Scaling-up coverage with insecticide-treated nets against malaria in Africa: who should pay?

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Insecticide-treated nets (ITNs) have been shown to reduce the burden of malaria in African villages by providing personal protection and, if coverage of a community is comprehensive, by reducing the infective mosquito population. We do not accept the view that scaling-up this method should be by making villagers pay for nets and insecticide, with subsidies limited so as not to discourage the private sector. We consider that ITNs should be viewed as a public good, like vaccines, and should be provided via the public sector with generous assistance from donors. Our experience is that teams distributing free ITNs, replacing them after about 4 years when they are torn and retreating them annually, have high productivity and provide more comprehensive and equitable coverage than has been reported for marketing systems. Very few of the free nets are misused or sold. The estimated cost would be an annual expenditure of about US$295 million to provide for all of rural tropical Africa where most of the world's malaria exists. This expenditure is affordable by the world community as a whole, but not by its poorest members. Recently, funding of this order of magnitude has been committed by donor agencies for malaria control.

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Insecticide-treated nets (ITNs) are the most efficacious, currently feasible intervention for preventing morbidity and mortality due to malaria in tropical Africa.[1,2] ITNs are comparable in their cost-effectiveness in preventing deaths and morbidity to that of measles vaccination.[3] Like vaccines, ITNs have both a personal protective effect to the individual user, as well as a community-wide effect because the occupied nets act like baited traps for mosquitoes.[4–7] The higher the percentage of the whole population covered with ITNs, the greater the mosquito kill, thus benefiting both individuals using ITNs and others who sleep nearby.[7] Although men in African rural areas are not so susceptible to malaria because of acquired immunity, including them among those provided with insecticidal nets kills many mosquitoes that might otherwise bite their more vulnerable pregnant wives or children.

The Abuja Summit on Malaria Control established a protection target of 60% for African pregnant women and young children. In fact, to achieve the full potential of the community effect of ITNs on the vector population, it will be necessary to cover a considerably higher percentage of the whole population. There are several issues to consider with sustained use of ITNs, such as whether acquisition of

Figure 1. A Tanzanian village health worker providing the annual retreatment of villagers' nets using insecticide brought by one outside supervisor.

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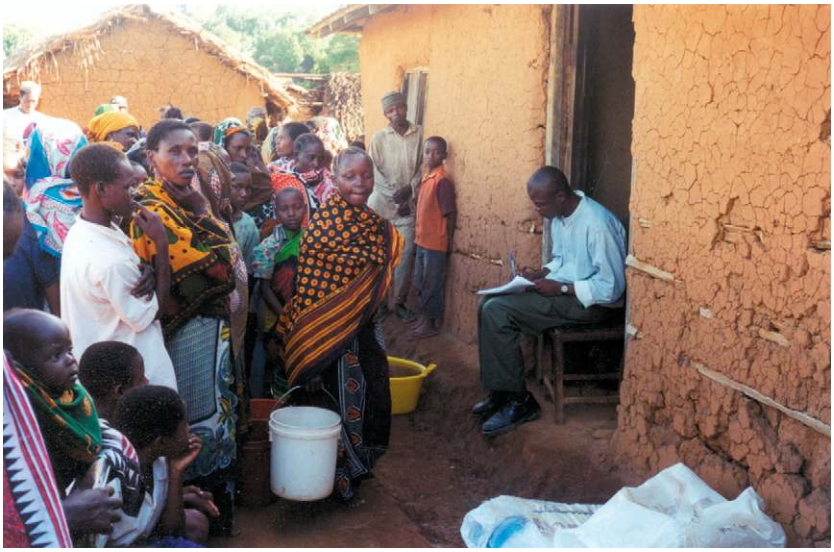

Figure 2. Net distribution day in a Tanzanian village: entitlement of each household is based on a survey of the number and sizes of beds and sleeping mats in each house.

malarial immunity is impaired when transmission is reduced and whether such a decrease would affect the beneficial impact of ITNs on malaria morbidity,[6,8] and whether or not mosquito resistance to pyrethroid insecticides interferes with effect of ITNs.[9] However, in this paper we focus on the continuing debate about the crucial question of how to achieve and sustain high coverage with ITNs throughout the extremely malarious parts of tropical Africa.

The debate about methods of funding

The approach recommended by several international organisations[10] and donors stresses reliance on the commercial market. Supporters of this view assert that the public sector in much of Africa cannot support wide-scale ITN procurement and distribution, and, consequently, that the private sector must be stimulated to fill the void. The approach allows for subsidised nets for very poor people, but also emphasises that subsidies should be targeted short term to vulnerable groups to avoid discouraging the commercial sector.

While African commercial markets are expanding to serve urban communities who are kept awake by the nuisance of culex mosquitoes, sustained subsidies will be required to assure high ITN coverage for the rural poor of sub-Saharan Africa to protect them from anopheles malaria vectors. The current commercial emphasis on ITN scale-up will neither achieve nor sustain the necessary coverage in poor subsistence economy communities. Recent studies underscore that the poorest in Africa have so little cash that, if they pay commercial prices for ITNs, they would have no cash for essential items such as user fees for primary schools and health facilities, and even food.[11] The international community should not advocate a strategy that relegates African children to being protected from malaria only if their parents can be persuaded to pay. The priority for Africa should be to adopt ITNs as a public good—like childhood vaccines—through public sector involvement in highly subsidised or free provision for the vulnerable African lowland rural populations, where the great bulk of the world's malaria burden is concentrated.

Through great efforts to stimulate marketing of nets, some districts in Tanzania have seen high rates of net purchase in towns but much lower rates in rural areas, especially among the people with lowest incomes whose children have the poorest health. To address these mismatches between rates of net use and malaria risk, the immediate priority should be to assemble the necessary funds and organisation to provide free nets and insecticide in a pro-active way in rural areas. The public sector in Africa has shown its capacity to deliver vaccines efficiently and sustainably; this infrastructure and complementary additional approaches should be developed to deliver ITNs. Rather than assume that the public sector is inadequate for this task, funds should be provided so that it can effectively fulfil its role in protection of public health. In Vietnam the public sector, with donor assistance, provides free treatment of nets for 10 million people.[12] An average of 80% of the nets in a village are brought for treatment on each visit by district mobile teams who work in close integration with commune and

Figure 3. The bales of nets arrived from the factory carried on a bus roof rack just in time for the distribution day in this village.

Figure 4. Nets are indelibly numbered and are signed for by householders so that these valuable items can be traced in the event of theft.

Figure 5. A householder finds a way of hanging her newly acquired nets over her family's beds.

village health workers. The build up of this net-impregnation service has been associated with a remarkable decline in malaria.[12]

It is often suggested that ITNs provided free or highly subsidised will not be valued, or will be misused or sold. However, of a UNICEF donation of 70 000 nets to pregnant women in Kenya, it was found that virtually none of the nets received were sold and that 80–91% were used by pregnant women as intended (H Guyatt, S Ochola, unpublished data). Results were similar from an antenatal programme distributing highly subsidised ITNs in Malawi (D Chavasse, Population Services International, Blantyre, Malawi; personal communication). Thus we consider that ITNs should be provided free in rural areas to achieve high population coverage (which necessarily implies high coverage and maximal protection of the vulnerable groups of pregnant women and young children) and any fee should be considered only if it helps to augment coverage.

The high productivity of teams providing nets and insecticide free of charge

Current ITNs require periodic retreatment with insecticide and, while there are now efforts to produce long-lasting ITNs, retreatment will be needed for some time to come. During the World Health Organization trials of the effect of ITNs on child mortality in The Gambia[13] and on the Kenya coast,[14] when teams visiting villages supplied retreatment free, retreatment rates were very high. However, rates declined disastrously when marketing was introduced and people had to take the initiative to seek and purchase insecticide treatment kits. Projects such as KINET Social Marketing, which have sold insecticide from the outset, also complain about disappointingly low retreatment rates, not exceeding 60%,[15] despite great efforts to find out how to make the purchase of ITNs as appealing as possible to villagers.[16]

By contrast, in one area of Tanzania where retreatment is provided by proactive visits to each village by one supervisor bringing free insecticide and working with local health workers (figure 1), more than 90% of nets are retreated in 2–3 days.[17] The productivity is so high that we can predict that, if one scaled-up such a system, only about 11 supervisors, travelling by motorcycle, would be needed to provide annual retreatment for one million people.

Experience with field trials and with pilot scale-up efforts emphasise the high productivity of teams that provide nets and retreatment in villages (figures 2,3,4,5).[17] These teams would be unencumbered by the need to handle money or assess who deserves a subsidy, and would require only limited facilities for storing nets, by contrast with marketing systems that have to hold stocks securely while they await customers. For a rural Kenyan team working on ITN

distribution the cost of wages, allowances, administration, and transport by four-wheel-drive vehicle amounted to about US$1 per net delivered. Their productivity is so high that we calculate that the 175 000 replacements for torn single or double nets that 1 million people would require each year could be distributed by two teams of five working full time, or probably preferably, equivalent part-time work by locally based health-care workers. A further reduction in delivery costs could be achieved by integration with other population-wide health-care activities such as vaccination campaigns (M Grabowsky, American Red Cross, Washington DC, WA, USA). With the above delivery cost and the current UNICEF bulk purchase price for nets of $1·40 each, we predict that for about $295 million per year, comprehensive coverage for 350 million people in rural tropical Africa could be achieved. The Global Fund for AIDS, tuberculosis, and malaria plans to provide malaria-control grants for about 24 countries at roughly $255 million over the first 2 years; thus, the resources needed for ITNs is consistent with the level of funding that can soon be expected to be available to assure that the public-health benefit of ITNs will be provided to those African communities bearing the brunt of the world's malaria burden.

Conclusion

In view of our experience with ITNs and the success of the WHO and UNICEF-supported Immunisation and Vaccine Development programme in sustaining high and equitable coverage of free vaccines, we consider that the provision of free or highly subsidised ITNs to Africa's poorest and most vulnerable populations is the priority. Fortunately, UN agencies, the Global Fund for AIDS, tuberculosis, and malaria and major foundations are now mobilising funding to have a real effect on the African burden of malaria. Rather than subsidising marketing systems, we urge that new funding would be better targeted at organised provision of ITNs and their retreatment so that cost to those suffering from malaria is not a limiting factor in attaining high coverage rates. Such targetting can be expected to produce a remarkable health and economic return from an investment that would be eminently affordable by the world community, but not by its poorest members in African villages.

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Conflicts of interest

We have no conflicts of interest.

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