion of perspectives from parents, teachers, health workers, program personnel, Indigenous leaders, and affected communities provided insight into why technically sound programs may achieve uneven results.

Several limitations should nevertheless be considered. First, few eligible studies directly measured changes in STH prevalence or intensity following preventive chemotherapy. Much of the evidence concerned perceptions, implementation barriers, surveillance, or costs. Second, the parasitological studies used repeated cross-sectional or sentinel-surveillance designs rather than randomized comparisons, limiting causal attribution. Changes over time may reflect differences in sampled populations, diagnostic procedures, secular trends, environmental conditions, or other interventions in addition to MDA. Third, the included studies varied substantially in location, population, treatment strategy, and outcome measurement, limiting direct comparison and precluding meaningful statistical pooling. Fourth, several qualitative and survey studies were conducted in selected communities with small or purposively selected samples, which restricts generalizability. Fifth, some reports addressed integrated STH and schistosomiasis programs, so findings specific to STH were not always completely separable. Finally, cost projections depended partly on modelling assumptions and may not fully reflect current prices, local capacity, or implementation conditions across all Philippine regions.

Implications for Research and Practice

Future studies should use standardized parasitological outcomes, including species-specific prevalence, infection intensity, moderate-to-heavy-intensity infection, cure rate, egg-reduction rate, and reinfection at clearly defined follow-up periods. Prospective evaluations should document the medicine, dose, treatment frequency, actual ingestion, coverage, adherence, adverse events, missed populations, and concurrent WASH or educational interventions. Where feasible, longitudinal or controlled designs should be used to strengthen causal inference.

Research should also determine whether community-wide treatment produces greater and more sustained reductions than school-based delivery under Philippine conditions. Particular attention is needed for *Trichuris trichiura*, persistent transmission areas, out-of-school children, adults, geographically isolated communities, and Indigenous populations. Studies comparing alternative or combination drug regimens, supported by efficacy and resistance monitoring, would help determine whether continued reliance on standard single-dose benzimidazoles remains appropriate in all settings.

For practice, the findings support maintaining preventive chemotherapy while strengthening the systems around it. Priority actions include validating treatment coverage, monitoring actual drug ingestion, improving medicine forecasting and delivery, training teachers and health workers,

establishing clear adverse-event protocols, expanding culturally appropriate community communication, and linking MDA with functional WASH services. National targets should be accompanied by subnational monitoring so that persistent hotspots and underserved populations can receive intensified, context-specific interventions.

CONCLUSION

Preventive chemotherapy has contributed to reducing the burden of STH in the Philippines, but the available evidence indicates that reductions have been incomplete and difficult to sustain. Persistent transmission cannot be explained or addressed through drug efficacy alone. Program impact is shaped by treatment participation, surveillance quality, workforce and supply capacity, community trust, environmental sanitation, health education, equity, and local financing. A sustained and context-sensitive strategy combining preventive chemotherapy with reliable monitoring, WASH improvements, community engagement, and targeted support for underserved populations is therefore required to achieve durable morbidity control and progress toward eliminating STH as a public-health problem in the Philippines.

LIMITATIONS

This review has several limitations. First, relatively few eligible studies directly measured changes in STH prevalence or infection intensity following preventive chemotherapy; much of the available evidence focused on perceptions, implementation barriers, surveillance, accessibility, or costs. Second, the main parasitological studies used sentinel-surveillance or repeated cross-sectional designs rather than randomized or longitudinal comparisons, limiting causal attribution. Observed changes may have been influenced by differences in sampled populations, diagnostic methods, environmental conditions, secular trends, and concurrent interventions. Third, substantial heterogeneity in populations, locations, treatment strategies, follow-up periods, and outcome measurements prevented a meaningful meta-analysis. Fourth, several qualitative and survey studies involved small or purposively selected samples, limiting the generalizability of their findings. Some studies also examined combined STH and schistosomiasis programs, making it difficult to separate findings specific to STH. Economic estimates were partly based on modelling assumptions and may not reflect current costs or implementation conditions across all Philippine regions. Finally, the restriction to English-language and accessible reports may have resulted in the omission of relevant unpublished government reports, local studies, or other grey literature. Consequently, the findings should be interpreted as a narrative synthesis of the available evidence rather than a definitive causal estimate of preventive-chemotherapy effectiveness.

RECOMMENDATIONS

Based on the findings of this review, the following recommendations are directed to the relevant authorities:

1. Department of Health: Strengthen the Integrated Helminth Control Program by improving medicine forecasting, procurement, storage, and timely distribution. Treatment coverage should be validated based on actual drug ingestion rather than the number of tablets distributed. Standard protocols for pretreatment assessment, adverse-event management, referral, surveillance, and reporting should also be implemented consistently.

2. Department of Education: Provide teachers with regular training on deworming-drug administration, eligibility screening, documentation, recognition of adverse effects, and appropriate referral procedures. STH prevention, sanitation, handwashing, and proper toilet use should be strengthened within the school curriculum and routine school-health activities.

3. Local government units: Allocate sufficient funding, personnel, medicines, transportation, and other logistical resources for preventive chemotherapy and WASH activities. Local governments should identify communities with persistent infection, low treatment participation, inadequate sanitation, and limited access to health services and provide them with targeted support.

4. Rural health units and community health workers: Conduct culturally appropriate information campaigns before every treatment round. These campaigns should address misconceptions about preventive chemotherapy, explain why stool examination is not routinely required before MDA, clarify expected adverse effects, and inform communities about available medical assistance.

5. Water, sanitation, and environmental authorities: Expand access to safe water, functional toilets, handwashing facilities, and proper waste disposal. WASH infrastructure should be regularly monitored to ensure that facilities remain functional, accessible, maintained, and consistently used.

6. Indigenous Peoples' authorities and community leaders: Adapt treatment schedules, communication materials, and distribution strategies to the cultural, geographical, and security conditions of Indigenous and geographically isolated communities. Indigenous leaders and local health workers should be involved in planning, implementing, and monitoring STH-control activities.

7. National and local surveillance authorities: Standardize diagnostic procedures, strengthen laboratory quality assurance, introduce reliable digital reporting systems, and conduct regular sentinel surveillance. Coverage and infection data should be disaggregated by age, sex, location, school attendance, and vulnerable-population status to identify underserved groups.

8. Research institutions and funding agencies: Support prospective and controlled studies evaluating species-specific prevalence, infection intensity, cure rate, egg-reduction rate, reinfection, adherence, adverse events, and cost-effectiveness. Further research should compare school-based and community-wide MDA and evaluate alternative or combination drug regimens where standard benzimidazole treatment shows limited effectiveness.

Authorities should maintain preventive chemotherapy while integrating it with reliable surveillance, health education, community engagement, and sustainable WASH interventions. Stronger coordination among the Department of Health, Department of Education, local governments, schools, communities, and development partners is necessary to achieve sustained STH control in the Philippines.

Generative AI Declaration

During the preparation of this manuscript, the authors used ChatGPT for proofreading assistance. All content was subsequently reviewed and edited by the authors, who assume full responsibility for the accuracy and integrity of the published work.

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