ASSESSMENT OF A SCHOOL-BASED MASS TREATMENT FOR SOIL-TRANSMITTED HELMINTH INFECTIONS IN CAPIZ, THE PHILIPPINES

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Abstract. We evaluated the War on Worms in the Western Visayas (WOW-V) school-based mass treatment strategy in Capiz, the Philippines by assessing potential determinants of program acceptance among parents, teachers, and local health and education officials involved. Written surveys were distributed to parents and teachers assessing knowledge, attitudes and practices regarding soil-transmitted helminth (STH) infections. Associations between data were examined using the Fisher's exact test ($\alpha = 0.05$). Descriptive statistics and *t*-tests were employed to analyze teacher survey results. Local health and education officials participated in key-informant interviews (KIs) to evaluate their attitudes and practices regarding WOW-V; data was qualitatively analyzed and grouped. A strong association was observed between parental consent during the first two rounds of treatment and willingness to do so again. Most parents gave consent for their child to receive treatment at least once and demonstrated a high level of knowledge regarding STH infections. The majority of teachers had positive attitudes toward their role in the program. Many identified lack of training and a fear of side effects as barriers to higher coverage. Lack of funding, program monitoring difficulties and insufficient parental education were identified by local officials as barriers. Proper planning and design is important to achieve high initial consent for program acceptance. The results correlate with studies showing relationships between health education and treatment acceptance. The implementation of health education and monitoring measures has the potential to greatly improve both treatment coverage and program infrastructure.

Keywords: soil transmitted helminthes, mass treatment, school-based, Philippines

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INTRODUCTION

Despite international efforts for treatment and control, the global prevalence of soil-transmitted helminth (STH) infec-

tions remains high; the burden of such infections falls primarily on children of school age (Albonico *et al*, 2003; Mondadori *et al*, 2006). Worldwide, on estimated 204 million children under 15 years old are currently infected with at least one form of intestinal nematode (de Silva *et al*, 2003). In one study conducted in the Philippines, 95.5% of primary schoolchildren examined were found to have at least one type of helminth infection (Lee *et al*, 2000; Ezeamama *et al*, 2005). Malnutrition, stunted growth, and impaired cognitive development are common outcomes seen in children with persistent intestinal helminth infections (Sakti *et al*, 1999; Lee *et al*, 2000; Wakelin, 2000).

In 2007, the War on Worms in the Western Visayas (WOW-V), a school-based mass treatment strategy as part of an intestinal helminth control program, was initiated in the provinces of Capiz, Antique, and Aklan of the Philippines. This collaborative effort between the Philippines Department of Health (DOH), Department of Education (DepEd), University of the Philippines-Manila (UPM), and Johnson and Johnson (J&J) assessed the pre-treatment infection and nutritional status of 357 public schoolchildren in selected sentinel sites in Capiz. Parasitological assessment using stool examinations by the Kato Katz method (Katz *et al*, 1972) revealed 64.4% of the children were infected with at least one type of intestinal helminth and 33.3% had a heavy parasite load. Additionally, nutritional assessments showed nearly 30% of these students were below average height for age and 26% were below weight for age.

Results from the baseline assessment led to the recommendation that high risk groups be treated. The WOW-V program provided sufficient mebendazole tablets to treat up to 300,000 elementary public schoolchildren twice a year from 2007 to 2009. Parental consent was required before a child received treatment. Teachers were responsible for administering mebendazole during scheduled mass treatment sessions. Goals for WOW-V included reducing the cumulative prevalence of STH infection by 50% and reducing the proportion of heavy intensity infections to near 0 by the end of 2009 (US-ASEAN Business Council, 2008). It also aimed to address long-term effects, such as malnutrition and school performance. Mass treatment coverage for Capiz was reported to be 77.4% in January and 80.4% in July of 2008. Follow-up evaluations conducted in 2008 showed a 26.4% decrease in the cumulative prevalence of STH infections and a 44.4% reduction in heavy intensity infections. Progression towards achievement of the WOW-V program goals was also demonstrated by a 49.3% reduction in the number of students who were under-weight and a 39.6% reduction in the number of students who were below the average height for age after two rounds of treatment.

Previous studies evaluating similar treatment programs in the Philippines and Uganda have identified parent and community health education as essential to achieving high consent rates and reducing disease burden (Montresor *et al*, 2002; Amarillo *et al*, 2008; Parker *et al*, 2008; Smits, 2009). Such evidence suggests that higher parental acceptance and knowledge of the effects of STH and its prevention are likely to correlate with an increased likelihood of consent for their child to receive treatment. This study aimed to evaluate the efficiency of the existing program structure and its overall acceptance by the community. Teachers and parents affiliated with participating schools were surveyed and local government officials

were interviewed regarding beliefs, attitudes and knowledge of STH and the treatment program. The purpose of this study was to recommend potential improvements in the WOW-V program and to provide guidance for the implementation of future school-based mass deworming programs in the Philippines and elsewhere.

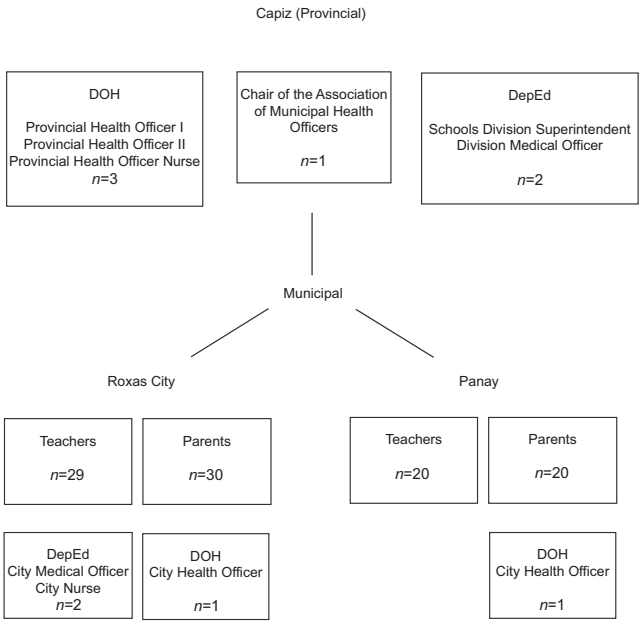

Fig 1–Distribution of survey and interview participants at provincial and municipal levels. Ten local officials, 49 teachers, and 50 parents participated in key-informant interviews and completed surveys for a total sample size of 109 participants.

MATERIALS AND METHODS

The surveys were anonymous. The distributed document contained a brief explanation of its confidential nature. This study was an evaluation of an existing program and collected survey and interview data from adult participants. This study was approved by the IRB at the University of Pittsburgh and was classified as not requiring IRB oversight.

Study area and distribution/study population

The program to evaluate WOW-V was conducted in June 2009, one month prior to the fourth bi-annual drug administration. All schools that participated in the evaluation of WOW-V were located in the northern province of Capiz on the island of Panay in the Philippines. Two distinct regions within the province were surveyed. Five schools from Roxas City, the capital of Capiz, were surveyed and four schools from the nearby primarily rural municipality of Panay (Fig 1). These schools were chosen due to their previous use as sentinel sites for monitoring the WOW-V program. A minimum of 5 parents and 5 teachers from each participating school were asked to complete surveys. Participation of selected parents and teachers was requested by the school administrator or principal of each school.

Key informant interviews (KIs) were conducted with the instrumental members of the WOW-V task force within the province. These included provincial and municipal level administrators and health workers from both the DOH and the DepEd (Fig 1). Health officers and nurses oversee the health of the population of their assigned province, city, or municipality, while medical officers and nurses oversee the health of the school-children in their assigned province or city. Superintendents are responsible for both the education and overall well-being of the children in their municipality. The interviews conducted included all essential

stakeholders involved in the implementation of WOW-V in Capiz.

Design

The survey distributed to parents collected demographic information and assessed knowledge and attitudes about STH. Parents were also asked to state whether or not they gave consent for their child to receive mebendazole during mass treatment and if they would do so again. Consent was defined as signing a form provided by the school permitting teachers to administer a mebendazole tablet to the child during scheduled treatments. The survey contained multiple choice, true/false, and 'check all that apply' questions. Parents were also encouraged to write a brief response explaining why they did or did not consent to have their child treated during the scheduled mass treatments. Provincial Health Office personnel served as translators in the field. Survey questions were then translated back into English to ensure accuracy of the explanation of each question.

Teacher surveys were self-administered and questions were in English. Questions addressed the teachers' level of knowledge and practices regarding STH infection symptoms and treatment and their attitudes toward the current school-based mass drug administration, including their willingness to distribute medications in the future. Open-ended, multiple-choice, and Likert scale question formats were used. Teachers and school administrators were interviewed upon survey completion to obtain their attitudes about the current program and make suggestions regarding the WOW-V program.

Local health and education officials were interviewed to assess their level of involvement and their attitudes about WOW-V. Interviews focused on four categories: the War on Worms Program, the local community, the local government and the integration of these three components. Officials were questioned about the acceptability of the program and perceived barriers to program success. Topics discussed included deworming practices, community beliefs, local government units, drug distribution, responsibility designation and funding. Interviews were recorded for future analysis.

Data analysis

Parent survey data were managed and analyzed using SAS 9.2. The Fisher's exact test was used to compare consent rates with knowledge and practice variables for potential association ($\alpha = 0.05$). In order to have a power of 80% to detect a statistically significant difference of 0.2, we needed 82 parent survey participants from each group to be compared. Written responses from surveys completed by parents were translated back into English by a staff member at the National Institutes of Health, Philippines; these were then grouped into general categories. For analysis of teacher surveys, sample size was calculated to be 16 per group in order to have a power of 80%, and to detect a difference of 1 on a Likert scale with standard deviation of 1. Data from the teacher survey were analyzed with descriptive statistics and *t*-tests, using an alpha of 0.05. In some analyses, Likert scales were collapsed from 5 to 3 points. Response frequencies were calculated using the available number of responses for each question. Recorded interviews with local officials were qualitatively analyzed and coded for common themes.

RESULTS

Parent survey

Fifty parents participated in the

Table 1
Socio-demographic characteristics of parent survey participants (*N*= 50).

Socio-demographic characteristics	%
Gender of respondent	
Female	98.0
Male	2.0
Age of respondent	
21-30 yrs	27.7
31-40 yrs	38.3
41-50 yrs	25.5
51 yrs or older	8.5
Education	
Elementary school	14.0
High school	40.0
College	44.0
Medical school	2.0
None of the above	0.0
Civil status	
Single	2.0
Married	98.0
Age of spouse	
21-30 yrs	29.8
31-40 yrs	29.8
41-50 yrs	17.0
51 yrs or older	23.4
Education of spouse	
Elementary school	30.6
High school	26.5
College	38.8
Medical school	2.0
None of the above	2.0
Religion	
Roman catholic	98.0
Protestant	2.0
Number of school age children	
1	59.2
2	32.7
3	4.1
4	2.0
5	2.0

survey; 20 parents from Panay and 30 from Roxas City. Ninety-eight percent of parental participants were mothers (Table 1). Education levels of parents differed slightly by district; 50% of parental participants and 40% of their spouses in Panay reported having a college education. The average education level of parental participants in Roxas City was a high school education. There was little difference in responses between districts; therefore, statistical analysis was conducted at the provincial level. Fifty-nine percent of parents reported having 1 child of school age.

Parental participants identified 78-94% of practices that decrease the risk of intestinal helminthes infections (Fig 2). The preventive method most frequently identified by parental participants was hand washing with soap and water (94%). Fifty-two percent of parental participants incorrectly responded polluted air is a method for transmission for helminth infections. The frequency of parents who stated rural communities were at higher risk of helminth infections differed by location. In Roxas City, 85% of parental participants stated those living in rural areas were not at risk, but in Panay, 50% believed no additional risk was associated with rural living. When questioned about the anthelminthic drug, 35% of parents incorrectly believed their child only needed to receive treatment once. Of those who reported side effects were associated with the medication given during mass treatment, fewer than 12% refused to give consent for their child to receive the medication at least once and would not do so in the future.

Consent rates for the first and second rounds of mass treatment were 96% and 86%, respectively, while willingness to give consent again was 92%. Parents who gave consent during the first round of treatment were 89% more likely to give consent a second time, and those who gave consent a second time were 92% more than like to give consent during the second round of treatment. Unfortunately,

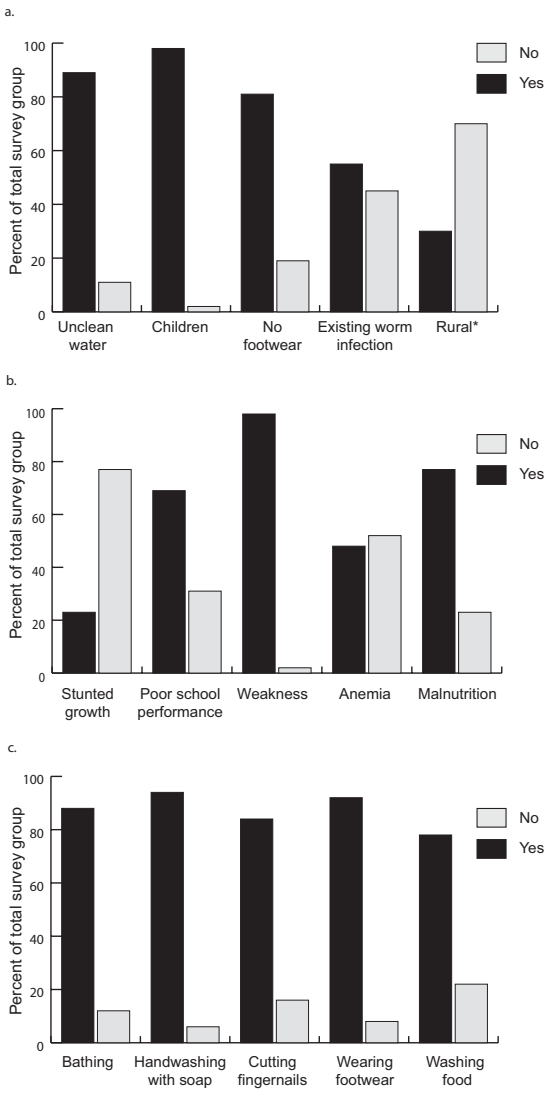

Fig 2–Assessment of parental knowledge of helminth infections. Parents were asked to identify all listed responses that fit the criteria in the survey question ("yes"). *Differed by district. a) Characteristics of those perceived to be at risk for infection; b) long and short-term effects of infection; c) methods of prevention.

the desired sample size was not reached due to time constraints. Written responses obtained from those who gave consent for their children to be treated at least once stated the primary reason for doing so was to improve the overall health of their children. One reason for not giving consent during a treatment session was the belief their children only needed to be treated once for STH infection.

Teacher survey

In total, 49 teachers were surveyed from 9 elementary schools. Four respondents did not answer the demographics survey. Teachers represented classrooms from grades 1 through 6, and had anywhere from 24 to 49 pupils in their classrooms. All but 1 respondent (97.7%) said they currently consent, or would consent, for their school-age children to be treated through the WOW-V program.

Teachers have been trained for the WOW-V distribution through a "trickle-down" of information. Provincial health officials directly trained the principals of each school, and those principals were responsible for passing along the information to teachers and school nurses involved in the medication distribution. Schoolteachers stated that they were offered training once at the beginning of the WOW-V program, 2 years prior to this assessment.

Teacher agreement with statements deworming medication reduces the problem of intestinal helminths and regular school-based deworming is the best way to address the problem were 98% and 100%, respectively (Table 2). Sixty-one point seven percent stated they thought the STH infection problem had already been solved since the WOW-V began (17% responded "unsure"), and 27.1% of teachers stated (6.3% "unsure") STH infections were never a problem among their students. All teachers agreed each child should be dewormed during mass treatment. Thirty-six point seven percent

Table 2
Select items from teacher survey: knowledge, attitude, preparedness toward role in school-based treatment (*N*=49).

Items	Agree	Unsure	Disagree
Knowledge			
De-worming medication reduces intestinal helminths in kids.	98.0%	2.0%	0.0%
Regular school-based de-worming is the best way to reduce the problem of intestinal helminth infections.	100.0%	0.0%	0.0%
The problem of intestinal helminths has already been solved by WOW-V.	61.7%	17.0%	21.3%
Children can develop new helminth infections after receiving one deworming tablet.	36.7%	12.2%	51.0%
Children with untreated helminth infections may perform poorly in school and have short attention spans.	75.5%	2.0%	22.4%
Attitudes			
My role in the distribution is difficult to perform.	30.6%	8.2%	61.2%
I enjoy participating in the tablet distribution.	77.6%	8.2%	14.3%
I find distributing de-worming tablets burdensome.	4.2%	4.2%	91.7%
I am happy to participate in the tablet distribution.	87.2%	2.1%	10.6%
Teachers/school workers should continue performing their role delivering de-worming tablets.	89.6%	4.2%	6.3%
I think the benefits of treatment for intestinal helminths is worth my extra time needed to distribute medications.	81.6%	2.0%	16.3%
I think health workers should be more responsible for de-worming than teachers.	51.0%	12.2%	36.7%
Preparedness			
I think I should have had more training before handing out medications.	81.3%	6.3%	12.5%

of teachers believed children can develop subsequent infections after receiving one deworming tablet.

Seventy-seven point six percent of teachers said they enjoyed participating in the programs, 87.2% stated they are happy to participate in the program while 4.2% and 8.3% responded that their role in the program is burdensome and stressful (Table 2). Sixty-one point two percent of teachers disagreed with the statement that their role in WOW-V is difficult, 83.8% disagreed that tablet distribution was disruptive to their schedule and 67.3% disagreed the activity takes time away from more important classroom activities. Eighty-nine point six percent of teachers agreed they should continue to perform their current role in the program, 20.4% believed tablet distribution should not be a teacher's job. Fifty-one percent believed health workers should be given more responsibility in the deworming process than teachers.

Teachers reported being fearful of giving tablets if side effects, such as abdominal pain, diarrhea, fever, worms in stool, erratic worm migration or a general feeling of illness, were reported by the child after previous treatment. Paired

t-tests showed participants were significantly ($p<0.05$) less likely to administer the tablet if a student had reported any of these adverse events after a previous treatment compared to if no side effects were reported. Receiving blame from parents if the child experiencing adverse effects from the drug was a common concern expressed by teachers. Of those who expressed these fears, none had experienced such a problem with parents. Independent *t*-tests showed no statistical differences in knowledge of or attitude towards the WOW-V program between teachers in urban schools (Roxas City) and those in rural schools (Panay).

Teacher interviews revealed a common concern they did not know enough about why they were giving the treatment, when to give (and not give) treatment, side effects expected and success of treatment efforts thus far. When asked about resources or program changes that would make the teachers' role easier, more training and education about STH infections, deworming, and the anthelminthic drug were listed.

Local health and education officials

A total of 10 local health and education officials in the province of Capiz were interviewed (Fig 1). Eight out of 10 believed schools were an appropriate location for deworming and teachers were capable of administering deworming tablets. Officials believed infections with intestinal parasites impaired a child's academic performance and schools are a logical place to address this concern. Schools are advantageous because they are the best place to capture the target population, in contrast to house-to-house distribution; tablets can be kept in one location and distributed simultaneously. Officials stated inadequate health staff in the community required utilizing teachers and schools for the program, but it is the best place to capture a large portion of the population targeted for treatment. They did not view bi-annual tablet distribution as an unnecessary burden for teachers and believe the training provided at program inception equipped them for this task.

Eight out of 10 officials stated funding was a potential barrier to the success of WOW-V. Funds were believed necessary to sustain the program in its current form, since the drug donation program from Johnson and Johnson concluded at the end of 2009. The majority of officials did not think program success depended on funding for additional items (education). Only 2 out of 10 officials wanted additional funds for multivitamins or for incentives for schools and teachers.

Monitoring was identified as a necessary measure in order to ensure the tablets were ingested by all the children; however, there was disagreement about who held this responsibility. Seven out of 10 stated the lack of monitoring of drug administration was an obstacle to the WOW-V, since many had heard reports of teachers sending tablets home with students. Officials at the Department of Health did not believe it was their role to monitor drug administration, as it was perceived to be part of local political propaganda for current officials. Many believed this was the Department of Education's role, but school officials felt overworked already.

Parental refusal to give consent was commonly viewed as a major obstacle to the WOW-V. Many officials mentioned parental lack of education, poor sanitation and hygiene in some homes and communities, as problematic to the achievement of helminth control. Some stated parents be-

came concerned after a child experienced erratic worm migration prior to treatment. Seven out of 10 officials believed better education of parents and communities would improve consent rates.

Eight out of 10 officials stated teacher unease with drug administration hindered the WOW-V. They believed teachers were unwilling to participate because they did not know how to handle side effects, did not want to be blamed if the child got sick or did not think it was their job because they are not health workers. One official believed more education and training of teachers was necessary to improve the deworming program.

A frequently mentioned obstacle was local politics. Half those interviewed believed the WOW-V was unstable because the program and its funds were subject to the priorities and opinions of whomever currently held the office of governor. Some stated support for the WOW-V should be made a law to rectify this situation. Five out of 10 officials felt advocacy by the local chief executives and government units (LGUs) is instrumental for helminth control. They believed this should be done by the University of the Philippines-Manila, Department of Health, and others involved and that it is the only way to address current barriers, such as hygiene and sanitation, and guarantee program longevity.

DISCUSSION

The high consent rates and level of parental knowledge regarding STH infections support existing literature on the correlation between community health education and improved health practices (Montresor *et al*, 2002; Smits, 2009). Associations between a parent's initial and subsequent consent have important implications for managers of future programs. These findings demonstrate the importance of achieving high coverage during the initial treatment sessions and place emphasis on program planning and community acceptance of a school-based program prior to the first scheduled treatment.

The results suggest the need for community health education targeting parents as a method of enhancing initial treatment coverage and maintaining a high level of consent during successive treatments. While knowledge pertaining to methods of prevention, symptoms, and transmission was moderately high for the entire group, parents were less aware of the long term effects of infection and information regarding the drug used during treatment. Although many teachers and school officials believed a fear of side effects might be a barrier to parental acceptance, our data suggest fear did not play a significant role in reducing parental consent.

Program managers wishing to launch education campaigns prior to administration of drug treatment should focus on importance, safety of treatment and the potential long term problems caused by intestinal helminth infections.

The teachers' fears of mebendazole tablet administration after a child has experienced side-effects previously or if the child is malnourished demonstrates the need for further education of teachers on the benign side effects of the drug and increased cooperation between teachers and health workers to insure all children receive the drug unless medically contraindicated.

The general feeling by teachers of lack of information about the program is in contrast to that of government workers, who thought teachers had enough information to do their job. Results from

both teacher surveys and informal interviews showed a high percentage (79.6%) of teachers desired more training prior to the first and subsequent drug distributions. These results demonstrate a need for education about treatment, side effects and a set of guidelines for when to treat and when to withhold treatment. The data collected from teachers indicate information may be better received when given by a health worker, such as a doctor or nurse. Many government officials indicated size of the local health-worker staff was insufficient to educate the school staff and communities about the WOW-V program in Capiz. The distribution of a flyer with basic information about STH infections, drug indications and success of the WOW-V program in the community could address teachers' desire for additional information considering the health staff limitations.

Such information could decrease fear among teachers about treatment and maximize the number of children who receive the tablets. Strengthening the partnership between local health workers and schools could increase teacher comfort with their role in distribution, should questions or problems arise during deworming.

Although local health and education officials believed one of the greatest barriers to success of the WOW-V program in Capiz was lack of consent from the parents, consent rates from the parental population surveyed indicate this is not the case. Officials concluded that more education targeting parents would improve consent rates. This belief is supported by data from the parental survey which found a high level of knowledge and moderately high consent rate among parental participants. This provides further evidence for the need for parental and teacher education at program inception in Capiz and elsewhere.

Local health and education officials agreed that although teachers were equipped to administer drugs, a low level of program acceptance existed within this group. The data do not support this belief. While teachers admitted to being worried about side effects and adverse reactions, none stated they were unwilling to participate in drug administration. The teachers might benefit from support from local health workers and officials to gain further insight into treatment and its effects. Even though the community health officials stated their role was to support teachers in deworming, especially in the case of side effects and adverse drug reactions, few teachers reported ever contacting such officials. This finding demonstrates a lack of communication and collaboration in the WOW-V.

When program monitoring was discussed, few officials believed their agency or group was responsible for helminth infection control. A greater feeling of ownership and responsibility for the program by all stakeholder groups involved could avoid the total burden of monitoring to fall on any one department and ensure accurate collection of program data. This can be accomplished with the clear assignment of responsibilities (*eg*, monitoring of drug administration, or chain of command in the event of side effects) to officials or departments involved in the program.

Survey and interview results demonstrate stakeholders largely accepted and valued the presence of a school-based helminth control program in their community. The impact of initial consent on subsequent treatment coverage demonstrates the importance of proper program planning and design by project managers. Additionally, the implementation of com-

munity education, program monitoring, and clarification of organizational roles has the potential to improve both treatment coverage and program infrastructure.

At the end of the Mebendazole Donation Program, local government and health departments are expected to adopt mass treatment as a locally run and funded program. As a result of the program's success, WOW-V has been expanded from its three pilot provinces to Iloilo, Negros Occidental and Guimaras in 2011 (Villavert, 2011).

This study provides a comprehensive evaluation of program acceptance by stakeholders whose participation is crucial for the success of the WOW-V. The selection of these schools for prior sentinel surveillance suggests these populations are likely representative of both rural and urban, coastal and inland areas. While the distribution of parental participants was fairly consistent between schools and districts to attempt to control for potential bias, parents at schools during surveying sessions may have been more likely to give consent for their child to be treated than those who were not present at the school. The Likert scale was an unfamiliar concept to some participants (primarily parents and some teachers), since local culture articulates agreement and disagreement by different means. Additionally, teacher surveys were written in the subjects' second language. However, the results of both surveys and informal interviews yielded consistent themes within this study and with previously published data.

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