Nothing But Net Only Works in Basketball
by Manuel F Lluberas

Approximately 40% of the world's population is at risk of malaria resulting in more than 500 million people becoming severely ill with malaria annually.[1] It is estimated that malaria kills a child less than five years of age somewhere in the world every 30 seconds with the majority of deaths occurring in Africa. Malaria is one of the major factors contributing to Africa's high rate of infant and maternal mortality, low birth weight, school absenteeism and low agricultural output and productivity, low foreign investment and persistent poverty. It afflicts primarily the poor, who tend to live in malaria-endemic areas in dwellings that offer little or no protection against the mosquito vector. By sapping people's health, strength and productivity, malaria further marginalizes and impoverishes the populations it affects.[2]

There is evidence that malaria control is a necessary precursor to development in malaria-endemic areas.[3] This is supported by well-documented negative impacts of malaria on tourism and agricultural development in the 1930s, before control measures were implemented.[4]

The foundation upon which current malaria control programs rest is based on three primary interventions that must be scaled up in affected countries in order to effectively respond to the disease:[5]

- Proper and timely diagnosis followed by prompt and effective treatment with artemisin-based combination therapies;

- Wide scale distribution and proper use of insecticide-treated nets (ITNs) to achieve full coverage of populations at risk;

- Indoor residual spraying (IRS) with insecticides to reduce vector populations decreasing or eliminating transmission.

This strategy attacks the disease on three fronts. It tries to eliminate the malaria parasite at the clinical level with the use of drug therapies, provides a physical barrier against malaria-carrying mosquitoes and attacks the vector significantly reducing the population and thereby reducing and/or interrupting transmission.

The first two components of this strategy require active community involvement. Community members must have access to primary health clinics where qualified health professionals with adequate tools can provide timely and accurate diagnosis and treatment. These health professionals must also ensure that mosquito nets are properly placed, used correctly, maintained in good repair, and brought out for re-treatment when required. Nets must also be used during periods when vector populations may appear to be so low as to make the net seem useless and their use result in uncomfortably hot nights.

The proper use of mosquito nets can significantly reduce disease transmission, but only if sufficiently distributed. For example, when used sparingly, the mosquitoes that are deflected by the nets will tend to seek out people not under a net. In this case, there would be little or no reduction in overall transmission. If transmission was diverted from high-risk to low-risk individuals, that would be beneficial, but there would be no major effect on the intensity of transmission of malaria in the community.[6]

The impact of using insecticide-treated nets on malaria transmission seems positive when compared with recent spraying trials. However, we have to admit that it has not matched up to that of the earlier spraying projects and that some of these reports have been unbalanced and incomplete. The efforts of the Malaria Eradication Program of the mid-1950s to mid-1960s, for instance, were instrumental in significantly reducing the global malaria burden, particularly in Asia, Latin America and Southern Africa. This program, based on indoor residual spraying (IRS) against mosquito vectors and endorsed by the WHO Conference of 1950 in Kampala, eradicated malaria from Europe, the former USSR and several countries in Asia and

the Caribbean. Approximately 700 million people, more than half of the previously exposed populations, were no longer at risk.[7]

There is abundant evidence that IRS, the third component of an effective malaria control program, is very effective in both stable and unstable malaria transmission areas where local vector populations are dependent on indoor resting and biting. In many areas, indoor spraying of residual insecticides has proved crucial for vector reduction or even eradication.[8] "This method [spraying] is under-utilised. It has been suppressed in the past but it has worked very well," said Dr Arata Kochi, head of the WHO's Global Malaria Program in an interview shortly after he settled in his new position.[9]

In contrast to net usage, the only requirement of householders for spraying to be effective is that they allow spray teams to treat their homes. After that, no further attention by the homeowner or resident is required for an insecticide deposited on a wall or ceiling to continue to do its job.[10]

As malaria surges once again in many parts of the world, victories are few, but some notable progress has been made in the recent past. South Africa, Swaziland, and Namibia and a handful of other countries are making strides against malaria with a simple remedy: spraying the inside walls of houses in affected regions once a year. Several insecticides are available, but many of these countries have chosen one that lasts twice as long as the majority and kills and repels mosquitoes, which delays the onset of pesticide resistance, while maintaining costs to a minimum.[11]

There is additional concrete evidence that the reintroduction of IRS has led to the reduction of locally important malaria vectors when all other interventions (treatment and mosquito net usage) have failed to produce results. In Mozambique, indoor residual spraying was associated with a statistically significant reduction in parasite prevalence in all areas. Because these reductions were significant across all zones, and artesunate combination therapies (ACT) were only introduced in two of the five zones during the last year of this multi-year study, the overall reduction in *Plasmodium falciparum* prevalence in southern Mozambique was largely attributable to IRS.[12] This study has also shown the benefits of reducing transmission intensity by establishing active vector control before obtaining a definitive diagnosis resulting in ACTs as first-line treatment. Evidence presented in this review confirms that malaria control through IRS has made epidemics less frequent and reduced malaria from hyper- to meso-endemicity and from meso- to hypo-endemicity at the southern fringe of transmission in tropical Africa.

A handful of other countries in Africa provide concrete examples of how active vector control interventions can reduce the malaria burden on affected populations. Zambia's National Malaria Control program, for instance, was developed from a template created from the work at the Konkola Copper Mine where introduction of a well-structured and organized IRS campaign pushed – and has kept – malaria far down the list of communicable diseases in a relatively short time.[13] Other programs making significant strides against malaria operate in Ghana and Equatorial Guinea. Furthermore, though still in their early stages, programs operating under the President's Malaria Initiative for Southern Africa (PMI) also show promising results in Zanzibar, southern Angola and parts of Uganda.

Indoor residual spraying is not a magic bullet. Its use should be planned carefully after considering major organizational, technical and financial implications. However, its track record in southern Africa and in many other areas of the world is outstanding and should certainly be considered when planning extended vector control activities in endemic areas.

To be effective, implementation of vector control interventions requires selection and judicious application of effective insecticides, selection of reliable and, durable application equipment combined with comprehensive operator training at all levels of the organization. If one of these three components fails or is deficient, the IRS campaign will most likely not produce the desired results. Unfortunately, we have reached a point where there is very large investment in IRS and rapid expansion of vector control programs into countries with limited experience. IRS campaigns need to be standardized so they can produce quantifiable and verifiable results and stimulate private/public sector partnerships to invest in new and innovative ways to address the global malaria problem. Moreover, the private sector

must be regarded as contributors rather than competitors.

Implementing and sustaining effective malaria control interventions requires clear political commitment and engagement from national authorities as well as long-term support and funding. Active vector control remains the most effective measure to prevent malaria transmission and is one of the basic elements of effective malaria control. Its goal is the reduction of malaria morbidity and mortality by reducing vector populations and thus the vector-human contact and dropping transmission levels. Implementing vector control depends on the magnitude of the malaria burden, the feasibility and timing of the intervention and the possibility of sustaining the resulting modified epidemiological situation. Thus, a systematic approach to vector control based on evidence and knowledge of the local vector that utilizes all available tools, (adulticiding, larviciding and environmental manipulation, etc.) should be implemented. This approach, known as integrated vector management (IVM), has its primary objectives to reduce the density of the vector mosquitoes and reduce their life span so that they can no longer transmit malaria parasites from one person to another.

"The benefits of developing and utilizing IVM derive from the facts that some disease vectors are responsible for multiple diseases and some interventions are effective against several vectors. In addition, IVM can lead to efficiencies by drawing on the resources, and supporting the work, of sectors beyond health, both public and private. It is, therefore, common sense to develop and apply an integrated management approach. Otherwise, the suboptimal use of available resources will continue, and millions of people will remain vulnerable to increasing risk of infection with preventable vector-borne disease."[14]

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