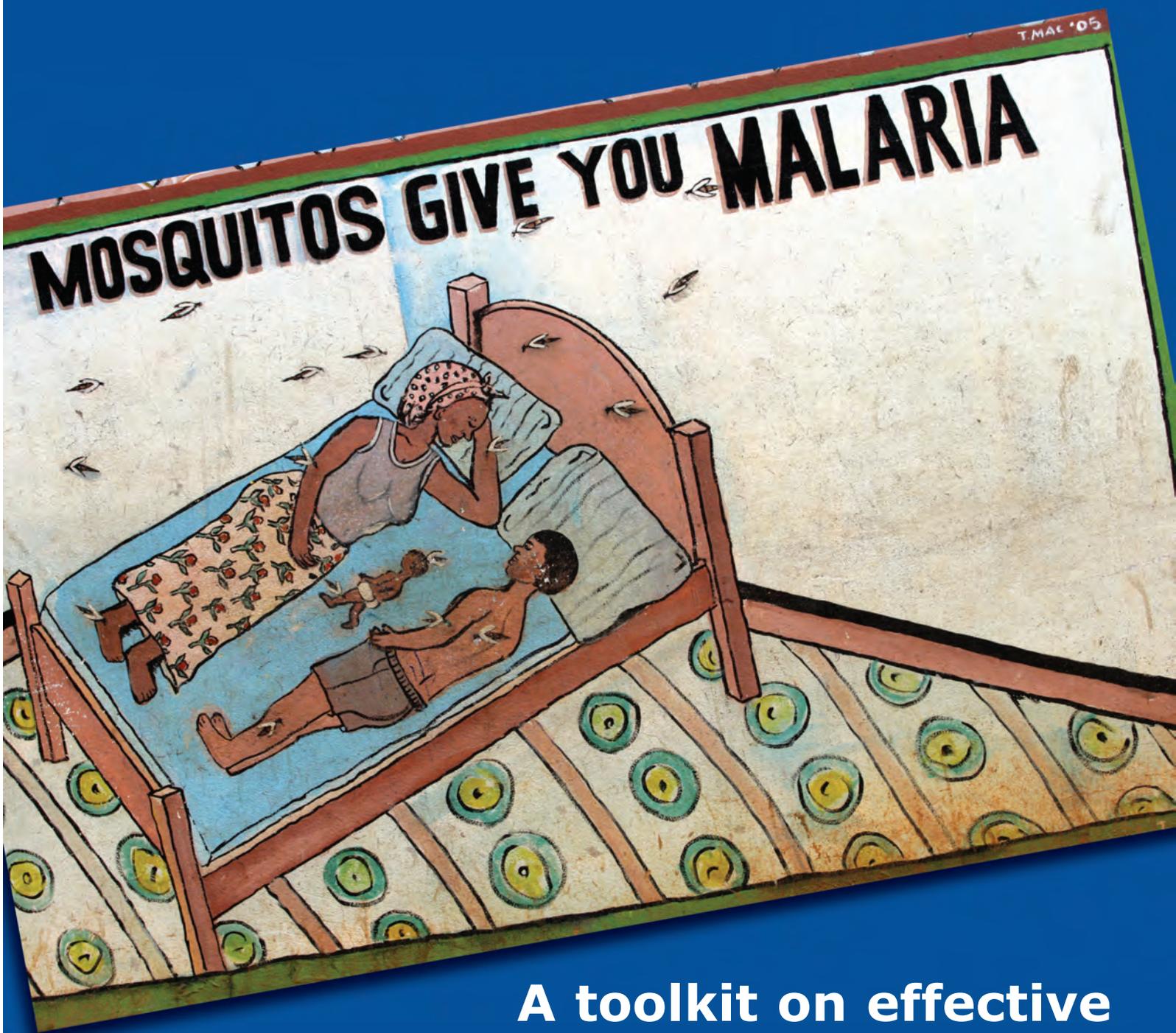
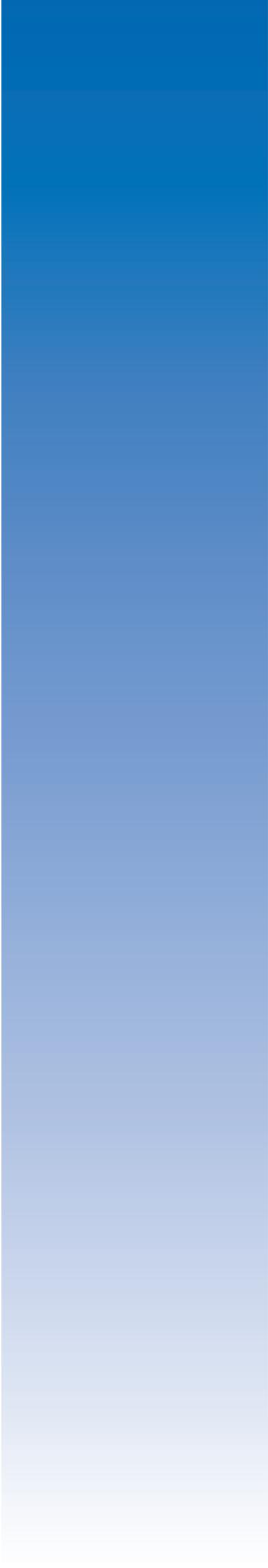


Malaria Control in Schools



A toolkit on effective
education sector responses
to malaria in Africa





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Partnership for Child Development

London School of Hygiene and Tropical Medicine

Kenya Medical Research Institute-Wellcome Trust

Research Programme

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Summary

The *Malaria Control in Schools* toolkit has been designed to help policymakers, health professionals, educationalists, researchers, donors and non-governmental organizations on how to implement country-led plans for school malaria programmes.

The WHO Global Malaria Programme recognizes the importance of the education sector and the role that schools and teachers can play on the prevention and control of malaria. The FRESH framework for school health, adopted by majority of African countries, has the ability to deliver school-based malaria interventions. This toolkit uses this infrastructure on how effective malaria control interventions can be implemented in schools.

Practical up-to-date information and experience on the control of malaria in schools is presented with both technical and policy advice on malaria, and how countries can plan and implement school-based malaria interventions. Useful links and technical resources specific to information on malaria as well as health education and school health are also provided.

This toolkit will help users to understand why the education sector should respond to malaria; the benefits of controlling malaria in schools; the appropriate malaria interventions which can be delivered through schools; examples of promising practice at scale; the key issues in developing a school malaria programme; how to formulate a national Malaria Control in Schools strategy; and how to design a malaria component of a wider school health programme.

The global situation on malaria is in transition, with evidence of declining transmission and disease burden. As transmission declines, school-age children will increasingly become an important clinical risk group. Within this context, it is hoped that the *Malaria Control in Schools* toolkit will facilitate professionals within the education sector to develop effective programmes on the prevention and control of malaria for school-age children within malaria endemic countries.

Abbreviations and acronyms

ACTs	Artemisinin-based Combination Therapies	KESSP	Kenya Education Sector Support Programme
AIDS	Acquired Immune Deficiency Syndrome	KIE	Kenya Institute of Education
AMREF	African Medical and Research Foundation	LePSA	Learner-centred, Problem-posing, Self-discovery, Action-oriented approach
AQ	Amodiaquine	LLIN	Long-lasting insecticidal net
AS	Artesunate	LSHTM	London School of Hygiene and Tropical Medicine
DDT	Dichlorodiphenyltrichloroethane	MDG	Millennium Development Goal
ECD	Early Child Development	MoE	Ministry of Education
EFA-FTI	Education for All – Fast Track Initiative	MoH	Ministry of Health
EPDF	Education Programme Development Fund	NGO	Non-governmental organization
ESACIPAC	Eastern and Southern Africa Centre of International Parasite Control	NMS	National Malaria Strategy
ESP	Education sector plan	PCD	Partnership for Child Development
FRESH	Focusing Resources on Effective School Health	<i>PfPR</i>	<i>Plasmodium falciparum</i> parasite rate
Hb	Haemoglobin	PSI	Population Services International
HIV	Human Immunodeficiency Virus	PTA	Parent Teachers Association
IEC	Information, Education and Communication	RBC	Red blood cell
IPT	Intermittent preventive treatment	RBM	Roll Back Malaria
IPTc	Intermittent preventive treatment in children	RDT	Rapid diagnostic test
IPTi	Intermittent preventive treatment in infants	SCN	Standing Committee on Nutrition
IPTp	Intermittent preventive treatment in pregnancy	SHN	School Health and Nutrition
IRS	Indoor residual spraying	SP	Sulfadoxine-pyrimethamine
ITN	Insecticide-treated net	SWAp	Sector-Wide Approach
KeNAAM	Kenya NGO Alliance Against Malaria	UNESCO	United Nations Educational, Scientific and Cultural Organization
		UNICEF	United Nations Childrens Fund
		UPC	Universal Primary Completion
		WFP	World Food Programme
		WHO	World Health Organization



A toolkit on malaria control in schools

Why this toolkit?

With the global momentum to ensure universal primary education, more children than ever before are attending school, and governments are increasingly recognizing the importance of child health for educational achievement¹. Among the main health problems afflicting schoolchildren, malaria is an important cause of mortality and morbidity, and may have profound consequences for learning and educational achievement¹. Yet surprisingly, little is known about the burden of malaria in schoolchildren or what schools should do about malaria³⁻⁵.

School-based health and nutrition programmes are a cost-effective strategy to alleviate a number of the health problems facing schoolchildren, and already provide them with health education and health services such as deworming and micronutrient supplementation. These interventions are simple, safe and familiar, and address problems that are widespread and recognized as important within the community. A major step forward in international coordination was achieved when a global framework for school health programmes was developed to form a partnership in "Focusing Resources on Effective School Health (FRESH)". Among the early partners were the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Children's Fund (UNICEF), the World Bank, the World Food Programme (WFP), and the World Health Organization (WHO), with the Education Development Centre, Education International, and the Partnership for Child Development (PCD)⁶. The FRESH framework includes the following core components:

- School health policies that advocate the role of teachers in health promotion and delivery.
- Safe water and sanitary school environments.
- Skills-based health education that promotes good health.
- Basic school-based health and nutrition services.

The FRESH framework has been adopted by a majority of countries in Africa as the organizing principle for school health programmes. This existing infrastructure has the ability to deliver school-based malaria interventions. The role that schools and teachers can play in the prevention and control of malaria is also recognized by the WHO Global Malaria Programme⁷.

There is currently no consensus as to the optimal approach on how available interventions can be implemented in practice. To help fill this information

gap, this toolkit provides an overview of existing knowledge and experience regarding the control of malaria in schools. Technical and policy advice is provided on how the education sector can respond to malaria. Practical up-to-date information is also provided to aid the effective implementation of school malaria programmes. The Malaria Control in Schools toolkit aims to assist countries in planning and helps to:

- **Highlight why the education sector should respond to malaria.**
- **Understand the benefits of controlling malaria in schools.**
- **Define the appropriate malaria interventions which can be delivered through schools.**
- **Learn from examples of promising practice at scale.**
- **Identify the key issues in developing a school malaria programme.**
- **Formulate a national Malaria Control in Schools strategy.**
- **Design a malaria component of a wider school health programme.**

The contents included in this toolkit apply to malaria endemic countries, with a specific focus on sub-Saharan Africa, where the malaria burden is greatest. The toolkit also draws on relevant information from Asia, where examples are documented.

The Malaria Control in Schools toolkit complements and expands upon the FRESH toolkit which presents essential components of school-based programmes and provides policymakers with information on how best to identify and effectively address school health problems⁶ (see www.freshschools.org/Documents/FRESHandEFA-English.pdf).

Who is this toolkit for?

The Malaria Control in Schools toolkit aims to provide sector professionals with practical up-to-date information to aid the effective implementation of country-led plans for school malaria programmes. Users include policymakers, and implementers of school health programmes. Educationalists, researchers, donors and non-governmental organizations (NGOs) will be able to use this toolkit to help determine priorities for funding and implementation.

What are the contents of the toolkit?

The toolkit presents information to help sector professionals develop strategies that can be tailored to specific programmatic and epidemiological settings. This information is set out as:

- **Rationale for malaria control in schools.**
- **Control strategies to prevent and treat malaria involving:**
 - **principles and tools of malaria control for school-based programmes;**
 - **skills-based malaria health education programmes; and**
 - **summaries of studies investigating the impact of school-based malaria control – Appendix 1.**
- **Example of practices at scale – Boxes 3, 4 and 5.**
- **How to get started?**
 - **A national stakeholders workshop on malaria in schools – Appendix 2.**
- **Key links and resources to specific information on malaria control.**
- **Glossary of terms.**

Questions that are frequently asked about malaria and its control are presented in Box 1.

BOX 1: Frequently asked questions about malaria and its control

What is malaria?

Malaria is a common and serious tropical disease. It is an infection transmitted to human beings by mosquitoes biting mainly between sunset and sunrise. Human malaria is caused by four species of *Plasmodium* protozoa parasite: *Plasmodium falciparum*, *P. vivax*, *P. ovale* and *P. malariae*.

How is malaria transmitted?

Malaria is most commonly transmitted through the bite of an infected anopheline mosquito. Malaria can also be transmitted by blood transfusion, and in rare instances, by contaminated needles and syringes. In congenital malaria, parasites are transmitted from mother-to-child before and/or during birth.

Who is at risk of malaria?

Plasmodium falciparum causes severe and life-threatening malaria. Anyone can get malaria. However, people who are heavily exposed to the bites of mosquitoes infected with *Plasmodium falciparum* are most at risk of malaria. People who have little or no immunity to malaria, such as young children and pregnant women are more likely to become very sick and die. School-age children can also be at risk of infection and disease.

What are the main symptoms of malaria?

The classical clinical course of malaria consists of fever and flu-like illness, including shaking chills, headache, muscle aches, and tiredness. Nausea, vomiting, and diarrhoea may also occur. Malaria may cause anaemia and jaundice (yellow colouring of the skin and eyes) because of the loss of red blood cells. Infection with *Plasmodium falciparum*, if not promptly treated, may cause kidney failure, seizures, mental confusion, coma, and death.

How is malaria diagnosed?

The clinical diagnosis of malaria is difficult under the best of circumstances. Definite diagnosis is based on light microscopic observation of parasites in the red blood cells of the patient. Newer diagnostic tools include antigen detection in the form of a dipstick, known as rapid diagnostic tests (RDTs).

BOX 1:

Frequently asked questions about malaria and its control

How can malaria be controlled?

The goal of malaria control is to prevent mortality and reduce morbidity and social and economic losses, through the progressive improvement and strengthening of local and national capabilities. Four basic technical elements of the malaria control strategy are:

- Insecticide-treated nets (ITNs) or long-lasting insecticidal nets (LLINs) to protect populations at risk of malaria.
- Indoor residual spraying (IRS).
- Prompt access to treatment with effective antimalarials, such as Artemisinin-based Combination Therapies (ACTs).
- Prevention of malaria in pregnant women, through measures such as Intermittent preventive treatment (IPT) and the use of LLINs.

What is a long-lasting insecticidal net (LLIN)?

It is a bed net which is manufactured with long-lasting insecticide directly incorporated into its fibres, hung over a bed to protect sleepers from insect bites. The insecticide adds a chemical barrier to the physical barrier provided by the net. LLINs have the advantage over previous insecticide-treated nets (ITNs) in that the insecticidal activity is not lost during washing.

Which insecticides are commonly used to treat nets?

A group of insecticides called pyrethroids, especially permethrin, deltamethrin, and lambda cyhalothrin.

What is indoor residual spraying (IRS)?

IRS is the application of long acting (6 to 12 months) insecticides to the walls and eaves of houses and, in some cases, public buildings and domestic animal shelters, in order to kill adult mosquitoes that land and rest on these surfaces. It aims to reduce transmission by decreasing mosquito survival and density. Spraying is done at stated intervals typically using a hand-operated compression sprayer. Previously, the cheapest and probably the most effective insecticide for malaria control was dichlorodiphenyltrichloroethane (DDT).

Is DDT still used for IRS?

No, DDT is not used for IRS for two main reasons: firstly, resistance in mosquitoes had begun to develop as a result of

extensive use; and secondly, there were also concerns over DDT poisoning both wildlife and the environment. There is now a worldwide ban on the agricultural use of DDT. However, there is little evidence that using DDT endangers human health when DDT is used appropriately for IRS. DDT has long been the cheapest insecticide and the one with the longest residual efficacy against malaria vectors (6 to 12 months).

What are the current insecticides being used?

Pyrethroids (i.e., Deltamethrin and Cyfluthrin) are the most commonly used. Organophosphates (i.e., Malathion) and carbamates are also used but these all generally have shorter residual effect (up to 6 months).

Should schools be sprayed with insecticides?

Yes, all schools and other public buildings should be sprayed with insecticides. Dormitories of boarding schools should also be sprayed.

What are Artemisinin-based Combination Therapies (ACTs)?

These are treatments for uncomplicated falciparum malaria that combine several antimalarial drugs, one of which is a derivative of artemisinin. The most common artemisinin derivatives used in ACT are artesunate (AS), artemether and dihydroartemisinin. These are usually used in combination with other antimalarials to treat the parasite. These combinations are called artemisinin-based combination therapies, or ACTs, and are now the recommended first line of treatment for malaria in most countries in Africa.

Why use ACT?

Resistance to older drugs including chloroquine and sulfadoxine-pyrimethamine (Fansidar) is now widespread, making them ineffective to treat clinical malaria. ACTs combine drugs with different modes of action which considerably reduces the risk of resistance developing. ACTs also produce the fastest clinical recovery because the artemisinin kills parasites more rapidly than any other malaria drug. ACTs are active against parasite stages called gametocytes (the sexual stage of the parasite cycle), which help reduce the risk of transmission from one treated patient to another person.

BOX 1:

Frequently asked questions about malaria and its control

What are the disadvantages of ACTs?

ACTs are expensive, costing up to US\$ 3 per treatment. The dosage regime is also complicated, resulting in lower levels of adherence to full course of treatment.

Can ACTs be used in pregnancy?

The safety of ACTs in pregnancy is not fully known. It is currently recommended that in the first trimester, the ACTs drug should be avoided as first line treatment for uncomplicated malaria. However, WHO has recently recommended that they can be used in all trimesters if the life of the mother is at risk, and in the second and third trimesters, to treat uncomplicated malaria, if there is no other suitable drug.

What about artemisinin resistance?

At present, there is no evidence of parasite resistance to artemisinins. This is not to say that resistance to the artemisinins will never happen; the best way to protect the artemisinins from resistance is to combine them with another effective drug.

Why not use ACTs in school-based programmes?

There is a consensus that the drugs used for IPT should differ from drugs used for first-line treatment of clinical malaria (which is typically ACTs).

What is intermittent preventive treatment (IPT)?

IPT is the periodic mass administration of a full therapeutic course of an antimalarial drug, irrespective of infection status. Intermittent preventive treatment of malaria in pregnancy (IPTp), which is administered at the time of antenatal clinic visits, is recommended by WHO for preventing malaria during pregnancy. For IPTp, WHO currently recommends the use of sulfadoxine-pyrimethamine.

Can IPT be given to other age groups?

A number of research studies have investigated the impact of IPT given during infancy (IPTi) as a malaria prevention approach in sub-Saharan Africa. The treatment is given on the regular infant immunisation schedule. An independent international committee found that IPTi using sulfadoxine-pyrimethamine (IPTi-SP) is safe and efficacious. IPT has also been successfully given to children up to the age of 5 years and to school-age children.

Can IPT be given in schools?

To date, two studies have evaluated the impact of IPT among schoolchildren. A study in Kenya showed that IPT given once a term markedly reduces rates of anaemia and malaria infection and improved cognition. Another study in Mali found that IPT reduced rates of anaemia and clinical attacks.

What about resistance due to IPT?

Because treatment is provided only periodically, individuals still become infected with malaria parasites which are not exposed to the drug. This helps to reduce the emergence of drug resistance, but sufficiently reduces the number of parasites harboured by an individual.

Is there a vaccine for malaria?

No. There is currently no malaria vaccine approved for human use. The malaria parasite is a complex organism with a complicated life cycle. The parasite is constantly changing and developing a vaccine is therefore very difficult. However, many scientists all over the world are working on developing an effective vaccine.

Rationale for malaria control in schools

Who is at risk of malaria?

Globally, malaria poses an enormous public health burden, with the majority of clinical episodes due to *Plasmodium falciparum* occurring in sub-Saharan Africa⁸. In areas of moderate or high malaria transmission (see Box 2), mortality is greatest among young children. The major causes of childhood death are cerebral malaria, severe malaria anaemia and respiratory distress caused by acidosis (see Glossary). Young children who survive cerebral malaria may be left with debilitating neurological impairments.

Older children and adults, who have been regularly exposed to malaria, typically acquire immunity to clinical malaria and most malaria infections generally remain clinically asymptomatic. However, during pregnancy, women are more susceptible to clinical disease, with infection of the placenta associated with maternal anaemia and low birth weight⁹.

Since school-age children have generally acquired immunity to malaria, they tend to suffer less mortality and morbidity from malaria than their younger siblings¹⁰ although pregnant schoolgirls may be an exception to this generality. However, though mortality and morbidity may be low in areas of high malaria transmission, it is not insignificant, and is of substantial importance of the education of schoolchildren through reduced school attendance, cognition, learning and school performance^{2,4,11}.

In areas of unstable or epidemic-prone transmission (see Box 2), where children and adults have little or no pre-existing immunity to malaria, infection is associated with a high risk of life threatening disease that needs to be treated promptly and effectively. However, these risks are balanced by the low, and often very seasonal, exposure to the parasite.

BOX 2:

Defining malaria risk among human populations

The amount of malaria may vary considerably between different geographic areas. Malaria is often classified according to whether transmission is **stable** or **unstable**. These situations form a continuum of differing settings. The continuum is also sometimes referred to as ranging from **high** through **moderate** to **low**.

Stable transmission: This situation occurs when the prevalence of malaria infection is persistently high and transmission is year round (perennial) and relatively insensitive to seasonal and environmental/climatic changes. High levels of immunity develop within the population due to regular exposure to malaria parasites. Transmission is said to be **high** or **moderate** in such settings.

Unstable transmission: This situation is when malaria transmission is **low** and varies greatly in space and time, often in relation to environmental/ climatic factors. Immunity is low and there is a propensity for epidemics to occur.

Why is malaria control in schools important?

This section explains why malaria in schoolchildren is important and highlights the role the education sector can play in malaria control in schools and in the wider community. The arguments presented can be used in particular, to convince policymakers and decision makers, as well as others of the importance of malaria prevention and control in schools.

Argument: Malaria control among all age groups, including school-age children, is required to achieve large reductions of the malaria burden in Africa.

- **School-age children represent 26% of Africa's population and an increased proportion of these children are going to school.** In sub-Saharan Africa since 2000 there has been a 52% increase in pupil enrolment¹², increasing the number of children who could benefit from a systematic approach to school-based malaria control.
- **The proportion of individuals who are infected with malaria parasites is highest among school-age children.** Studies in varying transmission settings reveal that the prevalence of infection has a consistent relationship with age, with prevalence rapidly rising in among young children, attaining a maximum in the age range between 5 to 15 year olds, and declines among adolescents and young adults (see Figure 1).

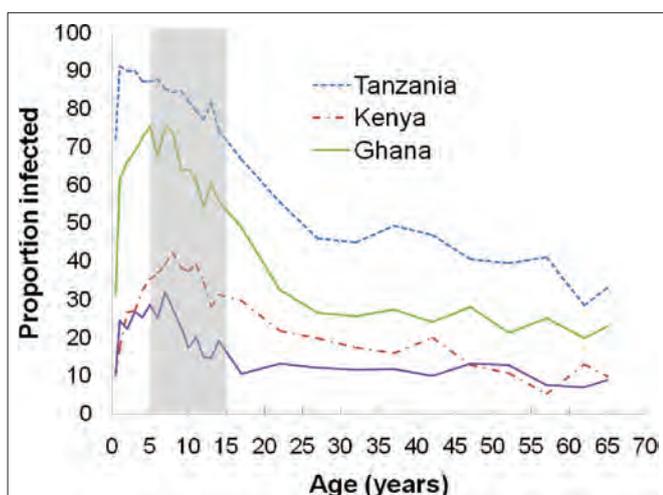


Figure 1: The relationship between age and *Plasmodium falciparum* parasite rate in varying malaria transmission settings. Note: Shaded box indicates typical age range of primary schoolchildren (between 5 years to 14 years) in sub-Saharan Africa. Source: Brooker *et al.*, 2009¹³.

- **To maximize the impact of current control efforts, everyone, including school-age children, should be protected.** Targeting limited subsidies to maximize personal protection of the most vulnerable – young children and pregnant women – should remain a priority, but more equitable and effective suppression of risk for entire populations can be attained with quite modest coverage (20% to 50%) across all ages. This is because over 80% of human-to-mosquito transmission originates from older children and adults since these groups constitute the bulk of the population and are more attractive to mosquitoes¹⁴.
- **Older children going to school may be at increased risk in the future.** As the movement to increase insecticide-treated net (ITN) or long-lasting insecticidal net (LLIN) coverage among young children continues its current momentum in Africa, clinical immunity to malaria will be acquired slower and the distributions of morbidity and mortality will shift into older age groups, requiring protection of all members of the population, including school-age children.

Argument: Malaria is one of the major health problems confronting schoolchildren.

- **Malaria accounts for up to 50% of all deaths among African school-age children.** This represents an estimated 214,000 deaths per year¹⁵.
- **Malaria frequently occurs among schoolchildren.** Studies indicate that 20% to 50% of African schoolchildren living in areas of stable high transmission experience clinical malaria attacks each year¹⁶. However, the burden of malaria among schoolchildren will vary according to the intensity of malaria transmission¹⁷. While the risk of clinical attack is lower in areas of unstable malaria transmission, the attacks are more severe as children have not acquired any significant level of immunity.
- **Malaria causes anaemia among school-age children.** Although there are a complexity of factors that cause anaemia, including nutritional deficiencies and helminth infections, evidence suggests that malaria is a major cause of the condition¹⁸. Efforts to control malaria among school-age children can dramatically improve haemoglobin (Hb) levels¹⁹.

- **Pregnant schoolgirls are at high risk of malaria.** In Africa, up to a quarter of girls give birth before the age of 18 years; as such, malaria in pregnancy is important when considering malaria in schoolchildren². Pregnancy-associated malaria is a major cause of low birth weight and maternal anaemia in areas of stable transmission^{20,21}, with severe anaemia during pregnancy being a major risk factor for maternal death. In Mozambique, for example, 27% of deaths in adolescent pregnant girls were caused by malaria²².

Argument: Malaria is a leading cause of illness and absenteeism among students and teachers and impairs attendance and learning.

- **Malaria causes between 4 to 10 million days of school absenteeism per year in Africa.** Studies in Africa indicate that malaria contributes between 5% to 8% of all-cause absenteeism, equivalent to 50% of all preventable absenteeism, and around 4 to 10 million school days lost per year⁴. Absenteeism is a particular concern during a malaria epidemic in areas of unstable transmission²³. Fortunately, preventing malaria in early life is associated with longer schooling²⁴.
- **Malaria impairs cognition, learning and educational achievement.** These effects appear to be mediated through two pathways: the anaemia that is associated with both asymptomatic and clinical malaria; and the neurological consequences of cerebral malaria^{11,25}. Recent evidence suggests that non-severe malaria can adversely affect cognition, attention and, ultimately, school performance^{26,29}.
- **Malaria can also impact on education supply.** This occurs through the malaria-related death and absenteeism of teachers. In areas of unstable transmission absenteeism of teachers can lead to the closure of schools during the malaria transmission season²³.
- **Reducing the educational burden of malaria is integral to the Millennium Development Goals (MDGs).** Addressing malaria is crucial to meeting many of the MDG targets, in particular goal 2, in 'achieving universal primary education'.

Argument: Schools provide an entry point for malaria prevention and control.

Schools have the mandate and responsibility to enhance all aspects of the development of children, including their health³⁰. They also provide an effective way to reach a large portion of the population, including future pregnant women and parents of young children – the most biologically vulnerable populations.

- **Malaria is perceived as a problem by schoolchildren, parents and teachers.** This perception enhances community involvement and responsibility for malaria control in schools.
- **Teachers can teach skills on how to prevent malaria.** Teachers have professional training in disseminating information and are in contact with children at a critical age of their development during which life skills, including those related to malaria prevention and control, can be developed. For example, teachers can provide children with the knowledge and skills they need to use ITNs throughout their life, including when they become future parents to the next generation of at-risk children.
- **Schools can support community-wide malaria control.** Schools are a central part of the community and can enhance community-wide malaria control^{30,31}. While families of schoolchildren may lack knowledge on ways to prevent and treat malaria they can learn about how to control malaria from their own children. Schools have legitimacy in the community and are thus, an effective gateway for schoolchildren to disseminate messages to their parents and to the wider community where schoolchildren can be important agents of change. Similarly, effective community partnerships can enhance and reinforce the malaria control activities in schools.

Argument: There is a clear policy context for the educational response to malaria.

Previous experience has shown that stand-alone school malaria programmes are not always effective or sustainable. Rather, it is important to see malaria in schools as part of a broader school health programme. The multi-agency FRESH initiative provides a framework for determining how an integrated school health package can be developed and which can include malaria.

Sponsored by UNESCO, UNICEF, WHO, the World Bank and other partners, the FRESH framework calls for four areas of concerted action in all schools: school health policies; water, sanitation and the environment; skills-based health education; and school-based health services. Malaria can be dealt within these four components of the FRESH framework:

1. School health policies: Education sectors perceive malaria as a major challenge, and recognize the impact of malaria on both schoolchildren and teachers. There is a lack of consensus as to the response, however, and there is a need for clear policy guidance. Policies are needed that make clear the role of teachers in health promotion and the delivery of treatment. However, any policy on malaria in schools needs to be consistent with national malaria policies.

2. Water, sanitation and the environment: During the malaria campaigns of the 1950s and 1960s there was considerable focus on the reduction

of mosquito breeding sites, with advice issued to schoolchildren to destroy potential mosquito breeding areas; however, the impact of these efforts remains uncertain. Boarding schools can set a positive example by providing screening on dormitory doors and windows.

3. Skills-based health education: This is the most common component of school health programmes. With respect to malaria, the focus tends to be on the biology of infection and less often, on the recognition of symptoms. Advice on treatment is usually confined to seeking attention in clinics.

4. School-based health services: This is the area of most controversy and the area in which specific guidance on malaria control is most lacking.

Recognizing the information gaps in what schools can do about malaria, the next section presents the general principles and tools of malaria control and evaluates their appropriateness for use within the school context.

Control strategies to prevent and treat malaria

The WHO Global Malaria Programme recommends four main evidence-based cost-effective interventions that can reduce the burden of malaria mortality and morbidity:

- Insecticide-treated nets (ITNs) or long-lasting insecticidal nets (LLINs) to protect populations at risk of malaria.
- Indoor residual spraying (IRS).
- Prompt access to treatment with effective antimalarials, such as Artemisinin-based Combination Therapies (ACTs).
- Prevention of malaria in pregnant women, through measures such as intermittent preventive treatment (IPT) and the use of LLINs.

While malaria has been included in the school health priorities for FRESH, there has been international consensus on the need for only health education; there is, at present, inconsistent policy advice on appropriate school-based malaria interventions.

This section presents the general principles and tools of malaria control as recommended by WHO and also presents other control options including chemoprevention and indoor residual spraying.

This section further discusses the relevance of these tools for a school-based programme based on empirical evidence. Summaries of the evidence for school-based malaria control interventions reported in this section are tabulated in Appendix 1.

Insecticide-treated nets

ITNs are mosquito nets treated with an insecticide. The insecticide adds a chemical barrier to the physical barrier provided by the net.

Research over the last two decades has shown that the use of ITNs substantially reduces mortality, severe malaria and infection, as well as reducing rates of anaemia among young children³². There is also well documented evidence on health gains for pregnant women who use ITNs³³. Thus, ITNs represent a practical and effective means to prevent malaria, and scaling up coverage to at least 80% use by young children and pregnant women is a consensus target of the MDGs, the Global Malaria Programme, and the United States Presidents Malaria Initiative.

As the insecticidal activity on ITNs is mainly lost during washing, LLINs are an alternative, practical and sustainable method for protection against malaria; as a result LLINs are now replacing conventional ITNs. While the initial cost of LLINs is higher (US\$4 to US\$6 per net) than for traditional nets, LLINs become more cost-effective within 2 years of use because they require no additional insecticide treatment. An evaluation in Kenya showed that nationwide, free mass distribution of LLINs was a powerful way to quickly and dramatically increase coverage, particularly among the poorest people, thereby reducing the health burden of malaria^{34,35}.

Previously, global guidelines focused primarily on providing ITNs for use by children under the age of 5 years and pregnant women, and these populations remain the priority target group. However, it has been recently recognized that protecting all community members yields enhanced health benefits and social equity^{14,35}, and therefore:

As part of its Cover the Bed Net Gap initiative WHO, UNICEF and other partners recommend that LLINs should be distributed freely or should be highly subsidized and used by all community members, including schoolchildren (see www.malariaprogress.org).

This recommendation is a direct response to the United Nations Secretary-General Ban Ki-moon's call for universal coverage of malaria control in Africa. For this to occur there would need to be dramatic increases in coverage to schoolchildren due to the current low levels of LLIN use among this age group³⁶(see Figure 2). This implies providing free LLINs to schoolchildren, encouraging the very large number of boarding schools to provide nets in dormitories, and supporting the strategy with skills-based malaria health education, to ensure that schoolchildren develop the knowledge, attitudes and skills necessary to reduce their risk from malaria.

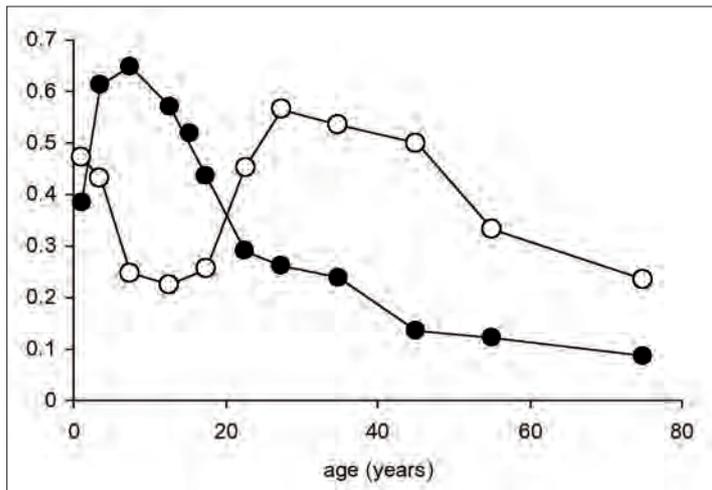


Figure 2: (1) the prevalence of *Plasmodium* infection among individuals of all ages in eastern Uganda, 2008 (closed circles), and (2) the proportion of the same population sleeping under an insecticide treated net (open circles). Source: Pullan *et al.*, 2010 (in press).⁷⁸

Promoting use of LLINs among schoolchildren

Although there is specific WHO advice on promoting the use of LLINs among school-age children³⁰, there are few empirical examples of the impact of this strategy:

- Evidence from the 1980s found that sleeping under untreated mosquito nets following a round of effective antimalaria treatment reduced malaria attacks, but did not reduce anaemia, among children in a rural boarding school in Kenya³⁷.
- A community-based trial of permethrin-treated mosquito nets in rural Western Kenya, showed that the use of ITNs halved the prevalence of mild all-cause anaemia in adolescent schoolgirls, aged 12 to 13 years³⁷, but was less effective in preventing anaemia among younger children.

Schoolteachers should relay simple messages to schoolchildren encouraging them and their families to sleep under a LLIN, thereby increasing uptake of this existing effective intervention. Moreover, promotion of LLINs in schools would be of particular benefit for pregnant adolescent girls, who are most vulnerable to the risk of malaria, but the least likely to use a LLIN during pregnancy³⁹. An innovative approach to promoting ITNs among schoolchildren and their families through schools comes from Kenya (see Box 3).

Supporting community-wide LLIN distribution

Schools can also support community-wide interventions such as LLIN distribution, thereby helping to maximize coverage rates. For example:

- In Kenya, schoolteachers were paired with health workers to provide messages using interactive learning methods including a 30-minute play, small group work to discuss the play and a poster competition⁴⁰. Although this increased childrens awareness of ITN, the messages were not always effectively transferred to parents at home.
- In Burundi, schools as well as health facilities, were used to hold meetings to promote ITNs as a tool for malaria control and to convince families to buy at least one net⁴¹. Two years later a reduction in malaria infection among under-fives had been achieved, but no reduction was observed among children aged between 5 to 9 years.

BOX 3: Promoting ITN use in Kenyan schools

The Population Services International (PSI) schools project was a pilot effort to promote ITN use among Kenyan schoolchildren and their families. Implemented in 2005, this project produced positive results by bringing together an NGO and the business sector to develop a pupil booklet and a teachers guide on the effective use of ITN by schoolchildren and their families. The key features of the programme were:

- Effective collaboration between an NGO and a development communication company, which developed and piloted the pupil booklet and teachers guide.
- Each booklet contained a questionnaire on ITN use by the pupils family and the teachers were provided with a poster to collate information on ITN coverage; incentives were offered to each participating class in the form of badges and certificates for pupils and t-shirts for teachers. The long-term sustainability of these incentives is unclear, however.
- A second round of questionnaires were sent out 3 months later where the results showed that ITN use had doubled; this increase was confirmed by separate community-based surveillance.
- The estimated cost of the programme was US\$0.60 per child reached.
- The learning of key lessons, which included the importance of appropriately informing district Ministries of Health and Education staff to enhance inter-sectorial collaboration; further efforts were needed to ensure the sustainability and scaling up of such an approach.

Source: PSI [personal communication].

The role of schools in monitoring malaria control programmes

Schools provide an established system to help monitor the coverage of community-wide implementation of ITNs. In Uganda, for example, the use of schools as sentinel sites for monitoring ITN coverage has been piloted. It was found that reports from schoolchildren on net ownership in their households provide a cheap and relatively fast method to collect reliable coverage data at community level. The additional work involved in administering questionnaires to the pupils did not appear to pose any problems to the teachers^{42,43}.

Following the guidance by WHO, UNICEF and other partners, it is recommended that schools promote the use of LLINs among school-children and their families. Schools also have a potentially important role in supporting the distribution and use of LLINs to all community members.

Indoor residual spraying

Indoor residual spraying (IRS) is the application of long acting (6 to 12 months) insecticides to the walls and roofs of houses and, in some cases, public buildings and domestic animal shelters, in order to kill adult vector mosquitoes that land and rest on these surfaces. It aims to reduce transmission by decreasing mosquito survival and density.

IRS is a valuable approach in controlling malaria at the community level, but it requires the spraying of all or most residential accommodations within target communities to effectively reduce malaria transmission and thus, risk within an area.

IRS has recently received increasing attention as a component of malaria control in many countries. Past experience has shown that the logistics of implementing spraying at high quality and on a regular basis are extremely challenging. It is therefore advisable to consider IRS as one of the possible options for vector control, rather than as the definite solution.

The role of schools in supporting indoor residual spraying

IRS in boarding schools is an important component in achieving community-wide coverage, to protect school-children at night. Spraying of schools is important if they are in or near a community that is being sprayed,

to increase overall IRS coverage in the area, or if schools are stand-alone structures away from any communities. Although, most often schools in or near communities are sprayed when there are no plans to provide IRS to the community at large; however, there appears to be no evidence that this approach provides complete protection to schoolchildren. Thus:

IRS in schools should be implemented as part of a wider community-based integrated vector management strategy.

Schools can also disseminate simple messages on the need, purpose, method and timing of community-wide IRS, to ensure that households prepare for the arrival of the spray team thereby allowing access to their homes.

Schools have an important role in supporting IRS programmes by providing education messages on the need, purpose, method and timing of spraying. Schools including residential schools should implement IRS as part of a wider community-based integrated vector management strategy.

Chemoprevention

There are two main approaches to the chemotherapeutic prevention of malaria:

1. **Chemoprophylaxis** is the *regular (daily or weekly) administration* of drugs in sub-therapeutic doses over a sustained period of time to all individuals, irrespective of infection status, in order to obtain persistent protective levels in the blood. Regular chemoprophylaxis is currently only recommended for non-immune travellers to malaria endemic areas.
2. **Intermittent preventive treatment (IPT)** is the *periodic mass administration* of a full therapeutic course of an antimalarial, irrespective of infection status. WHO currently recommends giving IPT to pregnant women (IPTp) regardless of their infection status during their second and third trimester.

Recent research shows that IPT given during the first year of life at the time of routine immunizations (so called IPTi) reduces malaria and anaemia⁴⁴.

Studies in West Africa, for example, have demonstrated that seasonal IPT can be an effective malaria prevention strategy among children under 5 years of age in areas of seasonal malaria transmission^{45,46}.

School-based chemoprophylaxis

Historically, school-based delivery of malaria chemoprophylaxis was associated with significant reductions in malaria-related morbidity and mortality, and improvements in educational outcomes^{19,47}, but fell out of use in Africa due to financing problems⁴⁸ and with the emergence of malaria drug resistance⁴⁹. More recent evidence suggests that weekly chemoprophylaxis can improve school examination scores²⁷, but tends to be compromised by declining compliance and coverage over time. However, no chemoprophylaxis regime provides full protection and should be followed with other malaria control measures such as LLINs.

School-based intermittent preventive treatment

An alternative strategy, already proven effective for protecting the health of young children and pregnant women, is IPT. In Kenya, the mass administration of a full therapeutic course of antimalarial drugs (sulfadoxine-pyrimethamine {SP} and amodiaquine {AQ}) to schoolchildren once a term, irrespective of infection status, dramatically reduced malaria parasitaemia, almost halved the rates of anaemia and significantly improved cognitive ability²⁶ (see Box 4). In an area of moderate seasonal malaria transmission in Mali, IPT using SP and artesunate (AS) or AQ and AS among school-age children not only reduced rates of anaemia and parasitaemia but also rates of clinical attacks⁵⁰.

IPT is likely to be most applicable in areas of perennial stable transmission, where malaria infections in schoolchildren are usually asymptomatic and likely to go untreated. IPT may also help prevent clinical attacks of malaria for a short period immediately after drug treatment, which could be beneficial in schoolchildren living in areas of more seasonal transmission, such as large parts of West Africa.

However, before there is widespread implementation of IPT in schools, a number of issues require further investigation: optimal drug regimen (including drug efficacy, ease of administration, costs, availability, acceptability, safety and tolerability); cost-effectiveness; and the impact in different transmission settings.

IPT in schools holds promise for a school-based malaria strategy, although it is still necessary to evaluate the effectiveness of the approach in a wider range of infrastructure and malaria transmission settings in Africa.

BOX 4: Intermittent preventive treatment in schools – trial results from Kenya

A novel approach to control malaria in schoolchildren was recently tested in a cluster-randomized placebo-controlled trial in 30 primary schools in Western Kenya. The impact of IPT on anaemia and school performance was compared between intervention and control schools after 1 year. The key features of the trial were:

- **IPT was administered once every term, to all children (aged between 5 to 18 years old). The drugs used were SP and AQ, given in combination, over 3 consecutive days.**
- **The use of IPT reduced the occurrence of anaemia by 48% after three terms.**
- **There was an 89% reduction in the occurrence of malaria infection.**
- **Significant improvements were also seen in class-based tests of sustained attention.**

In the study, IPT was administered by the research team; however, the feasibility of involving teachers in drug administration was also explored with parents and teachers. The intervention was found acceptable to pupils, parents and teachers and generally seen as beneficial. Teachers expressed a willingness to administer IPT in schools with training and support from local health authorities. The programmatic delivery of IPT by teachers was estimated to cost US\$1.88 per child per year.

Source: Clarke et al., 2008; and Temperley et al., 2008^{26, 51}.

Case management and treatment

Case management is the administration of a complete, effective antimalarial treatment and provision of necessary supportive care to a person with malaria-like symptoms within 24 hours of the onset of symptoms, unless a diagnostic procedure has shown that the patient does not have malaria⁵².

Until recently, the first line treatment in most African countries was either chloroquine or SP. In the face of rapidly increasing SP resistance, the WHO currently recommends treatment with ACTs. Until such time as ACTs can be made widely available, a non-artemisinin-based combination such as AQ plus SP may be considered as an interim strategy in countries where the efficacy of both drugs remains high. Confirmation of a malaria diagnosis through microscopy or rapid diagnostic tests (RDTs) is rarely undertaken owing to the lack of resources and infrastructure at peripheral health facilities and overdiagnosis and treatment of malaria is common.

Presumptive treatment by teachers

While prevention and health education are traditional and natural activities by which schools contribute to disease prevention, there appears to be unclear guidance on whether antimalarial treatment services can be provided through schools. This is due in part to limited evidence, with few studies investigating the effectiveness of treatment by teachers:

- In a pilot study in Tanzania, teachers used a combination of symptoms and oral temperature to diagnose malaria and used chloroquine for treatment⁵³. The accuracy of teacher diagnosis was 75%.
- A feasibility study of teachers providing early detection and management of presumptive malaria in Ghana showed that 93% of identified fever cases met the operational definition of malaria and 75% of presumptive malaria cases were treated correctly⁵⁴.
- A project in Malawi trained teachers to use Pupil Treatment Kits to treat suspected cases⁵⁵ (see Box 5).

While the potential of prompt, effective treatment by teachers has been investigated in pilot projects, there a number of challenges which have so far limited its widespread implementation:

- **Teacher motivation and ability.** In both Ghana and Tanzania, teachers were satisfied with their new role; though expressing a clear desire for close and continued support from local health providers. The study from Ghana also found that the performance of teachers to correctly diagnose malaria declined after 5 months⁵⁴, underscoring the need for regular refresher training. Other challenges included problems of teachers obtaining reliable histories from younger children, ensuring adherence to a 3 day drug regimen, high teacher turn over and need for retraining, and the disruption of teaching in class.

BOX 5: Pupil Treatment Kits in Malawian schools

A school health and nutrition programme in Malawi, supported by Save the Children (USA), evaluated the programmatic use of presumptive treatment in 101 schools in the Mangochi District. Started in 2000, the project trained teachers to treat malaria in schools using a Pupil Treatment Kit including SP. The key features of the programme were:

- In each school, three teachers received training, including recognition of the signs and symptoms used to diagnose malaria and safe administration of antimalarial treatment.
- Sick children were reported to teachers and suspected malaria cases were treated with SP according to the national guidelines where antipyretics were provided to the sick children to take home. Sick children whose health did not improve were referred to a health facility.
- The overall and malaria-specific mortality rates for the 3 years before and 2 years after the intervention dropped from 2.2 to 1.44 deaths/1000 student-years and from 1.28 to 0.44 deaths/1000 student-years, respectively.
- The estimated cost of the treatment kit was approximately US\$40 per school. Parents and communities were initially requested to contribute 10% towards the cost of replacing the kits, and by 2007 communities were paying 80% of the drug costs.
- The estimated cost of providing each child with access to a treatment kit is US\$0.38 per child per year. The estimated cost of a child receiving a malaria treatment is US\$2.30.
- However, the government withdrew antimalarial treatment from Pupil Treatment Kits following the introduction of ACTs.

Source: Pasha *et al.*, 2003⁵⁵; and Temperley & Brooker (unpublished).

- **Correct diagnosis.** Many of the signs and symptoms of malaria are non-specific, leading to unnecessary treatment of cases that are not malaria. Confirmation by microscopy is thus, preferable but may be impractical in many schools. RDTs may be a practical alternative, but are more costly and have to be stored at specified temperatures. In Tanzania, teachers used thermometers to confirm abnormal body temperatures in children complaining of fever⁵³; however, provision of thermometers will increase programme costs.
- **Accidental treatment of pregnant schoolgirls**
The use of antimalarial drugs should be avoided in the first 3 months of pregnancy, because it can harm the growing foetus. Whenever pregnancy is suspected in a schoolgirl with fever, malaria treatment should not be given; instead the schoolgirl should be referred to the nearest health unit for examination by a qualified midwife and appropriate treatment provided. The testing for pregnancy by teachers is not advised.
- **Antimalarial treatment using ACTs.**
The recent introduction of ACTs poses an additional problem in identifying a uniform case management policy for schools. In particular, treatment guidelines and practices differ substantially between countries. In Malawi, antimalarial treatment was withdrawn from Pupil Treatment Kits following the introduction of ACTs.

Prompt recognition and effective treatment of malaria among schoolchildren is essential. However, because of remaining operational challenges, presumptive treatment by teachers is not currently recommended until its feasibility and effectiveness has been further investigated. Instead, teachers should be trained on the recognition of danger signs and the need for prompt referral to a health facility, and schools should have a policy for referral.

Malaria and pregnant schoolgirls

Malaria is an important concern for pregnant schoolgirls since younger pregnant women often have a greater risk of malaria parasitaemia, maternal anaemia with associated increased chance of dying, and delivering low birth weight babies^{2,56,57}.

However, adolescent girls are less likely to use antenatal services and thus, less likely to access and use LLINs during pregnancy³⁹. Studies in Kenya and Malawi also show that less than half of adolescent mothers received the recommended dose of IPT⁵⁸. There is a strong need

therefore for appropriate health education in schools on the dangers of malaria during pregnancy and the benefits of attending antenatal health services, and of accessing LLINs and IPT. Many aspects of health education and life skills teaching in schools are also relevant in reducing early and unplanned pregnancies. Specifically, schools can promote the following:

- **Promoting the use of LLINs.** Schools can promote increased utilization of LLINs among schoolgirls. Increasing net usage amongst adolescents ensures that young mothers will be protected from malaria from the first day of pregnancy.
- **Promoting the attendance of antenatal health services.** Schools can inform pupils of the benefits of attending antenatal health services, such as availability of LLINs and IPT. However, teaching should include both boys and girls, as boys are also instrumental in deciding when to seek health care services. These actions can thus, help overcome the main barriers to effective use of LLINs and IPT during pregnancy.
- **Febrile illness during pregnancy.** Teachers can counsel pregnant schoolgirls suspected with febrile illness to attend a health facility for assessment by a qualified midwife and to obtain appropriate antimalarial treatment and antenatal care.

It should be noted however, that only a minority of adolescent girls in Africa currently attend school, and there remains an important need to promote greater gender equity in secondary schooling.

Schools should promote the use of LLINs among pregnant schoolgirls. Access to IPT should be encouraged through antenatal health services where both boys and girls need to be informed of the benefits.

Other malaria control methods

Other vector control methods for the prevention and treatment of malaria are:

- **Personal protection measures other than LLINs.** The use of window screens, repellents and wearing long trousers and long sleeved shirts can provide personal protection from host-seeking mosquitoes at times where LLIN use is not practical, such as during early evening. Like LLINs, other personal protection measures are meant to stop adult mosquitoes from biting people. Boarding schools should be encouraged to provide netting and screens on dormitory doors and windows.

- **Larval and environmental control.** Breeding sites can be controlled through application of larvicides or introduction of predators that feed on mosquito larvae (e.g. fish). Alternatively, sites can be eliminated or changed to make them unsuitable for larval development or inaccessible to adult mosquitoes. Larval control aims at reducing human vector contact, thus, rendering conditions less conducive to disease transmission. During malaria campaigns in the 1950s and 1960s, there was considerable focus on mosquito breeding source reduction, where advice was given to schoolchildren to destroy potential mosquito breeding areas. This had demonstrable benefits for removal of nuisance mosquitoes – and important vectors of dengue and filariasis – but uncertain impact on malaria. Thus, the health benefits in promoting schoolchildren to destroy potential breeding sites in school grounds remain unclear.

Boarding schools should be encouraged to provide netting and screens on dormitory doors and windows. However, the health benefits in promoting schoolchildren to destroy potential breeding sites in school grounds remain unclear.



Skills-based malaria health education

In general, skills-based health education aims to help children develop attitudes, knowledge and skills necessary to allow them to maintain and enhance their own health. With regard to malaria, this section provides information on key features of malaria health education based on current empirical evidence and presents examples of skills-based education programmes from different countries. Summaries of the evidence for skills-based malaria health education interventions discussed in this section are tabulated in Appendix 1.

Skills-based malaria health education should promote the following:

- **Attitudes** such as responsibility for personal, family and community health, and building confidence to change unhealthy habits.
- **Knowledge** such as symptoms of malaria and the importance of seeking appropriate treatment as well as the importance of personal prevention, especially the use of LLINs.
- **Skills** such as avoiding behaviours likely to cause malaria, encouraging others to change unhealthy habits, communicating messages about malaria and its prevention and control to families, peers and members of the community.

Specific components of a skills-based health education approach to malaria control are detailed in Box 6 below.

BOX 6: Components of a skills-based health education approach to malaria control in schools

Knowing: Children should:

1. Know that malaria is serious and kills many people.
2. Know that young children, old people and pregnant women are particularly vulnerable.
3. Know that malaria is spread by mosquitoes that breed in stagnant water and bite at night, spreading germs from infected to healthy people.

4. Know how to help to reduce mosquito breeding sites.
5. Know how to stop mosquitoes from biting people. (Bed nets impregnated with a mosquito repellent are the best means of protection.)
6. Know that even if there are some holes in impregnated bed nets, they still offer protection.
7. Know that treatment of malaria should begin immediately. Any delay can make the disease more dangerous.
8. Know that when malaria is treated it is essential that the full course of recommended medicine is taken.
9. Know that children with fever need plenty of drinks to replace the water and salt they have lost through sweating.
10. Know that children with fever need to be kept cool, but not cold, to prevent their temperatures from rising too high.

Doing: Children should:

1. Help prevent mosquitoes from breeding, for example, by getting rid of stagnant water.
2. Help prevent mosquitoes biting, for example, by making sure younger children use mosquito nets properly when they are available.
3. Help by calling attention to other children with health worker.
4. Help make sure that other children and family members take the full course of treatment.
5. Help look after children with fever and encourage them to eat extra food when they recover.

Feeling: Children should:

1. Feel confident about spreading messages about malaria control to their families and community.
2. Feel that they share the responsibility with the rest of the community for stopping mosquitoes breeding and biting.

Source: Child-to-Child Trust, 2007; and UNESCO, 2004^{59,60}.

Experience shows that malaria health education is most effective when it is incorporated within a broad-based approach to health and relevant life skills. The following school pilot projects demonstrate the potential impact of skills-based malaria health education:

- Results from a Kenyan study on the impact of participatory health education indicated that for children receiving education, awareness of malaria increased, especially awareness of the importance of control measures such as the use of ITNs⁶¹. Rates of infection and morbidity also decreased. However, childrens knowledge about the need for appropriate action when sick did not improve.
- Another study in Kenya which used a community intervention trial, paired schoolteachers with health workers to provide schoolchildren with messages on ITN use. The messages were conveyed through interactive learning methods including a 30-minute play, small group work to discuss the play and a poster competition⁴⁰. Although this increased childrens awareness of ITN, the messages were not always effectively transferred to parents at home.
- An evaluation of an action-oriented and participatory health education in Western Kenya found that children acquired new concepts of health and illness and took new responsibility for their own health and of others^{62,63}. The programme was based on the Child-to-Child approach^{59,64} and included an action-oriented teaching approach that sought to develop childrens skills on: problem solving; decision making; risk averting and positive actions.

Many valuable lessons have also been learnt from skills-based HIV&AIDS education programmes⁶⁵. These experiences show that behaviour change is possible if programmes focus on specific behavioural goals, and provide sufficient training for teachers. Therefore, skills-based health education (e.g. for HIV&AIDS, and malaria) is most effective when it is supported by other reinforcing strategies such as consistent school health policies, effective referrals to external health service providers and links with the community.

While it is crucial for each country to identify the content and approach of skills-based malaria health education, it is also important to consider the following issues:

- **Skills-based malaria health education should be embedded in the existing curriculum.** Knowledge about how malaria is transmitted, prevented and treated can be embedded in the science and health curriculum and integrated into school health curricula including HIV&AIDS. To avoid curriculum overload, activities that extend beyond the classroom are also important. These activities

can include health clubs, film and drama presentations and role playing.

- **Skills-based health education should address both prevention and treatment of malaria.** Typically, there is mismatch between the current school curriculum for malaria and the need for information amongst schoolchildren. Curricula often rely on conveying pre-formulated information based on biomedical issues, such as parasite species and transmission, without information about treatment. The curricula fails to teach treatment or medicine use when in reality many schoolchildren actively self treat for malaria, and this is done inappropriately in many cases⁶⁶.
- **Skills-based malaria health education should build on existing beliefs and practices.** Didactic teaching methods often used by teachers can be disempowering to those already equipped with knowledge⁶⁷.
- **Malaria education programmes should provide support to teachers.** Teachers often lack appropriate knowledge about malaria and lack confidence in using new participatory teaching methods. Support for teachers can be achieved through teacher training and the development of teacher guides.
- **Malaria education programmes must take into consideration that childrens learning differs at various stages of development.** The messages and teaching methods should be age-appropriate, targeting students and teachers at Early Child Development (ECD), and primary and secondary levels. For example, training ECD teachers to recognize signs and symptoms of malaria and to make appropriate referrals to the health facilities; older children can also be trained to recognize the signs and symptoms of malaria and when to seek appropriate treatment.
- **Skills-based malaria health education should aim to empower both boys and girls.** Teachers often treat boys and girls differently, viewing girls as less bright, which influences their self opinions and undermines their own self knowledge and actions. This differential treatment of girls continues into motherhood, and apparent when mothers present at a health facility⁶⁷. Educating schoolgirls about the vulnerability of pregnancy and malaria, and the dangers posed to their unborn child should be emphasized³⁰. Schoolgirls can also be taught about the care of their future children. In Ethiopia, teaching mothers to provide prompt treatment resulted in a 40% reduction in under-five mortality⁶⁸; these skills can be instilled during the school-age years.

- **Schoolchildren can be important health change agents in the wider community.** Skills-based malaria health education through schools can help promote a community-wide understanding of malaria with particular emphasis on the need for community-based control measures such as the use of ITNs. Studies in Kenya indicate how Child-to-Child, action-oriented methods can enable schoolchildren to assist their peers and parents to acquire health-related knowledge which lead to changed practices⁶².
- **Malaria education programmes should be consistent with the national school health policy and the overall malaria control strategy of the Ministry of Health.** Such programmes should focus on a few key strategic topics (see Box 7).
- Malaria skills-based health education tools (see www.unesco.org/education/fresh).
- A review of key concepts of skills-based health education and life skills examples of best practice (see www.rollbackmalaria.org/docs/schoolhealthservices_malaria.pdf). The Child-to-Child approach provides an additional framework for health education programmes (see www.child-to-child.org).

BOX 7:

Key strategies to be incorporated into a skills-based malaria health education programme

- **Clinical management:** Provide children with the knowledge and skills about the early recognition of the signs and symptoms of malaria, and when to report to the health facility to access effective treatment.
- **LLINs:** Promotion of LLIN use by schoolchildren and by their families, including priority groups such as under-fives and pregnant women.
- **Malaria in pregnancy:** Promotion of universal access to ITNs and IPT with SP for pregnant schoolgirls accessible through health facilities.
- **Epidemic preparedness and response:** Information on the need, purpose, method and timing of community-wide IRS in epidemic-prone districts.

Source: Roll-Back-Malaria, 2005⁷.

Skills-based malaria health education is most effective in behavioural change when it is incorporated within a broad-based approach to health and relevant life skills, and when supported by other reinforcing strategies such as school health policies, referrals to external health service providers and community links.

The FRESH framework provides the context for effective implementation of quality skills-based malaria health education programmes (see www.freshschools.org/education.htm). Technical toolkits on health education have been produced by the agency partners in support of the FRESH framework, including:



How to get started?

The Malaria Control in Schools toolkit provides ways in which policymakers/planners can design a malaria component in a wider school health programme. For effective interventions several strategic steps should be followed by policymakers/planners. These strategic steps are:

1. Conduct a situation analysis;
2. Ensure stakeholder participation;
3. Develop malaria control strategies which can be integrated into existing programmes;
4. Develop a national plan of action;
5. Mobilize resources.

Step 1: Conduct a situation analysis

A first activity in planning school health programmes, which includes malaria control, is to conduct a situation analysis. This can provide accurate and up-to-date information on the current situation of malaria in schools in a country, including disease burden, policies and previous experiences in implementation.

A key technical resource is FRESH and its toolkit on conducting such a situation analysis⁶ ([see www.freshschools.org/Documents/FRESHandEFA-English.pdf](http://www.freshschools.org/Documents/FRESHandEFA-English.pdf)).

This resource provides guidance on how to collect information which:

- Identifies the priority health and nutrition problems of school-age children;
- quantifies school enrolment, absenteeism, repetition, and drop-out rates and identifies the major causes of absence from school;
- reviews current policies and guidelines on school health;
- identifies practicable, sustainable interventions that are likely to most improve childrens health, nutrition and educational achievement;
- identifies major gaps in, and problems with, existing school nutrition and health services; and
- identifies issues requiring further investigation.

It is also important to define the burden of malaria among schoolchildren in the country, and especially how this may vary in different parts of the country. This information is critical for identifying suitable intervention strategies and to estimate the resources required for school-based malaria control (see Box 8).

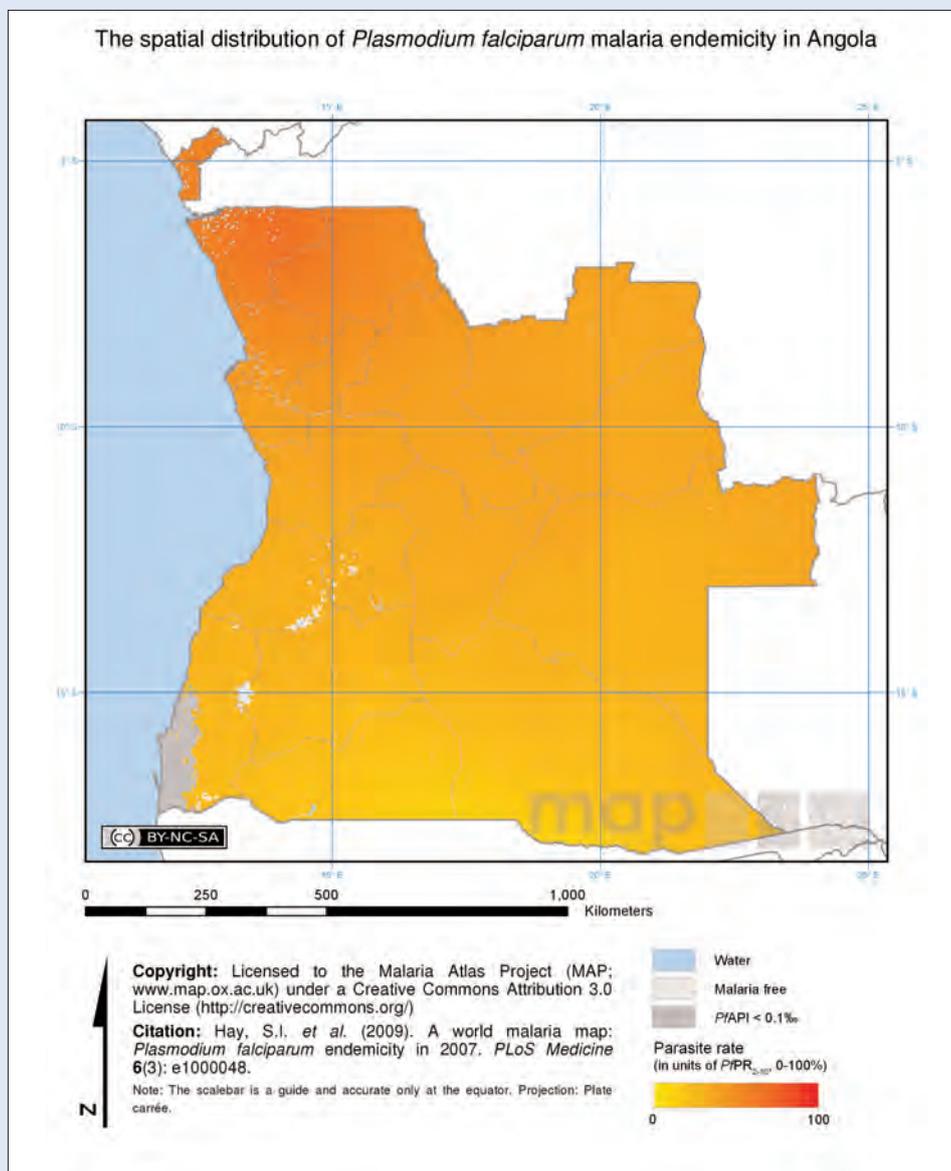
WHO, UNICEF and the World Bank also provide technical and practical information on malaria control, including school-based interventions. Relevant information needed to help guide a school malaria programme is provided by WHO³⁰. Useful websites and relevant technical resources are listed at the end of this toolkit.

BOX 8:

Country summary of malaria distribution – Angola

Angola has a rich set of data on community-based *P. falciparum* parasite prevalence data. These data provided by the Malaria Atlas Project (MAP at www.map.ox.ac.uk/) has been assembled from surveys undertaken by various partners and projects since 1985⁶⁹. The data were collected from randomly selected communities and individuals were examined using either blood slides or rapid diagnostic tests. The data were spatially located using combinations of Global Positioning Systems, electronic gazetteers and other sources of longitude and latitude. Mapping these data within a Geographical Information System provides an evidence-based approximation of the prevalence of malaria infection across the country.

Such maps help provide a framework to understand where different intervention approaches might be implemented. It also provides an indication of the resources required in order to implement a national school malaria control programme. If no relevant information is identified, it may be necessary to conduct a rapid school malaria survey, whereby children in selected schools in different parts of the country are examined for malaria parasites.



Source: Hay et al., 2009⁶⁹.

Step 2: Ensure stakeholder participation

In many countries, there will be a number of different partners concerned with school health and malaria in schools. It is essential that malaria control programmes in schools foster representative and informed participation of all stakeholders. Thus, effective partnerships should be built with national and international NGOs, teacher unions, international agencies and research institutions.

It is critical to create ownership of malaria control in schools at both local and national levels. **Step 1** will help identify the districts in the country which are most at risk of malaria. Specific attention should be given to local communities in those districts at greatest risk to ensure their commitment. Meetings should be held with parents, teachers and community leaders to discuss their needs and to identify existing structures.

Finally, a national workshop should be held to discuss how government programmes can plan to include malaria in their school health programmes and to develop effective programmes to help mitigate the possible impact of malaria on the education sector. Drawing on the situation analysis, the national stakeholder workshop should consider some of the following issues:

- **Consistency between policies and guidelines.** To ensure success and sustainability, it is essential that school malaria control programmes are consistent with and in support of the policies and guidelines of the local governments and their Ministries of Education and Health. It is important therefore to review relevant policies and guidelines and make suggested revisions to relevant policy documents and technical guidelines.
- **Learn from previous experiences.** To avoid implementing unsuccessful approach to malaria control in schools, it is important therefore to review the experiences, successes and lessons learnt from previous efforts in the control of malaria in schools. These experiences could include programmes implemented by the government or local NGOs. A number of lessons can be learnt from the experience of developing skills-based education for HIV&AIDS.
- **Harmonized approach to malaria control.** It is essential that ministries of education and health as well as local donor partners propose an integrated approach to malaria control in schools, rather than implementing separate programmes in parallel. It is important to have regular communication and collaboration between various stakeholders and that

a possible common approach is developed.

Box 9 offers an example of national dialogue and strategic planning for a response to malaria in schools.

BOX 9: National consensus and strategic planning for a school malaria response in Kenya

Approaches to controlling malaria in schools in Kenya have to date been piecemeal, small-scale, and funded by international NGOs. Strong political support with clear recommendations for action and international funding are key to addressing such shortcomings, as well as for enhancing control efforts. In order to help achieve these features, a national stakeholder workshop on malaria control in schools was held in 2007, which had the following aims:

- **To review school health policies of the Ministries of Education and Health, and to revise the malaria component in the draft school health policy of the Ministry of Education, Science and Technology.**
- **To review the guidelines for school-based malaria interventions.**
- **To develop a work plan for implementing school-based malaria interventions within the context of the existing School Health and Nutrition programme.**

The workshop brought together stakeholders to share their experiences, lessons learned and best practices, and sought to help achieve a shared vision and a detailed and achievable action plan and budget allocation. All stakeholders, including health and education officials from national and local levels, representatives from national and international organizations and NGOs, and teachers, were represented and who actively participated. The main outputs of the workshop included:

- **Suggested revisions to the malaria sections in the draft school health policy.**
- **Suggested revisions to the guidelines for school-based malaria interventions.**
- **Work plan for implementing school directed malaria interventions.**

A copy of the final workshop report is provided in Appendix 2.

Step 3: Develop malaria control strategies which can be integrated into existing programmes

In recent years, the education sector in many African countries has come to play an increasingly important role in the health and nutrition of school-age children. Schools provide a conducive environment for the provision of simple health services to many children at the same time, including school feeding, micronutrient supplementation and deworming programmes. School-based malaria control will have its full impact when delivered within an integrated school health programme.

Information obtained from the situation analysis (**Step 1**) and stakeholder meetings (**Step 2**) will provide a good sense of what is currently being done.

The same suite of school-based strategies will not be relevant everywhere. Life skills messages, about the use of LLINs, the early recognition of malaria and how to access prompt treatment, should be part of the health education in all transmission settings, whereas IPT, if proven to be effective, is likely to be relevant only in high transmission areas. In epidemic-prone settings, by contrast, neither LLINs nor IPT would be appropriate, instead schools may provide useful sentinels for epidemic detection and strengthening of drug supplies at health facilities.

Examples of good practice have been documented earlier in this toolkit, including:

- The promotion among schoolchildren of ITN use in Kenya – Box 3.
- Presumptive treatment of suspected malaria in schools in Malawi – Box 5.

The following malaria components of an integrated school health programme are recommended as possible strategies which should be considered in all malaria transmission settings:

- **distribution of LLINs through schools;**
- **health education to promote the use of LLINs;**
- **health education to promote early recognition of malaria and appropriate referral to health facilities; and**
- **health education to encourage pregnant schoolgirls to access diagnosis and early treatment through antenatal services.**

Distribution of LLINs in schools could occur on the same day as deworming is provided. While health education

messages should be incorporated into existing life skills messages.

The following strategies are only recommended in high transmission settings, where the prevalence of *P. falciparum* infection is 20% or greater:

- **School-based delivery of IPT or presumptive treatment to schoolchildren; again this could be coordinated with deworming.**
- **Health education to encourage pregnant schoolgirls to access IPT through antenatal services.**

Step 4: Develop a national plan of action

Government actions are typically implemented on a sectoral basis. It is therefore essential that the action plans for the school response to malaria are included within the relevant national sectoral plans. Actions involving curriculum change, teacher training and classroom activities should be included within the national education sector plan. Procurement of medicines, training of health personnel to provide youth-friendly services, and training of teachers by health personnel or school visits by health teams should be included in the national health sector plan. In practice, the most effective way to implement this is to hold a joint meeting of the relevant health and education policymakers to decide the division of responsibilities between the two sectors, and then for each sector to develop its own plan using the normal planning processes for each ministry.

In developing this plan, realistic projections of costs associated with the various strategies are clearly necessary.

Step 5: Mobilize resources

Resources too are likely to have separate sectoral origins. The costs of treatments, LLINs and health personnel actions are the responsibility of the health sector, which is likely to already have processes in place for mobilizing these resources for younger children. The biggest challenge is to identify resources for the education sector to ramp up activities which are seen as health-related. There is a need for an initial investment in – in-service teacher training, and in materials development and production – which might appropriately be supported by external resources. Once teachers have been trained in this way the process can thereafter be supported at marginal cost by the normal pre-service training mechanisms. Countries may wish to include funding for the education sector within their national proposal for malaria control to The Global Fund to Fight AIDS, Tuberculosis and Malaria.

Where countries have education sector alliances of development partners, these alliances can provide a first point of approach for an initial investment of resources. This process is facilitated if a national education Sector-Wide Approach (SWAp) is already established or if the country is eligible to access resources from the Education for All – Fast Track Initiative (EFA-FTI) (see Box 10). In both cases, however, it is essential that the malaria response is an established component of the education sector plan.

BOX 10: Education for All-Fast Track Initiative (EFA-FTI) education sector plan preparation

The FTI seeks to accelerate country progress toward the goal of Universal Primary Completion (UPC) by supporting credible and sustainable education sector plans. In general, a country education sector plan (ESP) would address key constraints to accelerating UPC in the areas of policy, data, capacity, and financing and align primary education priorities with those for pre-school, secondary, tertiary, and non-formal education. The ESP is developed or updated by the Government in consultation with the Local Education Group. An ESP that is a credible plan will be anchored in the country's existing circumstances and implementation capacities, while at the same time pushing those boundaries by strengthening policies and making the changes needed so as to seriously enhance the capacity to ensure quality education to all.

It is essential that the ESP be fully costed and clearly embedded into the country's overall poverty strategy, but also in terms of other policies and strategies around public service reform, decentralization, gender and other cross-cutting issues such as: HIV&AIDS, equity, inclusion, and learning outcomes, school health, malaria control, and school feeding.



Additional resources

As well as the information included in this toolkit, there are a number of additional resources that provide information on malaria, health education and school health.

Malaria – general

WHO

WHO-Southern Africa Malaria Control Programme. Information for Action Leaflet, Southern Africa Malaria Update, Malaria Control in Schools. Available at: www.doh.gov.za/issues/malaria/red_reference/SAMC/publications/iec1.pdf

Focusing Resources on Effective School Health. A FRESH start to improving the quality and equity of education, World Education Forum 2000, Dakar, Senegal.

Available at: www.schoolsandhealth.org/sites/fresh/Documents/FRESHandEFA-English.pdf

Diagnosis and treatment

Roll Back Malaria

Strategic framework for scaling up effective malaria case management.

Available at: www.rollbackmalaria.org/partnership/wg/wg_management/docs/framework.pdf

The use of Rapid Malaria Diagnostic Tests, Second Edition. Available at: www.wpro.who.int/health_topics/malaria/

Changing malaria treatment policy to Artemisinin-based Combinations: An implementation guide.

Available at: www.rollbackmalaria.org/docs/mmss/act_implementationguide-e.pdf

WHO

Guidelines for the treatment of malaria. Available at: <http://malaria.who.int/docs/TreatmentGuidelines2006.pdf>

Indoor residual spraying

Roll Back Malaria (RBM)

Insecticide-treated mosquito net interventions: A manual for national control programme managers.

Available at: http://rbm.who.int/cmc_upload/0/000/016/211/ITNinterventions_en.pdf

WHO

Indoor residual spraying: Use of indoor residual spraying for scaling up global malaria control and elimination.

Available at: <http://malaria.who.int/docs/IRS-position.pdf>

Insecticide-treated nets and long-lasting insecticidal nets

Lengeler, C. (2006). "Insecticide-treated bednets and curtains for preventing malaria." Cochrane Database Systematic Reviews (2): CD000363. A comprehensive review of published studies.

Roll Back Malaria

Factsheet on insecticide-treated mosquito nets.

Available at: www.rollbackmalaria.org/cmc_upload/0/000/015/368/RBMInfosheet_5.pdf

WHO

Scaling-up insecticide-treated netting programmes in Africa: A strategic framework for coordinated national action, Second Edition.

Available at: www.rollbackmalaria.org/partnership/wg/wg_itn/docs/WINITN_StrategicFramework.pdf

Insecticide-treated materials. Available at: www.who.int/malaria/publications/atoz/updateln_2/en/index.html

Malaria in pregnancy

Roll Back Malaria

Factsheet on malaria in pregnancy. Available at: www.rollbackmalaria.org/cmc_upload/0/000/015/369/RBMInfosheet_4.htm

WHO

Pregnant women and infants. Available at: www.who.int/malaria/high_risk_groups/pregnancy/en/index.html

Health education

Child-to-Child Trust

Child-to-Child Trust (2005). Children for Health. Children as partners in health promotion.

Child-to-Child Trust (2007). Child-to-Child A resource book. Child-to-Child activity sheets.

FRESH

Malaria. Available at: www.unesco.org/en/education

Additional resources (cont)

WHO

Skills for health: Skills-based health education including life skills: An important component of a Child-Friendly/Health-Promoting School. Information Series of School Health. Document 9.

Available at: www.who.int/school_youth_health/media/en/sch_skills4health_03.pdf

School health

FRESH

UNESCO, UNICEF, WHO, World Bank (2001). Focusing Resources on Effective School Health; A FRESH start to enhancing the quality and equity of Education for All. World Bank, Washington DC.

Available at:

www.freshschools.org/Documents/FRESHandEFA-English.pdf

PCD

Partnership for Child Development (1999). A situation analysis – A Participatory Approach to Building Programmes that Promote Health, Nutrition and Learning in Schools.

Available at:

www.schoolsandhealth.org/Documents/A%20Situation%20Analysis%20-%20A%20Participatory%20Approach%20to%20Building%20Programmes1999.pdf

Drake L.J., Maier C., Jukes M., Patrikios A., Bundy, D.A.P., Gardner A. and Dolan, C. (2002). School age children: Their health and nutrition. SCN News (25). Available at:

www.schoolsandhealth.org/documents/school-age%20children%20-%20their%20nutrition%20and%20health.pdf

Useful websites

The following are useful websites of organizations that support malaria control, health education and school health.

FRESH

FRESH provides a global framework for school health programmes and provides education policymakers and planners with information on how best to identify and effectively address health and education problems. The FRESH framework also captures best practices from programme experiences for the design and implementation of effective school health and nutrition programmes, including those addressing malaria.

www.freshschools.org/

http://portal.unesco.org/education/en/ev.php-URL_ID=35181&URL_DO=DO_TOPIC&URL_SECTION=201.html

Schools and Health

The Schools and Health website is administered by the Partnership for Child Development (PCD). An organization committed to improving the education, health and nutrition of school-age children and youth in low income countries. It helps countries and international agencies turn the findings of evidence-based research into national interventions that benefit children worldwide. It also acts as a resource centre on education, health and nutrition of school-age children and on school health programmes, including information on malaria.

www.schoolsandhealth.org

Child-to-Child Trust

An international organization that helps to promote the health, well-being and development of children and young people, their families and their communities through a child-to-child rights-based approach. Such an approach can be usefully adopted to disseminate messages about malaria prevention and control to school children and their families.

www.child-to-child.org

UNICEF

With the aim of improving global child health UNICEF supports various activities and programmes on malaria prevention and control. UNICEF is involved in various global partnerships in particular the RBM initiative (see WHO below).

Malaria

www.unicef.org/health/index_malaria.html

WHO

An organization responsible in providing leadership; technical support; evidence-based policies and research; monitoring and evaluation; and setting standards on global health issues. WHO has various programmes and activities on malaria prevention and control and school health programmes.

Global Malaria Programme

www.who.int/malaria

Global School Health Initiative

www.who.int/school_youth_health/gshi/en/

The World Bank

An organization that provides technical and financial assistance to developing countries which supports various programmes for the control of malaria.

Malaria

www.worldbank.org/malaria

Global Strategy and Booster Programme

<http://go.worldbank.org/GQXZEC5C60>



Glossary

Acidosis: A disturbance of the body acid-base balance in which there is excessive acidity of the blood, arising from abnormal metabolism (as in severe malaria).

Anaemia: A decrease in the number of red blood cells and quantity of haemoglobin. Malaria causes anaemia through rupturing of red blood cells (RBC) as well as through decreased RBC production.

Antibody: A protein produced by the immune system in responses to the introduction of a substance recognised as foreign.

Artemisinin-based Combination Therapies (ACTs): Treatments for uncomplicated falciparum malaria that combine several antimalarial drugs, one of which is a derivative of artemisinin. The most common artemisinin derivatives used in ACTs are artesunate and artemether. The drugs commonly used in combination with the artemisinin derivative include mefloquine, lumefantrine, and amodiaquine. ACTs are now the recommended first line of treatment for malaria.

Case management: A prompt, comprehensive and effective treatment and provision of supportive care. For malaria, this usually involves accurate diagnosis followed by treatment with an effective antimalarial drug.

Cerebral malaria: A complication of Plasmodium falciparum clinical malaria in which infected red blood cells obstruct blood circulation in the small blood vessels in the brain. Cerebral malaria often results in coma and sometimes death.

Chemoprophylaxis: The regular (daily or weekly) administration of drugs in therapeutic doses over a sustained period of time to all individuals, irrespective of infection status, to prevent infection or progression of infection to illness.

Clinical malaria: An acute febrile illness with a varying of clinical symptoms. The two major syndromes of clinical malaria are cerebral malaria and malarial anaemia.

Cognition: Conscious mental activity that includes perceiving, thinking, reasoning, judging, problem solving, and remembering.

Congenital malaria: Where the malaria infection spreads through the placenta to the foetus. Congenital malaria is very rare affecting <5% of

pregnancies. It is more common in non-immune populations with increased incidence during epidemics of malaria. Common signs of congenital malaria are when the newborn shows signs of anaemia, fever, jaundice, difficulties in feeding and irritability.

Dichlorodiphenyltrichloroethane (DDT): A synthetic insecticide which is highly toxic to insects. Until the 1990s, DDT was the most widely used insecticide in public health. However, because of its widespread use, resistance in insect populations developed, decreasing its effectiveness. There were also concerns over DDT poisoning both wildlife and the environment; there is now a worldwide ban on the agricultural use of DDT.

Epidemic: A rapid outbreak of a disease through a community in which the disease is normally absent or present at low levels.

Epidemiology: The study of the distribution and determinants of infection and disease in populations.

Haemoglobin: Protein in red blood cells which carries oxygen. Haemoglobin gives blood its red colour.

Helminths: Parasitic worms found in the intestinal tract, urinary tract or in the blood of humans.

Immunity: The body's ability to control or lessen a malaria attack with antibodies and other protective measures developed in response to previous malaria attacks. Immunity minimizes the clinical symptoms of malaria.

Incidence: The number of new cases of a disease occurring within a specified period.

Indoor residual spraying (IRS): Spraying long-lasting insecticide on the indoor walls and eaves of houses in order to kill resting mosquitoes that rest indoors following biting humans.

Insecticide-treated net (ITN): A fine meshed net that has been treated with a long-lasting insecticide hung over a bed to protect sleepers from insect bites.

Intermittent preventive treatment (IPT): The periodic mass administration of a full therapeutic course of an antimalarial, irrespective of infection status.

Glossary (cont)

Larvicides: An agent for killing insect larvae. In the case of malaria, these are mosquito larvae.

Long-lasting insecticidal net (LLIN): A bed net which is manufactured with long-lasting insecticide directly incorporated into its fibres, hung over a bed to protect sleepers from insect bites.

Maternal anaemia: The occurrence of anaemia during pregnancy. The main mechanism by which malaria causes anaemia in pregnancy is the destruction of red blood cells.

Microscopy: The technical use of microscope to view samples. When performed in optimal conditions, microscopy remains the crucial methodology for the detection of malaria parasites in the blood.

Morbidity: The number of cases of a disease during a specific period of time.

Mortality: The number of deaths in a population during a specific period of time.

Neurological impairments: Diminished capacity of the nervous system is limited or impaired with difficulties exhibited in the use of memory, the control and use of cognitive functioning, sensory and motor skills, speech, language, or basic life functions. Cerebral malaria can occasionally cause children to be left with neurological impairments, including partial body paralysis, speech disorders, blindness, epilepsy and behavioural disorders.

Parasitaemia: The presence of parasites in the blood with or without clinical symptoms.

Permethrin: A synthetic form of pyrethrum, an effective insecticide which kills insects. It is obtained from the flowers of chrysanthemum plants.

Plasmodium: The group of parasites that includes all of the malaria parasites affecting humans and other animals.

Prevalence: The proportion of a population that is affected with a particular disease at a given time.

Rapid diagnostic test (RDT): A rapid method of determining whether an individual has a certain disease. For example, malaria RDTs detect malaria antibodies present in the bloodstream.

Resistance: The ability of the parasite or insect populations to tolerate doses of a drug or insecticide which would prove lethal to the majority of individuals in a normal population of the same species.

Stable malaria transmission: A situation where the prevalence of malaria infection is persistently high and transmission is relatively insensitive to environmental/climatic changes. High levels of immunity develop within the population due to regular exposure to malaria parasites.

Unstable (or epidemic-prone transmission): A situation where malaria varies greatly in space and time, often in relation to environmental/climatic factors. Immunity is low and there is a propensity for epidemics to occur.

Vector: An agent that transmits disease from one host to another. For example, the mosquito that transmits the malaria parasite.

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Appendices

APPENDIX 1:

Tabulated summaries of studies investigating the impact of school-based malaria control

School-based ITN interventions

Study	Population	Methodology	Evaluation	Results
70	Adolescent schoolgirls, Kenya Age range: 12 to 18 years Transmission setting: High Stable	Intervention: Community randomized-controlled trial. ITNs were randomly distributed to half the villages in the area. Follow up: 2 years	Outcome(s): Hb concentration. Parasitaemia. Survey: Cross-sectional surveys performed in 28 selected schools.	Decreased prevalence of all-cause anaemia and an increase in haemoglobin concentrations. No effect on malaria prevalence or density was recorded.
41	Burundi communities Age range: community Transmission setting: High Stable	Intervention: Health promotion through health care facilities, schools and local administration were called on to promote bednets, which were being sold below the market price. There is no methodology on how the promotion in schools was done. Follow up: 2 years	Outcome(s): Net coverage. Rates of parasitaemia in under 9 year olds Survey: Cross-sectional surveys.	Increased net usage and decreased parasitaemia in under 5 year olds.
40	Primary schoolchildren in Kilifi, Kenya Age range: 5 to 18 years Transmission setting: High Stable	Intervention: Randomized-controlled evaluation using schoolchildren as a channel for communication to the surrounding community. Morning programme incorporating the delivery of the bednet, messages in the form of a 30-minute play, group work on the play and activities (i.e. a poster competition and a survey form to take home). Follow up: 3 months	Outcome(s): Knowledge. Survey: In a sample of six schools, questionnaires were given to random samples of children immediately before and after the teaching programme and to a third sample 3 months later. Parent Teachers' Association meetings were also held.	2,040 children (54%) had nets at home. Responses to the pre- and post-test questionnaires showed improvements in knowledge scores from 58% to 90% by the pupils and a level of 80% with the 3 month follow-ups.
37	190 Kenyan boarding school students Age range: 6 to 18 years Transmission setting: High Stable	Intervention: Comparative trial group (1) slept under nets (2) received proguanil hydrochloride daily according to weight (3) received placebo tablets daily. All were treated for malaria at start to clear any parasitaemia. Distribution of tablets was supervised by teachers. Follow up: School term	Outcome(s): Parasitaemia. Survey: Any child reporting sick was sent to dispensary where nurse took a blood slide for malaria and every 2 weeks thick blood film taken from all study participants.	A reduction in attack rates of: 97.3% for the net group and 77.1% for the proguanil treatment group.

School-based chemoprophylaxis

Study	Population	Methodology	Evaluation	Results
27	587 schoolchildren, 4 schools, Southern Sri Lanka Age range: 6 to 12 years Transmission setting: High Unstable	Intervention: Randomized double-blind, placebo-controlled clinical trial. Children in each school received either (1) chloroquine tablet or (2) placebo tablet after a meal under supervision by teacher or researcher. Follow up: 1 year and 4 months	Outcome(s): Parasitaemia, Hb levels, and Educational attainment. Survey: Thin blood smears taken at start and end of study Language and mathematic scores. End of term examination marks for language and maths in 1998 (pre-intervention) and 1999 (post-intervention).	No differences in language and math scores between groups in pre-intervention. During intervention, malaria incidence rate dropped (55%) and absenteeism decreased (62.5%) in treatment group. In post-intervention, treatment groups scored 26% higher in language and maths compared to placebo group.
71	392 suburban primary schoolchildren, Mozambique Age range: 7 to 12 years Transmission setting: High Stable	Intervention: Cohort study. Weekly Maloprim chemoprophylaxis or a placebo. A health assistant was permanently placed at the school. Parasitological and clinical examinations were undertaken throughout the study. Follow up: Children were treated for 1 year but followed prospectively for 2 years to observe any rebound effect.	Outcome(s): Parasitaemia, haematological responses and immune responses Survey: Daily monitoring for malaria symptoms; cross-sectional haematological surveys every month.	Compliance 96.3% a month. Clinical malaria significantly higher in placebo group (279 per 1000/year vs. 36 per 1000/year, $p < 0.0001$). In the experimental group weekly chemoprophylaxis reduced parasite rate during the rainy season from 43% to 4% and during the dry season from 18% to 0%. No signs of a rebound effect after the 1 year follow up.
37	190 Kenyan boarding school students Age range: 6 to 18 years Transmission setting: High Stable	Intervention: Comparative randomized-controlled trial. (1) slept under nets (2) received proguanil hydrochloride daily according to weight (3) received placebo tablets daily. All were treated for malaria at start to clear any parasitaemia. Distribution of tablets was supervised by teachers. Follow up: School term.	Outcome(s): Parasitaemia. Survey: Any child reporting sick was sent to the dispensary where the nurse took a blood slide for malaria and every 2 weeks thick blood films were taken from all study participants.	A reduction in attack rates of: 97.3% for the net group and 77.1% for the proguanil treatment group.
72	166 suburban primary schoolchildren, Mozambique. Age range: 7 to 12 years Transmission setting: High Stable	Intervention: Randomized-controlled trial. Chemoprophylaxis with weekly maloprim or placebo. Follow up: 17 weeks	Outcome(s): Parasitaemia. Survey: Blood was taken every 2 weeks.	Incidence rate per person year 1.08 in placebo vs. 0.00 in the treatment group.

School-based chemoprophylaxis continued...

Study	Population	Methodology	Evaluation	Results
73	80 primary schoolchildren, Tanzania. Transmission setting: High Stable	Intervention: Randomized-controlled trial. Chemoprophylaxis, a curative dose of mefloquine for all, then prophylaxis or placebo (1) proguanil 100mg daily (2) chlorproguanil 20mg twice a week (3) placebo. Follow up: 13 weeks	Outcome(s): Parasitaemia. Survey: Thick and thin blood films taken at regular intervals.	Both chlorproguanil taken twice a week and proguanil taken daily were found to be efficacious. Children in the placebo group were re-infected within 10 weeks compared to no infections in the two treatment groups.
74	118 schoolchildren, Kenyan coast. Age range: 6 to 10 years Transmission setting: High Stable	Intervention: Randomized-controlled trial. Chemoprophylaxis. Antimalarial drugs given as curative dose at start of the study then randomly allocated to treatment group chlorproguanil (20mg weekly) or a placebo group. Follow up: 20 weeks	Outcome(s): Parasitaemia. <i>P.falciparum</i> genotypes Survey: Thick blood films from all participants every 2 weeks.	<i>P.falciparum</i> attack rate significantly decreased.
75	105 primary schoolchildren from 4 schools in Kenya Age range: 9 to 14 years Transmission setting: High Stable	Intervention: Randomized-controlled trial. Chemoprophylaxis with daily (1) primaquine (2) doxycycline (3) proguanil plus weekly Chloroquine (4) vitamin plus weekly mefloquine or (5) vitamin tablets. Follow up: 11 weeks	Outcome(s): Clinical signs, parasitaemia. Survey: Weekly blood smears from each participant and clinical signs recorded.	Symptomatic and asymptomatic malaria infections decreased.

School-based IPT interventions

Study	Population	Methodology	Evaluation	Results
26	6,735 schoolchildren, in 30 primary schools, Western Kenya Age range: 5 to 18 years Transmission setting: High Stable	Intervention: Cluster-randomized placebo-controlled trial. IPTc. Schools were randomly allocated to an intervention (SP+AQ) or placebo: IPT was given 3 times per year, once each term. Mass deworming was carried out every 6 months in <u>all</u> schools. Follow up: 12 months.	Outcome(s): Hb levels. Prevalence and intensity of <i>P. falciparum</i> . Class-based attention function tests and knowledge tests. Survey: Cross-sectional surveys in March 2005 and 2006.	Both per <i>protocol</i> and intention-to-treat analyses show that IPT with SP+AQ resulted in 48% reduction in rates of anaemia and 98% reductions in prevalence of asymptomatic infection and anaemia
50	296 schoolchildren, in one village, Mali Age range: 6 to 13 years Transmission setting: Moderate and seasonal	Intervention: Individual-randomized trial. Children were randomly allocated to three arms: (1) IPT using SP+AS; (2) IPT using AQ+AS; and (3) Vitamin C. IPT was given twice, 2 months apart. Follow up: 8 months.	Outcome(s): Hb levels. Prevalence and intensity of <i>P. falciparum</i> . Incidence of clinical malaria. Survey: Monthly follow-up visits in January 2008 and May 2008.	IPT resulted in lower rates of anaemia (SP+AS, 17.7%; AQ+AS, 16.0%; and vitamin C, 29.6%) and fewer malaria attacks (SP+AS, 18; AQ+AS, 30; and vitamin C, 54).

Presumptive treatment by teachers

Study	Population	Methodology	Evaluation	Results
54	Schoolchildren from 12 primary schools, Ghana Age range: 5 to 18 years Transmission setting: High Stable	Intervention: Exploratory (phase 1) and quasi-experimental (phase 2) intervention trial. In Phase 1, treatment by teachers. Trained teachers (health and headteachers) for 5 days to diagnose presumptive malaria and treat with chloroquine (trained to recognize symptoms but not to use a thermometer). In phase 2, tested pre-packaging on treatment and user compliance. Follow up: 4 years	Outcome(s): Treatment accuracy. Parasitaemia. Survey: Thick blood smears and teachers records.	Found if teachers are willing partners they can diagnose malaria. Pre-packaging malaria drugs increases distributors and users compliance.
53	1,377 primary schoolchildren in 11 Tanzanian schools Age range: 7 to 15 years Transmission setting: High Stable	Intervention: School health programme. Treatment by teachers. In 3 day seminars the headteacher and the health teacher from each school were trained to recognize and record malaria symptoms and pupils temperatures using an oral digital thermometer. They were trained in the dispensing of supervised chloroquine delivery for pupils with presumptive malaria. Teachers were also trained in preparation of thick blood films using finger prick blood. Follow up: 2 years	Outcome(s): Parasitaemia. Treatment records Survey: Thick blood films used to validate teacher diagnosis (positive or negative parasitaemia). Malariometric surveys carried out annually from 1995 to 1997.	Among children who fulfilled the algorithm criteria, 75% were parasite positive. With little training it was feasible for teachers to make presumptive diagnoses of malaria. All children treated completed the treatment course over 3 days.
55	Schoolchildren in 101 Malawian schools Age range: 5 to 18 years Transmission setting: High Stable	Intervention: School health and nutrition intervention. Teacher treatment with treatment kits. Save the children – USA, dispensed Pupil Treatment Kits to 33 schools. Teachers and community members had a 3-day treatment kit orientation session and then two teachers from each school were trained for 5 days to diagnose malaria on the basis of symptoms and to treat with SP. Posters, theatre groups and community meetings advocated treatment kits. Follow up: 2 years	Outcome(s): Malaria mortality. Survey: The malaria specific mortality rates were calculated for 3 years before the intervention and for 2 years after its introduction.	Malaria-specific mortality rates dropped from 1.28 to 0.44 deaths/1000 student-years. Overall mortality rates dropped from 2.2 to 1.44 deaths/1000 student-years.

Skills-based malaria health education

Study	Population	Methodology	Evaluation	Results
76	10 rural secondary schools, Nigeria Age range: 5 to 18 years Transmission setting: High Stable	Intervention: Quasinon before and after experimental design. Health education in schools. Teachers were provided a 4-day orientation course to carry out health education to pupils in the control of malaria, schistosomiasis, dracunculiasis and onchocerciasis using demonstrations, story telling, role playing and visual aids. Follow up: 2 years	Outcome(s): Knowledge. Survey: 10 secondary schools in two clusters (five in each) formed experimental and control groups. Self-completed questionnaire testing knowledge given as pre-test (exp n=632, controls n=678) and post-test (exp. n=343 and control n=234).	After intervention, there was significantly higher scores in the intervention group compared to controls for knowledge of cause, prevention and treatment. No information was provided on the nature of the measuring instrument or what was considered as correct knowledge.
40	Primary schoolchildren in Kilifi, Kenya Age range: 5 to 18 years Transmission setting: High Stable	Intervention: Randomized-controlled community intervention trial. Using schoolchildren as a channel for communication to the surrounding community and other schoolchildren. Morning programme incorporating the delivery of the bednet, messages in the form of a 30-minute play, group work on the play and activities (i.e. a poster competition and a survey form to take home). Follow up: 3 months	Outcome(s): Knowledge. Survey: In a sample of six schools, evaluation questionnaires were given to random samples of children immediately before and after the teaching programme and to a third sample 3 months later. Following completion of the programme meetings were held with the committees of Parent Teachers' Association (PTA) in six of the schools.	2,040 children (54%) had nets at home. Responses to the pre- and post-test questionnaires showed improvements in knowledge scores from 58% to 90% by the pupils and a level of 80% with the 3 month follow-ups.
61	200 primary schoolchildren, Kisumu, Western Kenya Age range: 7 to 18 years Transmission setting: High Stable	Intervention: Experimental cohort study. Health education in schools. Pupils attended a 45-60 minute educational session using LePSA approach. Follow up: 3 months	Outcome(s): Knowledge, Attitudes and Practices, Parasitaemia, self reported morbidity. Survey: An experimental cohort of 100 pupils compared with 100 controls. Survey at start and repeated at end of 3 months.	No significant change occurred on the knowledge of the disease between the groups after 3 months. Authors claim positive improvement in attitudes, sickness and absenteeism rates but data presented were unclear with no significance test results.
77	40 primary schoolchildren in rural Kenya Age range: 10 to 15 years Transmission setting: High Stable	Intervention: Action-oriented health education intervention. Health education for select children to act as communicators. Teachers attended a 2-day training workshop in action-orientated teaching methods. Forty children from two schools were then selected to partake in a 2-month health education intervention where they were educated by teachers to understand malaria and diarrhoea. The study participants were then enrolled as communicators for the community. Follow up: 14 months	Outcome(s): Knowledge. Survey: In-depth interview before and after intervention. Inclusive of drawing and writing methods.	Qualitative results suggest that improved knowledge resulted in behavioural changes and that children can be used as agents for change through health education. NB: This study had no control group.

APPENDIX 2:

**Report of a national stakeholder's workshop
on malaria in schools, Kenya, 2007**



**Ministry of Education
and Ministry of
Health Republic of Kenya**

**National Stakeholder's Workshop on
Malaria in Schools**

At the Kenya Institute of Education

March 15th-16th 2007

Executive Summary

A National Stakeholder's Workshop on Malaria in Schools was held at the Kenya Institute of Education on 15th -16th March, 2000. The objectives of this workshop were to:

- 1) Review and revise the malaria component in the draft school health policy;
- 2) review and revise the guidelines for school-based malaria interventions; and
- 3) develop a work plan for implementing school-based malaria interventions within the context of the existing School Health and Nutrition (SHN) programme.

The workshop managed to accomplish the three objectives with the main outputs being:

- 1) Suggested revisions to the malaria sections in the draft school health policy;
- 2) suggested revisions to the guidelines for school-based antimalaria interventions; and
- 3) a tentative work plan for implementing school directed antimalaria intervention.

Background

Effective malaria health education and interventions which can be delivered to schoolchildren through schools currently exist, but there remains a lack of consistent policy guidance on how these can be implemented in practice. There are also a number of potential strategies of unproven effectiveness thus, requiring further discussions and research. Recent funding has been provided by EPDF of the World Bank to accelerate the education sector response to malaria. This work aims to provide both policy and technical guidance on how the education sector can respond to malaria and support an initial group of countries, including Kenya, to begin the process of developing scaled up school-based malaria interventions within the Malaria Booster Programme of the World Bank.

Each school malaria programme must be tailored to its specific context, considering variations in malaria epidemiology, existing infrastructure and national policy. Before a programme can be designed, a clear understanding is needed of the school health and educational policy and previous experience. In Kenya, there are a number of small scale programmes which provide examples of promising practice that can provide the basis of the development of more specific guidance and guide large-scale implementation. For this reason, it was deemed necessary to hold a national workshop to allow relevant stakeholders together to share their experience, lessons learned and best practices. It was against this background that the Ministry of Education (MoE) invited relevant stakeholders to a 2 day workshop at the Kenya Institute of Education (KIE), which had the following aims:

- 1) Review school health policies of the Ministries of Education and Health, revise the malaria component in the draft school health policy of the Ministry of Education, Science and Technology.
- 2) Review the guidelines for school-based malaria interventions.
- 3) Develop a work plan for implementing school-based malaria interventions within the context of the existing SHN programme.

Activity Report

The workshop was co-chaired by both the Ministries of Education and Health. After a brief self-introduction of the participants (see attendance list), the background and the objectives of the workshop were introduced. Various stakeholders including the Ministries of Education and Health, the African Medical and Research Foundation (AMREF), the Eastern and Southern Africa Centre of International Parasite Control (ESACIPAC), the Kenya NGO Alliance Against Malaria (KeNAAM),

Development Communications Ltd and the KIE gave presentations on their programmes and experiences. These presentations formed a basis for identifying and discussing crucial interventions that work and need to be considered for inclusion into the action plan. In addition, the presentations shed light on the existing gaps and challenges that need to be addressed. From these discussions, the participants identified possible interventions and strategies for school directed antimalaria interventions. Below is a summary of the salient issues that emerged from the presentations and the ensuing discussions.

- **The role of the education in the control of malaria was well appreciated.**
- **There are a number of players involved in school health but their activities are uncoordinated.**
- **A number of malaria-related skills-based health education materials exist but these are not uniform and there is an urgent need to standardize the Information, Education and Communication (IEC) materials across the country.**
- **There is a need for clear, simple messages to develop the necessary life skills related to malaria recognition, management and prevention.**
- **These messages should be consistent with the strategy of the national malaria control programme of the Ministry of Health (MoH).**
- **A draft child health policy of the MoH is available but requires input from the MoE.**
- **There is a need for improved communication and collaboration between the schools and health facilities at local levels.**
- **A number of lessons can be learnt from the experience of developing skills-based education for HIV&AIDS.**
- **It was recognized that malaria is a complex disease and there is a need to require careful deliberation and wider discussion before case management by teachers should be considered.**
- **A developed national school malaria action plan should be consistent with the National Malaria Strategy (NMS), the Kenya Education Sector Support Programme (KESSP), the draft School Health Policy and the current skills-based health education curriculum.**

Output of Group Work and Plenary Sessions

In the afternoon session of day one, participants worked in four groups to review the malaria section of the draft school health policy and the draft guidelines on malaria prevention and control in schools. The group work was presented and discussed during the plenary sessions. The results of the discussion are presented in Boxes 1 and 2 below.

BOX 1: School Health Policy Document - suggested revisions

Malaria control

Malaria is the leading cause of morbidity and mortality in Kenya. It is also a significant health constraint on the education sector, causing school absenteeism and poor academic achievement. Schools and teachers have the potential to play an important role in malaria control through prevention and treatment. School-based strategies need to be consistent with the strategic priorities of the National Malaria Strategy.

1) Clinical management

- Skills-based health education to provide children with the knowledge and skills about the early recognition of the signs and symptoms of malaria, and when to refer to the health facility to access effective treatment.
- Provision of teacher training to recognize signs and symptoms of malaria in ECD children and children with special needs, and appropriate referral to the health facility.

2) Malaria in pregnancy

- Skills-based health education to promote universal access to ITNs and IPT with SP for pregnant schoolgirls accessible through health facilities.

3) Insecticide-Treated Nets

- Skills-based health education to encourage schoolchildren and their families to sleep under an ITN, particularly LLINs, and help establish use of a LLIN as normative behaviour amongst all members of the family.

4) Epidemic preparedness and response

- Schools to support community-wide IRS. Schools can also play an important role in the early detection of epidemics by reporting unexpected increases in fever amongst pupils to the district authorities.

BOX 2: School Directed Antimalaria Interventions - suggested revisions

MALARIA

a. Definition

- A disease caused by a parasite called Plasmodium.

b. Mode of Transmission

- Transmitted through a bite from an infected female Anopheles mosquito.
- Can also be transmitted through blood transfusion, which is infected with Malaria parasites if not screened before transfusion or if an antimalarial is not given during transfusion.

c. Signs and Symptoms of Uncomplicated Malaria

- Fever
- Headache
- General body weakness
- Vomiting/nausea
- Joint pains
- Loss of appetite
- Diarrhoea

d. Management of Clinical Malaria

- Teachers shall be guided to watch out for signs and symptoms of uncomplicated Malaria.
- Referral of children to health facility for management of Malaria.

e. Prevention

1) Reduction of Contact between Human and Mosquito

- Use of ITNs, particularly the new LLINs.
- Use of other personal protection measures, such as mosquito repellents.
- Covering the body as much as possible, especially at night to reduce mosquito bites.
- Screen dormitories, classrooms and staff quarters with a mosquito mesh.

2) Killing of Adult Mosquito

- Spraying of dormitories, classrooms, staff quarters and other buildings with IRS.

3) Destruction of Breeding Sites/Source of Reduction

- Establish and maintain storm water drains within the school and the immediate community.
- Reclaim swampy/soggy grounds within and around schools (environmental guidelines on quarries to be followed).
- Larviciding breeding sites.

4) Health Education

- Teachers are to provide simple messages to develop the necessary life skills related to malaria recognition, management and prevention.

The Proposed Plan of Action

The second day was mostly devoted to charting the way forward and developing the plan of action.

The purpose of this plan was to identify malaria-specific activities which can be mainstreamed into ongoing activities of the School Health and Nutrition Investment Programme of the KESSP.

CURRENT ACTIVITIES

(1) Awareness and sensitization meetings

A. Regular coordination meetings between the Ministries of Education and Health, and other stakeholders i.e. Inter-agency Coordinating Committee at the national level.

B. Development of a malaria fact-sheet for use in:

- (i) divisional sensitization meeting;
- (ii) district sensitization meeting; and
- (iii) School Management Committee meetings at the school level.

(2) Skills-based health education

A. Review of existing malaria and school health IEC material to identify gaps and provide recommendations.

B. Development of malaria-specific, age-appropriate IEC materials to support the development of attitudes, knowledge, and life skills among schoolchildren. In accordance with the NMS the following strategic topics should be covered:

- **Clinical management:** Provide children with the knowledge and skills about the early recognition of the signs and symptoms of malaria, and when to refer to the health facility to access effective treatment.
- **Insecticide-treated nets (ITNs):** Promotion of ITN use by schoolchildren and by their families, including priority groups such as under-fives and pregnant women. Particular attention should be given to LLINs.
- **Malaria in pregnancy:** Promotion of universal access to ITNs and IPT with SP for pregnant schoolgirls accessible through health facilities.
- **Epidemic preparedness and response:** Information on the need, purpose, method and timing of community-wide IRS in epidemic-prone districts.

C. Development of guidelines and manuals for use by teachers to help infuse malaria-specific life skills in the existing school curriculum at ECD, and primary and secondary levels.

D. Strengthening of school health clubs in all schools to include malaria prevention and control, including assessment of current status of school health clubs.

(3) Training of MoE/MoH staff, trainers of trainers and teachers:

As part of the comprehensive school health package, to enhance training of Primary schoolteachers to include malaria-specific information. In each school, two teachers and the headteacher are to be trained. In ECD and special needs schools, this training should cover the early recognition of malaria and appropriate referral to the health facility.

(4) Community-wide outreach through multi media channels:

Produce media (radio and mobile film) messages focusing on malaria which can be included into current communication activities, such as those focusing on HIV&AIDS.

(5) Monitoring and evaluation:

MoH to review the current data collection and reporting instruments of the Education Management Information System and school health indicators of the School Health Programme to ensure appropriate harmonization. This should also include rewarding best practices in school health activities.

POTENTIAL ACTIVITIES WHICH REQUIRE FURTHER INVESTIGATION

- (1) IPT in schools.
- (2) Provision of first aid kits containing first line antimalarials and Rapid Diagnostic Tests, and training of teachers to provide treatment.
- (3) Periodic mass screening of schoolchildren for monitoring and evaluation of impact purposes.

Concluding Remarks

It was noted that making strong linkages between the Ministries of Education and Health is not an easy task and Kenya was commended for making good progress towards this end. The two Ministries have two more or

less similar documents i.e. the National Health Sector Strategic Plan (MoH) and the Kenya Education Sector Support Programme (MoE) and should therefore work closely with one another to avoid duplication of efforts.



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