



**REGULAR TREATMENT OF  
SCHOOL-GOING CHILDREN FOR  
SOIL-TRANSMITTED HELMINTH  
INFECTIONS AND BILHARZIA:**

**POLICY AND IMPLEMENTATION  
GUIDELINES**

**South African National Department of  
Health**

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The following people need special citation:

Professor Chris Appleton (University of KwaZulu-Natal)  
Dr Lesley Bamford (National Department of Health)  
Ms Janet Dalton (Provincial Department of Health, KwaZulu-Natal)  
Dr Ali Dhansay (Medical Research Council)  
Dr John Fincham (Medical Research Council)  
Dr Ameena Goga (formerly National Department of Health)  
Professor RC (Tammi) Krecek (University of Pretoria)  
Professor Jane Kvalsvig (University of KwaZulu-Natal)  
Professor Walter Loening (formerly National Department of Health)  
Professor Miles Markus (University of Witwatersrand)  
Dr Thabang Mosala (formerly Human Sciences Research Council)  
Dr Myra Taylor (University of KwaZulu-Natal)  
Dr Arvelee Willingham III (International Livestock Research Institute, Kenya)

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## ABBREVIATIONS

EDL	Essential Drugs List
epg	eggs per gram
IMCI	Integrated Management of Childhood Illness
NSNP	National School Nutrition Programme
PHC	Primary Health Care
STG	Standard Treatment Guidelines
STH	Soil-transmitted Helminth
WHA	World Health Assembly
WHO	World Health Organization

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## SUMMARY

Infections with soil-transmitted helminths (STH), commonly known as “worms”, and bilharzia impose an unnecessary burden on many South African children. Disadvantaged children living in informal settlements and rural areas, where sanitation is poor and access to potable water lacking, bear most of the burden. International and local studies have demonstrated that synchronised and regular treatment of school-age children for STHs and bilharzia can reduce the morbidity associated with these infections, and improve growth, learning and school attendance, especially when supplemented by other nutritional interventions.

Historically in South Africa, these infections have only been treated when complications arise or worms are passed. Although important, treatment of individuals will not have an effect on the prevalence and intensity of these infections within communities. From a public health perspective, helminth control programmes need to have three main interventions. These are:

- Improving living conditions with an emphasis on improving sanitation and access to clean water
- Health education and encouragement of health-promoting behaviours
- Synchronised, regular drug treatment of high-risk groups.

South African children have legal protection with respect to their right to health, and the government has a duty to make it possible for these rights to be exercised. Treatment of school-age children represents a cost-effective intervention which provides children with the best chance of growing and learning (Montresor *et al.* 2002; Anonymous 2004). The school infrastructure provides a cost-effective and efficient mechanism for delivery of health education and mass treatment against STH infections and bilharzia to school-going children. Pilot school-based parasite control programmes have been successfully implemented in parts of South Africa, and have demonstrated improvements in growth, school attendance and educational achievement amongst children who received treatment (Kvalsvig *et al.* 2001).

These policy and implementation guidelines outline the technical basis for introducing helminth control programmes, which include regular treatment of children for STH infections and bilharzia. Successful implementation of such programmes is dependent on close co-operation between numerous role-players at all levels. Close collaboration between the Departments of Education and Health, especially with school health services, is particularly important. School-based mass treatment programmes will only be successfully implemented with the support of all officials in the Department of Education especially school principals and teachers. These programmes also provide an opportunity for community members and structures, such as retired nurses and school governing bodies, to contribute towards improving the health of their communities.

The guidelines identify key factors which need to be in place for successful implementation of these programmes, and outline the responsibilities of the different

levels of government including national, provincial, district and schools. Indicators for monitoring and evaluation of the programmes are also included.

## SECTION 1: TECHNICAL BASIS FOR POLICY AND IMPLEMENTATION GUIDELINES

### Introduction

Soil-transmitted helminth (STH) infections, commonly referred to as “worms” include infections with the common roundworm (*Ascaris lumbricoides*), hookworm (*Necator americanus*) and whipworm (*Trichuris trichiura*). Bilharzia, also known as schistosomiasis, refers to disease which in Africa is caused mainly by infection with *Schistosoma haematobium* and/or *S. mansoni*. Bilharzia is a chronic disease that can result in liver failure due to fibrosis, and renal failure following hydronephrosis and secondary bacterial infection. It may also affect the reproductive health of women with resultant infertility.

There are many other helminth parasites that can be harboured in the human host. Although infections with some of these helminths, such as cestodes and trematodes other than schistosomes, are important public health problems in some areas, they are not dealt with in any detail in this document.

The burden of disease caused by bilharzia and STH infections is enormous. The latter are widely distributed in tropical and sub-tropical areas, with the poorest sections of the population being most affected (the life cycle of STHs are shown in Appendix I). In contrast, bilharzia occurs much more focally, depending on local environmental conditions and on the distribution of suitable intermediate hosts. School-age children carry the heaviest burden of disease. The World Bank (1993) estimated that STH infections accounted for 11.3% of the total burden of disease in children aged 5-14 years, making it the most common cause of morbidity in this age group. Although bilharzia and STH infections are most prevalent in school-age children, younger children (aged 2-5 years) are at most risk of severe morbidity (Chopra 2006; Stothard and Gabrielli 2007). Bilharzia tends to affect slightly older children with peak prevalence occurring in children aged 10-15 years (Appleton and Kvalsvig 2007).

Genital bilharzia in women appears to increase the risk of having HIV (Fincham *et al.* 1999; Kjetland *et al.* 2006). It is also important to note that immunological reactions to STH infections and bilharzia make it less likely that individuals will mount an effective immune response following vaccination against various non-helminthic diseases (Fincham *et al.* 2003a; Markus 2003; Robinson and Boyer 2004; Elias *et al.* 2005; Da’Dara *et al.* 2006). Moreover, helminthiasis may influence diseases such as HIV infection, malaria, tuberculosis, atopic conditions and others, in ways that are not yet clear (Fincham *et al.* 2003b and 2007; Borkow and Bentwich 2006; Mwangi *et al.* 2006, Secor 2006).

The aim of parasite control programmes is to reduce morbidity by reducing the burden of infection, which is assessed by looking at both the prevalence of infection (the proportion of the population which is infected) and the intensity of infection. The latter is ascertained by counting the number of eggs in a urine specimen or in a gram of an

individual's faeces – this gives an indication of whether few or many parasites are present in the individual's body. The prevalence for each of the STHs should be calculated together with the cumulative prevalence (the prevalence of infection with any of the STHs). WHO definitions regarding prevalence and intensity of infection, which are based on the number of eggs per gram (epg) in faeces or urine, are shown in tables 1 and 2.

**Table 1: WHO-recommended intensity of infection thresholds (Montresor *et al.* 2002).**

	Intensity threshold		
	Light	Moderate	Heavy
<i>A. lumbricoides</i>	1-4 999 epg	5 000-49 999 epg	>50 000 epg
<i>T. trichiura</i>	1 - 999 epg	1 000-1 999 epg	>10 000 epg
Hookworm	1 -1 999 epg	2 000-3 999 epg	>4 000 epg
<i>S. mansoni</i>	1-99 epg	100-399 epg	>400 epg
<i>S. haematobium</i>	1- 50 eggs/10ml urine		>50 eggs/10ml urine or visible haematuria

**Table 2: WHO recommendations for defining prevalence levels (Montresor *et al.* 2002).**

STH INFECTIONS	
High cumulative prevalence and/or high intensity	Prevalence > 70% and/or moderately/ heavily infected individuals > 10%
Moderate cumulative prevalence and low intensity	Prevalence > 50% and moderately/heavily infected individuals < 10%
Low cumulative prevalence and low intensity	Prevalence < 50% and moderately/heavily infected individuals < 10%
BILHARZIA	
High prevalence	Prevalence > 50% or visible haematuria > 30%
Moderate prevalence	Prevalence > 10%, but < 50%
Low prevalence	Prevalence < 10%

Parasite control programmes aim to reduce the burden of infection and keep it low, with an emphasis on ensuring that the proportion of heavily-infected individuals is reduced. It should be noted that parasites can be present in individuals from communities with a low burden of infection. The individuals should be treated, but public health programmes need to target communities which have been shown to have heavy or moderate levels of infection.

STH infections and bilharzia are transmitted by eggs excreted in human faeces or urine, which contaminate the soil or water sources in areas that lack adequate sanitation. Unlike other infectious agents (bacteria, viruses and fungi), these parasites do not multiply in the human host. This means that re-infection can only occur as a result of new contact with a contaminated environment. However, regular treatment will result in individuals being infected with fewer parasites for shorter periods, and will reduce environmental contamination over time.

## **Bilharzia and STH infections in South Africa**

As in other parts of the world, bilharzia and STH infections are most prevalent amongst disadvantaged children who live in densely-populated rural and under-serviced areas such as informal settlements.

### STH infections

High levels of infection with STHs have been documented amongst children in all provinces of South Africa, especially in low-altitude, coastal areas. Prevalences of the common roundworm *Ascaris lumbricoides* and the whipworm *Trichuris trichiura* are altitude-related and range at community level from >70% around the coast to <10% in high-altitude, mountainous areas such as Qwa-Qwa and Lesotho (Mosala *et al.* 2001). Infection is patchy and generally linked to lack of effective sanitation and clean water, although it is important to note that high prevalences have been recorded in several well-serviced Western Cape communities (Adams *et al.* 2005). Although STH infections are usually thought not to be prevalent in preschool children, recent clinic and crèche-based studies in the Eastern Cape and KwaZulu-Natal showed that  $\pm 20\%$  of children aged less than one year were infected, although these infections were light (Smuts *et al.* 2004).

Hookworm (*Necator americanus*) is confined to the sandy coastal plain of KwaZulu-Natal to approximately 150m above sea level and to at least some sandy areas further inland and in the Mpumalanga lowveld. Prevalence in children approaches 100% near the Mozambique border, but drops to around 40% in the extreme south of Kwazulu-Natal where the plain disappears. Polyparasitism, involving multiple STH infections, is common (reference).

### Bilharzia

The geographical distribution of bilharzia lies largely within the eastern half of the country, and involves parts or all of six provinces namely Limpopo, North West, Gauteng Mpumalanga, KwaZulu-Natal and the Eastern Cape (Gear *et al.* 1980; Mqoqi *et al.* 1996; Moodley *et al.* 2003). *Schistosoma haematobium*, which is responsible for urinary bilharzia, is much more widespread than *S. mansoni* which causes intestinal (rectal) bilharzia. Like STH infections, prevalences of *S. haematobium* in children on the eastern escarpment are highest (>70%) in the lowlands and near the coast, but decrease with increasing altitude to around 1000m. Transmission is also common across the eastern highveld with outliers west of Johannesburg in part of the North West Province (Wolmarans *et al.* 2006). Transmission in the Eastern Cape is patchy. A 2001 outbreak in the Jeffreys Bay area, west of Port Elizabeth, was attributed to infected migrant fishermen from further north. Intestinal or rectal bilharzia is limited to the low-lying areas of the three eastern provinces, Limpopo, Mpumalanga and KwaZulu-Natal. Its distribution falls entirely within that of *S. haematobium* so that in these three provinces children may be infected with both parasites (Schutte *et al.* 1995).

## **Neurocysticercosis in South Africa**

In some rural districts of the Eastern Cape (e.g. Alfred Nzo and Oliver Tambo District Municipalities), the prevalence of cysticercosis (with neurocysticercosis and related epileptiform seizures) is thought to be the highest in the world (Krecek *et al.* 2004; Willingham and Schantz 2004).

Ingestion of inadequately-cooked or raw pork can give rise to adult *Taenia solium* tapeworms in the intestines of the human host. Eggs produced by the tapeworms and excreted in the host's faeces can cause cysticercosis if they are swallowed by humans or pigs.

Public health interventions to reduce the prevalence of neurocysticercosis need to concentrate on improving sanitation, controlling free-range pigs and reducing the ingestion of infected and inadequately-cooked pork. Mass treatment programmes are not currently recommended.

## **Prevention and control of bilharzia and STH infections**

Historically, bilharzia and STH infections have been treated when individuals present to health facilities with complications or with a history of having passed worms. Standard Treatment Guidelines (Department of Health 2003a) for the diagnosis and treatment of helminthiasis are available and are summarised in Appendix II. Deworming in the absence of proof of the presence of worms has also been included in most protocols for the management of children with malnutrition or poor growth, and regular treatment with mebendazole is included in the Integrated Management of Childhood Illness (IMCI) (Department of Health 2005) as an aspect of routine care for any child between the age of one and five years who presents to a health facility for any reason. This is one reason why care-givers should be encouraged to take all children under the age of five years to PHC facilities on a regular (six-monthly) basis, even when the child is not ill.

For parasite control to be effective at a population level however, transmission of infection needs to be interrupted. Sporadic, erratic treatment of individuals through health facilities (or at home) will not have significant public health and environmental impacts, and will have little or no effect on transmission within a community.

From a public health perspective, helminth and bilharzia control programmes need to have three main interventions. These are:

- **Improvements in living conditions**, i.e. alleviation of poverty together with improved sanitation and access to a clean water supply.
- **Health education and encouragement of health-promoting behaviour** – aimed at reducing transmission and re-infection by encouraging healthy behaviours.
- **Drug treatment** – aims to reduce morbidity by decreasing the worm burden.

STH infection and bilharzia prevention and control were addressed by the World Health Assembly (WHA) in 2001. Resolution 54.19 (see Appendix III), to which South Africa is a signatory, calls on all member states to promote access to safe water, sanitation and health education through intersectoral collaboration and to implement and intensify control of bilharzia and STH infections. Member states were further called on to ensure access to essential drugs against bilharzia and STH infections in all health services in endemic areas for the treatment of clinical cases and groups at high risk of morbidity, such as women and children. Regular administration of chemotherapy to at least 75% of school-aged children at risk of morbidity was identified as a minimum standard, increasing to 100% by 2010.

### Why target school-age children?

School-age children are an important high-risk group for STH infection and bilharzia for a number of reasons. These include:

- Typically 6 to 15-year-olds have the highest prevalence and intensity of worm infections compared with other age groups.
- Children have increased nutritional needs due to intense physical growth and rapid metabolism; when these needs are not met, the child's growth may falter and he/she may be more susceptible to infection.
- Bilharzia and STH infections have been shown to have a negative impact on cognition and learning.
- Children are continuously exposed to contaminated soil and water, but often lack awareness of the need for good personal hygiene (Taylor *et al.* 1999).

International and local studies have demonstrated that synchronised and regular deworming of school-age children can reduce the prevalence and intensity of worm infections and significantly improve growth, learning and school attendance especially when supplemented by other nutritional interventions (Dickson *et al.* 2000; Jinabhai *et al.* 2001; Kvalsvig *et al.* 2001; Anonymous 2001a; Montresor *et al.* 2002; Partnerships for Child Development 2002). Treatment of school-age children therefore represents a cost-effective intervention and one which provides children with the best chance of growing and learning.

South African children have legal protection with respect to their right to health because South Africa has ratified the International Convention on the Rights of the Child, and the Constitution has given expression to this right. Safe, affordable and effective drugs for the treatment of helminthiasis are available, the transmission routes are well known, and parasite control programmes are in place in many developing countries with fewer resources than South Africa (Fenwick 2006).

Targeting school-going children for mass parasite control efforts also makes sense from a programmatic perspective for a number of reasons. School children are accessible and control programmes can make use of the well-established school infrastructure to implement and monitor control efforts. International experience has demonstrated that

deworming medication can safely be dispensed by people who are not health professionals, including school teachers (Awasthi *et al.* 2003). By using the school system to deliver drug treatment and health education, control and prevention programmes become more effective and efficient. Parasite control efforts are often popular as they address a problem which is frequently of concern to parents and other community members, and may provide an entry point for successful community-based health initiatives because they start to address perceived needs (Anonymous 2001b).

It should be noted that provision of medication to children should not be undertaken without parental consent. It has been suggested that parents or guardians should sign informed consent forms when they register children at school, although it must be possible for individuals to opt out at any time.

#### Which schools should be targeted?

Parasite control programmes should target schools in areas with a high prevalence and/or a large number of moderately or heavily-infected individuals. WHO definitions regarding intensity of infection are shown in tables 1 and 2.

STH preventive and control measures should focus on schools in densely-populated, under-serviced, impoverished areas in urban, periurban and rural settings. KwaZulu Natal, the Eastern Cape, Mpumalanga, the Western Cape and Gauteng have high prevalences of STH infection, and are in most need of effective STH control programmes.

Ecological zoning (mapping) has been used to produce maps of the expected distribution of endemic helminths (Appleton and Kvalsvig 2007). Rapid appraisals at sentinel sites can be undertaken to verify the data obtained from ecological mapping to determine the prevalence and intensity of infections, and to identify schools which should be targeted for parasite control efforts.

#### Experience in South Africa

Several school-based deworming projects have been successfully implemented in South Africa. One of the largest of these, a three-year school-based helminth control programme undertaken in Kwazulu-Natal (1998-2000), resulted in reductions in the prevalence and intensity of infections. There was a 65% reduction in mean egg count for *A. lumbricoides*, 18% for *T. trichiura*, 37% for *N. americanus*, and 46% for *S. haematobium*. Children benefited - by their own accounts they felt better, there was a drop in absenteeism, and improvements in the school performance of treated children were documented (Kvalsvig *et al.* 2001).

Likewise, the prevalence of roundworms and whipworms decreased significantly in children in schools in Khayelitsha when deworming was conducted on a twice-yearly basis between 1998 and 2005 (Fincham *et al.* 2005 a).

### Are there other important high-risk groups?

Although the prevalence of STH infections tends to be lower amongst preschool children, children aged two to five years can be most at risk of severe morbidity from helminth infections. Studies have shown that regular treatment for STHs is effective in decreasing the burden of infection (Taylor *et al.* 1995) and improving growth (Alderman *et al.* 2006) in this group of children.

Regular deworming is included in the IMCI case management guidelines and every child between the ages of one and five years who attends a PHC facility for any reason should receive mebendazole or albendazole on a six-monthly basis. Strengthening of IMCI is therefore an important strategy for addressing regular deworming; and care-givers should be encouraged to take their children to PHC facilities on a regular (six-monthly) basis, even when the child is well.

Other strategies to ensure that young children are treated for worms include extending treatment to crèches and preschools, and to consider including treatment of STHs as part of other interventions such as immunisation campaigns.

Out-of-school school-age children are a small, but significant group of children who are at risk for STH infection and nutritional problems, and parasite control programmes should aim to reach this group. Regular treatment of young women of child-bearing age is important in areas with a high prevalence of hookworm infection. This decreases anaemia and has been shown to reduce maternal and neonatal morbidity and mortality (de Silva *et al.* 1999). WHO has recently endorsed the treatment of pregnant women with praziquantel for bilharzia at any stage of pregnancy and the use of albendazole and mebendazole for STH infections after the first trimester (WHO 2006).

### **Ensuring adequate sanitation in schools**

Parasite control programmes will only be successful where adequate sanitation and water supplies are in place. This includes ensuring that schools have adequate toilets, that the toilets are maintained in a good state and that cleaning materials, soap and toilet paper are available. Responsibility for ensuring adequate sanitation and hygiene in schools must be clearly defined.

### **Health education**

Health education and promotion of healthy behaviours can play a key role in reducing the incidence of bilharzia and STH infection. Key knowledge, attitudes and practices related to STH and bilharzia prevention and control as identified by WHO are shown in the box below.

### **Knowledge, attitudes and practices related to reducing transmission of helminths infections (WHO 1996)**

**Knowledge:** learners and others should know that:

- People can become infected by swallowing tiny worm eggs which are shed in the faeces of individuals who are infected with worms. The eggs, which are invisible to the naked eye, may be present on people's hands and on food. Bilharzia is contracted via skin contact with or swallowing contaminated water, whilst hookworm and threadworm larvae can penetrate the skin of individuals who walk barefoot.
- Worm infections can be prevented by avoiding some very specific behaviours, including always using a toilet to urinate and defaecate and washing hands every time after using the toilet, so that eggs do not become disseminated in the environment.
- Poor hygiene and poor waste management lead to transmission of worms.
- Worm infections can easily be treated at a reasonably low cost.

**Attitudes:** Pupils and others can demonstrate:

- Responsibility for personal, family and community health.
- Compliance with screening and treatment activities in the school/community.
- Confidence to change unhealthy habits.
- Willingness to share information about preventing worm infections in the school, in the family and in the community.

**Practices:** Pupils and others will be able to:

- Avoid behaviours that promote transmission of infections, such as indiscriminate urination and defaecation, particularly in or near dams, rivers or streams.
- Practice regular handwashing after defaecation.
- Communicate messages about worm infection to their peers, their families and members of the community.
- Encourage peers, siblings, and families to take part in parasite control activities.
- Follow the guidelines on maintaining a healthy school environment.

### **Regular synchronised drug treatment**

As outlined above targeting school-going children for mass treatment efforts makes sense from an epidemiological and programmatic perspective.

The drugs used to treat bilharzia and the most common STH infections are effective and inexpensive. They have also been through extensive safety testing and have been used in millions of individuals with few, and minor side-effects (Montresor *et al.* 2002). Drugs recommended by the World Health Organisation for use in public health interventions are shown in table 3 (Montresor *et al.* 2002; WHO 2006). At present, levamisole and pyrantel pamoate do not have a prominent role in preventive chemotherapy – however they can be used in the in the treatment of STHs and since, unlike mebendazole and albendazole, they do not belong to the benzimidazole group, they will be expected to contribute the management of drug-resistant STH infections should that problem arise (WHO 2006).

**Table 3: WHO-recommended drugs for treatment of STH infections and bilharzia (WHO 2002)**

<b>Infection</b>	<b>Drug</b>
STH	Albendazole Levamisole Mebendazole Pyrantel pamoate
Bilharzia	Praziquantel

Recommendations for frequency of treatment based on prevalence and infection intensity are shown below in Table 4.

**Table 4: WHO recommendations for frequency of treatment (Montresor *et al.* 2002; WHO 2006)**

<b>STH INFECTIONS</b>		
High-risk community	Prevalence of any STH infection among school-aged children $\geq 50\%$	Treat all school-age children 2 – 3 times per year
Low-risk community	Prevalence of any STH infection among school-aged children $\geq 20\%$ and $< 50\%$	Treat all school-age children once a year
	Prevalence of STH infection among school-aged children $< 20\%$	Routine regular treatment not recommended
<b>BILHARZIA</b>		
High prevalence	Prevalence $> 50\%$ or visible haematuria $> 30\%$	Yearly treatment of all school-age children
Moderate prevalence	Prevalence $> 10\%$ , but $< 50\%$	Treatment once every two years of all school age children
Low prevalence	Prevalence $< 10\%$	Treatment of all school-age children twice during primary schooling (entry and exit)

### Recommended treatment schedule for South Africa

Current recommendations for treatment of children in South Africa are shown in table 5. The dosing schedule for mebendazole is the same as that contained in the IMCI guidelines (Department of Health 2005). The Standard Treatment Guidelines (Department of Health 2003a) recommend that the divided dose schedule (100mgbd x 3 days) is also used in children between two and five years of age.

The recommended dose for Praziquantel is 40mg/kg. WHO recommends that where scales are not readily available, dosages based on height can also be administered (see table 6 below). Side-effects from Praziquantel are potentially serious, and mechanisms need to be in place to ensure appropriate management and referral of children should complications arise. Malaise, non-specific gastro-intestinal disturbances, headache, drowsiness and dizziness are frequent, but are usually transient and mild. Less frequent side-effects include urticaria, eosinophilia and arthralgia. The major concern however is patients with concomitant neurocysticercosis, who may develop fever, cerebral oedema, raised intracranial pressure and convulsions. These symptoms result from an inflammatory response to dead or dying cysticerci. Treatment includes in-patient admission and treatment with oral steroids. Particular care therefore needs to be taken in areas where neurocysticercosis is common. Children with severe hepatic dysfunction should also not receive praziquantel due to reduced metabolism (University of Cape Town 2003).

Decisions regarding which groups to treat and frequency of treatment will need to be based on the intensity of infection as outlined in table 5.

**Table 5: Recommended drugs and dosages for treatment of children in South Africa**

<b>Infection</b>	<b>Drug</b>	<b>Age</b>	<b>Dose</b>
STH	Mebendazole	12-23 months > 24 months	100mgbd x 3 days 500mgstat
Bilharzia	Praziquantel	> 2 years	40 mg/kg stat

**Table 6 : Recommended dosages of Praziquantel (WHO 2006)**

<b>Height</b>	<b>Dose</b>
94 – 109 cm	1 tablet (600mg)
110 – 124 cm	1½ tablets (900mg)
125 – 137 cm	2 tablets (1200mg)
138 – 149 cm	2½ tablets (1500mg)
150 – 159 cm	3 tablets (1800mg)
160 – 177 cm	4 tablets (2400mg)
≥178 cm	5 tablets (3000mg)

### Provision of treatment at schools, preschools and crèches

The way in which treatment is delivered to school children may vary from area to area, depending on local conditions.

In South Africa, treatment will generally be dispensed by a school health or PHC nurse, whilst teachers (and other personnel or community members) have a key role to play in ensuring that consent for treatment is obtained from parents or guardians; that every child receives treatment; and that tablets are correctly swallowed or chewed. Pilot parasite control programmes in Kwazulu-Natal and the Western Cape have developed guidelines for organising treatment days (see Resource List).

Administration of mebendazole (or other drugs used in the treatment of STH infections) are provided in most cases as a single standard dose (see table 5). If praziquantel is to be given, each child should be given the correct number of tablets according to body weight or height, and should stay in school for two hours after the administration thereof. If side-effects occur, the teacher should refer the child to a health worker (Montresor *et al.* 2002).

WHO recommends that children who are ill on the treatment day should not receive drugs. This is not because of any danger of side-effects, but to prevent the potential misconception that the drug(s) caused the illness.

## **SECTION 2: EXISTING SCHOOL HEALTH PROGRAMMES AND INITIATIVES**

STH and bilharzia control efforts which focus on school children will form part of existing school health programmes and initiatives, the most important of which are summarised below. Progress in implementing these initiatives, as well as their capacity to incorporate parasite control into their activities, will need to be assessed when planning and implementing parasite control programmes at provincial, district and school levels.

### **The Health Promoting Schools Initiative (HPSI)**

This is an internationally-accepted programme of co-ordinated services that has been jointly developed by various sectors to comprehensively address the health and development needs of school communities. School health services are a component of this programme.

The HPSI is underpinned by a health promotion philosophy and has five components that together provide the basis for school health. These are:

- The development of school health policies that will assist the school community in consistently addressing its health needs.
- The development of the school as a supportive environment for the promotion of healthy attitudes and practices.
- Community action that involves the school and broader community in taking ownership of and seeking ways to address their collective health needs by accessing resources for health.
- The development of personal skills of members of the school community, thus enabling them to improve their own health, and influence the healthy development of others.
- Access to appropriate services to address the health needs of the school community.

Within this initiative, the health service is an important component that addresses specific health needs of children.

### **School Health Services**

The School Health Policy and Implementation Guidelines were launched in 2003 (Department of Health 2003b). They aim to facilitate the reorganisation of the school health service from a previously vertical service into a relevant and effective service that is integrated within existing primary health care services and which collaborates meaningfully with educational activities. There is recognition of the variation in school health resources in districts across the country.

The objectives of the School Health Services are;

- To support the school community in creating health-promoting schools.
- To address health barriers to learning so as to facilitate maximum benefit from education.
- To provide preventive and promotive services that address the health needs of school-going children, specifically those who have missed the opportunity to access service during their preschool years.
- To support educators in their school activities within the curriculum.

The school health service package includes health assessments for learners in Grade R/1, health promotion and health education for all learners, support to schools and educators, and appropriate referral and follow-up of learners requiring further assistance.

Other important health factors that affect the development of learners include issues related to sexuality, HIV/AIDS, reproductive health, trauma and violence, substance abuse, and mental health problems. Such factors should be addressed through health promotion and health education activities, and can be best accommodated within the life skills and life orientation areas of the educational curriculum.

### **The National School Nutrition Programme (NSNP)**

The National School Nutrition Programme (NSNP) aims to alleviate hunger and improve the attention span and performance of school learners. Priority is given to schools in the poorest communities, namely, schools in rural, farming and peri-urban areas. The Department of Education, which manages the programme, aims to reach 5 million learners in 15 000 schools in poor areas during the 2006/7 financial year (Hendricks *et al.* 2006).

Parasite control programmes should work closely with the school nutrition programmes. In addition to its primary focus on provision of food, the NSNP also aims to address issues related to improved sanitation and health-promoting behaviours amongst school children. Both programmes target the most disadvantaged schools and where well-functioning school nutrition programmes are in place, these provide excellent infrastructure and systems for provision of mass treatment and other components of parasite control programmes.

It is necessary for children to have something to eat before taking treatment medication, especially praziquantel. This is an important consideration in respect of child compliance.

### **SECTION 3: KEY FACTORS IN THE IMPLEMENTATION OF SUCCESSFUL PARASITE CONTROL PROGRAMMES**

Parasite control programmes in Kwazulu-Natal and the Western Cape have identified a number of factors which are key to the successful implementation of these programmes.

#### **Adequate technical support**

An understanding of the epidemiology of STH infections and bilharzia is required in order to effectively target schools where children will benefit most from treatment. Whilst the distribution patterns of these infections are relatively well understood in some provinces, in other provinces these patterns are poorly characterised; and technical advice and expertise will be required in order to identify schools which will benefit most from parasite control programmes.

#### **Inter-departmental collaboration**

Parasite control programmes require close co-operation between the Departments of Health and Education, whilst inclusion of crèches and preschool facilities necessitates the involvement of the Department of Social Development. Officials in these departments often have little experience of working together. Adequate mechanisms for communication and collaboration need to be established and roles, responsibilities and lines of accountability need to be defined.

#### **Adequate human resources**

Sufficient staff are required to run effective public health programmes. Most staff vacancies occur in poorer provinces and in rural areas, where water and sanitation services are least likely to be satisfactory and parasite control programmes are most needed.

#### **Adequate hygiene in schools**

Parasite control programmes will only be successful where adequate sanitation and water supplies are in place. This includes ensuring that schools have adequate toilet facilities, that the toilets are maintained in a good state and that cleaning materials, soap and toilet paper are available. Responsibility for ensuring adequate sanitation and hygiene in schools must be clearly defined.

#### **Support of parents and other community members**

Initial distrust of mass treatment programmes is common but can usually be overcome, especially where adequate information is provided and communicated to parents and other community members. Usually, these groups become firm supporters of the programmes once they understand them and begin to see the benefits. Parasite control programmes provide an opportunity for community members to become involved in

health programmes, and because they address a visible problem, may provide an entry point for successful community-based health initiatives.

### **Constraints regarding adequate drug treatment of school children in South Africa**

Fincham *et al.* (2005b) identify a number of factors related to drug availability which will need to be addressed if synchronised treatment is to be provided on a large scale and in a cost-effective manner to children in South Africa.

Of the drugs recommended for the treatment of STHs only the two benzimidazoles (mebendazole and albendazole) are currently available in South Africa. Mebendazole is a schedule 1 drug which means that it can be purchased over the counter. Albendazole is a schedule 4 drug and must, therefore, be prescribed on a named basis, which can make it difficult to use in mass treatment campaigns. Likewise, praziquantel is available for the treatment of bilharzia, but its use for routine, synchronised treatment may be limited in some settings by its classification as a schedule 4 drug.

Although mebendazole is effective in treating STH infections, concerns have been raised regarding the possibility of development of resistance to the drug following its widespread use for regular treatment of school children. For effective sustained deworming, anthelmintics should be used in such a way that the risk of drug resistance is minimised. Although targeting high-risk groups such as school children and treating infrequently (six monthly) should prevent or delay the emergence of resistance (Awasthi *et al.* 2003), the risk of resistance increases if the same drug is used continuously. Ideally, treatment should alternate between a benzimidazole (albendazole or mebendazole) and one of the following: ivermectin, pyrantel or levamisole. However these three drugs are not currently available in South Africa. In the long term the availability of drug availability, together with issues related to their packaging, labelling and dispensing, will need to be reviewed.

## **SECTION 4: IMPLEMENTATION GUIDELINES**

### **Objective**

To reduce morbidity from STH infections and bilharzia by reducing the number of children who are heavily infected with these parasites. This will result in improved physical growth and cognition, and enhance the development of disadvantaged children in South Africa.

### **Strategies**

#### Improved environments

- The long-term solution to reducing the burden of STH infections and bilharzia is to alleviate poverty and to ensure access for all South African to an adequate water supply and sanitation. These issues are addressed through numerous government and civil society policies and programmes, which are not discussed here. It is expected that all health managers and workers will support and participate in these efforts where appropriate.
- Ensure that all schools have access to a clean and reliable water supply and to adequate toilet facilities and sanitation.
- Ensure that schools have adequate supplies of toilet paper and soap to promote good hygiene.
- Encourage community participation in school programmes that provide treatment for STH infections and bilharzia.

#### Health education to encourage healthy behaviours

- Health education and promotion of healthy behaviour should be covered in school curricula, and should include knowledge concerning the transmission, prevention and treatment of STH infections and bilharzia.
- Develop and distribute appropriate teaching materials – it is often the case that these materials have already been developed as part of pilot projects, but mechanisms for sharing and translation of materials need to be in place.

#### Regular synchronised drug treatment

- Provide regular drug treatment against bilharzia and STH infections to primary school children in disadvantaged areas. The scale and frequency of treatment will depend on the prevalence and intensity of infection as well as re-infection rates, as outlined in the previous section.
- Strengthen implementation of IMCI and encourage care-givers to take their children to Primary Health Care facilities on a regular (six-monthly) basis.
- Extend school-based deworming programmes to crèches and preschool facilities.
- Consider including treatment for STH infections in other health-related interventions such as immunisation campaigns.

## **Responsibilities**

Implementation of successful parasite control programmes, especially where these include school-based mass treatment, is dependent on close co-operation between numerous role-players at all levels. Close collaboration between the Departments of Education and Health, particularly with school health services, is important. School-based deworming programmes will only be successfully implemented with the support of all officials in the Department of Education, especially school principals and teachers.

### National level

- Develop and disseminate policy and implementation guidelines.
- Support provinces in developing and implementing STH and bilharzia control programmes.
- Appoint and liaise with a team of technical experts regarding matters such as identification of target groups, the selection of indicators and setting of targets, and establishment of sentinel sites.
- Address issues related to the availability of appropriate drugs.
- Monitor and evaluate the impact of deworming programmes, and keep the Minister of Health informed.
- Integrate the prevention and control of bilharzia and STH infections into other relevant policy documents and programmes such as the Household and Community component of IMCI.
- Liaise with the national and provincial Departments of Education to ensure that health promotion topics are included in the school curricula.
- Develop and distribute information, education and communication materials for use by teachers and schools.

### Provincial level

- Define the extent of STH infection and bilharzia within the province, and identify high-risk groups, specifically school-age children who live in disadvantaged communities. In some provinces where the extent of the problem is poorly defined, studies to establish the burden of infection may be required.
- Set goals and targets for introduction of school-based control programmes.
- Implement mass treatment programmes in the targeted schools in collaboration with school health and district health services.
- Conduct sentinel surveys at proven high-prevalence sites where regular, synchronised treatment for STH infections and bilharzia is in progress.
- Monitor and evaluate the impact of parasite control and health education programmes, and provide information to national structures.
- Ensure that laboratories are adequately equipped, and that staff have been trained to diagnose STH and other parasitic infections.
- Ensure that drugs needed for STH and bilharzia control are available in provincial and district pharmaceutical depots, and that there is a functioning procurement and distribution mechanism which ensures that all facilities and health services have adequate supplies of these medicines at all times.

- Develop systems to ensure that children who develop serious side-effects are appropriately referred and treated.
- Ensure that prevention and control of STH infection and bilharzia are co-ordinated with other interventions, strategies and programmes, e.g. with the school nutrition programme and other school health initiatives.
- Liaise with local and other provincial government departments e.g. environmental affairs, water affairs, health, education and tourism in order to address the medium- and long-term strategies for the control of worm infections.
- Provide sufficient functional toilet and hand-washing facilities in every school.

#### District level

- Implement mass treatment programmes amongst high-risk groups, specifically school-age children who live in disadvantaged communities.
- Collaborate with other sectors, and with provincial departments, to ensure an integrated holistic approach to prevention and control of bilharzia and STH infections.
- Use school- and community-participation to obtain the capacity to implement all aspects of prevention and control in health facilities and schools.
- Expand services to include children attending crèches and preschool facilities.
- Ensure that IMCI is implemented in all PHC facilities, and that all children receive regular treatment with anthelmintics as outlined in the IMCI case management guidelines.
- Carry out sentinel surveys at proven high-prevalence sites where regular, synchronised deworming is in progress.
- Monitor and evaluate the impact of the intervention in the district and provide data to the provincial Health and Education Departments.

#### Schools, Preschools and Crèches

Department of Education staff, especially teachers, have a key role to play in implementing prevention and control programmes, and their support and participation in these efforts is key to their success. The activities required of teachers will vary from school to school, but will typically include:

- Teaching learners about healthy behaviours.
- Provision of information to children, parents and community members regarding the benefits of treating children for STHs and bilharzia on a regular basis.
- Obtaining informed consent from parents for treatment of their children.
- Facilitating provision of drug treatment to all eligible learners.
- Participating in efforts to monitor and evaluate STH infection and bilharzia programmes.

#### Academic Institutions

- Provide technical advice and support at various levels.

- Assist Departments of Health and Education in establishing sentinel sites and in implementing, monitoring and evaluating control programmes.
- Undertake research.

### Monitoring and Evaluation

Each province should identify indicators which are linked to their control and prevention plans. However, the following are recommended as the minimum set of indicators to be collected and forwarded to the National Departments of Health and Education.

**Table 7: Recommended indicators**

Indicator	Calculation	Target
<b>Process indicators (information to be collected in all intervention areas)</b>		
Percentage of targeted schools participating	<b>Numerator:</b> No. of primary schools in which children are receiving the intervention <b>Denominator:</b> No. of schools which are targeted to receive the intervention	90% of schools
Coverage	<b>Numerator:</b> No. of primary school children receiving the intervention <b>Denominator:</b> No. of primary school children in the intervention areas	75% of targeted primary school children
<b>Parasitological indicators (information to be collected in sentinel sites)</b>		
Proportion of “heavy-intensity” infections with any STH	<b>Numerator</b> No. of children with moderate or heavy infections with any of the three STHs <b>Denominator:</b> Total number of children investigated	0%
Proportion of “heavy-intensity” infections with each of the STHs	<b>Numerator:</b> No. of children with moderate or heavy infections with each of the three STHs <b>Denominator:</b> Total number of children investigated	0%
Proportion of “heavy-intensity” infections with bilharzia	<b>Numerator:</b> No. of children with heavy bilharzial infections <b>Denominator:</b> Total number of children investigated	0%

## SECTION 5: FINANCIAL IMPLICATIONS

School-based parasite control programmes will need to be funded by Provincial Departments of Health and Education. Costs will depend on the scale of these programmes in each province, which will depend in turn on the burden and pattern of bilharzia and STH infection in that province, and the coverage targets set.

One 500mg tablet of mebendazole currently costs R1.20, whilst each 500mg tablet of praziquantel costs R0.77. Prices are likely to decrease if provincial Departments of Health and/or Education purchase large amounts on a regular basis.

Funds will also have to be set aside for printing and distribution of these guidelines, convening of a national Technical Expert Team and undertaking sentinel surveys in each province (in order to establish the prevalence and intensity of STH infections and bilharzia). Estimated costs are summarised in table 7 below. Sentinel site surveys should be repeated every three to five years.

**Table 8: Estimated costs**

Printing of guidelines	20 000 copies @R60/copy	<b>R1,200,000</b>
Convening of an expert technical team	2 meeting /year @R100,000/meetings	<b>R200,000</b>
Undertaking sentinel surveys	Eastern Cape	R1,000,000
	Free State	R1,000,000
	Gauteng	R500,000
	KwaZulu Natal	R1,500,000
	Limpopo	R500,000
	Mpumalanga	R1,000,000
	Northern Cape	R300,000
	North West	R500,000
	Western Cape	R1,000,000
	Sub-total	

## Appendix II:

### Standard Treatment Guidelines for the treatment of STHs and Bilharzia adapted from the Primary Health Care Standard Treatment Guidelines and Essential Drugs List (Department of Health 2003a)

#### Helminthic infestation, excluding bilharzia and tapeworms

Types of worm infestation and the characteristics are shown in the box below.

Type of worm	Description	Signs and symptoms
<b>Common Roundworm</b> <i>Ascaris lumbricoides</i>	<ul style="list-style-type: none"><li>• Long pink/white worms</li><li>• Often seen in the stools</li></ul>	<ul style="list-style-type: none"><li>• Cough</li><li>• If there is vomiting consider intestinal obstruction</li></ul>
<b>Pinworm</b> <i>Enterobius vermicularis</i>	<ul style="list-style-type: none"><li>• White and thread-like</li><li>• Often seen in the stools</li></ul>	<ul style="list-style-type: none"><li>• Anal itching – worse at night</li><li>• Self-infection common</li></ul>
<b>Hookworm</b> <i>Necator americanus</i>	<ul style="list-style-type: none"><li>• Eggs thin-walled</li></ul>	<ul style="list-style-type: none"><li>• No symptoms or pain</li><li>• Anaemia</li></ul>
<b>Whipworm</b> <i>Trichuris trichiura</i>	<ul style="list-style-type: none"><li>• Worms and eggs in the stools</li></ul>	<ul style="list-style-type: none"><li>• No symptoms</li><li>• Light infestations</li><li>• Abdominal pain</li><li>• Diarrhoea</li><li>• Possible anaemia and rectal prolapse</li><li>• Abdominal discomfort</li><li>• Weight loss</li></ul>

#### Non-drug treatment

##### Patient counselling and education

- Wash hands with soap and water
  - After passing a stool
  - Before working with food or eating
- Keep fingernails short
- Wash fruit and vegetables well or cook
- Keep toilet seats clean
- Teach children to use toilets and wash hands
- Do not pollute the soil with sewage or sludge
- Dispose of faeces properly
- Wear shoes wherever possible (to prevent hookworm and threadworm infection)

#### Drug treatment

Albendazole, oral, single dose, repeat after 3-4 weeks

Children 1-2 years                      200mg stat

Children over 2 years                400mg stat

Adults                                      400mg stat

## Referral

- Abdominal tenderness
- Pain
- Vomiting
- Pregnancy

An alternative which is contained in the IMCI guidelines (Department of Health 2005), but which is currently not included in the EDL STGs is:

Mebendazole, oral, single dose

Children 1-2 years                      100mg bd x 3 days

Children over 2 years                500mg stat

Adults                                      500mg stat

## **Bilharzia**

### Description

A parasitic infestation with the bilharzia parasite.

Infestation occurs during washing, bathing or paddling in water harbouring snails shedding this parasite.

Clinically features vary with the location of the parasite.

Most cases are asymptomatic.

Chronic bilharzia may present with local or systemic complications, including urinary tract obstruction with ensuing renal failure or other organ involvement.

Type of worm	<i>Schistosoma haematobium</i>	<i>Schistosoma mansoni</i>
<b>Clinical features</b>	Initially (after exposure): itching or rash  Some weeks later: <ul style="list-style-type: none"><li>• Blood in the urine</li><li>• Lower abdominal pain</li><li>• Low grade fever</li><li>• Recurrent cystitis diarrhoea</li></ul>	<ul style="list-style-type: none"><li>• Diarrhoea</li><li>• Abdominal pain</li><li>• Blood and mucus in the stools</li></ul>
<b>Diagnosis</b>	<ul style="list-style-type: none"><li>• Eggs in urine on microscopy</li></ul>	<ul style="list-style-type: none"><li>• Eggs in urine on microscopy</li><li>• Rectal biopsy</li></ul>

### Non-drug treatment

- If bilharzia is endemic, educate the community to avoid contaminated water and infection
- **Do not** urinate or pass stools near water used for drinking, washing or bathing
- **Do not** swim in contaminated water

- Collect water from rivers and dams at sunrise when the risk of infection is lowest
- Boil all water before use

### Drug treatment

If you are not equipped to check for parasites, do not treat

If eggs of *S. haematobium* and *S. mansoni* are found in the urine/faeces

- Praziquantel, oral as a single dose  
children over 2 years - 40 mg/kg, single dose or as 2 divided doses  
adults - 40 mg/kg, single dose

### Note

Breastfeeding women should stop breastfeeding on the day of drug administration and for the next 48 hours (mothers who are exclusively breastfeeding should be advised to express and store breastmilk in advance).

### Referral

- Inability to identify parasites
- Children under 2 years
- Complications, e.g. urinary tract obstruction, systemic complications

Appendix I

# WHAT DO YOU KNOW ABOUT WORMS?

**Effective sanitation prevents pollution**

**Faeces containing thousands or even millions of worm eggs mix with soil or get into water**

**Worm eggs in soil, dust and dirty water get onto vegetables, fruit and other food we eat**

**Worm eggs on dirty hands, under finger nails and in water polluted by faeces and urine**

**Worm eggs in dust blown by wind**

**Larvae penetrate skin of bare feet (and cause itching) to reach bloodstream**

**Pinworm eggs are laid on the skin near the anus. They are sticky, cause itching and get onto fingers during scratching**

**Cows or pigs swallow tapeworm eggs on grass and cysts form in their meat, which we eat**

**Portion of intestine removed from a young child because of blockage by roundworm (ascaris)**

**Tapeworm eggs**  
**Roundworm eggs**  
**Pinworm eggs**  
**Hookworm eggs**  
**Whipworm eggs**  
**Roundworm cysts**  
**Hookworm cysts**

**Supporters:** ANHEP AMERICAN, ANHEP AMERICAN, ANHEP AMERICAN, ANHEP AMERICAN, ANHEP AMERICAN

**Supported by Anglo American Chairman's Fund and the Khayelitsha Trust Team**

## Appendix III

### **World Health Assembly resolution WHA54.19: Schistosomiasis and soil-transmitted helminths infections (WHO 2002)**

The Fifty-fourth World Health Assembly,

Recalling resolutions EB5.R5, WHA 3.26, EB55.R22, WHA28.53 and WHA29.58 on schistosomiasis;

Noting the report on the control of schistosomiasis and soil-transmitted helminth infections;

Recognizing that where control measures have been implemented in a sustainable way, as demonstrated in several countries, mortality, morbidity and transmission have decreased dramatically, leading to elimination in a number of countries;

Expressing concern that 2000 million people are infected by schistosomes and soil-transmitted helminths worldwide, of whom 300 million have associated severe morbidity, and that schistosomiasis and soil-transmitted helminth infections are invariably more prevalent in the poorest sections of the populations residing in the least-developed countries;

Further recognizing that sanitation and safe water are essential, and that repeated chemotherapy with safe, single-dose, affordable drugs at regular intervals ensures that levels of infection are kept below those associated with morbidity, and improves health and development, especially of children,

1. ENDORSES as the best means of reducing mortality and morbidity and improving health and development in infected communities, the regular treatment of high-risk groups, particularly school-age children, and ensured access to single-dose drugs against schistosomiasis and soil-transmitted helminth infections in primary health care services, complemented by the simultaneous implementation of plans for basic sanitation and adequate water supplies.
2. URGES Member states;
  - (1) To sustain successful control activities in low-transmission areas in order to eliminate schistosomiasis and soil-transmitted helminth infections as a public health problem, and to give high priority to implementing and intensifying control of schistosomiasis and soil-transmitted helminth infections in areas of high transmission while monitoring drug quality and efficacy;
  - (2) To ensure access to essential drugs against schistosomiasis and soil-transmitted helminth infections in all health services in endemic areas for the treatment of clinical cases and groups at high risk of morbidity such as women and children, with the goal of attaining a minimum target of regular administration of chemotherapy to at least 75% and up to 100% of all school-age children at risk of morbidity by 2010;

- (3) To promote access to safe water, sanitation and health education through intersectoral collaboration;
  - (4) To ensure that any development activity likely to favour the emergence and spread of parasitic diseases is accompanied by preventive measures to limit their impact;
  - (5) To mobilize resources in order to sustain activities for control of schistosomiasis and soil-transmitted helminth infections;
3. ENCOURAGES organizations of the United Nations systems, bilateral agencies, and nongovernmental organizations:
- (1) To intensify support for control of helminth infections, and to take advantage of the synergy that can be created with existing initiatives for the prevention, control and elimination of other communicable diseases;
  - (2) To intensify support to sanitation and safe water programmes as well as taking into account the health aspects of agricultural development programmes and programmes to develop water resources with respect to the possible re-emergence of diseases;
4. REQUESTS the Director-General:
- (1) To combat schistosomiasis and soil-transmitted helminth infections by advocating new partnerships with organizations of the United Nations system, bilateral agencies, nongovernmental organizations and the private sector, and by continuing to provide international direction and coordination;
  - (2) To continue to seek the resources required to support advocacy, coordination, programmes and research activities;
  - (3) To continue to promote the strengthening of health systems and services as an important component of successful disease control programmes;
  - (4) To keep the Executive Board and Health Assembly informed of the progress in controlling and eliminating schistosomiasis and soil-transmitted helminth infections in high- and low-transmission countries, respectively.

## Appendix I: Information on transmission of STHs

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