SURVEILLANCE OF SOIL-TRANSMITTED HELMINTHIASIS AND SCHISTOSOMIASIS IN THE PHILIPPINES: REVIEW OF CURRENT POLICIES, GUIDELINES AND PRACTICES

Vicente Belizario Jr[1,2], Sofia Anne Marie Ampo[1], Kiersten Henderson[3], Tala de los Santos[4], Emily Gerth-Guyette[4], Lorenzo Maria de Guzman[1], Carlo Lumangaya[1], Taggart Siao[1] and Rupert Stephen Charles S Chua[1]

[1]Neglected Tropical Diseases Study Group, National Institutes of Health, [2]Department of Parasitology, College of Public Health, University of the Philippines Manila, Manila, the Philippines, [3]Parasite ID Corp, Seattle, WA, USA, [4]PATH, Seattle, WA, USA

Abstract. Neglected tropical diseases (NTDs) mostly impact vulnerable populations in tropical and subtropical areas, which include schistosomiasis (SCH) and soil-transmitted helminthiasis (STH). It is recommended to use a national surveillance system to periodically assess disease prevalence to ensure that programs remain aligned with national goals for disease control. The implementation of surveillance activities at the national, regional, provincial, and municipal levels, the benefits and drawbacks of control programs, and the potential for the development and adoption of new tools to support diagnosis and surveillance were reviewed in this study, along with national policies on STH and SCH surveillance. Ten key informants from control programs at the national, regional, provincial, and municipal levels were interviewed. The study also described the roles of relevant stakeholders in the surveillance for STH and SCH, and the typical processes and data flow for surveillance, along with strengths and challenges for implementation. Participants expressed interest in applying cutting-edge surveillance and diagnostic methods. Opportunities for enhancement of the surveillance program were identified, such as engagement of a dedicated "external team", development of policies and better quality assurance programs, augmentation of health personnel's capacity, and creation and application of a digital program to support diagnosis, data collection, recording and reporting. These improvements should enable enhancement of policy and subsequent service delivery for better public health outcomes.

Keywords: health policy review, national surveillance system, Philippines, schistosomiasis, soil-transmitted helminthiasis, surveillance tool

Correspondence: Vicente Y Belizario Jr, College of Public Health, UP Manila, 625 Pedro Gil Street, Ermita, Manila 1000, Philippines
Tel: +63 2523 5929 Ext 142 E-mail: vybelizario@up.edu.ph

INTRODUCTION

Neglected tropical diseases (NTDs) such as soil-transmitted helminthiasis (STH) and schistosomiasis (SCH) are diseases of poverty, which predominantly affect vulnerable populations in tropical and subtropical areas (WHO, 2020). STH is a parasitic infection caused by the giant roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*) and hookworms (*Necator americanus* and *Ancylostoma duodenale*), while SCH is caused by blood flukes of the genus *Schistosoma*. In the Philippines, SCH is caused by *Schistosoma japonicum*. STH and SCH may present with anemia, signs of malnutrition, gastrointestinal disorders, impaired cognitive function, stunting, and developmental delay (WPRO-WHO, 2017).

STH and SCH affect globally approximately 800 and 240 million people respectively (WHO, 2020). The most recent prevalence survey for STH and SCH in the Philippines revealed a national prevalence of 28.4 (Tangcalagan *et al*, 2022) and 4.0% (DOH, 2019a), respectively. The World Health Organization (WHO) recommends preventive chemotherapy, robust disease management, provision of safe water, proper sanitation, and good hygiene practices to control STH and SCH. For the latter, additional strategies should include veterinary public health and vector ecology and management (WPRO-WHO, 2017). In the Philippines, the Department of Health (DOH) implements the Integrated Helminth Control Program (IHCP) and the Schistosomiasis Control and Elimination Program (SCEP) for the delivery of STH and SCH control strategies respectively (DOH, 2006; DOH, 2007).

WHO (2001) defines surveillance as the process of systematic collection and analysis of data, followed by prompt dissemination of findings to inform relevant stakeholders. Periodic assessment of disease prevalence through a national surveillance system is recommended to ensure that programs continue

to reflect national disease control priorities, remain efficient and capitalize on all opportunities to integrate activities (WHO, 2001).

This study reviewed national policies on surveillance of STH and SCH, described the implementation of surveillance activities at national, regional, provincial, and municipal levels, identified relevant strengths and challenges faced by control programs, and highlighted opportunities for the development and adoption of new tools to aid diagnosis and surveillance. The findings of the study should provide guidelines towards the installment of a regular review process for monitoring on-going achievements and improving the country's national health policy on the surveillance of STH and SCH.

MATERIALS AND METHODS

Research design and implementation

A review of policies was conducted through a search of published guidelines and policies on surveillance from the WHO and DOH, the Philippines. A qualitative case study was also designed to describe the implementation of STH and SCH surveillance at national, regional, provincial, and municipal levels. The region, province and municipality were selected based on documented endemicity for STH and SCH, their implementation of control programs, including surveillance, for both STH and SCH in the area, and the willingness of the DOH regional office and local government units (LGUs) to participate in the study.

Qualitative data collection was carried out via key informant interviews (KIIs). The interviews were conducted from April to May 2021 and recorded online via Zoom (Zoom Video Communications Inc, San Jose, CA) using a semi-structured questionnaire consisting of nine items to elicit information on i) roles and responsibilities of the informants in surveillance, ii) typical processes and data flow for surveillance, including strengths and challenges in implementation, and iii) interest in adopting new tools to aid diagnosis and surveillance.

The key participants included ten program personnel at the national (n = 1), regional (n = 5), provincial (n = 2), and municipal (n = 2) levels involved in at least one of the following activities, namely, policy formulation, planning, implementation, and monitoring

and evaluation of STH and SCH control programs.

Data processing and analysis

Video and audio recordings of each interview were uploaded and securely stored in a designated Box drive (Box Inc, Redwood City, CA), an online file storage and synchronization service. Each interview was transcribed in a separate Word document and uploaded to the same Box drive. Transcriptions of the interviews were generated and reviewed by the research team. A matrix of responses to the KII questionnaire was then developed to aid in identifying common themes, which were then interpreted as the results of the study.

Ethical considerations

The study protocol was reviewed and approved by the University of the Philippines Manila Research Ethics Board (UPMREB Code: 2019-326-01) and adhered to the Data Privacy Act of 2012 (National Privacy Commission, 2012) and the National Ethical Guidelines for Health and Health-Related Research 2017 (PHREB, 2018). Written prior consent was obtained from each participant, who also was advised of their right to withdraw from the study at any time. Data collected were anonymized and access to data was limited to designated members of the research team. Results of the study are to be shared with the DOH, concerned LGUs and other stakeholders.

RESULTS

Inclusion of surveillance programs in national policies

Surveillance for SCH was included in the national policy under the Schistosomiasis Control and Elimination Program (SCEP) (DOH, 2007), while STH surveillance was included in the national policy upon establishment of the Integrated Helminth Control Program (IHCP) (DOH, 2006) (Table 1). A strategic plan for STH Control 2017-2022 was developed by the DOH outlining goals, indicators and activities for STH reduction in the country (DOH, 2017). Similarly, a strategic plan for SCH Control 2019-2025 outlined strategies for the interruption of local transmission of SCH (DOH, 2019a). These documents also recommended guidelines for control programs, such as prevalence targets, mass drug administration (MDA) coverage targets, strategies for control of infection, and budgetary

Table 1

Policies issued by the Department of Health (DOH), the Philippines with provisions on soil-transmitted helminthiasis and schistosomiasis surveillance

Policy number	Title
DOH AO 2006-0028 (DOH, 2006)	Strategic and Operational Framework for Establishing Integrated Helminth Control Program
DOH AO 2007-0015 (DOH, 2007)	Revised Guidelines in the Management and Prevention of Schistosomiasis
DOH DC 2020-0129 (DOH, 2020a)	Adoption of the Schistosomiasis Control and Elimination Program Strategic Plan for 2019-2025
DOH DC 2020-0132 (DOH, 2020b)	Adoption of the Integrated Helminth Control Program Strategic Plan for 2017-2022 Monitoring and Evaluation (M&E) Field Guide for the Integrated Helminth Control Program

estimates. The DOH also formulated a Monitoring and Evaluation (M&E) Field Guide for IHCP to track the implementation and program outputs (DOH, 2019b). Completion of the equivalent document for SCEP was unfortunately interrupted by the COVID-19 pandemic.

Surveys of prevalence are recommended to be conducted every three to four years for STH (WHO, 2012) and every two years for SCH (WHO, 2013). In the Philippines, IHCP guidelines state that national STH prevalence surveys are be conducted every five years (DOH, 2006) and the recently issued SCEP strategic plan states that focal surveys for SCH in known endemic areas be conducted every three years (DOH, 2019a). Guidelines on passive surveillance through case reporting using the Field Health Services Information System (FHSIS) at the local level (DOH, 2010a) are in place.

WHO recommends the use of the Kato-Katz technique to process stool samples for the diagnosis of STH and SCH. Parasite species are identified during microscopy and the intensity of infection is quantified by determining eggs per gram (EPG) of feces (Montresor *et al*, 1998). Quality control during surveillance is performed by

re-examination of 10% of the slides by a reference microscopist blinded to initial results (Montresor *et al*, 1998). In the Philippines, IHCP and SCEP guidelines do not explicitly state performance of quality control during surveillance (DOH, 2006; DOH, 2019a).

WHO (2011) also recommends the collection of the following indicators in M&E of helminth control programs: i) process indicators determining whether organizational elements function properly, ii) performance indicators assessing coverage, and iii) impact indicators assessing the effects of the programs on health status.

Role of stakeholders in surveillance of STH and SCH

The DOH central and regional offices spearhead policy formulation and oversee the implementation of policies and guidelines at the provincial and city/municipal levels. In addition, they monitor the implementation of surveillance activities and allocate the annual budget for control programs.

For surveillance, the WHO recommends the selection of a "field team" composed of a team leader from the central level, laboratory technicians from the regional or provincial hospitals, and auxiliary workers from the local health units (WHO, 2011). The Department of Education (DepEd) issues memoranda for the implementation of both STH and SCH control and surveillance activities, such as MDA and school-based surveillance. DepEd also provides additional manpower such as school teachers during school-based surveillance to assist the "field team" of healthcare workers. Teachers compiled the master list of enrolled school-aged children, and Parent-Teacher Associations facilitated the provision of consent for participation.

In addition to the field team, WHO (2001) recommended there should be an "external team" composed of an epidemiologist, a laboratory expert and a designated WHO Country Office focal person. However, there was no mention of an "external team" in the national policies related to SCH and SCH surveillance.

Municipal LGUs through the Rural Health Units (RHUs) serve as the main implementers of surveillance activities in their respective localities. Municipal health workers functioned as the "field team" in addition to their routine work at the RHU, and barangay (village) health workers

(BHWs) participated in stool sample collection and processing. The RHU medical technologist performed microscopy and the recording and reporting of data. The DOH regional office and Provincial Health Office (PHO) may provide support to the RHUs during the conduct of surveillance in the form of additional health human resources, supplies, and equipment.

Similarly, research work from collaborating academic institutions in selected sites is supported by the DOH regional office and cascades down to the PHO and RHUs. Requests for research on surveillance of STH and SCH in areas under the jurisdiction of the DOH regional office were processed through appropriate channels: from the region and province to the specific municipalities where their respective offices provided necessary and feasible support as requested by the collaborating researchers.

Implementing partners for research, such as the Research Institute for Tropical Medicine and the University of the Philippines Manila, among others, can provide technical support for program implementation to guide policy formulation and enhancement of service delivery. The National Commission on Indigenous Peoples may assist in the coordination with tribal leaders prior to the conduct of surveillance activities in indigenous people communities.

Current status of STH and SCH surveillance

In the Philippines, surveillance was an LGU-implemented effort, supported by funding from the national control programs to the regional offices. Passive surveillance involving regular reporting of disease data from symptomatic patients in RHUs was via a reporting network collected at each RHU, while active surveillance, entailing the surveillance of all individuals in areas at risk for disease regardless of symptoms, was implemented in school and community settings. Active surveillance was conducted prior to a scheduled MDA. The conduct of active surveillance activities was highly dependent on the availability of resources (both manpower and financial), thereby greatly affecting the scheduling and frequency of these activities.

For both passive and active surveillance, stool samples were processed using the Kato-Katz technique and examined through microscopy by RHU medical

technologist/s, according to WHO recommendations (Montresor *et al*, 1998) and the national guidelines (DOH, 2019b). In the RHU, quality control was performed by a second reader from the same facility, who was usually not blinded to the initial results. Discrepancies between readings might be settled by a third reader/reference microscopist from the PHO or the DOH regional office, who likewise was not blinded to the initial results.

For passive surveillance, RHU medical technologists initially recorded patients' information and parasitological data in designated logbooks; for active surveillance, data were initially recorded in paper-based forms. The municipal surveillance officer compiles and encodes reports containing both passive and active surveillance data, usually as an electronic spreadsheet, prior to the submission of reports to provincial coordinators and regional program managers through paper-based and electronic reports. The regional statistician may conduct further analysis of the surveillance data. Compiled data were utilized at the regional level for policy formulation and planning and also submitted to the office of the national program manager at the DOH central office. At the DOH central office, technical staff compiled the data from different regions as input for decision-making by the program manager at the national level, which might include the provision of additional support for areas with higher levels of endemicity. Surveillance data were used to enhance the implementation of the control programs including resource allocation (*eg* financial allotment, assignment of manpower and conduct of succeeding surveillance). Fig 1 summarizes the flow of surveillance data from the municipal level to the DOH central office.

Surveillance data were transmitted officially through paper-based reports. Information could also be transmitted through non-formal channels, such as instant messaging, text messaging or e-mail upon request, although these would not be considered official until the paper-based reports have also been submitted. The duration of data collection and submission from the RHU to the next pertinent authority was variable, lasting from a week to six months.

Strengths and good practices

At the national level, the DOH develops the policies and guidelines

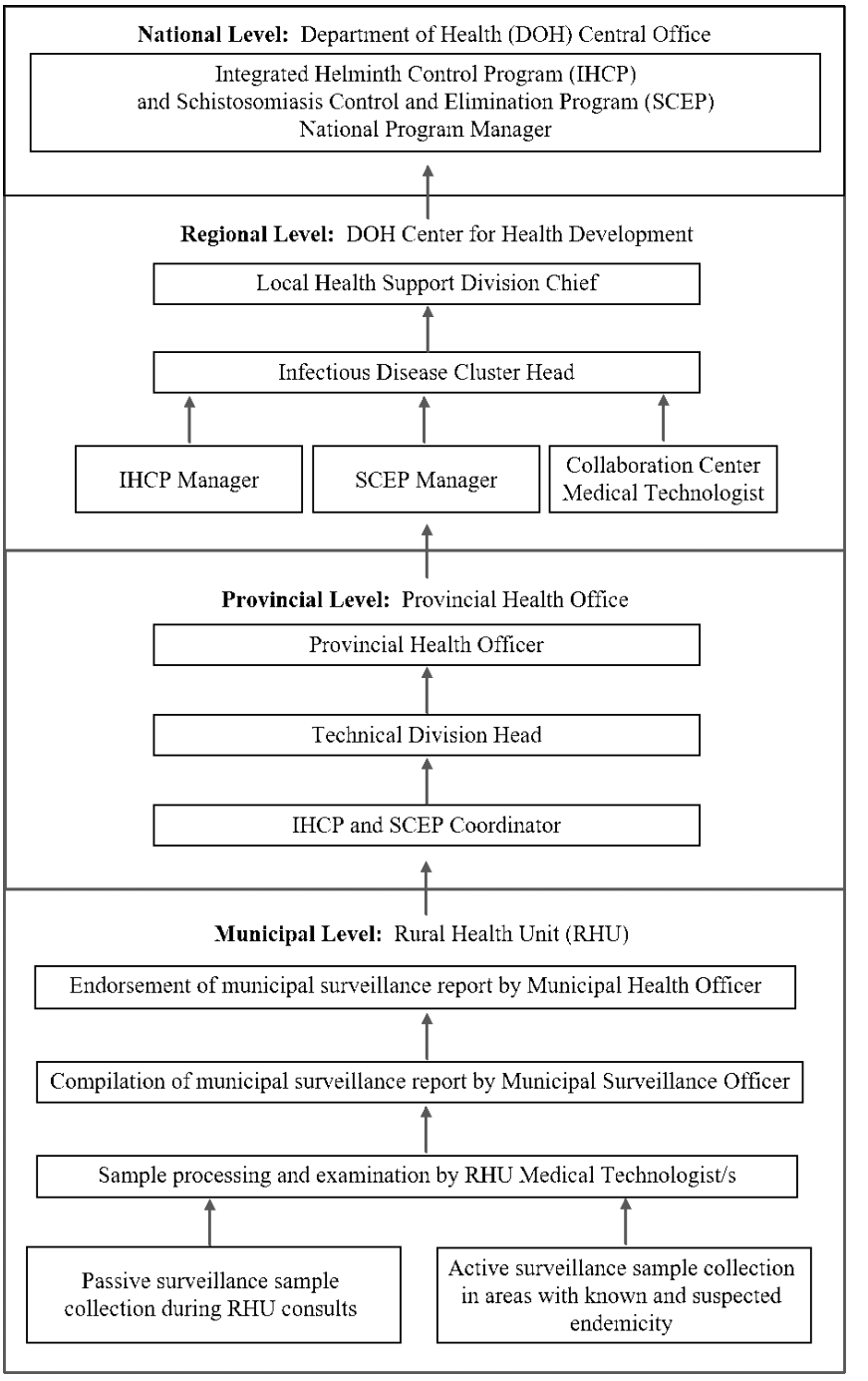

Fig 1 - Summary of surveillance data flow from municipal level to Department of Health (DOH) central office, the Philippines

of the national control programs and utilizes data from surveillance programs in the decision-making process. National targets for control were specified in the updated strategic plans for STH (DOH, 2017) and SCH (DOH, 2019a), which are intended to serve as a basis for program planning. Updated guidelines (DOH, 2019b) for M&E of the STH control program are also disseminated by the DOH, as a resource for municipal to national levels.

In the area (Department of Health National and Davao Regional Offices) where the study was conducted, the STH and SCH control programs were led by experienced personnel in key positions in the DOH central and regional offices and the LGUs. The IHCP/SCEP National Program Manager had more than nine years of experience in the field. The Local Health Support Division Chief of the region had 20 years of experience, and the Infectious Diseases Cluster Head had six years of experience in their respective fields. At the provincial level, the program coordinators had undergone academic and short-term training in public health and their respective programs. Health personnel at the municipal level were able to institute program implementation according to the local situation, as they were from and resided in the respective area.

Challenges in the implementation of surveillance activities of STH and SCH

There was limited familiarity with and adherence to guidelines for surveillance programs of STH and SCH across different levels of the health system. This was demonstrated by differences in the participant's knowledge of the recommended frequency of surveillance and the reported procedure for quality control. All participants reported that surveillance activities were done prior to scheduled mass drug administration (MDA)in agreement with WHO recommendations (Montresor *et al*, 1998), albeit at varying intervals depending on the availability of manpower and financial resources. Quality control, when conducted, was not consistent with WHO recommended methodology (Montresor *et al*, 1998).

Personnel was limited within the RHU with adequate knowledge, capacity and experience to undertake surveillance procedures following global and national guidelines.

Attrition due to transfer or retirement from service further reduced the pool of trained individuals, leading to the assignment of other programs (eg tuberculosis control program) to the same program manager for STH and SCH surveillance at the regional and provincial levels. Limitations in the number of health personnel have also resulted in competing roles between routine laboratory work and additional surveillance activities. Furthermore, staff also reported limited opportunities for capacity building.

Apart from challenges in human resources in the health sector, limited budgetary allocation contributed to a lack of regularity in the conduct of surveillance. The budget for control programs is determined initially at the national level and is distributed among the specific activities at the regional, provincial, and municipal levels. Informants reported reductions in the budget for STH and SCH control programs in recent years, and the COVID-19 pandemic has caused the reallocation of funds from the STH and SCH control programs, adversely affecting program implementation.

A paper-based system continues to be the official means of recording and reporting surveillance data for STH and SCH. The completion of paper-based reports was indicated as the major cause for the delay in the submission of information to the next pertinent authority. The data collection, recording and reporting tools used at the municipal level were inconsistent with the prescribed tool by the national control program. For instance, data recorded for "test done" and eggs per gram (EPG) were found only in the recording tool at the municipal level. Furthermore, regional and provincial recording tools have headings for pre-identified species under which respective egg counts were manually recorded, while the municipal equivalent tool has only a single heading for manual input of species, with another heading for manual input of egg counts.

Willingness to adopt new technology and a digital scheme for surveillance

All participants reported willingness to be involved in the development of a digital scheme for surveillance of STH and SCH. A high-level official at the regional level indicated that a digital scheme would assist in decreasing the workload of health personnel conducting active case findings, identifying other parasites, informing policy formulation,

prompting initiation of surveillance, and identifying specific geographic areas for prioritization. Participants also identified factors that would help with the adoption of new technology and the transition into a digital scheme, namely, only minimal additional infrastructure requirements for integration of new technology, user-friendly navigation instructions for implementation of the new technology and provision of training courses for control program personnel.

DISCUSSION

This study described the policies and practices on surveillance for STH and SCH at regional, province and municipality levels in the Philippines and sought out the strengths and challenges in implementation of these programs via structured interviews.

National policies were consistent with global policies regarding the recommended methods for diagnosing intestinal helminth infections. Specific indicators for M&E of control programs were recorded according to international guidelines (Montresor *et al*, 1998; WHO, 2011; DOH, 2017; DOH, 2019a), and the frequency of active surveillance was specified for both STH and SCH as recommended (DOH, 2006; WHO, 2012; WHO, 2013; DOH, 2019a). A provision for the conduct of passive surveillance was included in the national policy (DOH, 2010b). Strategic plans of the DOH included updated goals, indicators and activities related to the reduction of STH (DOH, 2017) and to the interruption of SCH transmission (DOH, 2019a). An M&E Field Guide for the IHCP was also issued (DOH, 2019b). Updated and region-specific policies to strengthen surveillance and response systems focused on NTDs were developed to inform subsequent planning and implementation (Ng'etich *et al*, 2021).

Gaps in national policies concerning surveillance for STH and SCH were identified. While the M&E Field Guide for the IHCP has been published, the equivalent document for the SCEP has yet to be completed. Another difference observed between global and national policies is the lack of an "external team" dedicated to surveillance. An "external team" would ensure that routine laboratory services in the RHU are not compromised and that bias from self-monitoring is avoided.

There is also a lack of national policy on a quality assurance scheme (QAS), which includes quality control for the diagnosis of STH and SCH (Belizario *et al*, 2014). These findings highlight the need for the national control program to complete the M&E Field Guide for the SCEP, the addition of provisions for dedicated health human resources for surveillance, and the inclusion of a QAS for both STH and SCH in the national policy. The challenge posed by the COVID-19 pandemic made access to routine health programs such as MDA for STH and SCH difficult due to the shift in public health priorities (Maravilla *et al*, 2023). Because of the disruptions in STH and SCH control programs caused by the COVID-19 pandemic, it is recommended to conduct surveillance to determine the effects of the pandemic on control efforts for STH and SCH.

Advocacy and capacity-building will help ensure familiarity with and adherence to recommendations by program implementers, thus ensuring efficiency and standardization (WHO, 2011; Ng'etich *et al*, 2021).

Personnel with an academic background in public health and years of experience in related programs occupy key positions in control programs for STH and SCH at central and regional DOH offices. Professionals with such academic background and expertise can help enhance the formulation of policy relevant to the health priorities of the country and the implementation of control programs (Onwujekwe *et al*, 2020). The limited number of RHU personnel trained in surveillance procedures leads to an increased workload and competing roles between routine and surveillance activities. Understaffing could force health workers to prioritize one activity at the expense of the other (e.g., patient care versus surveillance reporting) (Mwatondo *et al*, 2016). Additionally, limited budgetary allocations affect the regularity of surveillance, preventing effective implementation (Ng'etich *et al*, 2021). In this regard, the national policy should include provisions for the establishment of a workforce dedicated to and budgetary allocation for surveillance. The creation of a surveillance "external team" drawn from personnel from regional or provincial health offices should be considered, with the aim to minimize competing roles and to

avoid bias in M&E. Collaboration with other external research groups with funding separate from research institutions or institutions with technical support from the DOH offices and the local health sectors, may also contribute to lessening the burden of seeking budget allocation for surveillance programs, while at the same time generating necessary data for procuring funding of control programs.

Compliance with the recommended method for diagnosis (*ie* use of the Kato-Katz technique for processing stool samples recommended by Montresor *et al*, 1998) was reported by all participants. Subsequently, to assess the impact of control programs WHO (2011) recommended measurements of the following parasitological indicators: i) overall prevalence of any STH, ii) prevalence of each STH and SCH, iii) overall proportion of heavy-intensity (HI) infection of any STH, iv) proportion of HI per STH species, and v) proportion of HI SCH. The sensitivity of Kato-Katz ranges from 59.0 to 96.9% for a single smear in STH detection (Endris *et al*, 2013), and from 51.1 to 84.1% for SCH (Lin *et al*, 2008). However, sensitivity for both STH and SCH detection decreases with lower intensity of infection (Belizario *et al*, 2017). The technique is also limited by the diagnostic capacity of the microscopist. In addition, current reported practices of quality control do not conform with WHO-recommended procedures (WHO, 1998). As such, the introduction of more sensitive diagnostic methods is recommended in low-intensity settings. Continuous capacity-building opportunities for health personnel involved in surveillance activities, including quality control and enhancement of training in parasitological assessment in academic (undergraduate and graduate) programs are also recommended (Belizario *et al*, 2014).

Dependence on a paper-based reporting system and inconsistent use of non-formal reporting channels led to delays and inaccuracy of reports, hindering the retrieval of previously reported data and acting as a barrier to the adoption of novel paper-less (digital) recording and reporting systems (Ng'etich *et al*, 2021). Inconsistencies in reporting surveillance data and the lack of adequate reporting tools deter efforts to effectively investigate specific diseases and result in the loss of vital information necessary

to implement adequate responses (Ng'etich *et al*, 2021). Respondents recognized the benefits of utilizing a digital system in reporting diagnoses and in enhancing data collection, recording and reporting. Additionally, data stored in a digital platform can provide information in real-time to assist in creating a rolling development program in surveillance policy and planning of activities, including the selection of geographic areas for prioritization and the timing of surveillance actions. Periodic assessments are needed to increase the efficiency of surveillance systems and to enhance the accuracy of collected surveillance data (Ng'etich *et al*, 2021). The parameters identified by the interviewees to assist in the adoption of the new technology were consistent with the criteria laid out by WHO (2021a) and WHO (2021b) in its proposed target product profiles (TPPs) for new and effective diagnostics for STH and SCH. The TPPs describe ideal diagnostics that are rapid, inexpensive, capable of diagnosing infections independent of parasite intensity, and require minimal equipment and infrastructure to operate, including adequate training on their proper use. The development and adoption of such tools can aid control program managers in making reliable, timely and context-specific decisions regarding implementation strategies in their respective programs (WHO, 2021a; WHO, 2021b).

In conclusion, this study reviewed the national policies on surveillance of STH and SCH, described the implementation of surveillance activities and identified relevant strengths and challenges faced by control programs. The information should benefit the identification of opportunities to further the development and adoption of new tools to aid diagnosis and surveillance. Rolling policy reviews and regular conduct of KIIs of selected program personnel involved in STH and SCH surveillance at the national, regional, provincial, and municipal levels should be implemented to ensure a sustainable surveillance system for control and eradication of soil-transmitted helminthiasis and schistosomiasis in the Philippines.

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CONFLICT OF INTEREST DISCLOSURE

The authors declare no conflict of interest.

REFERENCES

Belizario VY, delos Trinos JPCR, Silawan B, *et al*. The use of geographic information system as a tool for schistosomiasis surveillance in the Province of Davao del Norte, the Philippines. *Geospat Health* 2017; 12(2): 540.

Belizario VY, Plan AO, de Leon WU. Laboratory diagnosis of selected neglected parasitic diseases in the Philippines: can we do better? *Acta Medica Philippina* 2014; 48(4): 4-10.

Department of Health (DOH). 2017-2022 Strategic Plan of the Integrated Helminth Control Program in the Philippines. Manila, Philippines: DOH Philippines; 2017.

Department of Health (DOH). 2019-2025 Strategic plan towards Interruption of Schistosomiasis Transmission in the Philippines. Manila, Philippines: DOH Philippines; 2019a.

Department of Health (DOH). Administrative Order No. 2006-0028: Strategic and operational framework for establishing integrated helminth control program, 2006 [cited 2021 Sep 13]. Available from: URL: https://doh.gov.ph/wp-content/uploads/2023/08/IHCP-Operational-and-Strategic-Framework-AO-2006-0028.pdf

Department of Health (DOH). Administrative Order No. 2007-0015: Revised guidelines in the management and prevention of schistosomiasis, 2007 [cited 2021 Sep 13]. Available from: URL: https://doh.gov.ph/wp-content/uploads/2023/08/AO2007-0015.pdf

Department of Health (DOH). Department Circular 2020-0129: adoption of the schistosomiasis control and elimination program strategic plan for 2019-2025. Manila, Philippines: DOH Philippines; 2020a.

Department of Health (DOH). Department Circular 2020-0132: adoption of the integrated helminth control program strategic plan for 2017-2022. Manila, Philippines: DOH Philippines; 2020b.

Department of Health (DOH). FHSIS Executive Edition 2004-2008. Public Health Surveillance and

Informatics Division, 2010a [cited 2021 Sep 15]. Available from: URL: https://doh.gov.ph/data-publications/fhsis-executive-summary-2004-2008/

Department of Health (DOH). Integrated helminth control program monitoring and evaluation guide. Manila, Philippines: DOH Philippines; 2019b.

Department of Health (DOH). The Philippines sustainable sanitation knowledge series: Guidebook for a disease prevention and control program for soil-transmitted helminth infections and diarrheal diseases. Manila, Philippines: DOH Philippines; 2010b.

Endris M, Tekeste Z, Lemma W, Kassu A. Comparison of the Kato-Katz, wet mount, and formol-ether concentration diagnostic techniques for intestinal helminth infections in Ethiopia. *ISRN Parasitol* 2012; 2013: 180439.

Lin DD, Liu JX, Liu YM, *et al*. Routine Kato-Katz technique underestimates the prevalence of Schistosoma japonicum: a case study in an endemic area of the People's Republic of China. *Parasitol Int* 2008; 57(3): 281-6.

Maravilla JC, Catiwa J, Guariño R, *et al*. Exploring indirect impacts of COVID-19 on local health systems from the perspectives of health workers and higher education stakeholders in the Philippines using a phenomenological approach. *Lancet Reg Health West Pac* 2023; 30: 100585.

Montresor A, Crompton DWT, Hall A, Bundy DAP, Savioli L. Guidelines for the evaluation of soil-transmitted helminthiasis and schistosomiasis at community level, 1998 [cited 2021 Sep 13]. Available from: URL: https://iris.who.int/bitstream/handle/10665/63821/WHO_CTD_SIP_98.1.pdf?sequence=1&isAllowed=y

Mwatondo AJ, Ng'ang'a Z, Maina C, *et al*. Factors associated with adequate weekly reporting for disease surveillance data among health facilities in Nairobi County, Kenya, 2013. *Pan Afr Med J* 2016; 23: 165.

National Privacy Commission. Republic Act 10173: Data Privacy Act of 2012, 2012 [cited 2021 Sep 16]. Available from: URL: https://www.privacy.gov.ph/data-privacy-act/

Ng'etich AKS, Voyi K, Mutero CM. Assessment of surveillance core and support functions regarding neglected tropical diseases in Kenya. *BMC Public Health* 2021; 21(1): 142.

Onwujekwe O, Mbachu C, Etiaba E, *et al*. Impact of capacity building interventions on individual and organizational competency for HPSR in endemic disease control

in Nigeria: a qualitative study. *Implement Sci* 2020; 15(1): 22.

Philippine Health Research Ethics Board (PHREB). National Ethical Guidelines for Health and Health-related Research 2017 version 2, 2018 [cited 2021 Sep 13]. Available from: URL: http://49.231.15.21/deptw13/upload/files/hercF256312041721022781.pdf

Tangcalagan DA, Daga CM, Tan A, *et al*. The 2013-2015 nationwide prevalence survey of soil-transmitted helminths (STH) and schistosomiasis among school-age children in public schools in the Philippines. *PIDSP J* 2022; 23(1): 75-96.

World Health Organization (WHO). Protocol for the assessment of national communicable disease surveillance and response systems: guidelines for assessment teams, 2001 [cited 2022 Sep 13]. Available from: URL: https://iris.who.int/bitstream/handle/10665/66787/WHO_CDS_CSR_ISR_2001.2_text_annexes1-11.pdf?sequence=1&isAllowed=y

World Health Organization (WHO). Diagnostic target product profile for monitoring, evaluation and surveillance of schistosomiasis control programs, 2021a [cited 2021 Sep 15]. Available from: URL: https://iris.who.int/bitstream/handle/10665/344813/9789240031104-eng.pdf?sequence=1

World Health Organization (WHO). Diagnostic target product profile for monitoring and evaluation of soil-transmitted helminth control programs, 2021b [cited 2021 Sep 15]. Available from: URL: https://iris.who.int/bitstream/handle/10665/342539/9789240031227-eng.pdf?sequence=1

World Health Organizarion (WHO). Eliminating soil-transmitted helminthiases as a public health problem in children. Progress report 2001-2010 and strategic plan 2011-2020, 2012 [cited 2021 Sep 13]. Available from: URL: https://iris.who.int/bitstream/handle/10665/44804/9789241503129_eng.pdf?sequence=1

World Health Organization (WHO). Ending the neglect to attain the Sustainable Development Goals: a road map for neglected tropical diseases 2021-2030, 2020 [cited 2021 Sep 13]. Available from: URL: https://www.eliminateschisto.org/sites/gsa/files/content/attachments/2020-06-10/WHO_Revised-Draft-NTD-Roadmap2021-2030-23Apr2020.pdf

World Health Organization (WHO). Helminth control in school-age children: a guide for managers of control programmes, Second edition, 2011 [cited 2021 Sep 13]. Available from: URL: https://

iris.who.int/bitstream/handle/10665/44671/9789241548267_eng.pdf?sequence=1

World Health Organization (WHO). Schistosomiasis: Progress Report 2001-2011, Strategic Plan 2012-2020, 2013 [cited 2021 Sep 13]. Available from: URL: https://iris.who.int/bitstream/handle/10665/78074/9789241503174_eng.pdf?sequence=1&isAllowed=y

World Health Organization Regional Office for the Pacific (WPRO-WHO). Expert consultation to accelerate elimination of Asian schistosomiasis, 2017 [cited 2021 Sep 13]. Available from: URL: https://iris.who.int/bitstream/handle/10665/259630/RS-2017-GE-36-CHN-eng.pdf?sequence=1&isAllowed=y