



Report

Workshop on integrating deworming intervention into preschool child packages in the Americas

March 24-25, 2011

Pan American Health Organization and McGill University



WORKSHOP ON INTEGRATING A DEWORMING INTERVENTION INTO PRESCHOOL CHILD HEALTH PACKAGES IN THE AMERICAS

Report

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List of Acronyms

ALB	Albendazole
CDC	US Centers for Disease Control and Prevention
CDD	Community Drug Distributors
CIHR	Canadian Institutes of Health Research
DALY	Disability-Adjusted Life Year
FBO	Faith Based Organizations
FRESH	Focusing Resources on Effective School Health initiative
GAIN	Global Alliance for Improved Nutrition
GNNTD	Global Network for Neglected Tropical Diseases
GSK	GlaxoSmithKline
IDB or IADB	Inter-American Development Bank
IEC	Information, Education and Communication
IMA	Interchurch Medical Assistance or IMA World Health
IMCI	Integrated Management of Childhood Illnesses
J&J	Johnson & Johnson
LAC	Latin America and the Caribbean
LF	Lymphatic Filariasis
M&E	Monitoring and Evaluation
MDA	Mass Drug Administration
MDG	Millennium Development Goals
MEB	Mebendazole
MoE	Ministry of Education
MoH	Ministry of Health
ND	Neglected Diseases
NGOs	Non-governmental Organizations
NTDs or NTD	Neglected Tropical Diseases
OBI	Operation Blessing International
PAHO	Pan American Health Organization
PELF	Program for Elimination of Lymphatic Filariasis
PoA	Plan of Action
Pre-SAC	Preschool-aged children
PTAs	Parent-Teacher Associations
R&D	Research and Development
SAC	School-aged children
SHN	School Health and Nutrition
SNS	Semana Nacional de Salud
STH	Soil-Transmitted Helminths
TDR	Tropical Disease Research
UN	United Nations
UNICEF	United Nations Children’s Fund
US or USA	United States or United States of America
USAID	United States Agency for International Development

WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WHA	World Health Assembly
WHO	World Health Organization
WAS	Water and Sanitation

Executive summary

Soil-transmitted helminths infect millions of young children across Latin America and the Caribbean. The illnesses caused by these intestinal parasites—including anemia, vitamin A deficiency, stunted growth and malnutrition, among others—slow children’s mental and physical growth and have long-term effects on educational achievement and economic productivity. Parasitic worms disproportionately affect the most disadvantaged, particularly in rural areas and urban shantytowns, and trap vulnerable people in a cycle of poverty.

Fortunately, there are highly cost-effective, proven interventions to treat intestinal parasites. Deworming interventions can be easily integrated into various existing programs that many countries and their partners are already implementing in health, nutrition, immunization, education, water and sanitation, and income support.

Many governments and other agencies are already conducting deworming campaigns, yet significant coverage gaps remain. One such gap is deworming coverage of preschool-age children. Given the rapid period of growth and development that normally occurs during the preschool years, the morbidity caused by intestinal parasite infections may have irreversible consequences for preschool-age children’s physical and cognitive development.

On March 24-25, 2011, the Pan American Health Organization (PAHO) and McGill University, in coordination with the Global Network for Neglected Tropical Diseases, held the first Workshop on Integrating a Deworming Intervention into Preschool Child Health Packages in the Americas, to explore mechanisms to close the deworming coverage gap for preschool-age children (pre-SAC).

At this meeting, experts from academia, international organizations, government ministries, non-governmental organizations (NGOs), and faith-based organizations identified the following top 12 challenges for expanding deworming coverage to reach pre-SAC:

1. Establishing, developing and maintaining intergovernmental and inter-agency coordination and partnerships.
2. Integrating deworming and related interventions across sectors and programs.
3. Creating guidelines for planning, implementing, monitoring, and evaluating interventions that are methodologically rigorous and evidence-based.
4. Developing and implementing accurate and reliable reporting systems, and ensuring that such systems are used by all actors.
5. Ensuring the long-term sustainability of deworming activities.
6. Securing political commitment at the local, regional, and national levels.
7. Developing an optimal community, clinic, school and/or home-based delivery strategy for reaching pre-SAC that can be adjusted according to local conditions.
8. Filling research gaps on deworming interventions for pre-SAC.
9. Planning and implementing advocacy activities targeted to reach a variety of audiences, including ministries of health, allied health professionals such as nutritionists, donors, and economists, among others.

10. Developing and implementing innovative communication strategies to raise awareness and encourage participation.
11. Fostering community involvement and educating traditional and non-traditional community leaders.
12. Identifying and developing ideal drug formulations for pre-SAC in the LAC context.

Based on these challenges, the meeting participants put forth the following 15 recommendations for future activities that must be undertaken to advance the deworming agenda for pre-SAC.

1. Encourage political commitment at all levels to move forward on deworming activities for pre-SAC.
2. Promote integration of deworming activities within existing public health programs and intersectoral platforms in order to optimize coverage.
3. Develop and promote national plans of action for deworming in the context of NTDs.
4. Promote intersectoral coordination and partnerships to optimize the efficiency and sustainability of deworming programs.
5. Advocate for deworming programs targeted to pre-SAC in among a variety of audiences, including ministries of health and education, allied health professionals such as nutritionists, donors, economists, and water and sanitation specialists, among others.
6. Strengthen national and sub-national capacity to expand deworming activities for pre-SAC
7. Promote community participation and social mobilization in deworming activities, from planning to implementation and evaluation.
8. Promote innovation in communication strategies, diagnostic tools, drug formulations and other tools to support deworming activities.
9. Develop, harmonize and disseminate guidelines for planning, implementing, monitoring, and evaluating deworming programs targeting pre-SAC, among UN agencies and other organizations.
10. Identify and fill research gaps pertaining to the health, nutrition and development impact of deworming interventions for pre-SAC, including articulation with the tropical disease research (TDR) agenda, and incorporation of other areas of interest such as cost-effectiveness.
11. Develop and implement accurate and reliable reporting systems for deworming activities for pre-SAC.
12. Plan optimal delivery strategies for deworming activities that are responsive to local conditions.
13. Scale up deworming activities for pre-SAC in the context of the new PAHO 10-year plan for *Comprehensive Child Health*.
14. Encourage South-South collaboration and dialogue on both the political and technical fronts, including sharing experiences and lessons learned.
15. Investigate the feasibility of setting a global or regional deworming coverage goal for pre-SAC.

Introduction and opening remarks

Introduction, Dr. Jon Andrus, PAHO Deputy Director

Intestinal parasites constitute a real and present danger to the health of millions of children in Latin America and the Caribbean. They cause anemia; and they adversely affect children's physical growth, cognitive development and attention span. They also contribute to malnutrition by reducing children's appetites; and decrease children's school performance once they enter primary school. In short, intestinal worms represent a large, but poorly recognized and understood, burden on children and poor families, as well as on communities, industries and even developing countries' economic development.

The good news is that there are very effective and very inexpensive preventive measures to take through the health sector to control this problem in children from age one upward. In addition, the social determinants of STH infections can be tackled in a cross-sectoral manner, involving partners from affected communities, other parts of the public sector, academic and research institutions, NGOs and faith-based groups, and the private sector.

In 2009, the Directing Councils of PAHO and the Pan American Sanitary Bureau (PASB) pledged to eliminate or drastically reduce the burden of a group of 12 neglected infectious diseases by 2015, including intestinal worms, Dr. Andrus said. In this vein, the goal of the workshop was to shine light on the needs of young children, who make up one of the groups most hard hit by soil-transmitted helminth (STH) infections.

In the workshop, experts from the public and private sectors will describe the current disease burden in Latin America and the Caribbean (LAC), will discuss currently available tools and interventions, and will determine how to integrate deworming activities into other health intervention programs and across sectors. They will also expand their collaboration efforts on this issue and share lessons learned from LAC countries, program managers, operational researchers and the many organizations that have been working to combat STH infections and diseases over the years.

Opening remarks: Dr. Theresa Gyorkos, Professor, Division of Clinical Epidemiology, McGill University Health Centre and the Department of Epidemiology, Biostatistics and Occupational Health, Faculty of Medicine, McGill University

Dr. Gyorkos welcomed all participants to this unique opportunity to talk about deworming in preschool-age children. She underscored the commitment shown by all participants in accepting the invitation to this workshop. She drew attention to the icons on the edge of each participant badge to emphasize the key elements of the workshop. First, around 3 edges, the flags of all countries in the Americas are represented. Along the bottom edge is a series of 9 icons: 1) a preschool-age child; 2) the three eggs of the soil-transmitted helminths (ie. *Ascaris*, *Trichuris* and hookworm); 3) the icon representing the fourth Millennium Development Goal (i.e. reduce child mortality); 4) a mother with her preschool-age child; 5) a classroom-full of school-age

children; 6) a school-age child swallowing a deworming tablet; 7) the icon representing the eighth Millennium Development Goal (i.e. global partnership for development); 8) an STH-endemic area and 9) the icon of the Canadian Institutes of Child Health, a major sponsor of the workshop. Dr. Gyorkos reminded everyone of the importance of each of these icons and challenged everyone to keep them in mind throughout the two days of the workshop.

Dr. Gyorkos said that much research has centered on deworming in school-age children (SAC), and that there is sufficient cumulative evidence regarding the effectiveness of these efforts in that population. However, significant research gaps exist regarding the population of preschool-age children (pre-SAC). Given that one of the United Nations' (UN) Millennium Development Goals (MDG) specifically targets child health, and the fact that STH infections aren't typically fatal, but do cause significant morbidity and disability, Dr. Gyorkos said that closing this gap is vitally important.

To do so, governments and agencies involved in deworming efforts need to examine and plan for the unique circumstances and challenges that might arise when trying to reach pre-SAC and their families. For example, deworming intervention programs need to be accessible to families, especially mothers. Education for both children and parents needs to be included in such interventions. Optimal delivery strategies for the deworming medications must be identified so that they are appropriate (e.g. mixed into a beverage or fruit or other food). Dr. Gyorkos underscored the need for workshop participants to challenge each other and themselves to develop and maintain active, robust partnerships and to promote the deworming agenda in a collaborative manner. Finally, she thanked PAHO for agreeing to co-host the workshop and the Canadian Institutes for Health Research (CIHR) for its generous financial sponsorship of the workshop.

Opening remarks: Mr. Steven Ault, Regional Advisor for Parasitology and Neglected Diseases, PAHO

From Canada to Argentina and Chile we can find individuals with various parasitic infections, said Mr. Ault. However, parasites most often infect people who live in poverty— particularly those who are often called the “Bottom Billion.” Afflicted by various neglected tropical diseases, often simultaneously, they struggle to break free from the cycle of poverty. In Latin America and the Caribbean, the Bottom Billion live in *favelas*, or isolated houses and communities in the mountains and plains, or fishing villages on the coast, or in rural indigenous communities.

Within this vulnerable group, women and children often suffer most from parasites like intestinal worms. For women, STH complicate pregnancies and may even put their and their babies' lives at risk; while children are adversely affected physically and intellectually. Both groups may suffer from anemia and malnutrition resulting from infection.

In LAC, PAHO estimates that millions are infected with STH, and millions more are at risk; and it has tables, numbers and maps that illustrate the scope of the problem. The workshop covers the impact of the STHs and the burden they have created. It also demonstrates the tremendous benefits that children experience from deworming, collateral health education activities, as well as improved water supply and sanitation services that must accompany these interventions to

ensure their long-term success. Participants will discuss mechanisms to reach and treat pre-schoolers, as they seek to identify which work best, which do not work, and which areas remain to be researched in the development of an optimal delivery strategy. To inform this discussion, presenters will share deworming experiences from countries in LAC, Africa and Asia; and they will discuss the policy and planning aspects of deworming programs.

The goal of the workshop is to identify some of the key challenges that must be overcome in order to establish or scale-up deworming programs and extend coverage in LAC. In addition, it will serve to identify gaps and operational research opportunities, and discuss how to monitor and measure progress. Perspectives and experiences are presented by various international actors that share a common goal to control STH infections in children.

The workshop brings together experts and program managers from Cuba, Nicaragua, Honduras, Peru and Guatemala, as well as colleagues working in international NGOs and faith-based organizations who have bravely decided to tackle intestinal worms in our Region and globally. The latter include: Save the Children USA, Operation Blessing International, the Global Alliance for Improved Nutrition (GAIN) project, and IMA World Health.

Colleagues from other parts of the UN system have kindly joined us, including the United Nations Children's Fund (UNICEF) and the World Food Programme (WFP), as well as specialists from the Inter-American Development Bank (IADB), the World Bank, and bilateral cooperative agencies, including the US Agency for International Development (USAID), the Canadian International Development Agency (CIDA) and the US Centers for Disease Control and Prevention (CDC).

Regional advisors and specialists from PAHO's immunization, nutrition and IMCI programs will participate in the meeting, as well as experts from the World Health Organization's (WHO) Department of Neglected Tropical Disease (NTD) Control. In addition, the workshop will benefit from the participation of academicians from several universities, including co-host McGill University, as well as Brock University in Canada, Harvard University, Georgetown and George Washington Universities in Washington DC, the Universidad Nacional Autonoma de Honduras, and the research center at the Instituto Pedro Kouri of Cuba.

Colleagues from a number of other LAC countries were invited but unable to attend the workshop. Likewise, experts from the Bill and Melinda Gates Foundation were invited but unable to participate, though their support to deworming efforts has been the key to huge advances in coverage for millions of children in dozens of countries worldwide.

Opportunities for improving deworming in the Americas

Keynote address: Dr. Neeraj Mistry, Managing Director, Global Network for Neglected Tropical Diseases (GNNTD), Sabin Vaccine Institute

We know there are 46 million kids infected with worms, and that treating them is very doable. We have safe, effective, proven drugs and treatment is simple—it just involves doing mass drug administrations (MDA) once or twice per year. We know that if we can succeed in reaching these children, we can without a doubt prevent infections.

The question is how to reach them? Past experience in the HIV/AIDS and Neglected Tropical Disease (NTD) world has shown that we need to bring in other disciplines, such as behaviour change communications experts, the media and entertainment industry actors. For example, it was the involvement of the entertainment companies that really got people to start using condoms and get tested for HIV. We need to think of other players we can bring in to get global impact around NTDs and deworming, as well.

It's important to clear up the confusion in the public health arena around NTDs. The way to do this is to move from a fragmented to a coordinated approach in global advocacy, fundraising and programming efforts. Likewise, we need to look at horizontal platforms and build from the bottom up, rather than the top down. In other words, rather than starting in capital cities and moving out, we need to start in the community and moving out, using school-based platforms related to complementary areas, such as nutrition and vaccines, and incorporate deworming into those platforms, as well.

We need to coordinate better with each other, too. So far, there has been spotty coordination with many different small programs run by NGOs and faith-based organizations, among others. If we're going to achieve the comprehensive coverage needed to reduce disease in the general population, we need to broaden the scale of our coverage efforts. That means thinking about the scalability of intervention programs; and I believe the current environment is perfect for that. We need to work together to develop and implement well-coordinated, sustainable, efficient, and high impact interventions. Our interventions must be comprehensive and take into account the complex implications of STH infections, such as malnutrition, impaired school performance, poor cognitive development, as well as the longer term effects of all of these.

The good news is that NTDs are starting to gain more attention. I spoke on a panel with Dr. Roses, where FIOcruz and institutions from all over LAC were present, at a very impressive conference for NTDs. It was a great opportunity to work with local experts because they know best. I also went to Chiapas, Mexico for a pilot program with PAHO and several other partners on the ground. Thanks to the high level of inter-agency coordination and superb planning, the program was an extraordinary success.

We are fortunate in that the LAC Region has a strong culture of prevention, with immunization uptake rates of 80, 90, and even up to 100%. With the emerging economies in countries such as Brazil, Argentina, and Mexico, this creates an interesting opportunity for promoting global

health and garnering donor support. With co-investment support from international partners, we've been able to create wide-scale international programs for quite a few diseases, which has implications for their long-term sustainability.

Nevertheless, the price tag for many global programmatic interventions is large, while it is much lower for STH control initiatives, since we can reach many children by finding ways to add onto pre-existing school-based and home-based interventions to improve nutrition, or deliver other social services. STH control is something that the region's ministers of finance can put in their budgets for the long run.

Looking forward, I see this meeting as an opportunity to provide recommendations for integrating STH control into horizontal and vertical school- and home-based platforms, and to find better ways to work with community health workers, gather evidence, and create the technical framework to scale up STH control. The recommendations that come out of this meeting will apply to the LAC Region, but will have global implications, as well. Similar to what has happened with the FRESH initiative as well as "Oportunidades" in Mexico, which works so well that a similar program has been launched in the Bronx in New York City, I expect that the experience of the LAC Region in STH control will become an important topic for both South-South and South-North collaboration.

Session 1: Epidemiology and global burden of STH infection and disease in the Americas

Moderator: Dr. Martha Saboyá, Regional Program of Parasitology and Neglected Tropical Diseases, PAHO

Epidemiology and burden in school-aged children (SAC): Dr. Theresa Gyorkos, Professor, Division of Clinical Epidemiology, McGill University

Deworming has had an impact on 8 Millennium Development Goals (MDG). Research has shown that deworming can prevent 82% of stunting and that it is responsible for 35% of weight gain in malnourished school-aged children. Further, it reduces school absenteeism by 25%, and improves girls' school enrolment and retention. It also improves health outcomes, reduces severe malaria, and reduces anemia in pregnant women. In the environmental sphere, it reduces contamination in the soil. Finally, it serves as a catalyst for collaborative action.

The WHO goal was to ensure provision of regular anthelmintic chemotherapy to at least 75% of SAC at risk of morbidity by 2010. We know that this goal has not been achieved in all countries, yet thanks to the data in the WHO preventive chemotherapy databank, countries can report coverage levels over time.

According to WHO statistics from 2006 and 2008, there are 31 STH endemic countries in the LAC Region, of which 12 reported deworming with albendazole (ALB) or mebendazole (MEB). What is of more concern is that, of the more than 106 million school-age children at risk of STH infections, only 6.4% were reported to have been treated in 2008, as compared to 22.7% in 2006. Coverage by country is as follows:

Deworming coverage reported to WHO

School-age children in 2006	School-age children in 2008
<ul style="list-style-type: none"> • 57% Belize • 13% Costa Rica • 11% Dominican Republic • 85% Ecuador • 58% El Salvador • 65% Guatemala • 28% Haiti • 61% Honduras • 60% Mexico → • 129% Nicaragua • 30% Peru • 2% Venezuela 	<ul style="list-style-type: none"> • 30% Belize • 43% Bolivia • 5% Colombia • 77% Dominican Republic • 39% El Salvador • 13% Guatemala • 24% Guyana • 41% Haiti • 27% Honduras • < 1% Jamaica • 89% Nicaragua ← • 0.5% Venezuela

Ref: WER 2008; WHO 2010

Peak prevalence and intensity of roundworm (*Ascaris*) and whipworm (*Trichuris*) infections occur in the 5-14 year age range. For hookworm infections, peak prevalence and intensity occur in young adulthood.

Experience has shown that infection will always reoccur in endemic areas, if no other changes are made to behavioural practices or the environment. Even after treatment brings the infection level down to almost zero, in the absence of changes to the environment, the prevalence curve will return to where it started. That is why we need to talk about education, too.

In terms of the morbidity caused by STH infections, it is important to note that in SAC, deworming treatments can reverse cognitive deficits in concentration and memory caused by STH infections. Deworming can also reduce anemia and other related consequences of STH infections by reducing the number of worms in the intestine. This is because a child's morbidity level is related to the number of worms in their system. Multiple studies have confirmed the high prevalence of anemia among SAC in the Region; for example, in Guyana, 57% of SAC have anemia.

Given the importance of reaching SAC with deworming interventions, collaboration between the ministries of health and education is critical in LAC countries. In countries where collaboration is strong, school-based deworming programs are much more sustainable. For example, in Guinea, West Africa, deworming started in just a few districts; but after collaboration between the ministries became strong, that small program scaled up to the national level. Other countries may want to consider this model.

Deworming programs need to find ways to overcome numerous challenges: getting political commitment and leadership; ensuring effective knowledge transfer and uptake; getting technical assistance; dealing with implementation constraints; issues of drug availability and cost; finding and using teaching materials; developing a monitoring and evaluation plan to measure impact; identifying and working with local partners; and integrating with other interventions.

There are several documents that are useful for program managers. One of them is called Helminth Control in School-age Children (WHO 2002). The second edition will be coming out shortly. Such documents should be translated into Spanish to better guide field operations for deworming programs in LAC.

Epidemiology and burden in preschool-aged children (pre-SAC): Ms. Serene Joseph, PhD Candidate, Department of Epidemiology, Biostatistics and Occupational Health, McGill University

Over 2 billion people worldwide are affected by STH infections; and children under age 5 are one of highest risk groups.

The highest prevalence countries in LAC include Bolivia, Ecuador, El Salvador, Honduras, Nicaragua, Haiti and several of the Caribbean countries. However, even in countries with low prevalence, there is plenty of regional variation; and many vulnerable pockets exist.

In pre-school age children (pre-SAC), *Ascaris* and *Trichuris* infections are the most common. The concern in this age group is that, while the size of the children's bodies is smaller, the worms are not; thus, they take up more space. In addition, young childhood is a period of very rapid growth and development, especially in the first 24 months of life, yet not much is known about the effects of STH infections in this age group.

In studies we conducted in the Amazon region of Peru, we found infections in infants as young as 8 months. By 12 months of age, 20% of babies are infected; and by 14 months, the infection rate is close to 40%. This shows that, as children become more mobile and begin to explore their environment, they rapidly acquire STH infections.

In a community household survey we conducted in Belén, Perú, we found an STH infection prevalence of 48% in children under 5 years of age. In addition, we found that moderate-intensity *Trichuris* infection was a risk factor for both underweight and wasting associated with malnutrition; and that hookworm infection was also a risk factor for the latter.

Throughout the LAC Region, it is estimated that 10% of people with STH infections are pre-SAC aged 0-4 years, meaning an estimated 8 million with ascariasis, 10 million with trichuriasis and 1 million with hookworm.

Pre-SAC are increasingly being targeted in deworming programs and included as a high-risk group. In 2002, WHO recommended inclusion in systematic deworming interventions of children as of twelve months of age. Its recommendation was to give children aged between 12-24 months, either mebendazole (500mg) or a reduced dose (200 mg) of albendazole.

From 2007-8, deworming among pre-SAC increased in terms of the number and percent of at-risk children covered (i.e. from 2% to 5%), but the overall coverage, at 5.3%, remains unacceptably low. Coverage details are as follows:

Deworming coverage in preschool age

	Global 2007	LAC 2007	Global 2008	LAC 2008
# endemic countries	130	31	130	31
# reporting	49	6	46	5
# treated	90 787 873	836 953	104 398 086	2 222 107
# at risk	385 571 176	42 300 793	386 121 144	41 926 290
% treated	23.55	1.98	27.04	5.30

WHO. Soil-transmitted helminthiasis. Weekly epidemiological record 2010;85:141-8.

Although some progress has been made, much still needs to be done. The LAC Region has the lowest coverage for this age group among all of the WHO Regions; and many countries are not reporting coverage at all. Nevertheless, there are some bright spots in this picture: Nicaragua achieved at least 75% coverage in 2007-2009; and Haiti also reached 75% coverage in 2008 (but not 2009). Mexico and Belize reached greater than 50% coverage in 2009, as well, with 7 countries reporting in that year.

The literature has described numerous physical benefits of deworming in the pre-SAC age group, including increases in weight and height and decreases in wasting. Cognitive benefits are harder to measure in this age group, since pre-SAC are not yet in school and cannot take IQ tests; however, improvements in language development have been noted.

There are still challenges to be overcome, and further research is needed in this age group. In particular, more studies are needed to determine the effect of deworming on pre-SAC's growth and development; also, it is important to gather data that is age-disaggregated. Operational challenges include devising optimal delivery and integration strategies, determining the ideal reduced dose of albendazole required for the 12-24 month age group, and experimenting with drug formulations, such as liquid suspensions and both chewable and crushable, non-chewable tablets. Cost-effectiveness of interventions must be considered, as well. Finally, given our study

results in Peru, it is important to discuss whether children under the age of 12 months should also be treated.

STHs in LAC; mapping update: Mr. Steven Ault, Regional Advisor for Parasitology and Neglected Diseases; Dr. Santiago Nicholls and Dr. Martha Saboyá, Regional Program of Parasitology and Neglected Diseases, PAHO

In the LAC Region, some 200 million people live below the official poverty line, representing 25% of the total population. A large number of children are included in this number.

NTDs disproportionately affect low-income, marginalized, indigenous and minority ethnic groups. As such, they are considered important social determinants of health. Historically, NTDs are a legacy of slavery, particularly leprosy, schistosomiasis, lymphatic filariasis and onchocerciasis, which came to the Americas from Africa through the slave trade 400 years ago. Today, they contribute to perpetuating the poverty cycle.

There are many challenges that families must overcome when faced with NTD infections. Many live in areas that are difficult to reach, from fishing villages in coastal areas, to houses in the mountains in rural areas. It is hard for families to travel to health clinics, plus there are language and cultural barriers to overcome.

Many of these families don't live in safe environments or have adequate access to services including education and health care, a safe water supply, adequate sanitation and drainage systems, and safe housing. All of these issues may contribute to STH infections.

As an international organization, we have an ethical and moral imperative to address this issue. In 2009, an important resolution was passed to eliminate as a public health problem, or drastically reduce, the burden of neglected tropical diseases (NTDs) by 2015. These diseases have been classified into three groups, with group one representing those targeted for elimination, and group two—which includes STH and schistosomiasis—identified to be drastically reduced using available tools, although complete elimination is not expected. The third group consists of diseases that require further assessment and development of more effective tools and methods for treatment.

For STH infections in particular, the goal for LAC is to reduce prevalence among SAC to less than 20% in areas of high and moderate risk (where prevalence is greater than 20% currently). To do this, the WHO recommends using mass drug administration (MDA) to cover a minimum of 75% of SAC. MDA should be given twice annually to high prevalence areas (infections in more than 50% of SAC). Complementary interventions should include health education, as well as improved access to potable water and sanitation services.

PAHO has entered into a partnership with the Inter-American Development Bank (IDB) and the Global Network of Neglected Tropical Diseases (GNNTD)/Sabin Vaccine Institute, to advance toward this goal. This partnership provides technical cooperation to promote the development and implementation of integrated plans for NTD control. It also supports mapping and promotes the design and implementation of surveys to determine baseline prevalence as well as intensity of

infections. Finally, it advocates and mobilizes resources for NTD control. In addition, a trust fund has been established to support integrated programs to control and/or eliminate NTDs and demonstration projects have been formulated in Mexico and Brazil.

Data on the risk population and deworming coverage: Dr. Santiago Nicholls

A few years ago, PAHO estimated the size of the pre-SAC and SAC populations at risk for STH infections in the Americas, using PAHO's basic indicators document and official data from the countries. According to an analysis of gaps and needs for technical support carried out by PAHO, countries were classified into 4 groups. The 17 (out of 33 total) countries with the largest numbers of at-risk pre-SAC and SAC children—consisting of Belize, Bolivia, Brazil, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Mexico, Panama, Peru, Saint Lucia, Suriname and Venezuela—were assigned to groups 1 and 2. Further, PAHO estimates that focusing deworming efforts and actions to reduce morbidity on these 17 countries would reach 94% of pre-SAC and 93.5% of SAC, which combined, are estimated to total approximately 42 million children. Thus, our focus is to prioritize these 2 groups without forgetting the other groups.

From 2005-2010, deworming coverage for pre-SAC has been much lower than for SAC in LAC. For pre-SAC, it has varied from 12.5% in 2005, to less than 2% in 2007, to almost 11% in 2009. For SAC, coverage began at almost 34% in 2005, dipped to under 22% in 2008, and increased to over 33% of all SAC in the Region in 2009.

The NTD team at PAHO sees a number of challenges and opportunities for collaboration. We need to work together to improve MDA deworming coverage as well as program monitoring and evaluation (M&E). We also need to find ways to insert deworming into other health system delivery platforms, such as adding it on as part of the MDA efforts of other NTDs, including lymphatic filariasis, schistosomiasis and onchocerciasis; integrating it into or piggybacking with control programs for HIV, TB, malaria and other diseases. To dramatically increase the success of our interventions, we need to take a sectoral approach by integrating deworming with comprehensive programs that also improve water supply and sanitation. Finally, we believe programs will have a greater medium- to long-term impact if they use a social determinants approach to plan for and measure success.

Mapping STH infection prevalence and intensity in LAC: Dr. Martha Saboyá

Since 2009, we've been working on mapping out the disease burden in all 33 countries. As part of this effort, we prepared epidemiological profiles of prevalence of STH among SAC and pre-SAC as well as of other NTD infections at the first administrative subnational level, because we wanted to know which areas within the Region have the highest disease prevalence. During 2010, we carried out a mapping study of prevalence and intensity of STH infections in both pre-SAC and SAC at the second subnational administrative level. Currently, our mapping study is only available in draft form, with release of the final document planned for next month.

For our study, we looked at the scientific literature published between 2000 and 2010, as well as at data published on websites of the Ministries of health and NGOs, and we found 236 papers reporting data. Of these, 120 met our inclusion criteria; giving us 335 data points in 18 countries.

Not surprisingly, we found a shortage of studies on pre-SAC; of the 335 data points, only 11.9% (40 data points) were for prevalence information in pre-SAC, 56.7% (190 data points) were for SAC and 31.3% (105 data points) were for children aged 1-14 years.

From this study, we conclude that 34.9% of the data points for prevalence of STH published and selected for this analysis showed values between >20-50% and 27.8% above 50% indicates that at least 62% of children need deworming at least once per year in these specific places.

In addition, the 151 data points in 7 countries that had information on intensity of infection showed that 28.5% of the infections were heavy (almost two-thirds due to *A. lumbricoides* infections), and almost 35% were of moderate intensity.

Determining prevalence for pre-SAC is difficult since there are so little data available. For instance, the Dominican Republic has neither prevalence data published for pre-SAC nor for SAC; in the case of Brazil were found a quite important number of data regarding prevalence of STH for SAC, but relatively few for pre-SAC. At least among SAC, these data show us where levels of prevalence indicate that locally targeted approaches to deworming should be used.

This study gives us prevalence data broken down by sub-region. Countries can use it to see where deworming programs have had an impact to date, as well as where mapping gaps exist. However, its usefulness is limited in that some countries do not publish data for either SAC or pre-SAC, and very little data are available for the pre-SAC group, in particular.

We believe that useful next steps include using the results of this study for advocacy to move forward the deworming agenda and the need for further mapping. In a second phase, we propose to use the data to develop geospatial models to predict prevalence in areas with similar socioeconomic and environmental conditions, Finally, we envision a third phase to use those predictive models in identifying areas for once or twice yearly deworming activities.

Session 2: Deworming policy and planning

Moderator: Ms. Karen Palacio, Senior Program Officer, Global Network for Neglected Tropical Diseases (GNNTD), Sabin Vaccine Institute

Undernutrition and deworming: Ms. Kari Stoeber, Senior Advisor for Global Advocacy, Global Alliance for Improved Nutrition (GAIN)

GAIN is the only alliance that is dedicated solely to global nutrition; its goal is to reach 1 billion people—particularly women and children—by 2015, through programs such as folic acid fortification of foods in South Africa, iron fortification in Egypt, and salt iodization in many

countries. It was created as part of the UN in 2002, and it became independent of the UN in 2005. Headquartered in Geneva, Switzerland, its support comes from donors such as the Gates Foundation, as well as more than 600 alliances with businesses and multinationals.

GAIN focuses its activities on 4 priority program areas: nutrition programs, business development and leverage, performance management, and policy and advocacy. Although it works in over 25 countries, most of these are in Asia and Africa and only a few are in LAC. It estimates that it reaches over 400 million people per day, only 2% of whom are in LAC; and it is currently exploring ways to expand its LAC initiatives.

Among its achievements are that it has helped achieve a 30% reduction in neural tube defects in Africa through its folic acid fortification program and it has helped reduce anemia in China by one-third.

Iron deficiency is the most common form of malnutrition and also the most common form of anemia; other important causes of anemia include intestinal parasites and malaria. Iron deficiency anemia is a major risk factor for maternal mortality, causing 115,000 deaths per year.

Part of GAIN's policy and advocacy work includes communicating the message that improving global nutrition is important economically due to its impact on GDP; and socially, because malnutrition currently accounts for one-third of deaths in children, worldwide. In economic terms, GAIN's research has shown that a \$347 million investment in improving global nutrition would bring \$5 billion return, through avoided deaths, improved earnings and reduced healthcare spending.

Undernutrition usually begins with mothers, and it creates an intergenerational cycle where undernourished women grow up stunted. As mothers, they give birth to smaller children, who are also undernourished and thus, fail to grow and thrive, both physically and intellectually. Damage suffered in early life leads to permanent impairments: the first 1,000 days of life, starting with conception set a child's future in stone. Undernutrition in mother or child during this time can cause permanent damage, including low IQ. When children are undernourished at age 2, they will suffer a 10% loss in future productivity. In addition, early undernutrition later on leads to high obesity rates because rapid weight gain occurs when previously undernourished children become adults; this phenomenon has had devastating effects in raising chronic disease risk worldwide. In short, stunting and wasting beginning early in life set the stage for life for a child, perpetuating the cycle of poverty.

GAIN estimates that 178 million children under age 5 are stunted. In LAC, this problem is particularly seen in Guatemala and Peru, where anemia rates are quite high. However, there are many hot pockets throughout the Region that can't be seen when looking at country averages.

According to the Lancet series on maternal and child undernutrition, published in 2008, undernutrition risk factors account for more than 35% of all child deaths, and 11% of the global total disease burden. In absolute numbers, more than 3.6 million women and children die as a result of undernutrition each year.

A new global nutrition movement called Scaling Up Nutrition (SUN) has been created to tackle the global undernutrition problem. SUN is a loosely affiliated task force, made up of the First 1,000 Days Initiative, Secretary Clinton's Feed the Future program, USAID, GAIN and over 100 other organizations. Its aim is to secure global resources to support national nutrition plans and scale up proven, cost-effective nutrition interventions. Obtaining and delivering deworming drugs is one of the interventions SUN is working to support.

SUN has the following primary areas of collaboration: developing and implementing country plans to scale up nutrition; project design, implementation, monitoring and reporting; communications and advocacy; creating global networks and movement; developing and sharing knowledge, standards and policies; financing pathways; and governance.

Through SUN and its members, there are opportunities to link deworming and nutrition. In particular, by establishing integrated delivery models, leveraging markets to deliver public goods, advocating for supportive policies, strengthening capacity, leveraging multi-stakeholder platforms, and developing and sharing evidence.

Choice of deworming drugs and safety precautions: Dr. Antonio Montresor, Department of NTD Control, WHO

The public health community has recognized the need for large-scale campaigns to deworm young children and worldwide over 100 million pre-SAC are dewormed each year.

Although GlaxoSmithKline (GSK) and Johnson & Johnson (J&J) have increased the availability of anthelmintics through drug donations (GSK - albendazole, J&J - mebendazole), at present such donations are only available for SAC.

Delivery modes in use to distribute these drugs include extended outreach strategies, immunization and vitamin A campaigns, targeted interventions in nutritionally deficient districts, routine outreach, and child health days or weeks. Mexico has been successful in using child health weeks to deliver deworming drugs, for example.

The drugs of choice for deworming have been albendazole (ALB) and mebendazole (MEB), both of which have experienced dramatic scale-ups in recent years. The rationale for choosing the best anthelmintic drug depends on three factors: cost, availability and effectiveness.

In terms of cost, anthelmintics are usually cheap, averaging \$0.02 per dose for either ALB or MEB tablets in large deworming programs. Some of the drugs are donated at no cost, but generally cost depends on quantity ordered. Generic and locally produced drugs may be even cheaper, but independent testing is required to ensure that the drugs contain sufficient amounts of active ingredients, as well as to ascertain appropriate disintegration and dissolution rates. Research has shown that both ALB and MEB have similar efficacy, on the order of 95% for *A. lumbricoides*, 85% for hookworms and 80% for *T. trichiura*.

Pyrantel/Oxantel (in 250 mg chewable tablets) and Levamisole (in 40 mg chewable tablets) are also effective against all three types of worms, but their use is complicated by the fact that they must be dosed according to each child's body weight (10 mg/kg and 2.5 mg/kg, respectively).

All anthelmintics recommended by WHO have an excellent safety profile when given in single dose amounts. Since the drugs are not absorbed by children's bodies, side effects are rare and when they do occur, they are mild and transient. Research has shown that MEB and ALB can be safely given in combination with praziquantel (in pre-SAC) and ivermectin (in SAC). However, there have been reports that pre-SAC find it difficult to swallow deworming tablets; thus, the choking risk needs to be addressed, even though the large majority of pre-SAC are able to take the drugs without a problem when teachers have been trained in drug administration, according to WHO field research.

WHO training materials teach drug administration basics, including never forcing children to take drugs, how to give drugs, what to do if a child chokes, and using chewables or crushing tablets to mix with food or beverages. Drug administration may be done at designated distribution sites or at home, in order to reduce stress on children. WHO also produces a training newsletter.

Before initiating deworming in a community, it is very important to communicate clearly with community leaders and parents to carefully explain the treatment and avoid raising suspicions or creating misperceptions. Likewise, it is important to show concern and treat even minor side effects to further reduce suspicions.

Integration with supplementation and vaccination programs: Dr. Antonio Montresor, Department of NTD Control, WHO

Pre-SAC, SAC and adolescents are at particular risk for worm infections because they are in periods of intense physical and intellectual growth. That's why it's so important to target them for deworming treatment. The dose of anthelmintic treatment (1 tablet) is the same for all age groups, except for the administration of ALB in children aged 12-24 months, who should receive one-half of a tablet (ie. 200 mg).

WHO is currently in the process of revising its estimate of worm infections in pre-SAC and SAC. The new estimates are that 272 million pre-SAC and 610 million SAC are infected. These estimates are based on new data from the countries, as well as epidemiological, ecological, and sanitation data. The WHO report containing these new estimates is expected to be published in June 2011.

The damage to children from worm infections includes anemia, poor memory and language fluency, and stunted growth. Distributing 400 mg of ALB or 500 mg of MEB once per year is sufficient to control morbidity due to parasites. At present ,deworming interventions for pre-SAC are integrated with immunization and vitamin A nutritional supplementation programs. Integrating with existing programs helps to reduce intervention costs.

As of 2009, however, only 30% (182 million out of 611 million at risk) of at-risk SAC and 37% (101 million out of 273 million at risk) of at-risk pre-SAC had been treated. To address the large treatment gaps, WHO is preparing a strategic plan for STH control. By taking advantage of drugs and donations from GSK and J&J, as well as using funds from foundations, WHO is hoping to significantly scale up deworming coverage in SAC and pre-SAC.

When integrating deworming into existing programs such as nutrition supplementation or immunization campaigns deworming costs decrease from \$0.27 (USD) to \$0.025 (USD) per child, when compared to the cost of dedicated deworming programs.

Integration also benefits other programs, as well, since deworming interventions tend to be well-received by local communities and are even popular, because they produce results so quickly. Thus, integrating deworming can increase the community's trust in health services as well as increase participation rates in supplementation and immunization programs.

Integration with vitamin A supplementation and immunization programs is synergistic from a biological standpoint, as well. Research shows that infected children's vitamin A absorption rates improve significantly after they receive deworming drugs. The mechanism behind this is still being studied, with the most plausible theories being that worms either compete for vitamin A or are somehow responsible for its malabsorption.

Worm infections have also been shown to weaken the immune system in animal studies. Thus, deworming is likely to increase immunization uptake, as evidenced by the results of studies showing reduced uptake of pneumonia and TB vaccines in worm-infected individuals. Again, further research is needed to define the mechanism by which worms alter their hosts' immune response.

Another reason why it makes sense to couple deworming with other programmatic interventions is that it is so easy to administer deworming drugs. A one-page fact sheet is all that is needed to train program personnel, instructing them to give 1 tablet per child, and how to handle any unlikely side effects such as choking. The bottom line is that deworming is cheap, simple and safe. Given its significant health impact, its capacity to create synergies with immunization and vitamin A programs, as well as its capacity to improve perceptions regarding health services, integration with such programs makes a lot of sense.

WHO has detailed data on all countries where worms are endemic, as well as documents and publications on helminth control and integrating deworming into existing delivery channels are available free of charge on its website (<http://www.who.int>).

Discussion on deworming policy and planning

Question 1: When ivermectin is added to ALB/MEB, the results are dramatic—cure rates increase a lot and intensity is reduced. In view of these results, do you see a role for adding ivermectin? Can it be given to pre-SAC?

Answer 1: Some developing countries are already treating pre-SAC with both ALB and ivermectin drugs because of the LF elimination program. We do have some data on this drug combination, but the problem is that ivermectin is not, on its own, a drug of choice for STH. Also, there are indications that giving both drugs might increase drug resistance in parasites. However, I think this may be the way forward and we'll do our best to provide the most informed recommendations for donors and drug producers.

Question 2: Why do you say that the nutrition community doesn't believe that deworming improves the nutrition status in children? What are the barriers beyond the scientific evidence?

Answer 2: They are focusing on the most vulnerable children and the availability of macro and micronutrients that are so important in the first 1,000 days. They also aren't aware of the risk-benefit profile for deworming in children under the age of two years. Their perception is that deworming is not effective because some children who are treated still have worms (although the number of worms is much reduced). It will be important to disseminate the information presented here, not only on the prevalence of STH in children under two years of age, but also on deworming's positive impact on vitamin A absorption.

Comment/Question 3: Given that deworming needs to be given periodically, rather than just one time, how can we include program sustainability in our policy, planning and advocacy efforts? Rather than talking about the high efficacy of single drug administrations, we need to promote sustainability in country-wide programs.

Comment/Question 4: In Honduras, if you ask school officials if a deworming program exists, most would say, yes, but most kids are still infected. The issue is that most people have no idea how worms are transmitted. How can we include health education, promotion, literacy and hygiene into the package; not just focus on specific diseases? We need to look beyond just providing tablets.

Answer 4: Water and sanitation is critical in nutrition, as well. If children have diarrhea, having good food available doesn't help them. We need to continue to promote water and sanitation in the agricultural and health systems to reduce diarrhea, and consequently, malnutrition.

Question 5: Can you provide more info regarding deworming in pregnant women?

Answer 5: There is evidence that pregnant women can receive ALB/MEB in their 2nd and 3rd trimesters with no ill effects on the fetus. Even in cases where women in their first trimester were accidentally treated, no ill effects on the baby have been observed. This is because the drugs are not well absorbed.

Comment on question 5: In Honduras, a study is being finalized with George Washington University where pregnant women were treated and both they and their children were followed for 2 years. No side effects were observed. When their children started having contact with soil, they became infected, but when they were treated, they had good results. We'll be finishing and disseminating the results of this study soon.

Question 6: One of the organizations that works with vitamin A distribution—Vitamin Angels—has been placing more emphasis on giving vitamin A to pregnant women and neonates. This concerns me because this creates a tendency to de-emphasize vitamin A distribution to children who have passed the neonatal period, namely because it eliminates the opportunity to piggy back deworming with vitamin A distribution. Do you think we're narrowing down one path or traveling down 2 parallel paths here?

Answer 6: We've medicinalized nutrition by going to capsule form. On the other hand, WFP has vitamin A enriched oil and other food products that are fortified. We have to look at how vitamin A is getting into the system and see what delivery mechanisms are available and how they may change over time. Vitamin A is important to prevent blindness, but how we deliver it is still up in the air.

Question 7: Regarding 'selling deworming' to other communities, such as nutrition, immunizations, etc., what does the TB community think of deworming?

Answer 7: Unfortunately, it is very difficult to convince other programs that deworming is a good thing because we are all competing for resources. All we can do is provide evidence on this issue. The good news is that the evidence is strong.

Question 8: In Peru, the guidelines say that pre-SAC should get vitamin A supplements every 6 months, but experience shows they are not getting it because donors are not providing it. The good thing is that in Peru, clinics give out vitamin A, so pre-SAC are getting it. But what is happening in other countries?

Question/comment 9: How can we better advocate in-house? And outside the organization, as well, of course, but it is also hard to talk with people inside our own organizations. We do have some good examples to share, such as what the IDB is doing by looking for opportunities to partner with the water and sanitation sector to work toward controlling NTDs. But in other areas, integrating deworming is seen as an extra burden. For example, in Honduras, we find that teachers don't accept it because they think it is an extra burden, something else to do. We have to change perceptions.

Comment 10: In Peru, doctors and health professionals administer ALB in areas outside Lima, but it is hard to know the results. A systematic review by the Ministry of Health is needed to know the benefits of deworming. Another concern is that medical and health personnel, as well as the people receiving the interventions, think that the drug companies are benefiting, which is not the case. Also, we have 5-6 different drugs available in Peru; it's important to make sure the quality of the drugs is good.

Answer 10: The Ministry has to survey a small sample of the SAC population and according to the results, decide whether to provide ALB. Second, providing the drugs doesn't benefit drug companies because doing so is not a commercial venture; actually, drug sales are reduced because children get healthy when they receive ALB. Third, checking drug quality is important and very inexpensive to do—it only costs about \$100 to test millions of tablets. WHO recommends that all countries do this testing; and if they can't, WHO/PAHO can help them find specialized labs to have it done.

Comment 11: Thanks for sharing the information regarding the longitudinal research that is being conducted. So much of what we do in public health doesn't get published; and it is hard to get around the perception that there is insufficient evidence if data are not published.

Comment 12: Since there is a limited supply of global resources, the more we can mainstream this issue and get it in front of decision-makers, especially in regard to maternal and child health, the better. Other sectors need to hear what the evidence is telling us. Even from a publications perspective, it is important to try to mainstream the research and get it into journals read by nutritionists (e.g. the impact of worm infections on vitamin A absorption); this helps get the evidence out to decision-makers in other sectors.

Session 3: Ongoing helminth control programs in the Americas

Moderator: Dr. Antonio Montresor, Department of NTD Control, WHO

Lessons learned from Nicaragua: Dra. Lidia Ofelia Davila Poveda, Childhood Monitoring Technician, Ministry of Health, Nicaragua

In Nicaragua, we have a comprehensive outlook; we don't have a single process or strategy for deworming. From 2007-2011, there was a change in the health system when we transitioned to community health care to provide care to the most remote, inaccessible areas. Now, we work in small, rural communities as part of the universal free healthcare process.

We have primary care centers with hospitals and national specialized clinics in some areas. Primary care is the basis for prevention and other healthcare aspects, though we also have health clinics, maternity care, and hospitals, of course.

In 2011, we are about to celebrate national vaccination day on April 11th. Having an annual national vaccination day has helped us improve our health indicators.

We also have national health awareness days, which focus on providing a preventive healthcare package to citizens according to our overall healthcare objectives; we also use these days to collect measurements and provide healthcare tools to citizens. National health awareness days were initially held 3 times per year. The original intention was to eradicate polio and prevent tetanus and other diseases, but we have since expanded.

National health awareness days work through a community network, where volunteers are trained to visit homes. We also partner with various organizations for this purpose. Since 1993, they were held 3 times per year, but now we only have them 2 times per year. In 1994, we expanded the tools used during these days to focus on deworming as well as vitamin A delivery.

Our initial national health awareness day guidelines were to administer vaccines to children ages 2-12 years, and to give vitamin A from the age of 6 months – 5 years. Now, we've expanded up to age 14, because our work with school census data provided by the Ministry of Education has shown us that many children are still in grade school around age 14. Thus, we visit schools and give them orange-flavoured 500 mg MEB, too, even though the main aim of health awareness day is to reach children ages 2-12.

National health awareness days allow us to measure successes in deworming. They also help us to measure how financial assistance has helped with immunization programs, and how effective the assistance is of various agencies, such as those from Canada.

It's important to stress the importance of collaboration in our healthcare networks, which involve community efforts, volunteer networks, the Ministry of Education, the armed forces, municipal governments and mayors, and others. Thanks to their support, we have trained 44,000 volunteers at the national level for these healthcare events. They have also helped us achieve much success

in disseminating information even to autonomous regions. Empowering local community organizations has made a real difference in our success.

Lessons learned from Honduras: Dr. Concepción Zúniga Valeriano, Chief, Chagas and Leishmaniasis Control Programs, Ministry of Health, Honduras

Since 1997, we've done deworming studies that have looked at 6 different regions, covering 14 municipalities out of a total of 284, and involving 1,600 students. Additional studies were done in 2001 and 2005, and our ongoing activities are based on prevalence data from 2002-2005.

Our conclusions from the data are that there is a direct relationship between disease prevalence and poverty. Also, there is much variation in prevalence, with some areas where prevalence of worm infections is high. Looking at SAC, we realized that there are gaps because many populations are not covered by deworming, including women of childbearing age and children not attending school.

We began working with WFP to distribute deworming drugs twice per year with school lunches. Lunches and deworming are incentives that encourage children to go to school, too.

We also distribute deworming drugs through vitamin A delivery and vaccine delivery programs to pre-SAC and women of childbearing age. We do 2 deworming cycles per year, and we now have coverage of 50%.

Our basic lines of action also include advocacy, technical and social outreach, and securing needed political support, because we know that without these, our efforts won't be sustainable over time. In the past 4 months, we have enjoyed plenty of political support, thanks to stronger relations with authorities, so we think we will obtain the resources we need. However, although we may have enough funds for deworming drugs, we still need to provide training for their promotion and community mobilization.

Distribution of drugs occurs with the help of WHO and other organizations in the country. Although they help with distribution of drug supplies, we still don't have enough records and data. Right now, due to lack of reporting, we are only gleaning information on 15% of ongoing deworming activities, and we don't know how many drugs and medical supplies have been transferred to schools and districts.

Monitoring and evaluation (M&E) efforts require additional resources and costs. The Ministry of Education expects us to provide information regarding coverage and the impacts achieved, but we haven't been able to do this appropriately. We need to train staff to do this reporting, and to have a well-defined strategy for planning and fundraising.

We need to develop a national survey to identify the number of people infected by soil-transmitted helminths. For this purpose, we are trying to sit down with each of the stakeholders, including people from the Ministries of Tourism, Health, the Office of the First Lady, and so on.

Our budget specialist has calculated that a tablet of MEB costs about 2 cents, and that we need to provide tablets to over a million pre-SAC. Including training, materials, storage and supplies, we estimate that \$400,000 per year is what is needed to cover 100% of the at-risk population in Honduras.

In the past 3 years we haven't expanded our coverage program due to lack of funding. Also, although we know we're getting results by coupling deworming with vitamin A and vaccine distribution, we don't know how successful we've been, due to lack of reporting. However, we estimate that among the groups we're covering now, particularly SAC aged 5-14 years, we are reaching about 1.2 million children, representing coverage of 61% of total target SAC.

Last year we surveyed the families of 33,000 children for Chagas disease. There, we need to cover the entire population, because parents and children live in the same conditions and have the same risks. If we don't eliminate the risks, we won't be doing anything. Not surprisingly, the survey found that parents and children have the same parasites. I say this because even though we may reach children, they get re-infected and they continue to be at high risk.

Improving the drinking water is also very important, since as of 2005, more than 40% of children didn't have access to treated water. If the hygiene situation is not improved and there is no access to safe water, other interventions are effectively useless.

Lessons from Save the Children: Ms. Seung F. Lee, Advisor/Sr. Director, School Health and Nutrition Development Programs for Children, Save the Children USA

We want kids to learn to be healthy; health is a means to an end—education. We need to sell this message to the education sector, and to do so, it's important to consider the education point of view. We'll be more successful if we work together in partnership with schools and share responsibility. We already know that deworming is easy to do; we just have to figure out which messages we can use to sell it to our audiences to get their participation.

School health and nutrition education consists of many topics: hand washing, methods for improving child health, drinking milk, and so on. There are difficult topics as well, such as the double burden of malnutrition and obesity. Tablets and deworming are just one component of school health education.

If we want children to be healthy continuously, we need to treat them with deworming drugs now as well as teach them how to prevent infections so they don't get re-infected. Thus, the long term solution is to figure out how we can prevent re-infections. To do this, we need to teach kids about how they got infected in the first place.

Of course, we can't tell kids to wash their hands if there is no clean water and soap available to them. We must also provide an enabling environment. To do this, we need political support to put in place effective national policies and to garner community support so parents don't pull their children out because they don't believe in the program and so school teachers buy into the programs, too.

Effective programs have to have 4 elements: good health policies and community support; good water & sanitation; skills-based health, hygiene, nutrition and HIV prevention education; and school-based delivery of health and nutrition services.

A global school health and nutrition (SHN) framework already exists, with leadership from UNESCO, UNICEF, WHO and the World Bank. As a member of this framework, Save the Children's approach is not to do things alone, but to talk to local governments, partner organizations and communities first in order to get parents and PTAs involved. After all, we need parents to be on the ground to keep the latrines clean—because often, there are no resources to hire cleaning staff!

Parasitic infections affect health and education in many ways. They cause malnutrition, diarrhea, general malaise, anemia, reduced learning capacity and inability to concentrate. When children get sick, they miss classes; have poor cognition; perform poorly in school; and after even small periods of absenteeism, many drop out of school altogether.

Save the Children International works in more than 110 countries, whereas in LAC, its SHN program work is in Bolivia, Haiti, the Dominican Republic and El Salvador. We do a baseline study in each country. In Haiti, for example, our baseline found that parasitic infections affected 65% of SAC.

In the under 5 age-group, we focus on providing SHN services to the younger siblings of SAC. Using the WHO recommendations on deworming, we partnered with Vitamin Angels in 2007 to deliver deworming tablets along with Vitamin A. In 2008, we participated in the Lancet series on nutrition that highlighted the importance of deworming for nutrition in pre-SAC.

By 2010, deworming pills were requested for almost half a million pre-SAC in Nicaragua, and we are working in partnership with that country through their community health networks and their Ministry of Health.

The challenges we see in reaching the under 5 age group are:

- Lack of data and clarity as to how to reach them.
- The fact that deworming has to be an additive onto an existing program; it is not a full package on its own.
- Mixed messages and policies exist—at first, we were not sure we could deworm under 5s; now know that for ALB, we need to use half a pill. Also, in some areas, they are treating children twice per year, regardless of prevalence. In other words, the messages are less clear for the under 5s.
- Partnerships need to be created and maintained between schools and healthcare; although we can provide technical expertise, we don't have a single infrastructure, namely schools, that serves the under 5 group. Instead, there are many more players in the mix.

Lessons from Operation Blessing International: Ms. Angela Cruciano, Manager, International Health Programs, Operation Blessing International

Operation Blessing International (OBI) was founded in 1978; its core competencies include water, health and disaster relief, among others. In health, OBI equips hospitals and clinics with medical supplies; improves rural health posts; helps control infections and disease outbreaks, and distributes anti-parasite drugs.

For this purpose, OBI generally uses ALB and MEB, depending on the preferences of each country. In 2010, OBI distributed 10 million single doses in Peru, Colombia, Mexico, El Salvador, Honduras, Guatemala and Nicaragua.

It uses 2 primary distribution methods:

- 1) Working with government agencies such as the MOH, MOE, and local governments and using their rosters of SAC to target. The difficulty with this method is that it is harder to get involved in campaigns, and there are often delays.
- 2) Working with non-governmental partners such as churches and NGOs. This works well for reaching women of childbearing age and pre-SAC and community volunteers can serve others in their community. With this method, too, we always work in cooperation with the government; and governments often assign us a region to cover.

Campaign components consist of logistics, such as how to get pills to the places where they are needed; volunteer training (we always have an education component in campaigns); site monitoring and reporting, including parasite studies, which is often the hardest part; and surveys.

Volunteer training requires selecting people in each department or level as field representatives, conducting second tier training, having people at the distribution level. To do this, we have to provide manuals; have them sign agreement forms; and make sure they understand what to do. This is especially important when working with non-governmental organizations.

Education components typically consist of training both parents and children in small groups. For example, moms or dads will come into schools and learn about parasites, how they are transmitted, and how to prevent infections. We often use slide shows, posters, and local health workers to do the presentations. Also, we have teachers train the children in the classroom. Finally, we're working with US university students to produce animations; and we use coloring books.

We have conducted parasite prevalence surveys in Peru, Guatemala and Honduras. This has given us data showing which areas have higher and lower prevalence. It is good for the field staff to be able to collect data themselves; it helps energize the staff to do this. Our prevalence surveys occur in 3 stages: 1) collect stool samples; 2) administer drugs according to the results; and 3) review the tests.

In Peru, we did tests in the Lima and Iquitos area. We found that children in the Lima area do not have STH. We plan to do ongoing surveys there to look at re-infection rates and intensity over time. In addition, we plan to publish the Peru prevalence survey on our website next month, as well as to continue doing the survey each year in order to decide where to distribute the drugs.

Our study in Honduras, which will be published soon on our website, showed that when children have access to shoes and sanitation facilities, many did not have parasites. However, in schools without water and sanitation services, only one child out of 25 tested did not have parasites.

Some of the challenges we've faced in our programs include the difficulty of overseeing distribution with a small field staff; getting accurate reporting information from distribution centers and local governments; delivering lasting education on disease control and prevention; and finding high impact distribution sites.

Some of the solutions we've tried to deal with these problems are doing tiered volunteer training; providing take-home manuals for all volunteers; and getting signed agreements from volunteers and distribution locations. To improve distribution, our surveys and studies help make sure we're treating the kids who really need it, not just those who live close to distribution sites. We're also trying to use new innovative education methods for disease prevention; we're recruiting hygiene promoters in the community; we're working to promote clean water initiatives and shoe distribution. We're conducting ongoing research to identify the most prevalent areas for future campaigns. Finally, we're investing in additional drugs and vitamins, as well as working with local governments to prevent overlap and improve reporting.

OBI's 5 year plan is to continue deworming at the national and local levels; scale up and integrate data from prevalence surveys; track communities for long-term health and hygiene improvements; and scale up our work with hygiene promoters in the communities we serve.

Discussion on helminth control programs in the Americas

Question 1: Does OBI provide incentives for volunteers?

Answer 1: Not monetary incentives, no. But we may provide small incentives in some countries, such as t-shirts in El Salvador. We've found that when we work through churches, people tend to have a simple philanthropic urge to help their community, so no monetary assistance is needed.

Question/Comment 2: The problem with some of these programs is that we don't see their impact, and there is no controlled follow-up done. Also, sometimes policies change as governments change. The population needs to understand the advantages and disadvantages of these types of programs. We need to work jointly—government, academia and NGOs, to create model communities that can show governments what can be done with effective community participation. As an academic, I like to work in the field. We also have students who can help do prevalence studies, so we can assist there.

Question/Comment 3: How do we improve coverage, how do we monitor the impact of interventions? I believe we have to look at the success of vaccine programs and issue certificates like they do for polio vaccines. Not only will having certificates help improve our records, but they will also improve family records and help family record reporting in countries. And they will help us join the monitoring strategy for vaccines and give us local data; then, someone can be sent out to verify that it is true. We can use quick monitoring to do this. We should find areas to integrate with existing record keeping, and take advantage of these existing efforts.

Question/Comment 4: Some countries in LAC work with NGOs and the MOH, but the risk is that maybe drug resistance will develop and we won't know about it. Also programs should be done in cycles, so they occur at established times. If there are drug alternatives, we can rotate with other drugs; the strategy of rotating ALB and MEB isn't always effective because sometimes it is confused with penicillin or other drugs. We have to join efforts to figure out how to do this; we have to consider all programs.

Answer 4: We always work with government agencies; the ministry literally gives us a department or region, so the ministry knows which schools we're doing. We work in complete transparency with the MOH and other programs. Doing so also helps us, because if we want to do subsequent rounds with the same children, theoretically, they are all still there.

Question/Comment 5: In Nicaragua, I understand the MOH works with NGOs. How does coordination occur? Also, in Honduras as of last year, there is a coordination committee for NTDs that lets NGOs and others come to the table to avoid overlaps and assigns distribution areas. I invite the speakers from Honduras and Nicaragua to speak to this.

Answer 5: In Nicaragua, we work with several agencies that support us in immunization programs and deworming. In deworming specifically, we work with the data registry of target areas, and there, each health center is presented to the agencies and introduced to the help or programs available from these agencies. Such meetings are programmed depending on our needs as a country. Based on this, we see what the needs are, and we get the support needed.

In Honduras, we inventory available aid so there is no duplication of aid, including that from international missions, churches, etc. In the inventory, NGOs are assigned to deliver drugs. OBI covers almost all the drug needs in Tegucigalpa. The government buys drugs and gets donations covering 1.5 million children per semester; and OBI covers the remainder with ALB, MEB, and so on. Without them, the cycles wouldn't be so regular, because we don't have the financial capacity to cover what they currently provide. I was concerned when I saw the 5 year plan because we need to continue to get this coverage beyond that. Also this group deals with nutrition and other areas. Some programs, like those I'm in charge with, are doing deworming activities and not reporting them. We have field groups doing deworming for family groups while doing interventions for Chagas disease control and surveys as well, but we'll have to start reporting them because we are not doing so now. Last time, we reached 72 or 74%, but I think we could reach 100%.

Question/Comment 6: All the speakers talked about the importance of coordination. We are also still in process of evidence collection, which is needed to get the nutrition community and others on board. Deworming is critical and has been put on national agendas, and coordination along with research activities must be reported. I don't know if all the players know where other players are in the countries. I am very glad to hear that national coordination teams are being used, but maybe we don't all need to do prevalence surveys—maybe PAHO could do that. We need to think about this so we can make recommendations. I like the idea of an inventory of activities.

Session 4: Challenges of control programs: Group discussion

Moderator: Mr. Steven Ault, Regional Advisor for Parasitology and Neglected Diseases, PAHO

What are the most important lessons you and your organization have learned regarding deworming control programs based on your experience in the Region?

Summary of Lessons Learned

1. National committees are now being organized to coordinate the response to NTDs, including STH.
2. PAHO will map STH prevalence for all endemic countries so that deworming efforts can be optimized and research gaps identified.
3. We should harness Nicaragua's experience in efforts to develop a strategic plan to address STHs, as well as a coordinating body for the various NGOs.
4. Knowing who is doing what, and where, is key to achieving high coverage rates and avoiding duplication.
5. Ensuring access to clean water, soap and proper sanitation is key to long term control, as is hand-washing education.
6. There are high-impact, cost-effective, feasible health interventions that should be promoted in the region.
 - a) There are a few examples of national policy in LAC. However, there are separate initiatives in each country in the Region that aren't integrated with national policies, and which therefore are not sustainable.
 - b) There is no one-size-fits-all recipe for success. Each country should develop its program according to local realities and capacities.
 - c) It is important to quantify (map) the problem and identify regions that require interventions.
 - d) It is important to improve M&E to convince politicians that interventions are effective and sustainable over time.
7. It is important to present cumulative scientific evidence to:
 - a) Guide program implementation, monitoring and evaluation, but in a way that is flexible enough to take into account unique local circumstances in each country or region (i.e. policies, culture, and so on).
 - b) Persuade health ministries about the importance of carrying out and evaluating intervention programs.
8. Deworming interventions should be part of a children's health package that:
 - a) Must be integrated into existing public health programs at the local level to ensure sustainability.
 - b) Require governmental leadership to coordinate the efforts of all partners.
 - c) Require community involvement in their planning, implementation and evaluation.
 - d) Must be monitored and have adequate reporting of progress.
 - e) Need established indicators and guidelines for proper M&E.

- f) Must contain social mobilization components before, during and after implementation.
- 9.
 - a) The concept of “first 1000 days” and the importance of adequate nutrition during that time, which if not provided, sets the stage for permanent damage to a child’s growth and development.
 - b) The need to communicate the importance of deworming pre-SAC to nutritionists and other health professionals.
 - c) Re-emphasis on the importance of collaboration and coordination between MOH, MOE, NGOs and FBOs; and the multiple reasons for doing so.
 - d) The importance of sustainability and the need to do outreach to other health programs, actors and sectors for this purpose.
- 10. Most deworming of pre-SAC (in Sub-Saharan African) is done opportunistically by means that are not sustainable over the long term (e.g. deworming as part of campaigns conducted with a different primary purpose, such as supplementary vitamin A or ITN distribution, and as part of time-limited mass drug distribution to eliminate LF).
- 11.
 - a) Pre-SAC are at risk of infection and deserve treatment.
 - b) Programs targeting pre-SAC are a reality in a number of countries.
 - c) Integration of deworming into EPI/Vitamin A supplementation activities is possibly the simplest and quickest way to ensure that pre-SAC are administered ALB/MEB.
- 12. Which platform is the most appropriate and effective for reaching the under 5 year population?
- 13.
 - a) Coordination/commitment/sustainability are key.
 - b) Survey of ongoing current activities is needed.
- 14.
 - a) Integration and coordination between the stakeholders is vital.
 - b) Understanding what control programs are happening where and when is key to preventing overlap and treating all at-risk children.
 - c) For long-term success, we must link deworming with water, sanitation and education.
 - d) We need to decide which delivery strategies are the most sustainable, cost-effective and appropriate.
 - e) We must communicate research results to the right people—the knowledge users.
- 15. All the donors and programs need to collaborate efforts.
- 16. There is a great need for pre-SAC formulations.
 - i. There are committed NGOs who have an interest in working with MOHs.
 - ii. Deworming can be safely integrated with vaccination programs.
 - iii. There is a need for advocacy to government outside the MOH.
 - iv. With sufficient communication, sensitization creates demand and makes it easier to find children (age 3+).
- 17. There is a good amount of data available via prevalence mapping → now we need to coordinate to get the most impact out of programs. How do we digest this information?
- 18. Interventions should be administered by nurses and medical personnel, not teachers. Mass deworming should be done after baseline epidemiological data has

been gathered. I am not sure that the ALB dosage is optimal for all *Trichuris* infections; some are chronic infections and continue to be present at low levels. We should monitor deworming programs and evaluate their impact on these infections.

19. We should focus on creating national strategies and coordinating activities, research and record-keeping at the national level.
20. There is a need to coordinate all governmental and non-governmental players. We need to focus on inter-programmatic, inter-sectoral integration in program implementation, monitoring and evaluation, information quality assurance, and verification of treatment coverage. We also need projections of future drug needs.
21. Teamwork across institutions and organizations, with civil society and especially, with the community, is key for transferring knowledge and educating people about the importance of deworming for our children, particularly in rural areas where myths persist.
22. Some relatively cheap ways to get the community involved may be using technologies like radios and cell phones, for communication. In Honduras, many people have cell phones, so it makes sense to have a private enterprise or NGO send text messages on how to choose the right foods, avoid parasites, and so on. Also, maybe we could have commercials dramatizing the issue on the radio during telenovelas.
23. Maybe WHO could create protocols for deworming pre-SAC that are simple and straightforward and we can implement them.

Based on your experience with deworming, what would you consider to be the single most important challenge for deworming control programs targeted to preschool-age children, in research, in programs you'd like to introduce and/or for scaling up programs?

Summary of challenges

1. Coordination and partnerships—opportunities to improve in some countries, also models presented yesterday, maybe we can find ways to strengthen, expand to other communities, become more efficient in drug delivery.
2. Integration (intersectoral, interprogram)—we have to explore opportunities on how to integrate with ministries and other actors such as FBOs, as well as explore how actors can come together.
3. Guidelines for planning, implementing, monitoring and evaluation (methodologically rigorous and evidence-based)—it is important to flag opportunities for other health programs to see what benefits deworming brings, may increase participation in other program. New guidelines will be released for program managers for SAC soon, but for pre-SAC, they need to be developed further.
4. Accurate and reliable reporting systems—facilitate coordination among different programs, ministries, faith-based groups, NGOs, etc. All must report accurately.

5. Sustainability of deworming activities—want to avoid situations where deworming programs for pre-SAC are given the status of a one-time campaign. Deworming has to be consistently done and carried over for kids as they enter school.
6. Political commitment (local, regional, national)—it is very important to establish and scale up deworming programs in general. For pre-SAC, political commitment will be challenging to achieve; as well as reaching families and ensuring the resources are there. If coverage for SAC is not available, it is even harder to add on new programs for pre-SAC.
7. Optimal delivery strategies for pre-SAC—clinic-based, in schools, or at home. Maybe they can be reached when SAC are done.
8. Filling research gaps for pre-SAC deworming; there are even gaps in prevalence and baseline studies, as well as in operational strategies. We need to discuss everything from delivery strategies to sustainability.
9. Advocacy to different audiences (MOH, nutritionists, economists, donors, etc.)—some may not yet be convinced of the benefits, others may not have thought of it at all.
10. Innovative communication strategies—Such as using cell phones in Honduras to deliver health messages if we can develop partnerships with telecom companies, or use radio.
11. Community involvement and education – to both traditional and non-traditional leaders.
12. Ideal drug formulations for pre-SAC—to improve choice, chewability, flavors, liquid forms of ALB and MEB. And making sure that generic drugs are of high quality and meet international standards, and that competition between the private sector and programs delivering drugs is minimized.

Session 5: Approaches to deworming in pre-school aged children

Moderator: Dr. Santiago Nicholls, Parasitology and Neglected Diseases Program, PAHO

What are the specific benefits of the 3 delivery models for pre-SAC: home-based, school-based and health center-based? We need to consider logistics, and whether other health services can be delivered at the same time at one point of entry, as well.

Determining the best approach to deworming in pre-SAC depends on the local, regional and national context, and how health interventions have been done in the past. In some communities, going home-to-home has been successful, especially if there isn't a health center and schools able to participate. In others, there is a good local health center, or robust school infrastructure. In still other communities, deworming has been integrated successfully with national immunization weeks or nutrition programs. In any case, parents should be required to carry cards to track annual deworming treatment records. No matter the venue, it must be supervised by trained personnel and be part of the mandate of primary healthcare.

Advantages and disadvantages of the different approaches

Home-based programs

Advantages

- Better coverage
- Easier to get children to collaborate
- Easier to reach children who don't have school-aged siblings
- Easier to expand the age-range of children covered (under age 2 and over 15)
- More sustainable
- Easier to get buy-in from parents
- Can also provide health education
- Can involve community health workers, volunteer community groups and use local community networks
- Can build relationships with families
- Easier logistics and capacity
- Can use census data, reach all children under 5 in the community as well as siblings not at school and adults
- More intimate setting
- Provides a better chance to influence behavior change
- Potential to target greater number of children and the most vulnerable
- Could piggyback with other home-based interventions in the community

Disadvantages

- Higher costs

- People must be at home
- Time-consuming and less cost-effective
- Coverage limited by availability of community health workers; they have a lot of other things to do
- Greater resources may be needed

Advantages and disadvantages of community organization-based programs

Advantages

- Existing community infrastructure/organizations
- Can partner with other health interventions (nutrition, vaccines, etc.)
- It is an opportunity to gather the community
- It is a good forum for parent education
- A variety of donors from different countries can participate
- Can organize working groups with participation from all players

School-based programs

Advantages

- Can work with NGOs and other agencies that focus on education
- Easier to reach children
- The school is a known, familiar location
- Ideal place for provision of education on deworming
- Logistically easier
- Could potentially be integrated efficiently with a school-based deworming of SAC
- Fewer resources are needed if there is existing school-based program

Disadvantages

- Don't reach pre-SAC without school-aged siblings
- Depends on too many logistic factors
- When would you do this so it doesn't interfere with school or conflict with SAC distribution?
- If pre-school child does not have older siblings s/he is likely to be missed
- Useful only if schools (teachers, principal) have a good relationship with the community and attendance is high
- Many times school programs not consistent
- "Open school days" would be needed

Health center-based programs

Advantages

- Children already go there for growth and development check-ups
- It is easier to make it a permanent part of existing health programs
- Can collaborate with companies that make vaccines for pre-SAC

- Easier to integrate with strategies for nutrition, vaccines, vector control, maternal/child health and health education
- Can work with NGOs and other agencies that focus on pre-SAC health
- More likely to be regular and easier to monitor
- Health professionals and patient records are available
- Known, familiar location
- Could use vaccination and immunization days or baby weighing days for deworming
- Can reach mothers and siblings not at school
- Useful if this center is a community “hub”
- If doctors, nurses, health care workers have good relationship with community then this could provide an opportunity for health education, other medical services
- May be useful to discuss non-traditional health services as well
- Extended routine prevention visits (beyond infancy, up to age 4) could provide high coverage opportunity from delivery of a package of interventions (deworming, vitamin A, family planning, provisions, etc)
- There is a strong existing infrastructure

Disadvantages

- Many parents don't take their children to health centers, so coverage may be limited
- Health posts may not be close to villages
- Women in remote areas are often marginalized and feel intimidated to see/discuss intimate issues with doctors and health professionals
- Dependent on rates of attendance of children to health clinics and accessibility

Ideally, we need to use a combination of strategies.

We should explore using school-based deworming activities targeted to SAC to include pre-SAC where schools are known to serve as a focal point for community activities; where we've identified baseline infection data and where there is strong involvement of PTAs (parent-teacher associations) or volunteers.

When we know that a country, region or village has a nation- or community-wide health campaign coming up, we should explore including deworming in that program. We need to form alliances with local governments on the issue of safe drinking water, as well. We also need to form partnerships with traditional community health providers and health promoters.

We must identify local programs that focus on pre-SAC and work with them to integrate deworming into their programs, both in the health sector and in other sectors. Deworming pre-SAC should be a flexible exercise that takes advantage of and piggy-backs on existing public health and other interventions. Home-based, school-based as well as health center-based interventions are all acceptable; and each one of them could be the best option in a given country or community, depending on local social characteristics. Recommendations made to endemic countries should not enter into too much detail with regard to specific delivery channels. Instead, they should present all the available options, highlighting the opportunities and

challenges of each approach and leaving the final choice to the national authorities and implementing agencies.

Session 6: Program monitoring, evaluation and research

Moderator: Dr. Theresa Gyorkos, Professor, Division of Clinical Epidemiology, McGill University Health Centre

Measuring Progress and Impact: Dr. Antonio Montresor, Department of NTD Control, WHO

We estimate that 100 million children are dewormed per year; and sometimes this is done through vaccination or nutritional supplementation campaigns. In some countries, they are using ALB/MEB for pre-SAC, too.

The treatment threshold is that in high risk communities, where the infection rate is >50%, twice yearly treatment is required. In lower risk communities, with prevalences between 20-50% of children, once yearly treatment for all children is sufficient. When the infection rate is lower than 20%, WHO recommends treating children on a case-by-case basis when they are positive for infection. In all endemic communities, this decision threshold should be calculated at baseline.

The process that WHO recommends for pre-SAC is the same as for SAC. It recommends monitoring coverage after each drug distribution. Sentinel sites should be considered. Prevalence should be monitored once every 2 years to see if the program is working as expected. Then, monitoring should be done again after 5-6 years to see where to go next and whether to continue as is, or reduce coverage.

Some principles that need to be considered:

1. To consider having an exit strategy or reduce frequent drug administration. After several years of anthelmintic distribution, the advisability of reducing drug administration frequency should be considered;
2. The recommended measures apply only if the intervention coverage has been consistently over 75% of school-age children, during at least 5-6 years. If satisfactory coverage has not been reached, it is suggested to defer the decision to reduce the frequency of the intervention until this condition has been satisfied.
3. Only a limited amount of information is available in this area, so these suggestions are based on expert consensus and will be revised as soon as sufficient data from long term programs are collected;
4. A survey should be organized after 5-6 years of school-based control is completed, and disease prevalence is measured;
5. A decision on the frequency of distribution should be directed by more restrictive thresholds than the ones used to determine treatment frequency at baseline, because in this case, the prevalence is being collected after years of drug administration, and

therefore even a moderate STH prevalence (e.g. 20%) indicates that the parasites maintain relevant transmission capacity.

Suggested measures (See figure below):

After 5 or 6 years of intervention (coverage over 75%) if the cumulative prevalence measured in sentinel sites is:

Over 20%: continue with 2 rounds/year of anthelmintic treatment for the following 4 years;

Between 5% and 20%: continue with 1 round/year of anthelmintic treatment for the following 4 years;

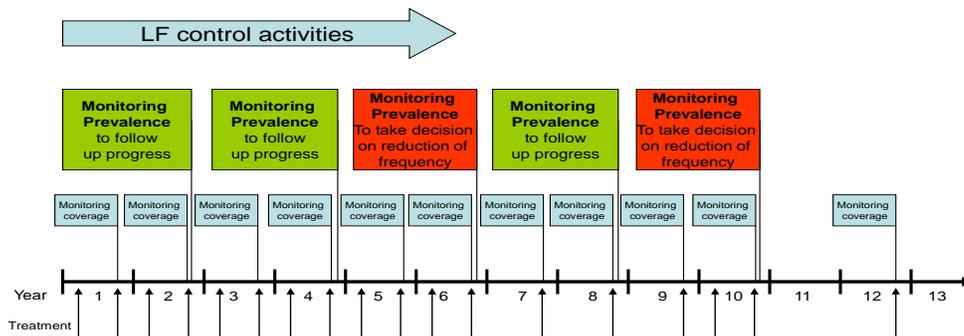
Lower than 5%: Preventive chemotherapy should be organized every 2 years for the following 4 years.

After 4 years, another sentinel site evaluation should be conducted to decide whether a further reduction in intervention frequency is warranted.

Assessments are typically done by dividing a country into ecological areas: coastal, mountains, and so on. We assume that prevalence is homogenous in each area. We may look at one area where drugs haven't been given and another where they have, to determine intensity of infection.

This information is currently being incorporated into manuals to circulate to the countries.

Figure. Suggested timeline of activities for STH control programs based on deworming for school-age children (based on an example from deworming linked to LF control programs).



Discussion on monitoring

Question 1: When do you take this evaluation? How many months after the drugs are given?

Answer 1: WHO recommends collecting data immediately before the next distribution, not after the distribution. Just before is the most informative time to collect data, so you'll know if the frequency that you are using for your interventions is efficient.

Question 2: Consider a case where prevalence is 60% and after 5 yrs, it is still 15%. You expect prevalence to return to 60% after a couple of years, right?

Answer 2: Yes; that is why you measure again after 5 years, and decide how often to keep giving drugs. Then you monitor again and see the trend—if it keeps going down, that's good; if intensity returns to the original level, you go back and give the drugs more often.

Question 3: So longstanding programs have to be monitored year after year to see if prevalence is going down, and after prevalence reaches 5%, you plan 2 more treatment rounds for 4 yrs, then nothing? And the whole program stops?

Answer 3: Even if you stop giving drugs after those 4 yrs, you still keep monitoring.

Question 4: So after 4 years, you stop treating, but keep monitoring. For how long?

Answer 4: That has not been defined yet.

Question 5: The methodology recommended by WHO has to consider many different contexts—such as countries where logistics are a prime concern. How about in areas where concerns are different? Some countries may want a better assessment than others, but WHO's assessment method is not a probabilistic sampling technique. How about mapping for areas where we want more precise estimates of the situation?

Answer 5: It depends on the amount of money spent on mapping and not intervening. We can spend lots of money on mapping. You can gather lots of data on millions of children, but 5 years later, the data is old and you have to redo it. When we have sufficient resources, we can decide what to do; some countries have different standards for prevalence—for some countries, 20% is too much and they want to use 10%. The important thing is that mapping shouldn't be an end by itself; it should be a basis for deciding on the intervention strategy.

Question/Comment 6: In practice, talking about % prevalence over time also entails costs. If, say, we have prevalence >20% and in 4 years, we want to lower it, we have to think of things beyond the intervention—such as water and sanitation, and how to sell that aspect politically. Once prevalence is below 5%, costs go up because surveys have to be done on a larger scale to see who is intensely infected. However, if we have <5% prevalence, but 3% are severe infections, then the likelihood of a return to >20% prevalence in 3-4 years is likely.

Answer 6: Monitoring isn't just for intervention; and prevalence depends on the definition of prevalence. If our definition covers all aspects of the disease, then with <5% prevalence, all infections are of low intensity unless you have forgotten to include a group of people. Of course, we can't cover all cases, but these are general principles. Program managers can use the data and decide what to do.

Discussion following the video on the Kato-Katz Technique

The technique can be used in a field environment (in backyards, schoolyards, etc.) because a light microscope can be used, which does not require electricity.

How long you wait before examining the microscope slide depends on the local temperature. This is because hookworm eggs clear fast and you will not be able to see them after that. You can leave the glycerine on for 20 minutes and read the slide within 2 hours. You may need to read it at the school because there is no time to take it to the lab. Sometimes, we prepare 30 slides, and then start reading the first one, rather than waiting for 2 hours.

Temperature is a critical factor. We wait 10 minutes in temperatures of 37 degrees Celsius. If the temperature is high, then you have to prepare a small number of slides, and read them sooner. Some pre-testing is needed to establish the examination procedure to use in a specific area.

Deworming Program Evaluation: Dr. Theresa Gyorkos, Professor, Division of Clinical Epidemiology, McGill University Health Centre

When we plan for regular deworming programs, it is important to have baseline data to compare the results of future deworming cycles. Having this allows us to make more effective use of scarce financial resources. These data inform us about treatment frequency needs, and when we can move from higher to lower frequency with the success of our deworming interventions.

At different M&E time points, we can measure different indicators. We always measure coverage—how much of the target population is being reached by the deworming program in this cycle? How many SAC and how many pre-SAC were dewormed?

At times, we also need to measure health impact such as anemia, infection rates, and growth. Impact indicators must be chosen carefully, because we can't measure them all. For example, if we have a 5 year program, we may want to include anemia in the baseline; and then measure it again after 5 years to see how much it has been reduced.

Cost effectiveness is another important thing to measure. How much does a deworming cycle cost in your setting? What are the costs for doing it in schools, health centers, etc.?

Gender should be considered, too. Do boys and girls receive deworming treatment equally?

It is also important to look at the overall research on programs, and the different types of programs in existence for different periods of time.

We know that Mexico has a long standing program, for example. What can we learn from them? Mexico's program started in 1993; and they included deworming in their "Semana Nacional de Salud" (Health Weeks) program. Health officials organize health activities for children in many different settings—schools, parks, metro stations, and all over Mexico City during Semanas de Salud (SNS). When they first incorporated deworming in SNS, they put in an M&E component, organizing all their state labs to monitor deworming.

Part of a grant application we're preparing now is to look at different deworming programs and learn from them. We know that Honduras has one, and other countries have new programs, too. In Mexico, the original national coordinating agency no longer has responsibility for the program. Actors change over time, and we can learn a little from Mexico, but that is from over 15 years ago, so it is hard to find people who remember how it came about.

In Honduras, we have colleagues here who know how their program was established and we'd like to benefit from knowing how the program was put in place, what their current challenges are and how they envision its sustainability. .

Peru doesn't have a national deworming program now, but it does have some NGOs that participate in community deworming programs.

From the Mexico program, the lessons learned include the great importance of getting political will to do the program, the importance of program evaluation, and the need for multi-level involvement in the program, including local, national and global players.

Regardless of which actors are coordinating deworming programs, rigorous baseline assessments must be done immediately before the program and planning is key to mobilizing the community. After 5 years, you need to plan to do a full evaluation and compare with baseline measures.

Timing the drug intervention cycles is important; and monitoring must be done every year. Evaluations can be done every 5 years, or 3 years, depending on local needs and resources available.

Finally, developing capacity and technical skills of health and non-health personnel through the program helps with future planning and implementation.

Timing and frequency of deworming in children under two: Ms. Serene Joseph, PhD Candidate, Department of Epidemiology, Biostatistics and Occupational Health, McGill University

The current research project which I will be conducting, entitled: "Improving early childhood growth and development in resource-poor low and middle income countries by incorporating deworming in integrated child health care," will benefit all of us in deciding how often and when

to administer deworming drugs to children between the ages of 12 and 24 months. Research into the youngest age groups is important because it will provide evidence on how much we can improve early childhood growth through deworming. This project will be done in Iquitos, Peru.

Iquitos is an area with high STH prevalence. There is 30% STH prevalence at 12 months; and by 24 months, prevalence is 50%. However, routine deworming is not currently done in pre-SAC currently in Iquitos.

Ascaris and *Trichuris* are the major infections at this age; children under 24 months make up 5–10% of the 2 billion people who are infected with STH. After a WHO informal consultation was held in 2002, in which all existing evidence was reviewed, WHO began recommending inclusion of children <24 months of age in deworming activities. However, empirical evidence is still needed, especially in the area of how deworming affects the growth and development of children aged 12-24 months.

Our study will look at deworming's effect on growth, measured by body weight, of children aged between 12 and 24 months. In addition, we will measure its effect on body length, cognitive and motor development (measured using the Bayley scale of infant development) and prevalence and intensity of STH infections (measured using the Kato Katz method). Our goal in doing this is to determine the impact on growth and health according to the timing and frequency of deworming treatments.

In this double-blind randomized controlled trial, we will recruit and follow 1,760 children 12 months of age living in a highly STH-endemic area of the Peruvian Amazon. We will assign the children to four groups and give them either 500 mg of MEB or a placebo at 12, 18 and 24 months. One group will get MEB in all three instances, two groups will get MEB twice and a placebo at either 12 or 18 months, and the fourth group will get two placebos at 12 and 18 months, followed by treatment with MEB at 24 months. The children will attend routine growth and development clinics, where they will receive routine supplements and vaccines; and where growth monitoring and other measurements will be taken by trained personnel.

We plan to disseminate the results of our research in national and international fora, through seminars and conferences, journal articles, newsletters and global initiatives in collaboration with the various international, governmental, and NGO partners.

We expect that this research will inform the evidence base around deworming in pre-SAC and be useful in policy development. Additionally, we expect it to be relevant to all 130 STH- endemic countries.

Gender and community participation issues: Dr. Ana Sanchez, Associate Professor, Applied & Community Health Sciences, Brock University

The research we did on STH in Honduran SAC was part of a larger project that we worked on with Dr. Gyorkos, called “Gender and Parasitic Diseases: Integrating Gender Analysis in Epidemiologic Research on Parasitic Diseases to Optimize the Impact of Prevention and Control Measures.”

Honduras is recognized as a country with high prevalence (>20% nationally), although there are areas with much higher prevalence rates. Deworming coverage was inadequate prior to 2009, but it improved in 2009.

In this study, a cross-sectional survey was administered to 314 primary SAC in rural areas, using a standardized questionnaire to study prevalence. We also took stool and blood samples and measured hips and head size. We provided information sessions in schools and communities for parents and children.

It was hard to start the study because coordination of deworming is somewhat complicated in Honduras. The First Lady has this project in her portfolio; but the ministries of Health, Education and Social Development are also all involved, as is the Healthy Schools Program. So coordination is not very well defined. Plus, we needed to work with schools, principals, teachers, children, and the community. Finally, we had to get the national agriculture department involved, too.

Our approach was to get community integration at all levels—using that one gear got all the others going. The fieldwork was conducted between Feb. 21 and March 2, 2011, in the department of Olancho, Honduras, in collaboration with the national agriculture department. Once we went into the community, we found that they were very well organized. The entire community came out and we found that we couldn't meet the demand. Eight of the nine schools invited to participate did so. In total, we enrolled 356 children from grades 3-5 (ages 9-11).

We found that 6 schools had deworming programs and 2 did not. There was some variation in the frequency of treatment: some said twice per years, others only once, and one didn't know. When we spoke with the children, we found that some of them knew the word "deworming." Only 13% said that they received deworming drugs at school, so distribution is a problem. Also, most children did not know how parasites are transmitted. Only 21% were able to explain how transmission occurs. Most didn't know at all, even though they had received deworming treatment in the past.

The data on prevalence showed that most infections were light, although some were moderate. *Trichuris* was the most common (59% prevalence). Hookworm affected 22% and *Ascaris* 17%, even though they had been dewormed last year. Thus, our preliminary findings are that in spite of receiving deworming treatment, there is still high prevalence of STH (64%) among children in these Honduran communities. Nevertheless, only one child had a hemoglobin concentration below 11, which is very good.

We also found that deworming programs in Honduras need to be better coordinated and have better coverage, distribution and M&E. All these things are needed to better produce scientific evidence needed to ensure a political commitment.

Without community participation, it would not have been possible to do this study. The group from the national agricultural department was essential in helping us win the trust of the

community. One of the principal messages of our research is how important it is to use organized communities and hold them up as role models for other communities.

Discussion

Question 1: What is the timeline of the Peru study? Also, is it possible to add a component to track the costs?

Answer 1: The timeline is that we plan to finish the follow-up by the end of 2012; recruiting will start in the next few months. We expect to have results early in 2013. The study protocol is finalized and ready to go, but yes, I think we can track the costs of drugs and the program as part of the study.

Question 2: Can you elaborate on the roles and activities that the national agricultural department offered in Honduras?

Answer 2: The agricultural department is located in that part of the country. They have agriculture and veterinary schools; and they work with the community to raise capital for dairy products, improve food security and safety, and vaccinate animals, among other things. The community is very engaged in their activities. Community leaders even let them stay in their houses. They helped a lot by bringing us into the community and introducing us to the people there. Also, they are very ethical; and they have very egalitarian relationships with the community; they are not patronizing. It is extremely important to identify partners like this before we go ahead into any community.

Question/Comment 3: In Honduras, you mentioned that STH prevalence was high even though there had been deworming activities the year before. Maybe the community where you were would benefit from twice yearly treatment. Or maybe it takes a longer time to see prevalence come down.

Answer 3: The study certainly underscores the importance of monitoring and knowing who is doing what. When organizations come in, they act, but often without keeping records. It is important to record deworming on a card when it is being done. It is simple to do; and we will do it.

Question 4: Why did you take blood samples instead of just collecting anemia data?

Answer 4: We hired a private lab to do hematological values, not just hematocrit, so we had to take venous blood samples. We were also looking at antibodies as a side project, among other things. The idea was to add value to the study, since a huge amount of resources were spent to do it; it was not cheap to do. This was done in a research context, not as part of a national deworming program. No deworming survey would do what we did.

Session 7: Special considerations: Global actors' & donors' perspectives

Moderator: Mr. Josh Colston, Research Fellow in Public Health, Social Protection and Health Division, Inter-American Development Bank

Perspective of the World Food Programme: Dr. José Castillo, Program Officer of the Programs for School Feeding, World Food Programme

The WFP works with vulnerable populations that suffer from hunger; we do this through the diversity of our program. In addition to support for deworming, we provide nutrition assistance, food for work, and we are leaders in school feeding. Around the world, countries use school feeding to take care of children, whether rich or poor.

The school feeding program started 50 years ago; one of WFP's first programs was to provide immediate assistance in Southern Sudan where children suffered from malnutrition and many other problems.

The school feeding programs center on hunger reduction, child nutrition, promoting school attendance, and promoting deworming, since when children are infected, giving them food has no effect.

In 2010, we took care of 21 million children in 63 countries worldwide. In LAC, the WFP School Feeding Program works with the governments; although in most cases, the governments assume responsibility for feeding the children.

WFP's goal is to improve the quality of the school feeding program and reinforce the essential package we provide to children; which are the parallel activities developed by our program. We also work to develop school feeding programs in special situations like Haiti. Now, 900,000 children are benefiting from the school feeding program in Haiti.

However, we have a serious problem in coordinating with many different governments. Many feeding programs do not work with the MoE, but instead work with the Ministry of Agriculture, such as in Honduras. We need to have the ability to take advantage of all structures to harmonize the programs.

Why is WFP working with WHO and doing deworming? Because children need both deworming and food to have better brain development and perform better in school. We have been working with WHO to do deworming since 1998.

We also have an essential package that we give to children and their families; this program is conducted jointly with UNICEF. It includes deworming, micronutrients, hygiene and sanitation, health and nutrition education, HIV and malaria prevention, and fuel-efficient stoves. Our main partners include governments, donors, UN agencies, NGOs, and the private sector. Johnson &

Johnson and the Bill Clinton Foundation have been donating tablets directly to WFP due to our logistical capacity for distributing tablets.

I also want to emphasize the importance of community participation. Teachers are overburdened, and when the community participates actively, they reduce the load on teachers. Active community management of the program is essential for our efforts, reducing the costs of monitoring, for example.

Our plans for the future are to improve our coordination with the sectors of education and health. We want to grow with our partners and with the private sector, to encourage local social responsibility.

The school feeding program doesn't just mean food. It includes the provision of water, deworming, improvements of kitchens, hygiene, teacher training, latrine construction, food security and safety, and gardens—these are all components of our school feeding program. What does a child attending school think when s/he sees all these elements? The child understands and appreciates the value of what schools have to offer. We need to make sure that children have all the basic elements needed for life.

Perspective of UNICEF: as reported by Dr. Antonio Montresor, Department of NTD Control, WHO

UNICEF has said that there are 3 areas where they can collaborate with us. I will follow up with them on this.

- 1) Deworming of pre-SAC. UNICEF says that the best way to include a large number of pre-SAC is to use programs that are already working for them, such as Vitamin A supplementation, and begin to collaborate there. They say that if they can get donated drugs, it is easy for them to include these in the package that is given to each child. It is also easy for them to train teachers and personnel on deworming procedures; they can include it as part of the training they already do. However, they are concerned about the availability of drug donations for pre-SAC, since the current focus is on SAC and not pre-SAC, and they know drug producers are sometimes afraid to donate drugs for a new population.
- 2) School activities. UNICEF vaccinates school-aged young women; and they believe our school interventions have the potential for including their vaccine intervention, as well.
- 3) Collaboration on sanitation. There is a team working on sanitation in UNICEF. They think they can use our survey data to see where sanitation needs to be improved. If they know where high intensity infections exist, they can designate sanitation improvement funds to those areas. Providing our data to them would be very useful.

With more resources available for deworming, we can be more proactive partners with UNICEF.

Perspective of the US CDC: Dr. Michael Deming, Captain, United States Public Health Services, Division of Parasitic Diseases, Center for Global Health, US Centers for Disease Control and Prevention

The CDC's mandate is to protect the health of US nationals, so CDC usually gets involved in managing international programs only when supplementary funding is available. Currently, there is only a modest amount coming from USAID for NTDs, although there is no specific designation for STH. Thus, we usually work with funded projects as technical consultants. With STH, our work is divided into 2 branches—one group includes lab science and the other, epidemiology. Although no one works specifically on STH, five of us are looking at diseases that can be eliminated: LF, onchocerciasis, STH, schistosomiasis and others. Most of the funding for this comes from LF projects.

It is disconcerting to hear that some STH and LF campaigns are scheduled to end in 5 or 6 years, and that most strategies are opportunistic, short-term and partial. With LF, only kids over 90 centimeters tall are treated with drugs; and parts of each country are not treated at all. The short-term nature of the campaigns is also disconcerting, since they rely on the continuity and goodwill of vaccination campaigns and national immunization days; thus, they aren't scheduled as needed and they are not long-term proposals. We have to think about how they can be maintained. We have analyzed the demographic datasets of 27 Sub-Saharan countries, looking at mothers who had contact with health care facilities. The median percentage for coverage is 92%; and the median number of medical visits is 7. What is working for them is to include deworming with other services for the whole family, including Vitamin A, the tetanus toxoid for mothers, insecticide-treated bed nets, iodized salt, family planning and birth spacing. It would be interesting to try this package out someplace in LAC, but I understand there are other promising community strategies, too.

Also disconcerting is that reporting of coverage isn't working well for pre-SAC; as some agencies are covering children, but not reporting that coverage. Or if they do report, the campaigns will give the total number of children treated, but they don't break it down by age, so we don't know how many SAC or pre-SAC are treated.

IMCI is another challenge. Any child with pallor should be treated with ALB, but we don't have an algorithm for this. One-third of 2-4 year-old children had pallor, and should be treated, but we don't know how to include this in our estimates of coverage. We can do surveys to measure coverage, which depend on the accuracy of maternal recall. When we looked at this option in Togo, it looked promising. There, they treat children for three diseases: schistosomiasis, STH and LF. The mothers answered accurately regarding if their children received pills and how many doses they were given, as well. For ALB, it was almost always one dose; but for other drugs, the dose increased with the age of the child. If we find that mothers provide accurate information, then we should look at using surveys to report coverage. The advantage would be to have an accurate measure of pre-SAC coverage. Also, questions on pre-SAC coverage could be made part of large, multi-purpose surveys such as a demographic and health survey or the UNICEF study. These studies sit on the desks of MoH directors and would give lots of visibility to our programs. We hope to have a database to show that coverage can be measured accurately in this way.

Discussion

Question 1: How can a country make sure sufficient drugs will be available to support their deworming programs?

Answer 1: ALB/MEB is easy to make; they just need to let the producers know how much is needed. That is why it is important to estimate how much of the drug will be needed in the next 4-5 years. For countries, this involves several factors: getting the funding to implement a successful program; having enough storage capacity; figuring out how to organize drug distribution; and deciding the frequency of doses needed. J&J has pledged to donate 200M tablets; and GSK has pledged 400M. That is enough for SAC. Since the LF program is scaling down next year, now is a good time to scale up the STH program and use drugs that will not be used for LF. My impression is that GSK doesn't want to scale down its factory; it wants to keep making its drugs. Also, there is space for generic producers and local producers; and there is hope that using local producers can promote the local economies.

Question 2: Is there a potential role for deworming in the special program WFP started for child under-nutrition in Central America? Also, I wanted to mention that PAHO does periodic surveys of water and sanitation coverage in the Americas, and we've also started working with the IDB to do mapping of water and sanitation coverage as well as poverty—this may be interesting for UNICEF, since it was mentioned that they need to know where the need is for sanitation in schools. Finally, are there large international surveys done by bilateral agencies or WFP in LAC that may offer opportunities to add questions about deworming?

Answer 2: WFP's nutrition and food programs for SAC are aimed to complement activities that are being done by specialized agencies. Why do we use school programs? Because they are long-term programs and we can follow them up and assess them. Our nutrition programs are only done for a certain period, until we see a drop in under-nutrition rates; but we may have some long-term programs where malnutrition is a problem.

Answer 2 (cont): Yes, it is very important; we can have better results when both deworming and water and sanitation improvements are done together.

Answer 2 (cont).—I think there is a third survey on the same scale—the malaria indicator survey. It is not done very much in LAC and it may continue for a long time, but I think it will be conducted every 3 years rather than every 5 years; and a mixed survey will be done throughout LAC. These surveys are large and provide opportunities for mapping—it isn't uncommon to have 250 sectors in a country, as well as biosamples, too. Maybe you can use the surveys for mapping impact as well as coverage.

Question 3: When countries receive drug donations, it is important for them to store and distribute the drugs, as well as monitor and follow up on their use. Having this capacity is required before a country can officially accept a donation; however, this is very complicated for some countries. Some have to pay even for donated drugs in order to import and nationalize them. Also, agencies asking to use drugs may not have authorization to use those drugs in a

country; and sometimes the technical staff are not aware of this, so the drugs may sit for months in warehouses, which adds another cost to maintain warehouse storage for the drugs. However, UNICEF has huge capacity in communities, as well as social mobilization expertise. They have staff that do this; they have country offices. Can we establish partnerships with UNICEF like we have with WFP and use UNICEF vaccination and immunization campaigns? We have to maximize our partnerships in each of these countries.

Answer 3: Costs can be a big problem; and different ministries may be involved and they may not all agree. The MoH may be happy to get the drugs, but maybe the ministry of transportation or tourism may have concerns about receiving huge numbers of drugs and they may be looking for money, too. Sometimes, there may be problems in getting approvals; and the costs of storage may be very high. Also, we aim to get the drugs delivered a couple of days before the distribution date; we have to get them beforehand, so if the process is not hurried and we have negotiating power, we will not need to go to the ministries and say, “hey, it is already here!” It facilitates things if the drugs can be imported without too many costs.

Answer 3 (cont): We have to be consistent in what we tell the countries. We used to do one single donation; now, we’re trying to find donors who are involved in multi-year, sustainable programs, so we can include these issues in the planning process.

Question/comment 4: I wonder if we might be able to reach more pre-SAC by doing school-based programs and whether incorporating deworming into nutrition programs might be efficient, especially since nutrition is so important for the pre-SAC age group.

Answer 4: The cost for such a program is approximately 20 cents per child. Some governments like Brazil want to invest more. In Brazil, they have at least 1 nutritionist for every 2 schools. We are looking at revitalizing the feeding program in schools there. Now, schools are starting to buy food products—food doesn’t come from a central market, but from the farmers who are next to the school. The model to consider is the zero hunger program in Brazil, which has the whole gamut of poverty sectors included; and where schools are stratified according to the level of poverty in community. We have lots to learn in the different sectors on how to reduce costs and benefit the population more.

Question/comment 5: WFP has been very successful in Honduras. At first, 100% of the school lunches came from WFP, but now the government pays 90% of the costs, so the program is sustainable. We need to think about finding storage for the deworming program so that it can be included within the school feeding program, especially for new children coming into the program.

Question 6: ALB and MEB are available in many types of formulations right now. Should all deworming programs focus on having a single dose formulation?

Answer 6: For clinical treatments when a doctor is available, a multiple dose of MEB is the standard protocol. But in practical terms, in mass deworming programs it is very difficult to do more than a single dose. We also want to have visual confirmation that the tablet is taken by the child. That is why single-dose tablets for both MEB and ALB were introduced. Fortunately, the

single dose tablet has been demonstrated to have very similar efficacy as the multiple dose one, so the same, single dose can be given to everyone, even though clinical usage is different and can be in a multi-dose format.

Question 7: We know that there are generally no real side effects; and so, there is no system for reporting side effects in the schools. The teacher may tell someone if s/he notices something, that is usually all. Are side effects a greater concern for pre-SAC? Should M&E reporting of deworming cycles that target pre-SAC consider adding a system for reporting side effects?

Answer 7: Even for SAC, we try to include side effect monitoring in M&E activities. When a child experiences a big side effect, it happens very fast. Maybe some minor side effects are not reported by the children. We have done one experiment, looking at teachers' reports, and we have not seen any prevalent side effects. However, when we ask the children themselves, the number of reported problems is ten times higher because we are seeking out the information. With pre-SAC, it is important to make sure monitoring is happening and to collect data on the presence of side effects. We think that by crushing the tablets, it is possible to avoid serious problems. Companies have reported problems with liquid formulations, so the idea is to crush tablets and give the drug as a powder (for example, stirred into food).

Question 8: Is there evidence that the parasite eggs are not fertile any longer when present in stools outside the human body? If there are no latrines, and all the children are treated at the same time, are we increasing transmission after the program through the mass expulsion of parasites? Are the females' eggs still viable after the female dies and her body decays?

Answer 8: The drugs kill the worms, but have no effect on the parasite eggs. A 1995 study was done to follow up on the effect of ALB on parasite eggs. It found that 95% of the ALB was retained in the gut for 21 days. So, while ALB attacks the parasite and affects reproduction in the female worms, it has no effect on the expelled eggs. Female adult parasites living in the gut of infected people are the source of fecal contamination of the environment. Therefore, it is important to educate children to use latrines when possible, so there won't be lots of eggs in the soil. Once the adult female dies, egg production ceases.

Comment 9: USAID was not able to join us, but I wanted to share some information about how they are involved in deworming efforts. USAID works on 2 streams in the area of health:

1) USAID's Global Health Bureau, located in Washington, DC, manages money and implements the programs of the Bush/Obama Global Health Initiative that includes NTDs. They have programs and activities in Africa, Asia and LAC (in a restricted manner). USAID has selected a group of 40 or so countries, and they invest funds for tropical disease control—mostly in Sub-Saharan Africa, as well as some in Asia, and in Haiti. Recently, the Obama Global Health Initiative has added Guatemala to the list of countries eligible to get money for tropical disease control. I don't know if deworming and STH control is part of the work plan in Guatemala, but I will find out and let the PAHO focal point in Guatemala know. With the USAID Global Health Initiative, Haiti and Guatemala can get funding for tropical disease control programs.

2) USAID's LAC bureau is a separate group; this group staffs the USAID offices in LAC countries. It operates independently with respect to its health programs. USAID offices, called missions, have the power and authority to work with national governments in each country, so countries may be able to get funds from the local USAID mission. Doing so takes political negotiation and the planning process is involved. However, the bad news is that due to the budget crisis, the USAID missions in some countries will be closing.

Comment 9 (cont.): In WHO's experience, USAID only finances plans of activities that are integrated; so they would cover all NTDs together in an integrated plan. They will provide support by complementing such a plan. It is a long process to prepare the plan of action, because all the ministries have to be consulted and come together behind one plan; and they have to establish a steering committee to be responsible for implementing all the activities. Also, the plan must be presented to USAID after the whole plan is complete to ask for financial support. We've done it in Nepal, and have other countries in the pipeline, but we are not doing it in the Americas at the present time.

Comment 9 (cont.): USAID supports water and sanitation projects in countries where it may not support NTD projects, so this is a way to get more data and bring it to the attention of the public health community.

Comment 9 (cont.): The IDB is setting up a trust fund for NTD control and elimination projects to give financial and technical support to member countries; and all countries can apply for that funding, once it is established, if they are IDB members. The trust fund is part of the partnership with PAHO and the GNNTD.

Session 8: Conclusions and recommendations; Next steps

Moderators: Mr. Steven Ault, Regional Advisor for Parasitology and Neglected Diseases and Dr. Theresa Gyorkos, Professor, Division of Clinical Epidemiology, McGill University Health Centre; Dr. Antonio Montresor, Department of NTD Control, WHO

Now is the time to start paying attention to the third high risk group for STH—preschoolers. We are at the cusp of new efforts to establish large-scale deworming efforts in the region. The 2015 timetable for the MDGs gives us a window; what can we do through deworming between now and then that will help achieve the MDGs?

We have used this workshop to accomplish a number of goals, including:

1. Raising the profile of deworming for pre-SAC.
2. Sharing lessons learned with each other.
3. Learning from the deworming programs in Honduras and Nicaragua: both how the programs were developed and why they are successful.
4. Stimulating each other to advocate for deworming pre-SAC in the circles in which we work.
5. Consolidating our experiences into a single document.

Based on our experiences and the challenges and priorities identified in this workshop, the participants in the workshop agreed on a set of 15 recommendations for future activities that should be undertaken to advance the deworming agenda for pre-SAC in Latin America and the Caribbean:

1. Encourage political commitment at all levels to move forward on deworming activities for pre-SAC.
2. Promote integration of deworming activities within existing public health programs and intersectoral platforms in order to optimize coverage.
3. Develop and promote national plans of action for deworming in the context of NTDs.
4. Promote intersectoral coordination and partnerships to optimize the efficiency and sustainability of deworming programs.
5. Advocate for deworming programs targeted to pre-SAC in among a variety of audiences, including ministries of health and education, allied health professionals such as nutritionists, donors, economists, and water and sanitation specialists, among others.
6. Strengthen national and sub-national capacity to expand deworming activities for pre-SAC
7. Promote community participation and social mobilization in deworming activities, from planning to implementation and evaluation.
8. Promote innovation in communication strategies, diagnostic tools, drug formulations and other tools to support deworming activities.

9. Develop, harmonize and disseminate guidelines for planning, implementing, monitoring, and evaluating deworming programs targeting pre-SAC, among UN agencies and other organizations.
10. Identify and fill research gaps pertaining to the health, nutrition and development impact of deworming interventions for pre-SAC, including articulation with the tropical disease research (TDR) agenda, and incorporation of other areas of interest such as cost-effectiveness.
11. Develop and implement accurate and reliable reporting systems for deworming activities for pre-SAC.
12. Plan optimal delivery strategies for deworming activities that are responsive to local conditions.
13. Scale up deworming activities for pre-SAC in the context of the new PAHO 10-year plan for *Comprehensive Child Health*.
14. Encourage South-South collaboration and dialogue on both the political and technical fronts, including sharing experiences and lessons learned.
15. Investigate the feasibility of setting a global or regional deworming coverage goal for pre-SAC.

Next steps

We are proposing 4 items as next steps for discussion, and there is space for others, as well:

1. Plan a follow-up workshop to this one. It should occur in a couple of years and serve as an opportunity to report back on the measurable progress we will have achieved by that time, as we partner and work together in the field.
2. Produce a meeting report and circulate the draft for comments, especially the recommendation section.
3. Explore opportunities for disseminating the meeting report; maybe via a short article in an open access journal to summarize the key points, or an article in another journal to bring attention to the viewpoints and recommendations expressed in this meeting.
4. Create an E-network on deworming pre-SAC. Organize it on a Website or another mechanism so we can continue to communicate. Who might host it?
5. Create a sub-regional network to discuss cross-border issues and common interests relevant to STH and NTDs.

Discussion on collaboration among agencies and countries

There are many areas that could benefit from collaboration: South-South collaboration, advocacy & resource mobilization, operations, operational research, technical support, planning, policy development, international cooperation involving players such as the CDC, WHO, PAHO, WFP, NGOs, among others.

What can each agency offer?

- We could open up some space for deworming pre-SAC at regional initiatives, such as meetings around other NTDs.
- Rather than documenting our activities at the national level, we could do so on a subregional level (i.e. for Central America instead of just Honduras); the Mesoamerican initiative is another opportunity for collaboration.
- PAHO can facilitate collaboration among countries or subregions.
- Cuba's medical brigades are another way to collaborate between countries; we should also invite other countries to participate that were unable to attend this meeting.
- McGill and Brock university research centers can help develop pilot projects and joint grant applications; we are available to cooperate in research at any time. It may also be possible to arrange for technical support in all stages of deworming activities (eg. planning stage, implementing stage, monitoring and evaluation activities, and other impact assessments).
- GNNTD can collaborate on communications and advocacy efforts, through blogging, participating in international forums, showcasing the issue on Capitol Hill and at regional events on NTDs, and partnerships with PAHO and the IDB.
- CDC could contribute its expertise in the design and analysis of technical research, as well as the technical aspects of M&E. It can also provide our services as a reference lab, if needed. CDC is available to contribute technical assistance, making comments and suggestions by phone or email; or if funding can be arranged, CDC can do on-site visits.
- There is a lot of opportunity for WFP to work with PAHO within the school and preschool food program. The WFP will plan workshops as a baseline to measure the success of food school programs, giving the MoE, MoH and Ministry of Agriculture an opportunity to discuss results and initiatives. WFP is going to include PAHO as a collaborating partner when doing its work on the ground.
- WFP has vast experience and can help develop standards to show governments how school programs are implemented and communicate the importance of having sustainable resources, partnering with the community to reach the children, as well as with schools, health centers and clinics. We can also help facilitate the South-South collaboration process.
- NGOs can provide technical assistance and support for supply chain management, as well as assist in the countries. Each NGO has its own particular strengths. For example, some NGOs know how to write applications that respond to USAID's reporting requirements. Others are skilled at creating implementation plans and still others take vertical programs that countries have initiated and make them into integrated NTD plans; their strength may be getting different disease departments to work together. That is what has worked in Africa—having an integrated approach is what helps countries can gain access to funds.
- PAHO, WFP and the regional MoHs can discuss creating a regional deworming goal for pre-SAC; then we can advocate to WHO to try to get pre-SAC included in the UN goal.

ANNEX 1

WORKSHOP ON INTEGRATING A DEWORMING INTERVENTION INTO PRESCHOOL CHILD HEALTH PACKAGES IN THE AMERICAS

AGENDA

Location: PAHO headquarters, 525 23rd Street NW, Washington DC 20037

Meeting Room C

Date: March 24-25, 2011

DAY 1: THURSDAY, MARCH 24, 2011

08:00 - 08:10	Welcome	J Andrus
08:10 - 08:30	Introductions	All participants
08:30 - 08:45	Opening Remarks	TW Gyorkos, S Ault

Keynote speaker

08:45 - 09:15	Opportunities for improving deworming in the Americas	N Mistry
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Session 1: Epidemiology and global burden of STH infection and disease in the Americas (Moderator: M Saboyá)

09:15 – 09:30	Epidemiology and burden in school-aged children	TW Gyorkos
09:30 – 09:45	Epidemiology and burden in preschool-aged children	SA Joseph
09:45 – 10:15	STHs in LAC; mapping update	S Ault, M Saboyá, S Nicholls

10:15 – 10:30 Health Break (ground floor lobby)

Session 2: Deworming Policy and Planning (Moderator: K Palacio)

10:30 – 10:45	Undernutrition and deworming	K Stoeber
10:45 – 11:15	Choice of deworming drugs and safety precautions	A Montresor (for M Albonico)
11:15 – 11:45	Integration with supplementation and vaccination programs	A Montresor
11:45 – 12:00	Question and answer session	All

12:00 – 13:00 LUNCH (ground floor lobby)

Session 3: Ongoing helminth control programs in the Americas (Moderator: A Montresor)

13:00 – 13:30	Lessons learned from Nicaragua	L Davila
13:30 – 14:00	Lessons learned from Honduras	C Zúniga
14:00 – 14:30	Lessons from Save the Children	S Lee

14:30 – 15:00 Lessons from Operation Blessing International A Cruciano

15:00 – 15:30 Health Break (ground floor lobby)

Session 4: Challenges of control programs (Moderator: S Ault)

15:30–17:00 Group discussion on lessons learned and future challenges All

DAY 2: FRIDAY, MARCH 25, 2011

Session 5: Approaches to deworming in preschool-age children (Moderator: S Nicholls)

09:00 –10:30 Follow-up on Day 1 Group Discussion: Benefits of different home-based, school-based, health centre-based and other approaches to deworming programs targeting preschool child populations

10:30 – 10:45 Health Break (ground floor lobby)

Session 6: Program Monitoring, Evaluation, Research (Moderator: TW Gyorkos)

10:45 – 11:15 Measuring Progress and Impact A Montresor

11:15 – 12:15 Research questions being addressed:
Kato-Katz video TW Gyorkos
Deworming program evaluation TW Gyorkos
Timing/frequency of deworming in children under two SA Joseph
Gender and community participation issues A Sanchez

12:15 – 12:30 Question and answer session All

12:30 – 13:30 LUNCH (ground floor lobby)

Session 7: Special considerations for pre-school deworming control programs: Global actor's and donor's perspective (Moderator: J Colston)

13:30 – 13:45 Perspective of USAID M Van Dyke
(unable to attend)

13:45 – 14:00 Perspective of the World Food Programme J Castillo

14:00 – 14:15 Perspective of UNICEF A Montresor

14:15 – 14:25 Perspective of CDC M Deming

14:25 – 15:00 Question and answer session All

15:00 – 15:30 Health Break (ground floor lobby)

Session 8: Next steps (Moderators: S Ault, A Montresor, TW Gyorkos)

15:30 –16:00 Discussion All

16:00 –17:00 Summary and Recommendations TW Gyorkos, A Montresor, S
Next steps Ault

ANNEX 2

PARTICIPANT LIST

Workshop to integrate a deworming intervention into preschool child health packages in the Americas, March 24-25, 2011

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