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We have excellent
tools to prevent
malaria and to treat it**

Delivering Malaria Control to Those in Need: How to Succeed in a Time of Renewed Hope

Report of the All-Party Parliamentary Group
on Malaria and Neglected Tropical Diseases (APPMG)



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(APPMG)

Using evidence presented to the APPMG in 2008

Chairman: Stephen O'Brien MP

Vice-Chairman: Dr Ian Gibson MP Vice-Chairman: Dr Evan Harris MP
Vice-Chairman: David Drew MP Vice-Chairman: Lord Rea
Treasurer: Ashok Kumar MP Secretary: Eleanor Laing MP
Coordinator: Susan Dykes



House of Commons
All-Party Parliamentary Group on Malaria and Neglected Tropical Diseases

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Abbreviations

ACT	Artemisinin-based Combination Therapy
AMFm	Affordable Medicines Facility for Malaria
BMGF	Bill and Melinda Gates Foundation
GFATM	Global Fund to fight AIDS, Tuberculosis and Malaria
DFID	Department for International Development
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Net
LLIN	Long-lasting Insecticidal Net
MDGs	Millennium Development Goals
PMI	President's Malaria Initiative
RBM	Roll Back Malaria
RDT	Rapid Diagnostic Test
WHO	World Health Organization

Chairman's Foreword



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The All-Party Parliamentary Group on Malaria and Neglected Tropical Diseases

It is with the greatest pleasure that I introduce and endorse the All-Party Parliamentary Group on Malaria and Neglected Tropical Diseases Fourth Report:

“Delivering Malaria Control to Those in Need: How to Succeed in a Time of Renewed Hope”.

In its first ground-breaking report, published in June 2005, **“Tackle Malaria Today - Give Tomorrow a Chance”**, the Group brought together the most expert knowledge and experience worldwide to highlight malaria as one of the world's greatest challenges. It's massive burden falls mainly on the peoples of sub-Saharan Africa, and across populations in Asia, the Pacific, Central and South America. This (then) neglected disease was – and remains – a major cause of death, poverty and a heavy burden on vulnerable economies. There was insufficient political will, focus and determination to deal with the challenge of this wholly avoidable and treatable disease. A “boom-and-bust” approach to funding was the biggest obstacle to progress.

In its second influential and authoritative report, **“Financing Mechanisms for Malaria”**, options for financing and scaling-up malaria control were explored. In its third report, **“The Right Drug at the Right Time: the Power of the Affordable Medicines Facility to Save Lives”** the issue of making artemisinin-based combination therapy affordable and accessible to those who most need it was described. Last month, the Roll Back Malaria board endorsed the Facility, and the Prime Minister has committed on behalf of the UK to help provide the funds that are needed for it.

Three years after publication of the first report, our All-Party Group is pleased that, on the basis of the evidence that we have gathered from the most knowledgeable and respected sources from around the world, this fourth report is able to be more optimistic. But there is still a monumental amount to do both on the ground in terms of effective delivery of preventive and control measures in local communities as well as in the research, academic, manufacturing, pharmaceutical, financing, logistics and political fields – all of which need to be co-ordinated and sustained. Malaria still remains one of the biggest killers of children and pregnant women but the evidence shows that there has been real progress in recent years. Now that there are many effective new tools available, the next challenge is how they can be delivered to the right place at the right time. Based on the evidence given by many individuals and organisations during 2008 (to all of whom the Officers and Members of the Group are extremely grateful), this report examines and evaluates the range of available delivery mechanisms and options – above all what is most effective and what works.

Our All-Party Group has had a major effect on raising the awareness of the scourge of malaria. Given the position that the Group has established through the support and contribution of the countless individuals and organisations who have presented to us, we have recently expanded our remit beyond malaria, recognising both the need and the cross-benefits that arise between malaria and other tropical diseases. The Group

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Secretary: Eleanor Laing MP

Website: www.appmg-malaria.org.uk



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is now called the All-Party Parliamentary Group on Malaria and Neglected Tropical Diseases (retaining its abbreviation – APPMG). It remains a very lively forum where, at least monthly, new ideas, technologies, methods and field work can be explained and debated from across the spectrum of all those involved in the battle against malaria and the other neglected tropical diseases.

The UK Government and the Opposition Parties are now all equally committed to malaria control and DFID has become one of the leading government departments in helping to bring tools to communities who need them.

There is a growing political will both in the developed countries of the North and West, and in malaria afflicted developing countries, to join in the global goal set by Bill and Melinda Gates in their visionary call to action in Seattle a year ago to eradicate malaria from our world. Even if that is a 30-50 year vision, it behoves us all to find the most effective and sustainable ways to make best use of the resources available in this epic battle. We must control malaria in the highest transmission areas of sub-Saharan Africa and eliminate the disease country by country, as we all work together to 'shrink the map' of malaria. It is vital that this political will is maintained to sustain the long term commitment required.

In addition to all the contributors, the Officers and Members of the APPMG are deeply grateful to Professor Christopher Whitty of the London School of Hygiene & Tropical Medicine for his time,

expertise and hard work in producing this report with the generous assistance of Dr Sylvia Meek of Malaria Consortium. We thank them wholeheartedly.

I should also like to thank Medicines for Malaria Venture for their generous support in providing the resources for this report to be published and distributed as well as their continuing outstanding commitment and participation to the APPMG's ongoing programme.

I commend this report and its recommendations to all those who, with us, are determined to understand and use every available effective tool to bear down on malaria - the world's most preventable and treatable scourge.

Stephen O'Brien MP

Chairman of the All-Party Parliamentary Group on Malaria and Neglected Tropical Diseases



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- Lee Wells, Novartis International AG
- Professors David and Joanna Schellenberg, LSHTM
- Dr Graham Root, Malaria Consortium,
- Professor Francis Omaswa, Global Work Force Alliance
- Professor Robert Sinden, Imperial College, London
- Professor Janet Hemingway, Innovative Vector Control Consortium (IVCC), Liverpool School of Tropical Medicine
- Dr Mark Perkins, FIND Diagnostics
- Dr Didier Lapierre, GSK Biological
- Dr Christian Loucq, Malaria Vaccines Initiative
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- Malaria Consortium for use of their pictures by William Daniels

The responsibility for this report remains with the APPMG

Executive Summary

Malaria remains one of the leading killers of children and pregnant women - but this can and must change. Almost every death from malaria could be prevented with current interventions. Long lasting insecticidal nets (LLINs), indoor residual spraying (IRS) and artemisinin-based combination therapies (ACTs) all work. They are, however, not getting to those who need them. Most children in Africa do not sleep under a mosquito net; most children with malaria do not get an ACT. There is a substantial commitment to malaria control from major donors and northern governments in support of southern governments. The key to translating this commitment into saving lives is better delivery. Good tools that reach only a fraction of those who need them have limited effect. Africa faces the greatest burden of malaria and the response is hampered by poverty, inaccessibility to those most in need, weak health systems, and limited numbers of skilled health workers. Despite this in Africa we now have clear evidence that delivery of existing tools can be improved, and where it is there is impact on lives saved on a substantial scale.

This report for the All-Party Parliamentary Group on Malaria and Neglected Tropical Diseases (APPMG) therefore focuses on delivery of malaria control mechanisms, both to prevent and to cure the disease. We report evidence of widespread failures of delivery - but also evidence that delivery can be improved. The report looks at the lessons we are learning on what it takes to deliver the current interventions at scale to improve access and correct use.

The main conclusions of the report are:

- 1) No child or adult need die of malaria in 2008. We have excellent tools to prevent malaria and to treat it. Our failures are largely in delivery of these tools to those who need them.
- 2) The fall, and in some cases dramatic fall, in deaths from malaria in some countries since the first report of the APPMG in 2005 shows the effect that improved delivery of existing malaria control tools can have.
- 3) Most children who need an antimalarial do not get one; most children who need an insecticide treated net do not sleep under one; a substantial proportion of those given an antimalarial do not have malaria. These are failures of delivery, and without addressing them, malaria cannot be defeated. A 95% efficacious drug given to 30% of those who need it has limited effectiveness. In fact, less than 5% of under-fives are actually getting the life-saving treatment they need.
- 4) The reasons for this failure of delivery of existing tools are complex, and context specific. The APPMG has received evidence showing the key to delivery is recognising that there are multiple steps where delivery can fail, all of which need to be tackled simultaneously, rather than expecting a single intervention to provide a quick and easy fix.
- 5) We have received evidence of many imaginative ways that have been used to try to improve delivery, some very successful, some less so. Interventions to improve delivery that work well in one setting may not in others.
- 6) The work of the Global Fund to fight Aids Tuberculosis and Malaria (GFATM) in financing free ACTs in the public sector, home management of malaria through community distributors, the Affordable Medicines Facility for malaria (AMFm) and rapid diagnostic tests (RDTs) all have the potential to improve delivery and targeting of antimalarials, but none is a quick fix in isolation.
- 7) All delivery methods have their greatest problems reaching the poorest.
- 8) Any attempts to eliminate malaria in the foreseeable future will depend far more on massively improved delivery of existing technologies than on some technological breakthrough.

Recommendations arising from these conclusions are:

- 1) A variety of methods of delivering insecticide treated nets (ITNs) through the public and private sector are successful at increasing coverage, but need to be linked to interventions to promote use and retention.
- 2) The public sector, civil society and the private sector all have a part to play in improving delivery of treatment. Decisions on how best to use them should depend on evidence of what works, and not on ideology.
- 3) The reasons for failure of delivery of existing tools are complex and context specific. For this reason, interventions need to be combined as packages tailored to particular settings.
- 4) Investing in new drugs and insecticides is essential, as development of resistance to insecticides and antimalarials is inevitable. This should occur in parallel with investment in research into better ways to deliver our existing tools.
- 5) It is essential that current funding is increased and continued for long enough to see through what has been started. Maintaining support for the GFATM in this work so that the flow of funds is predictable and sustained is also vital.
- 6) Political support is required for more coordination of efforts globally and nationally.

1. Introduction

The landscape of malaria in this fourth report developed by the All Party Parliamentary Group on Malaria and Neglected Tropical Diseases (APPMG) in 2008 is different, and in many respects much more positive, than when the first report examining the burden of malaria and status of control and research was launched in 2005¹. Although the scale of the problem we face in controlling malaria remains considerable, for the first time in Africa we now have clear evidence that control measures are having an impact on lives saved on a substantial scale.

The testimony to the APPMG this year (listed in Annex 1) has highlighted the importance of *delivery*. We have at our disposal powerful tools - but unless they are used systematically their impact is limited, and often they are not. However, if used correctly and at scale, we can have a major impact on malaria, now.

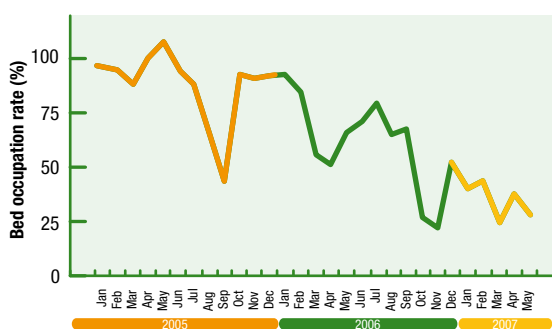
Where are we now?

Many countries which would historically be considered very high-transmission settings have had a substantial, and in some cases dramatic, reduction in malaria incidence over the last few years. In Zanzibar and Rwanda, for example, which had massive malaria problems, malaria has dropped to very low levels (Figure 1 and Table 1 from the evidence of Michel Kazatchkine).

A pattern of substantial reductions in malaria has been seen throughout East Africa. Early evidence from West Africa suggests that a reduction is also occurring in some countries which have made progress in delivery of malaria control measures, such as The Gambia². At the fringes of malaria, some countries in North Africa and the Middle East are likely to achieve local elimination of malaria within the next few years. In many areas, however, malaria is as much of a problem as it ever was, and in areas associated with conflict, malaria can often increase, as control mechanisms break down. What all the positive changes have in common is that they have not depended on a major new technological breakthrough, but on the proper delivery of existing tools for malaria control and treatment.

The first part of this report considers strengths and weaknesses in our current methods of delivering existing interventions and some new approaches to delivery. The second section considers the essential elements of improving delivery of tools we currently have. The final section of this report will look at malaria globally and consider the areas where effective application of existing tools is achieving substantial strides forward, and those areas where the situation is static or even, in some cases, moving backwards.

Figure 1. Steady reduction of malaria treatments needed in Rwanda



(source: Michel Kazatchkine, GFATM, APPMG presentation)

Table 1: Recent impact on malaria from scaling up interventions.

Country	Evidence	Interventions
Burundi	39% decline in malaria cases, 2000-2005	ACT, ITNs*
Eritrea	64% decline in malaria mortality, since 2001	ITNs, ACT in 2007
Southern Africa	87-96% decline in malaria incidence, multi country grant	IRS, ACT demand decline
Tanzania	50% decline under 5 mortality in some districts 86% decline in malaria cases in Zanzibar	ITNs, ACT
Zambia	90% decline malaria deaths Southern provinces, 2001-5	ITNs, ACT

* ACT = artemisinin-based combination therapy; ITN = insecticide-treated net; IRS = indoor residual spraying
(source: Michel Kazatchkine, GFATM, APPMG presentation)

¹ APPMG. *Tackle Malaria Today, Give Tomorrow a Chance*. London, 2005.

² Ceesay SJ et al. Changes in malaria indices between 1999 and 2007 in The Gambia: a retrospective analysis. *Lancet*. 2008;372:1545-54.

2. The Problem

The fact that malaria remains one of the leading preventable killing diseases is well known, but bears repeating³. Africa faces the greatest burden of malaria and the response is hampered by poverty, inaccessibility to those most in need, weak health systems, and limited numbers of skilled health workers.

In the last year presentations were made to the group by a range of experts from Africa, Asia and northern countries suggesting that in some countries we could, with political will and excellent delivery, eliminate malaria with existing malaria control measures. For other countries, particularly in central Africa, new tools will almost certainly need to be developed before elimination becomes a likely prospect. All our expert testimony has stressed, however, that whilst eliminating all malaria transmission in countries with the highest transmission is not currently possible, deaths from malaria could be drastically reduced, and in principle stopped completely if current tools were deployed effectively. The key tools for prevention in Africa and most of Asia are insecticide treated nets (ITNs) and indoor residual spraying (IRS) where feasible. For treatment, appropriate and high quality antimalarial drugs, especially the artemisinin-based combination therapies (ACTs), are available. The APPMG has reviewed ITNs, IRS and ACTs in previous reports, and a summary is provided in Annex 2. Continuing research into new drugs and insecticides will be needed to maintain our current position, let alone advance it, as resistance will continue to emerge in mosquitoes and parasites. This should not detract from the fact that most of the gains we can achieve are by using what we have better, and these gains could be huge.

All the experts we consulted agreed that in principle nobody needs to die of malaria. In 2008, most cases could be prevented with our existing tools, and all children and adults with malaria could be treated effectively with existing drugs. It is clear, however, that much of the vulnerable population does not receive these highly effective interventions for prevention and treatment, and this leads to needless loss of life on a massive scale. Most children in malaria-endemic Africa still do not sleep under an effective insecticide-treated net, or indeed any net at all. Indoor residual spraying of insecticide is not appropriate for all situations, but is not used in many areas where it would be highly effective. The majority of children with malaria do not get an antimalarial, whilst simultaneously most of those given an antimalarial do not have malaria. These themes will be developed later in this report, but common to addressing them is better targeting and delivery of existing antimalarial interventions.



Malaria primarily affects vulnerable groups, in particular children under five and pregnant women in Africa.
Photograph: William Daniels

³ WHO. *World Malaria Report 2008*. Geneva, 2008.

3. The Opportunity

Since our first report, several new interventions which were only being tested in trials in Africa in 2005, have now become available on an industrial scale. Several makes of long-lasting insecticidal nets (LLINs) are available almost anywhere, and are being manufactured in Africa as well as Asia. Effective fixed-dose combination ACTs are available in almost all countries with several either licensed recently or soon to receive a licence, and the price of some older ACTs has dropped. It is also important that the ACTs available are of good quality and control mechanisms are in place to prevent the use of sub-standard and counterfeit ACTs. Rapid diagnostic tests (RDTs) have become widely available, and their quality and heat stability is improving. There is a good pipeline of new antimalarial drugs, and a slower pipeline of new insecticides thanks to the work of MMV, IVCC, and industrial partners, all of whom have given testimony to the APPMG. We therefore do not have any excuse to say that we need to wait for new technological breakthroughs before we can act decisively.

In addition to the new tools available, there has been a substantial commitment to malaria control from major donors and northern governments in support of southern governments described as essential in the first report to the APPMG. More recently, Margaret Chan, Director General of the World Health Organization (WHO), joined Melinda Gates, to call for the steady elimination and eventual eradication of malaria. The UK government has played a leadership role in highlighting the importance of malaria control in development policy, and there is clear cross-Party support for malaria control efforts. The Department for International Development (DFID) continues to provide leadership on some of the major initiatives in malaria, such as the Affordable Medicines Facility for Malaria (AMFm), with the active support of the Prime Minister. All opposition party leaders have pledged their support to malaria control efforts and to continuing them irrespective of the composition of the government. The APPMG strongly welcomes the cross-Party consensus that malaria control should be a priority within the UK development effort.

The Roll Back Malaria (RBM) Partnership has developed a Global Malaria Action Plan, recognising the need for a broad partnership to tackle malaria effectively. It was presented to the APPMG by Wendy Woods and was summarised in the Global Malaria Action Plan (Box 1).

Box 1

Our [RBM] vision is of a world free from the burden of malaria.

By 2015, the malaria-specific Millennium Development Goal (MDG) is achieved and malaria is no longer a major cause of mortality and no longer a barrier to social and economic development and growth anywhere in the world.

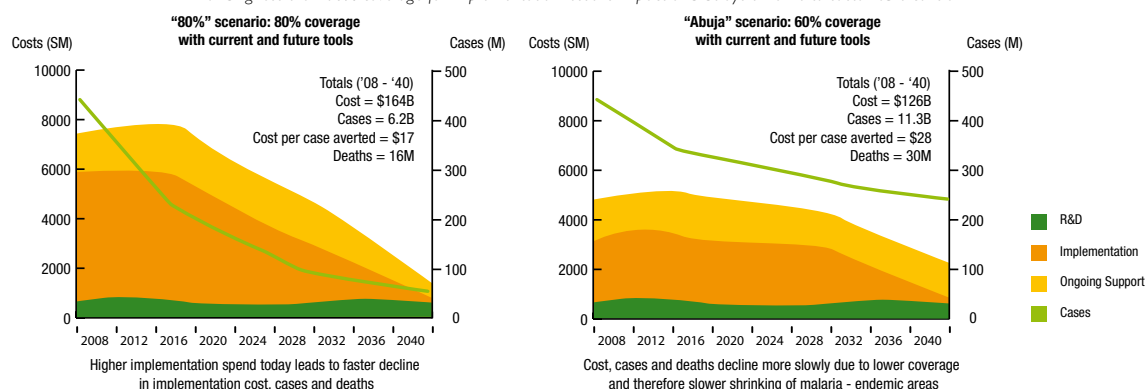
Beyond 2015, all countries and partners sustain their political and financial commitment to malaria control efforts. The burden of malaria never rises above the 2015 level, ensuring malaria does not re-emerge as a global threat.

In the long term, global malaria eradication is achieved. There is no malaria infection in any country. Malaria control efforts can be stopped.

The excellent news about malaria decreasing dramatically in countries where current tools are properly applied is boosting morale and commitment to achieve more. However, the 2010 milestone is approaching fast to achieve a 50% reduction of the malaria burden from the year 2000 and 80% coverage with priority interventions, and the 2015 deadline to achieve the Millennium Development Goals is not far behind. These ambitious targets pose several challenges including how best to deliver malaria control interventions.

David Brandling-Bennett of the Bill & Melinda Gates Foundation (BMGF) made an important point on the effects of timing of investment in malaria control, showing that investing in proportion to the targets set at the right time can achieve far greater impact than investing later (Figure 2).

Figure 2: Investment now pays dividends later.
Funding less than 80% coverage for implementation lessens impact and delays timeline to sustainable control



From the evidence of Dr. David Brandling-Bennett, Bill & Melinda Gates Foundation, APPMG presentation

Note: Hypothetical need model assuming 80%/60% coverage possible in all malaria endemic countries. Deaths figures assume a case fatality rate of 0.26%. See funding model appendix for further details of scenario assumptions. Source: Global Fund, Akhavan (2005); Malaria R&D Alliance (2005); Expert interviews; BCG analysis.

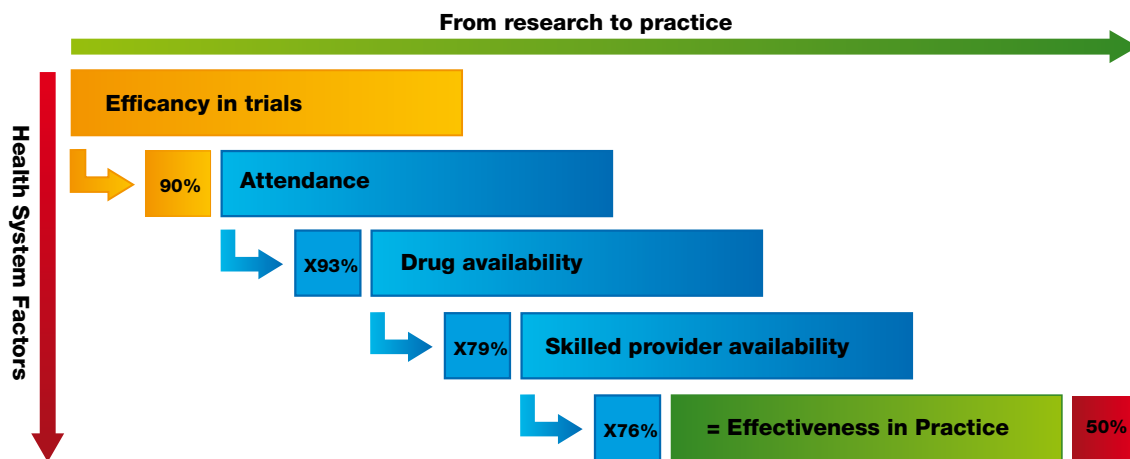
4. The Challenge

There is a serious gap between what we could do, and what we are doing against malaria. The technical difference all our expert witnesses stressed is the difference between efficacy and effectiveness. Efficacy is the impact of a tool under ideal conditions; effectiveness is the impact when deployed in the field operationally. Although we have excellent tools, a 99%-efficacious tool which reaches only 30% of the population has only limited effectiveness. Delivery to the people who need it most is the key to minimizing the number of lives lost to malaria. It is clear however that it is not just a matter of expanding the numbers

who are protected and treated; in the case of drugs and to a lesser extent nets, it is also a matter of getting them to the right people.

Evidence from Professors Francis Omaswa and Joanna and David Schellenberg to the APPMG demonstrated graphically the problems which exist with delivery. Figure 3 shows how a highly effective intervention, at each stage of its delivery, is reduced in its effectiveness to the point where a 95% effective drug or anti-vector measure can have less than 25% effectiveness.

Figure 3: How an efficacious tool becomes an ineffective one with poor delivery



Adapted from presentation of Professors Joanna and David Schellenberg, London School of Hygiene & Tropical Medicine, to the APPMG.

We need not only to deliver 50 million LLINs per year but also to ensure that they are kept and used by those who need them most, who are generally the poorest and hardest to reach. We need to diagnose and treat up to 250 million cases of malaria per year. We need to create capacity to run IRS programmes. Delivery needs to ensure coverage and use, and this requires substantial investment in capacity as well as in tools.

Strategies for high coverage need to achieve three objectives:

1. Rapidly increase currently low coverage levels
2. Sustain high coverage through longer term systems development
3. Target those most in need

Several of the early signs of success are in small politically stable countries with limited areas of poor access and high burden. These demonstrate it can be done. We can, however, only achieve the goals of making a major impact on reducing deaths from malaria by tackling also the most challenging areas of highest malaria burden. Without increasing delivery of malaria control to many more people in large, high burden countries such as Nigeria and Democratic Republic of Congo the RBM goals cannot be reached.

5. The Response

In the first APPMG report in 2005 and in meetings since then the APPMG has reviewed a number of the tools available for malaria control. Annex 2 provides a summary of the most important existing tools. We have previously reviewed additional tools, such as vaccines, that may be important in the future, but this report concentrates on delivery of existing tools, whilst welcoming the investment in novel tools for the future through organisations such as the Malaria Vaccine Initiative. This section takes the broad themes we have outlined above and focuses in more detail on the lessons we are learning on what it takes to deliver these interventions at scale. It includes the coverage of and access to malaria control strategies such as effective ACTs and ITNs, ensuring that the effective antimalarials reach those with malaria and are not given to everyone with fever; using all channels to deliver control measures, conducting effectiveness studies in the field and sustaining political support for tackling malaria. The APPMG has been helped in this by expert witnesses from around the world, whose testimony is summarised briefly in Annex 1: further details of their presentations can be found on the APPMG website <http://www.appmg-malaria.org.uk/>

5.1 Coverage and access

Efficacious tools have little impact if they do not reach those who need them. In the case of preventive interventions such as mosquito nets and IRS this is discussed in terms of coverage - what percentage of those who need to be protected are covered by the intervention. For treatment it is discussed in terms of access - what percentage of those who need a drug are able to get one. In both cases it is clear that in Africa and resource-poor parts of Asia our coverage and access rates are very low. In almost no country with a substantial population and major burden of malaria does even a slight majority of children sleep under an ITN or have access to ACT drugs when they get malaria. Additionally all the experts we have consulted agree that the poorest in every community are both those who are at greatest risk from malaria (as they tend to live in rural and marginal areas where mosquitoes are common) and those where coverage and access are least good. This risk is multiplied in the most populated countries such as Nigeria and the Democratic Republic of Congo. Even well-planned and executed programmes tend to benefit the moderately poor more than the very poorest. We give examples of how this poor access and coverage occurs for drugs and mosquito nets below - the details vary by country, but the broad principles are common to all the countries where malaria is most common. The APPMG is convinced from all the testimony and evidence we have been given that the key to reducing deaths from malaria is delivery, and the key to delivery is recognising there are multiple steps where delivery can fail, all of which need to be tackled simultaneously, rather than expecting a single intervention to provide a quick and easy fix.

Access to ACT anti-malarial drugs

Many of the new ACTs are 95% efficacious. This means that under controlled conditions, 95% of children who are given the drug are cured. The effectiveness of the drug is what happens in practice. There are multiple steps where effectiveness will be reduced despite the availability of this efficacious drug.

- a) There is good evidence from many parts of Africa presented to the APPMG that up to one in three children who have malaria are not brought to medical care of any sort. These children will by definition not get drugs.
- b) Of those who seek care of any kind up to 40 - 60% will do so outside the public healthcare sector (although this varies by country). This means they will go to shops, chemical sellers or traditional healers. Even if good drugs are available in the public sector, these children will not be given them at current costs.
- c) The poorest are often those who find it hardest to reach the public sector where free and effective drugs are available. Barriers include the cost of getting to the facilities and the opportunity cost of time away from productive work, both of which particularly affect the poor.
- d) Even if they reach the public healthcare sector there is good evidence they may have an inaccurate diagnosis made and not be treated with the correct drug.
- e) The small proportion of children who originally had a fever due to malaria who do reach the public healthcare sector and who are prescribed the correct drug may then be prescribed too low a dose, or parents may only give it for two days rather than three, meaning that even those who have been properly diagnosed are not being fully effectively treated.



Riders for Health enables health workers to reach even the most isolated and vulnerable people with regular and predictable health care.
Photograph: Riders for Health

When these are all multiplied up, the result is a very efficacious drug, which at an operational level has only a fraction of the impact it would have if these drugs were well deployed. There is a consensus from our expert witnesses that searching for a silver bullet which will solve this is a mistake - it needs a painstaking integration of interventions for each of the multiple steps along the chain concentrating on delivery to maximise our effectiveness and improve access to drugs for the poorest.

The APPMG has taken evidence on a number of methods of overcoming these steps. Some concentrate on the nuts and bolts of delivery - literally in some cases; Riders for Health are a good example, where meticulous attention to detail on the maintenance schedule of motorcycles delivering services is the key to an effective distribution programme. Providing free care through the public sector removes one of the barriers to the poorest accessing care - but not all of them; transport costs and indirect costs remain a problem. Supply-chain issues to prevent drug stock-outs are essential, and often overlooked. What is clear from our expert evidence is that there are many potential solutions, all of which have strengths and weaknesses. Each setting is unique, and the evidence we have heard shows that one of the problems with early attempts to improve delivery is that they have sometimes failed to recognise this diversity, or to acknowledge the complex nature of a problem, but have concentrated on one method to the exclusion of all others. What is encouraging, however, is that where there has been a systematic approach to the multiple steps, these problems of access to drugs can be overcome. The rapid drop in deaths from malaria in some countries demonstrates what an impact this can have.

For those children and pregnant women who reach the public healthcare sector clinics the solution to the problem of delivering effective drugs has been to provide effective high-quality ACTs free in the public sector. This has largely been achieved through the financing from the Global Fund for Aids, Tuberculosis and Malaria (GFATM). The impact in countries which have successfully secured GFATM resources for ACTs has been dramatic, especially where the majority of the population obtain their antimalarial treatment through the public sector. The APPMG has seen remarkable data from Rwanda and Zanzibar showing the effect of systematic deployment of free ACTs in this way. Of course these two countries have small populations and we need to see such examples in the larger countries in Africa. The APPMG is very strongly supportive of the work of the GFATM in this area, and in most countries where GFATM provides funding, there is no reason why a child who has reached a health facility and who has been proven to have malaria, should receive a sub-standard drug. Maintaining support for the GFATM in this work so that flow of funds is predictable and sustained is essential. Some proposals to the GFATM have been unsuccessful for technical reasons, because the experience of countries in writing them has been limited; ensuring they have good technical support for their planning and proposal writing is essential. Unfortunately, simply having the funds it is not enough, and there is real cause for concern that several countries at present, which have secured GFATM grants, do not have ACTs in their clinics. There is an urgent need to resolve emerging bottlenecks to execution of GFATM grants to keep drugs reaching all outlets. These bottlenecks are particularly related to procurement and supply chain management, and require far greater attention.

5. The Response



Community drug distributors are crucial for delivering medicines to people who have little access to such interventions. Photograph: Malaria Consortium, S. Sudan

For those who do not reach the public healthcare sector the APPMG has heard evidence about three broad approaches to improving delivery of drugs to those who need them. It is clear from our expert witnesses that all have strengths and weaknesses, and that relying on only one of these is unlikely to be successful. The best mix will depend on the context. What works in an urban slum may not work in a rural village. A high-transmission setting where the majority of fevers is due to malaria is very different from one where malaria is still a significant cause of death, but most fevers have other causes. The approaches outlined to us by the experts in presentations or written evidence are:

- 1) *Increasing the proportion of children who attend the public healthcare sector for their care.* The public healthcare sector is the area over which governments, supported by their donor partners, have the greatest influence. It is not effective to have highly-trained staff with good diagnostics and effective drugs available in the public sector if only a minority of those who have malaria attend the public sector. Many of the reasons the poorest do not attend the public sector are very difficult to fix, at least specifically for malaria. Issues of transport and the time away from work that a visit to a hospital entails may be improved by solutions such as strategic building of roads, important but beyond the scope of this All Party Group. The APPMG has, however, received evidence that where public health services are perceived to have effective care with reliable stocks of drugs, the proportion of those who use them significantly increases. Reducing or ideally eliminating the cost of care also leads to increased utilization wherever people have examined this. This is an obvious point from the research, but is only very patchily applied. Good care with good drugs in

pleasant surroundings, provided at a cost people can afford, or ideally free, will lead to a greater proportion of people using the public sector. This is not just true for malaria but more widely, but since malaria is one of the most common reasons for attending care, this potentially is a very important way to improve malaria treatment outcomes. It is not however a panacea.

- 2) *Delivery of drugs through community drug distributors.* Home management of malaria is a method for providing antimalarials much closer to people's homes by giving them to community drug distributors in every village or locality. If parents have children who have a fever which might well be malaria, they can go to the community drug distributors and receive a course of an effective anti-malarial. The APPMG has received evidence that this method can substantially increase the proportion of children with a fever who receive an effective anti-malarial within 24 hours, and at least in some settings this can have an appreciable impact on malaria, and its most common consequence, anaemia, although this cannot be assumed to work in all settings⁴.
- 3) A very large proportion of children with fevers are treated in the private sector throughout Africa. This means going to shops to buy drugs rather than the formal private sector. The committee has repeatedly heard that this is actually more likely to be true of the poorest. These are the individuals who are least able to afford the time or money to travel to public healthcare sectors, even where treatment there is free. At present, ACTs are rarely available in the private sector, or are extremely expensive and well beyond the reach of most of those who have malaria. An imaginative mechanism for reducing the costs of these to all end-users through the AMFm has been designed and is, in the view of many experts, the best potential mechanism for improving access to affordable antimalarials through this channel.

⁴ Hopkins H *et al.* Impact of home-based management of malaria on health outcomes in Africa: a systematic review of the evidence. *Malar J.* 2007;6:134.

The APPMG's third⁵ report focused specifically on this issue of making ACTs affordable, the right drug at the right price. A summary of the report is provided in Box 2.

Box 2

The Affordable Medicines Facility – Malaria (AMFm) is a mechanism for providing effective antimalarials (in practice ACTs) at a very low cost through whatever channel of distribution they are provided. Affordability should improve the coverage of ACTs, whether through the public health sector, community drug distributors or the formal or informal private sector where many of the poorest receive their care. The AMFm essentially provides a subsidy for the difference between the affordable cost of the drugs and the cost of the drugs as they leave the factory gate. The APPMG strongly commends the support given by DFID to development of the AMFm.

The APPMG is very supportive of this mechanism, whilst accepting it has risks, and needs to be complemented by other interventions to improve delivery. In particular, discussions at the APPMG meetings highlighted the need to consider complementary measures to ensure affordable parasitological diagnosis to promote rational, rather than excessive, use of drugs.

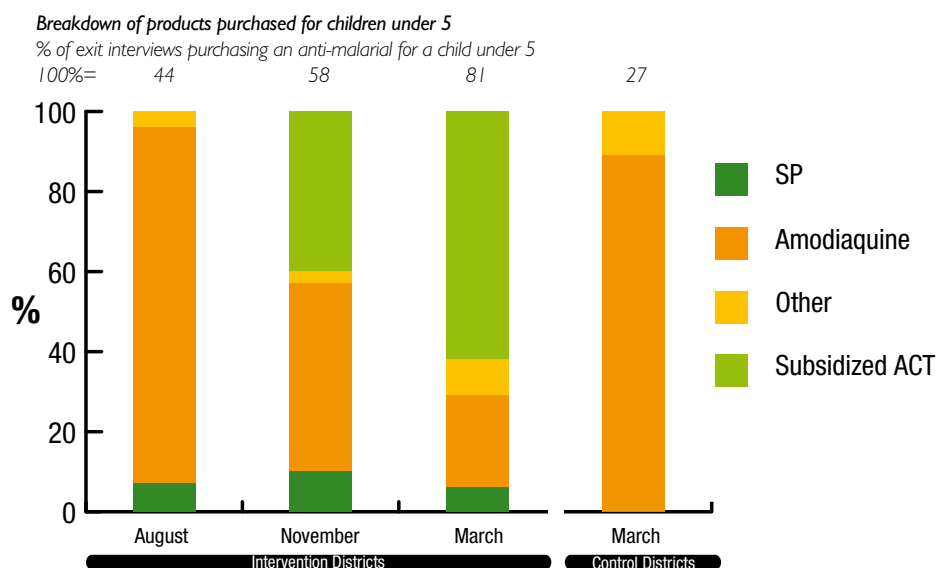


People go to private drug stores as they can't access health facilities.
Photograph: David Nahamya NDA Uganda

We warmly welcome the decision of the RBM board to endorse the AMFm, and of the Prime Minister's commitment on behalf of the UK to help provide the funds that are needed for it. The UK government has already pledged £40 million for this facility.

Evidence we have heard since our report was launched has continued to be encouraging about the potential of the AMFm. Evidence presented to the APPMG from Oliver Sabot of the Clinton Foundation shows that, at least in a pilot project, a subsidy can have a substantial impact on malaria (Figure 4).

Figure 4: The impact of a subsidy on ACT uptake in Tanzania - provisional data from a pilot study by the Clinton Foundation.



Evidence presented to the APPMG by Oliver Sabot, Clinton Foundation

⁵ APPMG. *The Right Drug at the Right Time: The Power of the Affordable Medicines Facility for Malaria to Save Lives*, London 2007

5. The Response

Coverage with anti-vector methods

ITNs are essential to malaria control in Africa, and there is overwhelming evidence that they save lives, but repeated testimony to the APPMG has also demonstrated that the effectiveness of this highly efficacious tool is very well short of what it should be. Again there are multiple steps where effectiveness can be reduced.

- a) Only a minority of children who live in malaria-endemic countries sleep under mosquito nets of any sort - this can be as low as 20%. The low coverage can be due to lack of availability or more commonly because the poorest simply never have sufficient funds at one time to buy them. There is good evidence that the poor may spend quite significant sums on relatively ineffective methods such as mosquito coils, because they can be bought in small quantities.
- b) Of those who do have nets some will be torn and many are in a condition where the insecticide has either been washed off or was never applied in the first place.
- c) Children and their parents may not have information about how to maximise the effectiveness, and therefore use nets at the wrong time of day (e.g. to ward off flies not mosquitoes), or do not use them in the peak malaria season because they feel too hot.

In terms of coverage, many of the experts testifying to the APPMG has stressed that, whatever mechanism is used to distribute mosquito nets (whether free distribution or social marketing of subsidized nets), the poorest, who are those who most need them, are the hardest to reach. Again each of these barriers to proper usage and high coverage can be tackled, but it needs an approach which concentrates on the multiple steps along the

delivery pathway where things can go wrong, rather than hoping that one bold intervention will work.

The APPMG has heard of a number of very encouraging schemes including free distribution of nets in campaigns (which may be targeted to pregnant women and/or children under the age of 5 or universal), marketing of nets and use of vouchers. All the mechanisms have advantages and limitations, although in the many countries where coverage rates are low or dismally low, free ITN distribution using the new LLINs is highly attractive providing coverage can be sustained. The APPMG has, however, heard evidence of many schemes where initial distributions are not followed up by long-term sustained support, leading to substantial operational problems. Random distributions of free mosquito nets are not an appropriate approach. The correct mix of free and commercially marketed nets has to depend on the local conditions rather than on ideological preference. As several countries move from targets of coverage of specific groups to universal access, the mechanisms need to be adapted.

As with drugs however; along with evidence that delivery often fails, we have received evidence of highly effective programmes of mosquito net distribution, which not only achieve rapid coverage, but then lead to sustained use. Dr Graham Root of the Malaria Consortium emphasised that reporting numbers of nets and drugs distributed is not enough, as public health impact depends on use. All delivery programmes need to include both an effective communications component and adaptive implementation to increase appropriate usage. He cited a LLIN programme through antenatal clinics in Uganda, where several months after launch 92.8% of the women who reported receiving a



*Use of Insecticide treated mosquito nets can reduce the number of deaths of children under five by 20%.
Photograph: William Daniels*

LLIN still owned it, and 93.8% of women who had retained the LLINs slept under them the previous night. This was contrasted with some campaigns elsewhere showing 40% usage. Sufficient attention to communication and follow-up can therefore clearly avoid such low usage.

5.2 Targeting of drugs

It is important to treat children for the diseases they do have, those who have malaria get an antimalarial, and those who do not have malaria are treated for other potentially serious causes of illness. Treating children who have other diseases with antimalarials is dangerous, wastes an important resource and potentially speeds up the development of drug resistance. The APPMG has received clear evidence that the diagnosis of malaria, even in public healthcare sectors, is extremely poor throughout Africa and there is some evidence that this is true in parts of South Asia. In some areas with low transmission of malaria, the APPMG has received evidence that over 90% of those given an anti-malarial do not have malaria⁶, whilst large proportions of children who do have malaria are not given an anti-malarial.

Technology exists to make a clear diagnosis of malaria; evidence to the APPMG in 2008 from FIND (the Foundation for Innovative New Diagnostics) demonstrates the range of current and future diagnostic tools available to diagnose malaria, and especially the range of rapid diagnostic tests (RDTs) now available. In large hospitals, microscopes to diagnose malaria have been used for over 100 years and remain a very good diagnostic technique in theory, but often poorly executed in practice. RDTs are both sensitive (meaning they pick up cases of malaria) and specific (meaning they rarely go positive when a child does not have malaria). The problem of overtreatment of children and adults who do not have malaria is therefore not because diagnostic tools do not exist, but that they are poorly applied. Delivery, again, is the key. The APPMG has identified two clear areas where improvements in delivery could be achieved. The first is that many clinicians, particularly in the periphery, do not have access to these diagnostic tests. We were told that light microscopy for diagnosis of all cases is never going to be realistic where the numbers of cases are small, because

it requires skilled technicians and expensive equipment. Working out ways to deploy rapid diagnostic tests in these settings, so that they are safe and effective is, in our view, a priority. Secondly, in hospital settings where tests are available, we have received evidence that they are often ignored. Most of the studies we have been told about demonstrate that around 50% of children with negative tests are given antimalarials anyway. This requires changes in behaviour: Finding ways to change behaviour, so that clinicians prescribe more safely and effectively, is challenging in all environments, including the UK. It is, however, in the view of the APPMG an investment well worth making since, in the long term, it should save many lives and improve the cost-effectiveness of existing antimalarials.

5.3 Who delivers?

Three sectors, public, private and civil society, are already involved in delivery of malaria control interventions. The APPMG has heard clear evidence of highly effective, and essentially ineffective, delivery of malaria control interventions through all of these channels. By drawing on the unique strengths of each sector and optimising its involvement there will be a far greater chance of achieving high and sustained coverage and use of tools to prevent and treat malaria. The public sector not only delivers services but also sets policies and provides stewardship of other sectors (although not in all settings where malaria is common). Civil society focuses on the poorest and marginalised, and the commercial sector can improve access through competition and its widespread availability and convenience. The composition of the private sector in malaria-endemic countries is often misunderstood. It not only comprises general stores selling drugs or mosquito nets in addition to soap, oil and other daily necessities but also licensed and unlicensed drug stores selling a selection of essential medicines. For those who cannot afford transport, especially in rural areas, the private sector is often all they have. The APPMG is strongly against ideology being used to make decisions on something as important as malaria prevention and treatment. Ideology-free evidence-based assessment of what channel is most effective at delivery in each setting should be what drives policy. The delivery of mosquito nets and antimalarial drugs to children who might otherwise die of malaria is not an appropriate place to be fighting ideological battles.

⁶ Reyburn H et al. Rapid diagnostic tests compared with malaria microscopy for guiding outpatient treatment of febrile illness in Tanzania: randomised trial. *BMJ*. 2007;334(7590):403.

5. The Response

5.4. Better delivery- and also better research on delivery

The massive gap between the potential efficacy of the tools we have, and their practical effectiveness in the field, particularly their very low coverage, is both a tragedy but also in a sense a reason to be hopeful. It is a tragedy because it has been repeatedly stressed to us that almost all the children and adults who die with malaria could have had the malaria prevented, or treated, with tools we have at present. The potentially encouraging fact is that we do not need to wait for new tools to become available from basic science in order to have a massive improvement in our impact on malaria. The remarkable drop in malaria in some countries outlined in the introduction to this report was achieved by better application of existing tools, not by new breakthroughs in technology. There is clearly a consensus amongst all those we consulted that if we are to achieve our long-term goal of eradication of malaria, new technology will be needed. To lower child mortality rate from malaria every year, what we need to do is use what we currently have, only much better. This will, however, from all the testimony we received, require extensive operational research in parallel to implementation to see what works in improving delivery, backed up by proper resources to respond to the lessons learned. What seems reasonable is often not what works, and investigating new ways of delivering malaria interventions is going to be essential. Once in place, monitoring the effect under operational practice, and over time, is also very important if we are to learn lessons for the future.

5.5 Political involvement

There has been a welcome sea-change in political support for tackling malaria over the last few years. Governments in the malaria-endemic parts of Africa, Asia and Latin America have always recognised the importance of malaria for their populations and economies, but often felt powerless to act - now we have the tools and commitment. Within the UK senior members of all parties have stated publicly their commitment to tackling malaria. Political support has also been expressed throughout the developed world. Converting this genuine support into action is now a priority. In a frank and forceful testimony, Admiral Ziemer, departing from his script, expressed the potential frustrations and outlined some of the difficulties of getting genuinely political pledges of support for the President's Malaria Initiative in the USA translated into release of funds from Congress within the crowded Congressional timetable, in a timely way. This experience is far from unique. It is essential that current funding is increased and continued for long enough to see through what has been started. Political support is also required for more coordination of efforts globally and nationally.

6. The Future

Improving delivery of malaria control tools is essential if we are to save lives now. It is absolutely critical if the bold plans to eliminate malaria from some countries are to have any hope of being realised.

Reintroducing the idea of elimination and eradication of malaria

The country-by-country elimination, and eventual eradication, of malaria is firmly back on the agenda, following the call from Dr. Chan, the Director-General of the WHO and Bill and Melinda Gates that this was their eventual aim. Over the last year there have been concerted efforts led by the WHO and BMGF to consider how this can be achieved. We heard presentations from Dr. Brandling-Bennett of the BMGF, Professor Sir Richard Feachem and others on how the attempts to achieve this might look in the medium term. The APPMG is excited by the possibilities which the attempts to eliminate malaria raise, whilst being conscious that it is essential that these do not detract from efforts to control malaria in the parts of the world, especially in Africa, where the great majority of the deaths from malaria occur in countries where elimination is not a realistic current proposition. Any attempt to eliminate malaria in the medium term is going to depend on much better delivery of our powerful existing tools.

The collapse of the first eradication programme for malaria marked the low point in malaria control. It is easy looking back to underestimate the achievements of the first global eradication attempt. Malaria was completely removed from Europe and North America and pushed right back into its heart-lands in Asia. Only in Africa (excluding South Africa) was the attempt at eradication largely unsuccessful. Nevertheless, the eradication campaign was considered to be a failure because the attempt had been to eradicate malaria completely from the globe. Against this incredibly high standard, it did not achieve its aims and subsequently there was a dramatic loss of political will to control malaria. This tragic loss cost millions of lives. It is essential that the energy, focus and enthusiasm of any new attempt at eliminating and eventually eradicating malaria avoid this pit-fall. The APPMG is aware of the political dangers of over-promising and then failing to deliver. For this reason this report and our work over this last year has focused very clearly on the practicalities of delivery. The intellectual environment has changed sufficiently, however, that it is worth noting what the call to eradication means now and could mean in the future.

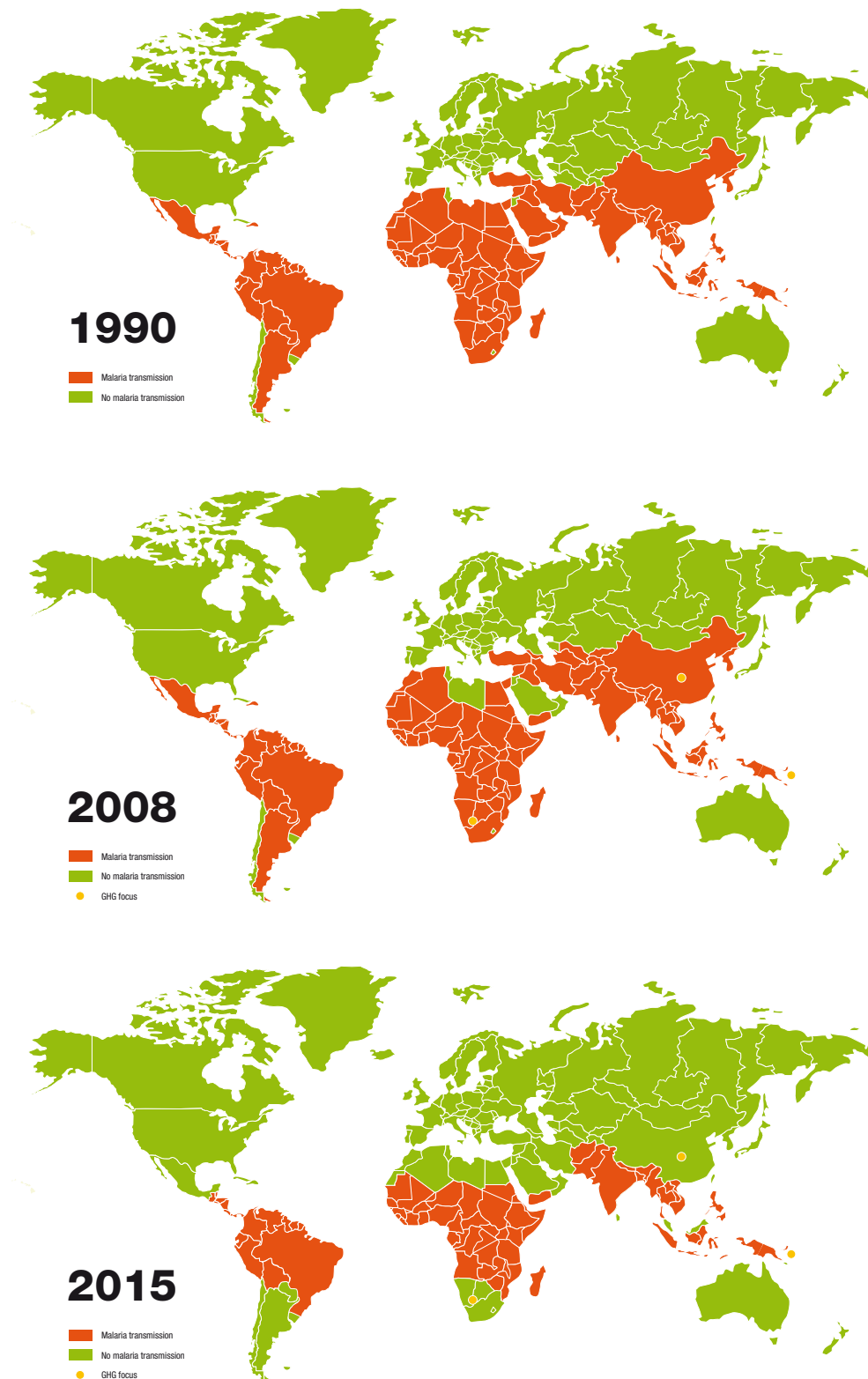
There is a lot of confusion about what elimination and eradication mean. Eradication is the removal of malaria completely from the globe. Elimination is the removal of malaria transmission within a defined geographical boundary, such as a country. It is now recognised that eradication will be achieved by incremental elimination from countries and regions. Eradication is the goal, but it is a long-term goal. The fact that we are now talking about this again is, however, a major step forward and has encouraged people to think much more boldly about what can be achieved.

The APPMG has received evidence that there are areas in the world where malaria could *technically* be eliminated using existing tools in the next few years. In much of Asia, South America and the most southerly parts of Africa, the elimination of malaria could be a very realistic goal, if proper delivery of existing anti-vector measures and drugs were applied systematically and in a sustained way. The majority of deaths, however, occur in the central part of Africa, and here elimination of malaria is a distant prospect, but the chances of massively reducing mortality by the concentrated application of existing tools, is an immediate one.

Even before the WHO and the BMGF came together to declare the eradication of malaria as a major goal, the elimination of malaria has been a practical goal for several countries over the last 10 years. It seems likely that malaria will be eliminated from several countries in North Africa and the Middle East over the next five years provided current efforts continue. This programme pre-dated the recent call to elimination, and has been a remarkable, if unsung, success. It is likely for example that Iraq, a country that has obviously not had an uninterrupted public health system, will eliminate malaria by 2012. There is a reasonable chance that the EURO region of WHO will be malaria-free by 2015. The map of malaria has shrunk substantially over the last 100 years and, with the proper application of existing tools, it should shrink further in the foreseeable future. Figure 5 shows maps presented by Prof. Feachem in his talk in October 2008; the first two maps show existing malaria, the final one is a speculative assessment of what might be achieved if our delivery of existing tools were optimised.

6. The Future

Figure 5: The boundaries of malaria transmission by country- past, present and future



From the presentation by Professor Sir Richard Feachem, APPMG presentation

Total eradication of malaria from the globe, however, remains a distant prospect in the view of all experts that the APPMG has consulted, and what we hope will be medium-term success in shrinking the map of

malaria should not take resources or efforts from the need for sustained effective delivery of anti-malaria measures in the areas most of the deaths occur.

7. Malaria at the end of 2008

The APPMG has considered the state of malaria in 2008, and in particular what changes, opportunities and threats there are now compared to when we launched our first report. The changes we outline have in all cases depended on the improved delivery of tools which existed at the stage our first report was launched. The position at the end of 2008 globally has several very bright spots and one area of considerable concern, which requires rapid intervention. It is sensible to concentrate on Africa and Asia since this is where most of the changes have occurred: in North Africa and the Middle East, several areas which were malaria-endemic, malaria has substantially decreased, and there is a realistic chance that most of the countries in North Africa and the Middle East will be malaria-free within the next five years. This includes some remarkable successes in areas which would normally be considered very difficult such as Iraq.

Some smaller countries have already achieved official elimination status certified by WHO. On the Arabian peninsular, only Yemen remains a serious malaria concern; if malaria were eliminated here, the Middle East would be essentially malaria-free. In South Asia, defined as Afghanistan, Pakistan, India and Bangladesh, where development has occurred, malaria has drifted down in incidence. Chronic instability in some regions means that malaria remains a problem, although in Afghanistan and Northern Pakistan, vivax malaria, a form that is seldom fatal, is predominant. Falciparum malaria appears to be retreating in this area. Effectively delivered malaria control in Southern India and Sri Lanka have demonstrated that, in almost all parts of South Asia, malaria could be taken down to trivial levels using existing tools. Here delivery is really the key.

An area of considerable concern in 2008 has been South East Asia and in particular the border area of Cambodia and Thailand. Malaria transmission here continues to fall as economic development has increased. The problem is that there does appear for the first time to be tolerance of *Plasmodium falciparum* parasites to the artemisinin class of drugs, at least in a small area of Cambodia and Thailand, and possibly more widely in Southeast Asia. It is essential that malaria transmission in this area be brought down to as low a level as possible to minimise the risk of this drug tolerance spreading or developing into full-blown resistance to ACT drugs. This is an area where proper application of the standard tools of indoor residual spraying and insecticide-treated mosquito nets to reduce malaria transmission may have a less dramatic effect than in Africa. Because of the predominant mosquito vectors much of the malaria is transmitted out of doors rather than inside houses, and the people most at risk are often highly marginalised and hard to reach with preventive measures. There is also concern about whether the drug-resistant malaria has spread to Burma; if this is the case, achieving control will be more difficult for technical, access and political reasons. This re-emphasises the need to continue to invest in new antimalarial drug discovery and development. We are currently very reliant on the ACT class of drugs, and it is naïve to assume that, even if the current tolerance of artemisinins in Southeast Asia can be contained, it will not emerge eventually elsewhere.

In Oceania, including Indonesia, malaria appears to be at a low but stable rate. Small islands with relatively low amounts of malaria are in principle good candidates for elimination and there are efforts being planned to attempt elimination of malaria in the Solomon Islands. The APPMG was fortunate to have some very detailed and helpful descriptions of this from Professor Sir Richard Feachem, who has led much of the thinking on this attempt.

7. Malaria at the end of 2008

Malaria in Central and Southern America is probably drifting down gradually as development increases, but there have been no dramatic shifts over the last four years. The APPMG would welcome more evidence about the experience in this part of the world.

In Southern and East Africa, the malaria situation appears to have changed dramatically due to effective application of existing tools in a systematic way. Extensive funding from PMI, DFID and other donors, in countries with relatively well organised public health systems, including Zambia, Rwanda, Zanzibar and mainland Tanzania, Eritrea, Ethiopia and Kenya, has been associated with a substantial reduction in malaria in many areas. Large areas with high-transmission of malaria remain, however, and the prospects for elimination at this stage are remote, but the prospects of reducing malaria to a point where almost no children die of malaria look far more realistic now than they did when the APPMG first started taking evidence in 2005. The APPMG considers this to be one of the most encouraging stories in international public health over the last five years. Its importance for the people of the region, and as a demonstration that good delivery of existing tools can have a substantial benefit, cannot be overstated.

In West Africa, in the countries where there are good records, there have been areas where malaria appears to have decreased, sometimes substantially, with the introduction of wide-spread insecticide-treated mosquito nets and effective ACT treatment. Unfortunately, in large areas of West Central Africa, including the Democratic Republic of Congo, we do not yet have evidence from systematically delivered effective malaria control measures, and the mortality from malaria remains tragically high.

This generally much brighter picture since our first report demonstrates that malaria can be defeated, and where delivery of antimalarial measures is good, it is being defeated. We need to continue to invest in new drugs, insecticides and better technology—the evolution of resistance by mosquitoes and parasites makes this imperative. Better delivery of our existing tools to prevent and treat malaria is however essential, achievable and clearly has the potential for a massive impact. No child or adult in 2008 needs to die of malaria, and better delivery is the key to translating this statement of our potential to make a decisive difference into a reality.

8. Conclusions & Recommendations

Conclusions & Recommendations of the APPMG

8.1 Conclusions

- 1) No child or adult needs to die of malaria in 2008. We have excellent tools to prevent malaria and to treat it. Our failures are largely in delivery of these tools to those who need them.
- 2) The fall, and in some cases dramatic fall, in deaths from malaria in some countries since the first report of the APPMG in 2005 show the effect that improved delivery of existing malaria control tools can have.
- 3) Most children who need an antimalarial do not get one; most children who need an insecticide treated net do not sleep under one; a substantial proportion of those given an antimalarial do not have malaria. These are failures of delivery, and without addressing them we cannot defeat malaria. A 95% efficacious drug given to 30% of those who need it has limited effectiveness.
- 4) The reasons for this failure of delivery of existing tools are complex, and context specific. The APPMG has received evidence showing the key to delivery is recognising that there are multiple steps where delivery can fail, all of which need to be tackled simultaneously, rather than expecting a single intervention to provide a quick and easy fix.
- 5) We have received evidence of many imaginative ways that have been used to try to improve delivery, some very successful, some less so. Interventions to improve delivery that work well in one setting may not in others.
- 6) The work of the GFATM in financing free ACTs in the public sector, home management of malaria through community distributors, the AMFm and RDTs all have the potential to improve delivery and targeting of antimalarials, but none is a quick fix in isolation.
- 7) All delivery methods have their greatest problems reaching the poorest and remotest (who are often the same people).
- 8) Any attempts to eliminate malaria in the foreseeable future will depend far more on massively improved delivery of existing technologies than on some technological breakthrough.
- 9) Malaria can be defeated - improving delivery is essential to achieving this.

8.2 Recommendations

- 1) A variety of methods of delivering ITNs through the public and private sector are successful at increasing coverage, but need to be linked to interventions to promote use and retention.
- 2) The public sector, civil society and the private sector all have a part to play in improving delivery of treatment. Decisions on how best to use them should depend on evidence of what works, and not on ideology.
- 3) The reasons for failure of delivery of existing tools are complex and context specific. For this reason, interventions need to be combined as packages tailored to particular settings.
- 4) Investing in new drugs and insecticides is essential, as development of resistance to insecticides and antimalarials is inevitable. This should occur in parallel with investment in research into better ways to deliver our existing tools.
- 5) It is essential that current funding is increased and continued for long enough to see through what has been started. Maintaining support for the GFATM in this work so that flow of funds is predictable and sustained is also vital.
- 6) Political support is required for more coordination of efforts globally and nationally.

Annex 1

Presentations on Delivery to All-Party Parliamentary Group on Malaria and Neglected Tropical Diseases

Andrea Coleman and Barry Coleman, Founders, Riders for Health, **A Presentation on Transportation**, 2nd April 2008

Riders for Health is primarily about filling a gap of missing expertise in management running of vehicles in Africa. The focus was on transport for the delivery of healthcare for rural places. Motorcycles are a useful tool in this environment as they are low tech, can travel on narrow roads and are cheaper to buy, run and maintain. Health workers need to have access to reliable transportation the key to which is regular maintenance.

Dr. David Brandling- Bennett, Senior Programme Officer, Infectious Disease Development, Bill and Melinda Gates Foundation, **Malaria Strategy Summary**, 2nd April 2008

This presentation gave a summary of Malaria Strategy of the Foundation and its new thinking on eradication & elimination. The Foundation malaria strategy focuses on five key areas: Vaccines, Drugs-therapeutic and preventive, Vector control – including improvements of existing tools and discovery and development of new tools and delivery systems, Effectiveness- control, and scale-up and Advocacy and Financing. The priority focus is on R&D for the tools to fight malaria- innovate to improve current tools and create new tools but the Foundation will also focus on strategy and long-term commitment to achieve impact.

Dr. Graham Root, Managing Director, Malaria Consortium, **Delivering malaria interventions in Africa: what works and why**, 2nd April 2008

In order to achieve efficiency and value in delivery it is necessary to foster competition among delivery organisations to provide high quality, timely and efficient deliver. It is important to recognise and utilise the efficiencies of commercial sector. Key lessons for the future are to consider what works, which is proving to be a mixed model of delivery. Successful delivery must stress usage as much as distribution and must establish the value of the intervention. There needs to be comprehensive malaria control which includes a thorough understanding of malaria and health systems. Elimination requires effective delivery systems that can be sustained.

Dr. Oliver Sabot, Director of Malaria Control Team, Clinton Foundation, **Update on Tanzania Pilot ACT Subsidy**, 13th May 2008

The Tanzania Pilot ACT subsidy, which started from mid 2007 will provide evidence for the global AMFm. It addresses the fact that 40-60% of people seek treatment from private sector and less than 5% are accessing recommended ACTs due to the price. Moreover, many are taking ineffective/inappropriate drugs. The study showed that the suggested retail prices has controlled variation and lowered prices for infant doses, but inflated prices for adult doses. Penetration of ACTs has been slower in more remote shops in rural districts but prices charged in those shops are not higher.

Professors Joanna and David Schellenberg, Professors of Malaria and International Health, London School of Hygiene & Tropical Medicine, **Delivering Malaria Interventions in Africa- what works**, 13th May 2008

This presentation outlined how the grand challenge of malaria can be delivering tools already available. Research spending priorities are always about new technologies even though existing technologies have better results. There is a need to understand what works and plan for key steps that lead to delivery in practice. There also needs to be research on delivery systems otherwise malaria will not be adequately controlled.

Dr Chris Hentschel, Chief Executive, Medicines for Malaria Venture, **Curing Malaria Together**, 11th June 2008

This presentation showed how MMV works in the bigger context of what tools are needed to conquer malaria. Tools are not enough, and malaria control should be a long term endeavor. The Global Malaria Business Plan talks about scaling up for impact and this is what is happening now with existing tools. MMV has the largest ever pipeline of antimalarial drugs and its first product will be launched in a couple of months.

Lee Wells, Head of Global Access to Medicines Policy, Novartis, **Coartem-the story so far**, 11th June 2008.

This presentation focused on Coartem, the largest product by volume of Novartis and it is part of a PP agreement with WHO since May 2001. The presentation described the challenges associated with scale-up, delivery and the use of ACTs and procurement of the drug including short shelf-life and quality associated problems.

John "Luke" Lucas, Development Specialist and Adam Flynn, Assistant Manager, Global Vector Control, Sumitomo Chemical UK, **The Olyset Net Success Story**, 11th June 2008

The presentation described the Olyset net technology and its positive impact on the control of malaria. It is a polyether long-lasting insecticidal net with insecticide control release technology. The nets last at least 7 years because they are knitted rather than woven with an internal reservoir of insecticide. The Olyset net is costed at \$0.68 and compares favourably in prices to other nets on the market. As they are made in Africa, the supply security and the quicker regional supply all make for sustainable economic development.

Chris Gilbert, the Crown Agents, **Responsible for the support and procurement provided by the UK office to malaria projects worldwide**, 11th June 2008

Crown Agents is responsible for the support and procurement provided by the UK office to malaria projects worldwide. The key to its business is having a network of international offices in order to gain local knowledge and have the ability to be on the ground. Crown Agent's malaria control activities with regards to Insecticide treated net, indoor residual spraying and artemisinin-combination therapy were described.

Wendy Woods, Chief Executive, the Boston Consulting Group, **The Global Malaria Business Plan**, 24th June 2008

The GMBP is a document that is intended to support and build on global momentum to fight malaria in order to get broader success and align individual contributions so we are all working in the same direction. The two major thrusts are 1.) An effort to dampen down the burden of malaria in high transmission areas 2.) Shrinking the map of malaria globally. The focus is around high burden countries of Africa with the aim of universal coverage of mosquito nets and universal access to ACTs and where appropriate IRS.

Dr James Banda, on behalf of Executive Director, **Roll Back Malaria**, 24th June 2008

The presentation described people's passion for fighting against malaria. The question often gets asked, he said, is that with 2010 around the corner will we achieve the goals? Is there room for optimism? The answer is yes and therefore we need to keep the passion fired up. The key problem in countries is that there were far too many projects on the ground. What is needed is not endless procedures but funding and help.

Admiral Tim Ziemer, Director the President's Malaria Initiative, **The President's Malaria Initiative (PMI) – where now?**, 24th June 2008

In 2005, the US President announced the initiative and committed \$1.2 billion in new malaria funding to reduce malaria-related deaths by 50 percent in 15 African countries. PMI seeks to accomplish this by expanding coverage of four highly effective malaria prevention and treatment measures. The presentation described how PMI works within countries, the impact it has had on reducing malaria morbidity and mortality and how sustainability of malaria control programmes is a critical goal of PMI.

Dr Christian Loucq, Director, PATH Malaria Vaccine Initiative (MVI), **Malaria Vaccines: What we need for success**, 8th July 2008

The PATH Malaria Vaccine Initiative is not-for profit organisation that is an investor in products that will deliver a vaccine. MVI will accelerate the development of malaria vaccines and ensure their availability and accessibility in the developing world. WHO has prioritized the need for a Malaria vaccine and what is required is sustained commitment between partners.

Dr Didier Lapiere, Vice President of Clinical Development for Infectious Diseases at GSK Biologicals, Rixensart, Belgium, **GSK's Commitment to Malaria**, 8th July 2008

GSK is a global company committed to the diseases of the developing world and is the only company with drugs and vaccines in development. GSK's African Malaria Partnership (AMP) was established in 2001 to improve the prevention and treatment of malaria in sub-Saharan Africa. The focus was then on RTS,S/AS which has grown into a viable vaccine candidate through partnerships and an unprecedented, streamlined regulatory strategy.

Dr Mark Perkins, Chief Scientific Officer, The Foundation for Innovative New Diagnostics (FIND), **Diagnostic Testing in Endemic Countries**, 8th July 2008

The presentation focused on the importance of why one should accurately diagnose malaria: a) manage non-malarial fevers b) Avoid resource wastage c) Decrease drug pressure towards resistance and d) Monitor epidemiology with a description of rapid diagnostic tests (RDTs), FINDS malaria portfolio which is about the methods for improving the quality of RDTs in use and getting new assays (RDTs with novel targets, New thermostable reagents & Molecular reference assay (LAMP)).

Professor Robert Sinden, The Malaria Research Centre, Imperial College, **Malaria in the mosquito, and its critical place in formulating eradication strategies**, 16th July 2008

Elimination/eradication, as an objective, refocuses our attention on the critical need to break the parasite transmission cycle and this presentation demonstrated how and why attacking the mosquito is an effective strategy. How different vector control strategies (e.g. repellents, transmission blocking vaccines, environmental management and genetically modified technologies) can work.

Professor Francis Omaswa, Executive Director of the Global Health Workforce Alliance (GHWA) and ex Director General for Health Services in the Ministry of Health in Uganda, **Delivering malaria control tools: Opportunities and Challenges for Low Income African Countries**, 16th July 2008

The main messages in the presentation were 1) Malaria control has never looked as promising as it does now 2) to manage enthusiasm is a challenge in and of itself 3) it is hard to coordinate but this is best done at country level and 4) there is a need for an integrated health core that can deliver the tools.

Professor Chris Whitty, Professor of International Health and Director, Malaria Centre, London School of Hygiene & Tropical Medicine, **The state of malaria control globally; threats and opportunities**, 16th July 2008

A review of the current state of malaria control in different parts of the world, including areas where malaria is decreasing in Africa and Asia, areas where elimination attempts are proving successful (mainly North Africa and the Middle East), the prospects for malaria elimination elsewhere and the potential for the emergence of drug resistance to the artemisinin class of drugs in Southeast Asia.

Dr Chris Drakeley, Senior Lecturer, London School of Hygiene & Tropical Medicine, **What measures of malaria do we need to monitor elimination?**, 27th October 2008

The move towards malaria elimination is gaining momentum. To maximize the effect of control and elimination efforts, control programme managers need accurate measurement of the burden of malaria. As transmission reduces, measures will need to be increasingly sensitive to pick up infections. The advantages and disadvantages of the measures that are available were discussed with a view to identifying what we need in the tool box for malaria elimination. There is also a need for rapid assessments to identify key areas which should then lead to detailed surveys for malaria risk.

Professor Sir Richard Feachem KCB CBE, Professor of Global Health at University California both in San Francisco & Berkeley, **Shrinking the Malaria Map: 1900 to 2025**, 27th October 2008

The presentation focused on the progressive elimination from the endemic margins inwards. The steady progress of shrinking the malaria map from 1900 to the present day and new efforts to achieve further shrinking between now and 2025 were discussed. A possible three pronged strategy for eradication was presented: 1. Aggressive control in the heartland to achieve low transmission and zero mortality where possible, 2. Progressive elimination from the endemic margins to shrink the malaria map and 3. Research to bring forward a vaccine and better drugs/diagnostics and other tools.

Annex 2

Principal Tools for Malaria Control

Vector Control

Most malaria can be prevented by effective anti-vector measures. Using mathematical models that have been validated, Professor Bob Sinden, in evidence to the APPMG demonstrated the power of methods which lead to infected mosquitoes being killed to reduce transmission. The majority of mosquitoes which transmit malaria in Africa bite at night, indoors, and largely when people are asleep. Two tools have proved to be highly effective against mosquitoes and when properly applied, they can have a dramatic effect on mortality. In areas where transmission is moderate or low, malaria can essentially be driven out completely. The first is insecticide-treated nets (ITNs). The second is indoor residual spraying (IRS) with insecticide.

Insecticide-treated nets

A simple mosquito net protects the person sleeping under it. When it is treated with an insecticide, it kills or repels some mosquitoes before they bite. Even if the net has some holes, mosquitoes which land on the net and crawl through the holes may die before they reach the person sleeping under it. The net works as a baited trap. Mosquitoes, which are attracted to humans, fly to the net, come in to contact with the insecticide and die. The result of using an ITN is reduced transmission of malaria. Furthermore, it has been demonstrated that whilst the nets protect those that sleep underneath them, they often also protect those around them. This mass effect, means that even where coverage by ITNs is not 100%, they can have a substantial impact on transmission.

One of the biggest barriers to operational effectiveness of mosquito nets when provided is that they used to have to be repeatedly dipped every six months. We have received evidence in previous sessions that this seldom occurred in practice, and this remains a problem for nets obtained through the private sector: The new technologies which lead to long-lasting insecticidal

nets being available are a major technological way forward to reduce this barrier to effectiveness. In essence, these technologies allow these mosquito nets to have an insecticide incorporated into the manufacturing which is released throughout the life of the net. The insecticide therefore continues to be effective for as long as the net remains viable (relatively free of holes), which is usually a few years. We have had evidence on a number of different manufacturing mechanisms by which this can be achieved, including incorporation into the plastic of the nets and polymer resin coatings. The technology is advancing, but what is clear is that we already have a variety of effective long-lasting nets at this point in time. We therefore need to get them to people. The APPMG has heard evidence about a number of mechanisms which work at least in some settings. Common to all of them though is the need for low-cost, high-quality, long-lasting nets to be provided. It is very encouraging that large-scale production is now available in Africa and the Chairman has visited the factory of one of the companies in Tanzania. The widespread adoption of long-lasting insecticidal nets (LLINs) over the last few years has removed one of the key operational barriers to their successful use, as it has eliminated the need for re-treatment.

Indoor residual spraying

IRS has consistently been shown to be one of the most effective ways of reducing transmission in areas where mosquitoes bite indoors (most of Africa, some of Asia). The aim is not to protect a person sleeping in a room, but to protect all those around them. Mosquitoes fly in, bite humans and then rest on the walls to digest their meals before flying out again. Where the mosquito rests on a wall with insecticide it is then killed and cannot transmit malaria, if it has acquired it from the individual sleeping in that room, to other people. Historically, the insecticide use has been DDT because it was highly effective, long-lasting and non-toxic. Major concerns about DDT toxicity lead to its falling out of favour following the eradication campaign, but it is important to understand that the problems that were identified with DDT stemmed almost entirely from its wide-spread use in industrial agriculture rather than IRS. The negative effects of DDT were also very substantially exaggerated by those arguing against it. The reality is that DDT IRS was one of the most effective public health interventions of the last century. This was the mainstay of eliminating malaria from Europe and North America and many other areas in Asia and South America. Its reintroduction in the last few years has, in places where it is technically appropriate, led to a dramatic reduction in malaria transmission. It is not a panacea for all settings but remains one of the most powerful tools at our disposal.

IRS was the keystone to the first eradication attempt and, in the right settings, is highly effective as a control mechanism against malaria. Currently it is being used by programmes, particularly those supported by the President's Malaria Initiative (PMI). Evidence of its impact has been seen in countries including South Africa, Zanzibar and Mozambique.

Other vector control measures

Additional vector control measures are being considered which include larvicidal chemicals which kill juvenile mosquitoes and the use of a variety of other methods in integrated vector control management. A variety of novel methods of vector control methods exist, including dipping or sponging animals with insecticide, insecticide-treated over-sheets and tents for refugee populations and other tools which can be adapted to local settings. Where, as happens in many sites in Asia, mosquito species have identifiable breeding sites water engineering solutions can have a major role. This is especially important in areas where mosquitoes bite outdoors, making conventional ITNs and IRS much less effective.

Professor Janet Hemingway, of the Liverpool School of Tropical Medicine, gave a presentation to the APPMG on the full spectrum of insect vector control from bench to bus. This included the cutting edge work ongoing on the biochemistry and molecular biology of specific enzyme systems associated with xenobiotic resistance through to large scale operational programmes in Mexico and Mozambique where control theory is being put into practice.

Annex 2

Treatment of malaria

Drugs

The use of Artemisinin-based Combination Therapy (ACT) has revolutionised the treatment of malaria in many parts of Africa, Asia and South America. ACTs work and, in cases where malaria is identified early and treated with an effective anti-malarial, there is no technical reason for children with fevers due to malaria to die. There are several ACT classes which are effective in most parts of the world. Additionally there are some non-ACT drug combinations which are effective in certain geographical areas, and where these are affordable they have a significant role to play in the private sector, and some countries still advocate them as policy. Effective drug treatment can also in principle lead to reduction in transmission, particularly with the ACTs, where the drug combination reduces the number of the sexual forms of malaria which lead to transmission. This effect is most important in low transmission settings. It is however only significant when there is good coverage with antimalarials; where many cases are missed the effect on transmission is, inevitably, lower.

Practical experience backs up mathematical models which demonstrate that the impact of effective antimalarials, given to all those with malaria has a substantial impact on transmission.

Diagnostic tools

In hospital settings light microscopy remains an excellent technology, provided well trained microscopists, properly trained and motivated, are used. In Southeast Asia these conditions have been met. In Africa and parts of South Asia microscopy has been less effectively deployed. Although microscopes can use mirrors and sunlight, in practice they are limited to areas where there is power, and good supplies of reagents. This means they are not easy to use outside hospital or clinic settings.

New rapid diagnostic tests (RDTs) have proved highly sensitive for malaria, are portable and as they use blue lines similar to pregnancy tests, are relatively easy to use and the results can be seen by both patients/parents and prescribers. In principle therefore they are an excellent technology. Their major current technical limitations are that many of the current marketed examples are heat sensitive, losing their sensitivity if exposed to the kind of temperatures routinely found in malaria-endemic areas, and their cost. The real limitation on their use has been getting prescribers to act on the results.

**A 95% efficacious
drug given to 30% of
those who need it has
limited effectiveness**
