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A Critical Evaluation of the World Health Organizations Roll Back Malaria Initiative

Malaria is a mosquito-borne disease resulting from infection with one or more species of Apicomplexan parasite of the genus *Plasmodium* (Suh *et al*., 2004). There are several species of Plasmodia pathogenic in humans but the four most important are *P. falciparum, P. vivax, P. malarae* and *P. ovale* (*ibid*) (although *P. knowlesi* is an important zoonotic in parts of Southeast Asia (Ash, 2001)). According to varying estimates, malaria was responsible for somewhere between 650,000 (WHO, 2011) and 1.2 million (Murray *et al*., 2012) deaths in 2010, and of these deaths the WHO (2011) report that approximately 91% occurred in Africa. Infection is marked by a recurrent febrile disease with a regular periodicity (something that distinguishes malaria from other febrile diseases), headache and muscle pains (Bronzan et al., 2008). The plasmodium parasite is transmitted from person to person by the bite of an infected female mosquito of the genus Anopheles. There is no animal reservoir for *P. falciparum, P. vivax, P. malarae* or *P. ovale,* and so sustained transmission depends upon the continual presence of both infected and susceptible individuals within the human population, as well as a suitable mosquito species.

The vast majority of malaria deaths are due to *P. falciparum* infection as this species often gives rise to serious complications, including severe anaemia, shock, renal failure, hepatic involvement and the blockage of vascular beds in key organs, including the brain (leading to, often fatal, cerebral malaria) (Ahmed *et al*., 2011). For a variety of immunological and physiological reasons, it is children under 5 and pregnant women (and their unborn babies) who are at greatest risk of both morbidity and mortality as a result of *P. falciparum* infection (Eisele *et al*., 2010). Children and pregnant women typically have a less robust immune system and so are less able to suppress the population of *P. falciparum* organisms in their blood (Garmain *et al*., 2007). Additionally, as the parasite tends to sequester in and obstruct vascular beds – including those surrounding the placenta – this can have a serious effect on the foetus, leading to foetal death, premature birth or low birth weight at term (Steketee et al., 1996).

The World Health Organizations first internationally-focused attempt to control malaria on a large scale took place in the 1950's, where it concentrated primarily on seeking to eliminate the disease from Europe, South and Central America, Asia and Oceania (although some smaller programmes ran in certain African countries) (Muhe, 2002). The idea that eradication might be possible stemmed largely from the earlier success of the continental United States, which had managed to eradicate malaria in 1951 (Lisansky, 1958). However, while the subsequent efforts of the WHO proved successful in freeing some wealthier countries from the burden of malaria (both Italy and Spain were declared free of the disease in the 1960s), it was only temporarily suppressed in Africa and rapidly began to re-emerge as interventions eventually eased (Bate, 2008). The principal limitation for many African nations was that, whereas wealthier developed countries had well organised, well-resourced public health services, the majority of African States remained poor with an under resourced health infrastructure (Bate, 2007). This weakness in infrastructure was perpetuated by international under-investment in health service provision; such investment being a factor referred to specifically by the WHO (1971) as being vital if eradication were to be achieved.

There were further issues which made Africa a particularly challenging environment for malaria control. Malaria tends to be primarily a rural disease (Onwujekwe *et al*., 2004) and

much rural housing affords its residents very little in the way of protection from biting insects. As a result, the level of contact between mosquitoes and rural inhabitants tends to be high, supporting a high malaria transmission intensity (Hay *et al*., 2005). The mean entomological inoculation rate (the rate of infective bites that an individual will receive) in most other malarious regions of the world is typically around five per year (Greenwood and Mutabingwa, 2002); in many parts of Africa this value can exceed a thousand (*ibid*). This high entomological inoculation rate is not simply a reflection of the level of human-mosquito contact but is further supported by the particular traits of one species complex of anopheline mosquito, *Anopheles Gambiae*. *An. Gambiae* is highly prevalent across Africa and feeds preferentially on humans, is endophilic (feeds and rests indoors) and long lived (Cohuet *et al*, 2010). These traits combine to make this mosquito a particularly efficient vector for malaria in comparison to other, less specialised anopheline species (Sinka *et al*., 2010). Still, despite these difficulties, eradication programmes in some parts of Africa, notably Kenya, were initially effective, resulting in reductions in malaria transmission of up to 96% and an associated drop in infant mortality by around a fifth (WHO 2007c). However, in other parts of Africa – particularly in countries with little in the way of an organised public health service – reductions in the incidence of the disease were far less substantial (*ibid*).

On the back of their difficulties in Africa, in 1969 the WHO finally capitulated, announcing that efforts to eradicate malaria should be confined to areas where there was some real chance of success (Muhe, 2002). Instead, they suggested, less aggressive (and presumably less costly) measures should be used elsewhere to simply reduce, but not eliminate, malaria transmission. However, as the WHO seemingly stepped back from their goal of global malaria eradication, a new wave of infections returned to some areas where the disease had been previously well controlled during earlier attempts at eradication. For example, during the 1950s and 1960s malaria was virtually eliminated from several Southeast Asian countries (WHO, 2007a), however, once aggressive interventions were eased malaria returned. More significantly, the proportion of new infections caused by the most dangerous species, *P. falciparum*, increased disproportionately as the disease regained its grip. In 1970, approximately 20% of malaria cases in Southeast Asia were due to *P. falciparum* but by 1991 this had doubled to over 40% (*ibid*).

Between the 1970's and the late 1990's, most attempts to control malaria were either local or regional as the WHO adopted a more supportive rather than pioneering role (Snow *et al*., 2012). However, in 1998, in partnership with the World Bank, the United Nations Development Programme (UNDP) and the United Nations Children's Fund (UNICEF), the WHO announced their Roll Back Malaria (RBM) programme, which aimed to halve deaths from malaria by 2010 (Bate, 2008). This announcement was the culmination of several years work by the WHO and its partners, beginning in 1992 with the approval of a revised Global Malaria Strategy at an international meeting of health ministers in Amsterdam, (WHO, 1993). The agreement provided the motivation necessary for many developing countries to begin to press for additional funds to fight malaria, successfully obtaining and extra US$20 million from global donors between 1996 and 1998 (Nabarro and Tayler, 1998). In 1997 the annual meeting of the Organisation of African Unity focused strongly on the issue of malaria and, at the G8 summit held in the UK during the same year, they gave their support to the WHOs efforts, securing a £60 million commitment to fight the disease from the UK government (ibid). As funding constraints had been a major reason behind the failure of earlier eradication attempts (WHO, 1971), these new financial commitments were seen as being absolutely key to any attempt to sustainably control malaria (Bate, 2008).

With funding commitments in place, the principle stated goal of RBM was to halve the number of deaths from malaria by 2010 through a combination of 'evidence-based, outcome-focussed and cost-effective interventions' (WHO, 2002). The initiative sought to overcome past failures and to take full advantage of both public and private health care providers, ranging from the traditional healer to the pharmaceutical multinational, and capitalise on this combined strength (Nabarro and Tayler, 1998). Interventions were divided into four key areas or 'pillars' (*ibid*) organised through strategic links from the RBM Secretariat through Country Partners (government, private sector, NGOs and donors) an on to health delivery systems (public, private and community-based). The pillars were:

- Prompt access to treatment;
- Insecticide-treated mosquito nets (ITNs);
- Prevention and control of malaria in pregnant women (later modified to include children (WHO and UNICEF, 2005);
- Malaria epidemic and emergency response.

Prompt access to treatment is essential, particularly in cases of falciparum malaria, where early treatment can mean the difference between life and death (Getahun *et al*., 2010). The case was made by the WHO that simpler ways of administrating antimalarial drugs, ideally at village level would be an important way to ensure rapid treatment of the disease. However there are reasons, other than the strictly clinical, that make local access to appropriate treatment an important concern. For isolated communities, the nearest reliable source of treatment could be some days travel away. Such a journey would, in most circumstances, be associated with a financial cost and, in the case of a child or seriously ill person, may require an additional family member to accompany the patient to a treatment centre (Asenso-Okyere and Dzator, 1997). This requirement for a companion for the sick individual could further compound the expenses emanating from travel by removing a healthy individual from economically productive labour – something that could have significant consequences for impoverished families (*ibid*). Evidence suggests that in these circumstances individuals may be more likely to defer appropriate but costly treatment and so increase the chances of prolonged morbidity or death (Chuma *et al*., 2007). Having the opportunity for treatment close at hand ensures both timely and convenient access to cure, with little in the way of ancillary costs or the associated pressure to defer treatment. This helps to strip away some of the structural violence inherent within under-serviced communities where the possession of wealth is directly associated with the possession of health (Gilligan, 1997, p. 89).

Insecticide-treated mosquito nets (ITNs), as identified by RBM, are a fundamental measure for the reduction of malaria transmission. They comprise a fine net, made of either cotton or a synthetic fibre, designed to be hung over a bed to prevent mosquitos from gaining access to the sleeper beneath. These nets are then treated with an insecticide, such as a biodegradable pyrethroid, making them lethal to mosquitos that come into contact with them. The evidence supporting the use of ITNs is strong and the benefits are two-fold. If used correctly, they provide a physical barrier that prevents mosquitos from gaining access to sleeping individuals, particularly important as the majority of anopheline mosquitoes are night-biting (Chiodini, 2003). Evidence provided by Nevill *et al*. (1996) suggests that the use of ITNs in areas of stable malaria can reduce the number of episodes of clinical malaria by half. A more recent Cochrane review of ITNs conducted by Lengeler (2000) found that consistent use of ITNs could reduce all cause child mortality by roughly one fifth, leading to a saving of up to six lives per 1,000 children aged range of 1–59 months. However, insecticide impregnation of bed nets confers additional, community level protection in comparison to untreated nets as it

turns the sleeper into a baited trap that may lure and kill large numbers of mosquitos each night (Maxwell *et al*., 2002). This overall reduction in local mosquito prevalence has the additional effect of protecting others within the community by reducing their likelihood of being bitten and subsequently infected (Hawley *et al*., 2003). RBM focused on widening the distribution and lowering the cost of ITNs (primarily through government tax and tariff elimination), combined with educating people on how to use, repair and re-treat the nets to help to provide sustainable protection from infection. However, although many developing world governments were willing to assist in helping to bring the costs of ITNs down, others, for a variety of reasons, were not (Bernard *et al*, 2003).

The third pillar of the RBM strategy, that of focusing on treatment and prevention in pregnant women, was also derived from a robust evidence-base. Pregnant women and their babies are particularly vulnerable to malaria and the disease is a major cause of maternal anaemia, low birth weight and perinatal mortality (d'Almeida *et al*., 2011). RBM targeted this group in particular for ITN use, but also for a further intervention known as intermittent preventative (or presumptive) treatment (IPT or IPTp, the final 'p' standing for pregnant women, as opposed to IPTi as a similar intervention for infants). IPTp involves giving women curative doses of antimalarial drugs at various points throughout their pregnancy on the presumption that they are infected and without any attempt at diagnosis (Wilson *et al*., 2011). In endemic settings, this approach has been found to be both cost effective and clinically appropriate. A review conducted by Ishaque *et al*. (2011) identified IPTp to be as effective as the use of ITNs in reducing the number of stillbirths and perinatal deaths as a result of malaria infection. Where both ITNs and IPTps are of undoubted value in settings with endemic or stable malaria, the final RBM pillar emphasised the issue of epidemic malaria. In areas of stable transmission much of the community acquire a degree of immunity to infection, making bouts of malaria less dangerous than they might otherwise be (Gupta *et al*., 1999). However, when outbreaks occur in areas where malaria is less common, the effects of the disease on the immunologically naïve is often associated with significantly higher levels of morbidity and mortality (Doolan *et al*., 2009). As certain natural and human-related factors tend to precipitate epidemics of malaria (for example unusual climatic conditions or population displacement), the RBM initiative sought to improve their 'prediction, detection and response' to these outbreaks (WHO, 2002), enabling them to be rapidly contained and managed.

In addition to these four pillars, the WHO and its partners pledged to encourage the development of new drugs and support efforts to develop a vaccine for malaria (Bate, 2008). Malaria is a treatable disease and there are several drugs available that may be utilised. Chloroquine (CQ) is a cheap and safe drug that was once used universally for the prevention and treatment of malaria. However, through overuse (combined with extensive misuse and under-dosing) this drug has now lost its clinical effectiveness throughout much of Africa and elsewhere through the establishment of resistance (Summers et al., 2012), most significantly in *P. falciparum* infections (Chan *et al*., 2012). Although other drugs have been developed to help to address this issue of resistance, such as sulphadoxine-pyrimethamine (SP), the loss of CQ as an effective treatment was a public health tragedy. Although effective in many settings, drugs like SP are more expensive and often less safe than CQ (Nuwaha, 2001). In addition, resistance has rapidly emerged to many of these alternatives as well, forcing reliance on the last line of treatment available, artemisinin combination therapy (ACT), in many settings (White, 2006).

However, despite all of the interventions proposed by RBM, one thing that was conspicuously absent to many was reference to the use of the insecticide DDT (Roberts *et al*.,

2000). Indeed, the following year the WHO released a statement outlining that DDT should be phased out completely as a means for controlling mosquitos and reducing malaria transmission (Bate, 2008). DDT, or dichlorodiphenyltrichloroethane, is an organochlorine insecticide which is cheap, easy to use and highly effective against mosquitos and most other arthropods (Walker *et al*., 2003). For decades DDT was used globally and with great effect to control the prevalence of mosquitos and so the incidence of mosquito-borne diseases. It had been used to great effect for the control of anopheline mosquitos as part of the post-war US domestic eradication programme, reducing the transmission intensity and compounding the effects of other interventions (USCDC, 2010). However, during the 1960's and 1970's the use of DDT came to be increasingly frowned upon as an environmental pollutant by the developed world which, ironically, no longer needed it to control malaria. DDT was banned completely in the US in 1972 (Rogan and Chen, 2005) and internationally for agricultural use under the Stockholm Convention on Persistent Organic Pollutants in 2001 (Karlaganis *et al*., 2001). Although DDT remained legal for controlling vectors of human disease, concerns regarding its detrimental ecological effects and broader health worries made international donors less willing to fund its use for malaria control (Turusov *et al*., 2002). The British Medical Journal published an ethical debate in 2000 during a time when many academic malariologists and in-country public health workers were struggling with the reticence of the WHO and the international community to re-endorse the use of DDT. This debate led Amir Attaran, then Director of International Health Research at Harvard University, to refer to environmentalists demanding the complete banning of DDT in the developing world as "*stunningly naïve*" (Attaran *et al*., 2000).

The key argument underpinning the opinion of those against DDT use for the control of malaria hinged largely on historical evidence from the US, where widespread open-air spraying (for agriculture as well as for vector control) contaminated the wild animal food chain and caused substantial ecological damage (Walker, 2003). However, the fact is that the principal use for DDT in malaria control now is in indoor residual spraying (IRS) and not outdoor spraying (Roberts *et al*., 2000). Since most anopheline mosquitoes are endophilic, both feeding and resting indoors, the application of an insecticide to the interior walls of houses can rapidly kill any mosquito that rests there. Such treatment may remain active for 6-12 months (WHO, 2007b), providing protection for both the resident and the wider community in a similar fashion to ITNs (Zhou *et al*., 2010). In fact, in 2010, Pluess *et al*. produced a Cochrane review on IRS, comparing it to both no treatment and to ITNs. The authors found IRS to be highly effective across a range of settings and comparable to bed nets in areas of unstable malaria. A further historical review by Mabaso *et al.* (2004) concluded that IRS in Africa has consistently both reduced the incidence of epidemic malaria and reduced its impact in endemic areas. The authors continued by stating that almost all countries in Africa that have managed to reduce the impact of malaria on their populations have enjoyed accelerated economic growth immediately thereafter. Since an important reason for the failure of malaria eradication programmes in the past has been the underfunding of health services, this positive effect of IRS on economic output and national wealth generation should have been an important consideration.

These benefits do not negate genuine safety concerns surrounding the use of DDT as an intervention against malaria transmission. DDT does possess a degree of human toxicity, particularly as a mutagen (Eskenazi *et al.,* 2009) and work by Van Dyk *et al*. (2010) highlights that the chemical can be absorbed by individuals utilising IRS, through both dietary and non-dietary routes, and that it may be transferred to infants in breast milk. The true extent of the risk to human health as a result of exposure due to DDT through IRS is

unclear (Eskenazi *et al.*, 2009), however what is clear is the enormous effect that IRS with DDT has had on saving lives that would otherwise be lost to malaria (Bouwman *et al*., 2011). This is clearly a highly charged ethical issue but one that the WHO failed to properly address throughout much of the RBM initiative. Governments and other funders were under pressure from environmentalists to prevent the use of DDT for any purpose (Mandavilli, 2004) but RBMs concerns should, arguably, have lain primarily with their principle objective – to prevent deaths from malaria. Despite all the evidence in favour of IRS with DDT, the WHO was caught between the 'rock' of DDT withdrawal and the 'hard-place' of funders threatening to withhold money on the grounds that it would be used for DDT (Bate, 2008). Ultimately, in 2006, a full eight years after announcing the RBM initiative, the consequences of the marginalisation of DDT had become painfully clear (*ibid*) and the WHO finally declared the chemical safe for IRS use (WHO, 2006), publishing a position statement to that effect in 2007 (WHO, 2007b). However, the delay undoubtedly caused far more lives to be lost from malaria than it saved from DDT toxicity, and significantly hampered global progress to eliminate malaria (Olliaro, 2005).

Even more of a problem for the aspirations of RBM than the marginalisation of DDT was the substantial degree of underfunding ultimately experienced by the entire initiative. The reasons behind this underfunding were multifactorial but began with the projects initial target to halve the number of deaths from malaria by 2010. The problem was that there was no clear baseline from which to judge the success or not of this somewhat ambitious target, with estimates of the number of deaths from malaria at that time ranging from anywhere between one and three million a year (Attaran *et al*, 2006). When it began in 1998, the RBM initiative estimated that it would require roughly US$200 million per year, but by 2000 it had been forced to increase this estimate to US$1 billion (Bate, 2008), and then to US$3.5 billion per year in 2005 (WHO, 2005), over seventeen times the figure originally proffered by RBM. These spiralling costs, due in part to increases in treatment costs (*ibid*) and in part to unrealistic expectations early on, were further compounded by the failure of several donor agencies, including the World Bank, to meet their financial obligations to the programme (Attaran *et al*, 2006). In some respects the WHO found itself back in the same situation that it had in the 1970s, being squeezed financially while, at the same time, being cognisant of the fact that underfunding had largely been responsible for earlier failures to control malaria.
This financial squeeze, coupled with the fact that baseline data was so poor that the true scale of the malaria problem was unclear, led the leadership of the RBM initiative to sometimes adopt rather high estimates of need as an initial bargaining position in its negotiations with donors (Bate, 2008). However, problems emerged when RBM adopted the same strategy with drug companies contracted to supply antimalarials to the initiative. In the absence of reliable data, in 2004 the WHO used a model to project the likely number of doses of the antimalarial artemisinin that would be needed globally during the following year (*ibid*). The problem arose when their projected need of 130 million doses failed to match the actual demand for 25 million doses, leaving the suppliers, in this case Novartis and Aventis, with over 100 million unwanted treatments to perish in their inventory. However, the problem did not end there as the overstock of artemisinin pushed down the price of the raw material, *Artemisia anua*, in 2006 leading to reduced production (and therefore availability) in 2007 (Kindermans *et al*, 2007). This 'whipsawing' in the price and availability of artemisinin was wholly undesirable in a product which, in many settings, was the only reliable form of antimalarial treatment left (WHO, 2010).

There were also problems with the distribution and usage of ITNs during the RBM period, some of which remain an issue today. While evidence of the benefits of ITN use was already

strong when RBM began in 1998, the subtleties of their adoption and utilisation by communities affected by malaria were not. In many settings (where not freely distributed by NGOs) ITNs represented an additional household cost, albeit small in Western terms (Cohen and Dupas, 2010). Regardless of the WHOs view that ITNs would be adopted by all if made available cheaply, this was simply not the case on the ground. Evidence suggests that when associated with a charge, ITNs are purchased and utilised far more frequently by the relatively wealthy than by the poor (Matovu *et al*., 2009). The lack of social justice reflected in this inequality in ITN utilisation exacerbated already significant inequalities between the rich and the poor, something that could have really only been properly addressed by the universal provision of free ITNs. A study by Ruhago *et al*. (2011) found that in Tanzania when low-cost, subsisted ITNs were replaced with zero-cost ITNs, net coverage rose from 13% to 77% and calculations of inequity of ITN utilisation across socio-economic strata fell to virtually zero. In addition to socio-economic inequalities, there is some evidence to suggest further inequalities within the family unit that place the most vulnerable at the greatest risk of acquiring malaria. Work by Mugisha and Arinaitwe (2003) found that in Uganda, parents rather than children were more likely to sleep under bed nets (although children from wealthier families were generally better off in this respect). Issues such as these were simply not in the plan, and this further reflects the poor planning that sometimes underpinned the RBM initiative - in many instances it ran on assumption.

Although being top down and expert-led in design, the individual interventions of the RBM initiative were underpinned by a good evidence base and genuinely sought to deal with the health and social inequalities resulting from malaria. The four pillars of prompt access to treatment, the wider use of ITN, prevention and control of malaria in pregnant women and children, and the need for epidemic and emergency response were all well supported by evidence both prior to and throughout the life of the programme. However, the choice to marginalise DDT in response to donor pressure was a weak and misguided attempt at hegemony, and it is impossible to know how much more could have been achieved or how many more lives could have been saved if IRS with DDT had formed the fifth pillar of RBM. The programme was also undermined by poor data and unrealistic expectations, and these inherent weaknesses laid a poor foundation that forced RBM through a series of re-evaluations and revisions within the 12 years that it ran, repeatedly raising its cost projections and acknowledging the limitations on its grand aspirations (Bate, 2008). The effect of these rising costs and repeated shifting of the goal posts by the WHO were compounded by some donors failing to meet their financial obligations to the programme, leading to a double-squeeze on what the initiative was able to deliver on the ground. Donors could perhaps be forgiven for a lack of enthusiasm in seeing the costs of the programme that they had agreed to fund increasing exponentially, but the promised funds were needed and the withholding of them hampered the efforts of RBM further. The apparent confused and disorganised leadership of the RBM initiative is in part reflected by the fact the programme went through four leaders in five years before the arrival of the dynamic, if abrasive, Arata Kochi in 2006 (Bate, 2008). Upon taking control of RBM, following the embarrassing and costly artemisinin over-supply incident the previous year, Kochi was quick to criticise the WHO for poor leadership in the handling of RBM (Boseley, 2006) and was directly responsible for the U-turn on the use of DDT in 2007 (WHO, 2007b). The ability of Kochi to reverse the power relationship with funders on the DDT issue supports the view by Foucault (1994, p. 292) that all such relationships are mobile, reversible and unstable – all that was required was strong leadership.

However, the task facing RBM was always going to be huge, particularly in Africa. The continental geography of that region, coupled with its economic and structural heterogeneity meant that malaria was extremely difficult to sustainably control, even at country level (Tatem, 2011). The elimination of the disease from one country would be insufficient to remove the threat of reestablishment since both infected mosquitos and infected persons can cross between countries with little in the way of impediment. Only the eradication of malaria from the entire continent, as happened in the US, is likely to be able to lead to any sort of sustainable solution. Although eradication was not a stated objective for RBM, it is difficult to conceptualise how their target to halve deaths from malaria could be sustained, even if it could be achieved, without eradication of the disease from substantial parts of the world to off-set the difficulties inherent in Africa.

Despite the disappointments, RBM has had a clear positive effect on reducing inequalities in health in many malarial settings. For example, the availability and use of ITNs amongst the rural poor in the developing world has historically been low, since even those who had access to buy ITNs often lacked the funds to purchase them (Matovu *et al*., 2009). Although reliable figures for ITN utilisation are difficult to obtain on a global scale, as part of RBM in 2000 UNICEF procured around 1 million ITNs for distribution, free of charge, to impoverished families. Between 2000 and 2010 the Fund purchased and distributed another 163 million ITNs (WHO. 2011) – an achievement of a magnitude unlikely to have happened outside the main thrust of RBM. In addition, during this same period the WHO moved from purchasing less than 1 million doses of ACT to acquiring 692 million doses (*ibid*), helping to provide poorer people suffering from clinical malaria with free and effective treatment. Unfortunately, not all of the countries targeted by RBM were willing or able to follow suit by providing free ITNs or antimalarials (Bate, 2008) and so the efforts of the WHO were somewhat stunted. Still, as a result of this effort, tens of millions of poor people were provided protection from the ravages of malaria and empowering them with the opportunity to enjoy a life free of the disease, raising their status, in this regard at least, to the same level as those with the funds to be able to purchase bed nets and effective antimalarial therapies for themselves.

Although RBM did have a substantial impact on the health and wellbeing of millions of people living in malarious regions around the world, and especially the poor, it may also be viewed as a lost opportunity in many respects. While the WHO was very effective at raising awareness of malaria and generating initial financial support, the project suffered from poor planning, confused leadership and unreliable donors. It is possible to levy blame at the RBM secretariat for setting off without the necessary data on which to base their projections, and for their weakness in the face of opposition to the use of DDT. Likewise, the financial donors share some of the culpability for both pressurising the WHO with their opposition to DDT and for failing to meet their financial obligations to the programme. Beyond the optimistic rhetoric of the WHO there are many lessons to be learnt from the experience of RBM, not least of which is that interventions on any scale require meticulous planning based on robust data and must be supported by sufficient resources throughout their life. With regard to RBM in particular, the one thing that is clear is that, in developing economies at least, malaria remains a stubbornly difficult and expensive disease to control.

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