



Reducing malaria's impact on child health, development and survival

Malaria accounts for one in five of all childhood deaths in Africa. Anaemia, low birth-weight, epilepsy, and neurological problems, all frequent consequences of malaria, compromise the health and development of millions of children throughout the tropical world. Yet much of the impact of malaria on the world's children could be prevented with currently available interventions.

The unacceptable mortality from malaria

Over 40% of the world's children live in malaria-endemic countries. Each year, approximately 300 to 500 million malaria infections lead to over one million deaths, of which over 75% occur in African children < 5 years infected with *Plasmodium falciparum*¹. The rapid spread of resistance to anti-malarial drugs, coupled with widespread poverty, weak health infrastructure, and, in some countries, civil unrest, means that mortality from malaria in Africa continues to rise. The tragedy is that the vast majority of these deaths are preventable.

The under-recognized consequences of malaria

The profound consequences that one or more episodes of malaria may have on a child's subsequent health and development are often unrecognized or inadequately managed.

Low birth-weight

Malaria in pregnancy leads to low birth-weight and premature delivery, both of which are associated with an increased risk of neonatal death and impaired cognitive development. In

Malaria

- Accounts for 1 in 5 of all childhood deaths in Africa
- Causes low birth weight, anaemia, epilepsy, and learning difficulties
- Is both preventable and treatable

many parts of the developing world, specialist care for low birth-weight babies is very limited, and untreated hypoglycaemia (low blood glucose, a common problem in low birth-weight babies) may cause brain damage.

Consequences of cerebral malaria

Approximately 7% of children who survive cerebral malaria (a severe form of the disease, characterized by coma and convulsions) are left with permanent neurological problems. These include weakness, spasticity, blindness, speech problems and epilepsy. The limited availability of specialized educational provision and equipment for such children means that opportunities for subsequent learning, and for attainment of independence, are compromised even further. Epilepsy may be inadequately treated, or untreated, due to lack of appropriate drugs and expertise, and further injury or death may result from uncontrolled convulsions. Recent evidence suggests that some children who appear to have made a complete neurological recovery from cerebral malaria may develop significant cognitive problems (attention deficits, difficulty with planning and initiating tasks, speech and language problems), which can adversely affect school performance².

Anaemia

Although nutritional deficiencies, hookworm infection, and HIV all predispose to anaemia in children, evidence suggests that, in endemic countries, malaria is one of the most important contributory factors. It has been estimated that severe malarial anaemia causes between 190,000 and 974,000 deaths each year among children < 5 years³. Antimalarial drug resistance exacerbates the situation, by increasing the proportion of children who fail to adequately clear parasitaemia after treatment, and who consequently remain anaemic.

Anaemia also predisposes to lethargy, which reduces a child's ability to learn from his or her environment.

Recurrent fever

It is estimated that African children have between 1.6 and 5.4 episodes of malarial fever each year, a figure that varies according to geographic and epidemiological circumstances³. In some areas of intense transmission, approximately 70% of one-year-olds have malaria parasites in their blood during the peak transmission season. Fever reduces appetite, and exacerbates malnutrition. Recurrent episodes of malaria in the child, or in a family member (which may mean that the child is required to stay at home to help with domestic chores), are likely to result in the loss of a substantial amount of time from school.

Preliminary data from Sri Lanka also suggest that multiple attacks of uncomplicated malaria *per se* have a deleterious effect on school performance, and that this is independent of both school absenteeism and socio-economic circumstances.

Below: Striking contrast between the palm of a Kenyan child with anaemia, and that of his mother. Severe anaemia is the leading cause of death in children with malaria.

Below right: Dysconjugate (asymmetric) gaze in a comatose Gambian child with cerebral malaria. Convulsions, which are often prolonged and multiple, complicate over 60% of cases.





The renewed urgency to Roll Back Malaria

Recognition of the unacceptable mortality and morbidity from malaria in Africa, and the availability of a number of evidence-based, cost-effective interventions, led to the formation, in 1998, of the Roll Back Malaria initiative. In the Abuja Declaration of April 2000, African Heads of State resolved to support scaling-up of the following interventions, which form the core of the Roll Back Malaria strategy, aimed at halving mortality from malaria in Africa by 2010.

The tools to Roll Back Malaria

There are a number of evidence-based, cost-effective interventions which, if brought to scale in malaria-endemic countries, could have a significant impact on both morbidity and mortality from malaria.

Insecticide-treated bednets (ITNs)

ITNs have been shown to reduce all-cause mortality among children < 5 years by approximately 20%⁴. This translates to the prevention of almost 0.5 million deaths each year in sub-Saharan Africa. ITNs also protect against the development of anaemia in both pregnant women and young children, the groups at highest risk from malaria and malarial anaemia. Nets can cost as little as US\$ 4, while a year's supply of insecticide to re-treat a net costs from US\$ 0.5 to US\$ 1. The recent development of long-lasting, wash-resistant ITNs, which will remain effective for up to four years, will avoid the current need to re-treat nets with insecticide every six months, which has proved extremely difficult to sustain.

Intermittent preventive treatment

Intermittent treatment of pregnant women with sulphadoxine-pyrimethamine (SP) has been shown to reduce the risk of maternal anaemia, placental parasitaemia, and low birth-weight, and is now being integrated into the malaria control programmes of a number of African countries. Recent research from the United Republic of Tanzania has also demonstrated that treatment of infants with SP at 2, 3, and 9 months of age, at the time of routine immunization, reduces episodes of clinical malaria by 60%, and episodes of severe anaemia by 50%⁵. Although further research is needed to determine whether similar results can be obtained in other epidemiological settings, this study introduces the promising possibility of using the Expanded Programme of Immunization for the sustainable delivery of a number of possible interventions (antimalarial drugs, vitamin A, iron supplementation, ITNs) against malaria and anaemia.

Antimalarial drug combination therapy

The combined administration of antimalarial drugs such as SP, to which resistance is developing rapidly, with artesunate, a derivative of the Chinese plant *Artemisia annua*, has been shown in field trials in several parts of Africa to markedly improve cure rates for malaria.

Above left: Gambian child with cerebral malaria, exhibiting severe opisthotonic (extensor) posturing. Between 10-20% of children with cerebral malaria die, while approximately 7% are left with neurological sequelae.

Above: Children who survive cerebral malaria may develop cognitive problems, which can adversely affect their subsequent school performance.

Tools to prevent and treat malaria

- Insecticide-treated bednets
- Intermittent preventive treatment in pregnancy
- Antimalarial drug combination therapy

Roll Back Malaria BRIEFING DOCUMENT

In a joint effort to provide essential medicines at affordable prices, WHO has negotiated an agreement with a major pharmaceutical company to make a co-formulated artemisinin-containing combination therapy available for public sector use in malaria-endemic countries at cost price (approximately US\$ 0.1 per tablet, which translates to around US\$ 1 per young child for a full treatment course). Similar arrangements are being explored with other companies manufacturing combination antimalarial drugs. Finding the financial resources to pay for the greatly increased cost of combination therapy will provide a major challenge for all African countries, and drug costs are likely to feature prominently in future country applications to the Global Fund for HIV, TB, and Malaria.

Improving access to effective antimalarial treatment

The majority of deaths from severe malaria in childhood are caused by the delayed administration of effective antimalarial treatment. There is a relentless deterioration in the clinical condition of a young child with malaria who fails to get effective treatment, with death ensuing in a matter of hours or days. Any successful attempt to reduce mortality from malaria will have to explore novel possibilities for minimising such delays.

Most sick children in Africa are initially treated with drugs bought from a local shop or drug-seller. Training shopkeepers in the appropriate choice and dose of antimalarial drugs for the treatment of childhood fevers is therefore a high priority. User-friendly packaging of antimalarial drugs (such as numbered blister packs) is a low-cost way of increasing the proportion of patients who complete a full course of treatment.

Artesunate suppositories are a potentially useful way of providing effective emergency treatment for patients unable to tolerate oral medicine, who are at home or in a rural health centre. In such situations, transport to hospital may take several hours, and it is therefore essential to commence antimalarial therapy prior to transfer.

Strengthening health infrastructure

To justify the considerable time and expense of taking their child to a health facility or hospital in rural Africa, a parent must be confident that the treatment their child will receive at the health facility will be superior to treatment that can be obtained nearer the home. Unfortunately, this is often not the case. There is a critical need to establish systems for ensuring that health facilities have adequate stocks of drugs and clinical consumables, and that health facility staff are trained and supervised in the rapid identification, resuscitation, and subsequent clinical care of children with severe malaria.

Summary

Malaria still kills an unacceptable number of African children each year, and blights the life of many millions more. Recent scientific advances now make it possible to dramatically reduce this burden. It will require an enormous financial, technical, and political commitment to reduce the number of childhood malaria deaths in Africa from the current level of one every 30 seconds to one every minute. At the start of the 21st century, there is unprecedented political momentum to carry this challenge forward. It will be well worth the effort.



Roll Back Malaria is a global partnership initiated by WHO, UNDP, UNICEF and the World Bank in 1998. It seeks to work with governments, other development agencies, NGOs, and private sector companies to reduce the human and socio-economic costs of malaria.



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Reducing the burden of malaria will dramatically increase the number of children who lead healthy, happy, and productive lives.

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