In this month's *Bulletin*

Bednets vs spraying

From the late 1950s to the 1970s, the global malaria eradication effort ultimately failed to achieve its global objective, partly due to the development of mosquito strains resistant to insecticides, particularly DDT, the mainstay of the eradication programme's house spraying operations. Over the past 15 years, public concern over the ecological impact of DDT, the relatively high cost of alternative insecticides and the rapid spread of malaria parasites resistant to antimalarial drugs have led malaria experts to turn to lower-tech and relatively low-cost solutions, such as bednets, particularly those impregnated with insecticides. In a review of six recent studies in Africa, Asia and Melanesia, that compared insecticide-treated bednets with indoor insecticide spraying, Curtis & Mnzava (pp. 1389–1400) observe that the bednets were invariably as effective as, and in some places more effective than, spraying in reducing mosquito populations, malaria infections and malaria cases. However, when the authors compared the effectiveness of the insecticide-treated bednets with that of spraying programmes conducted 30 to 50 years ago, the bednets made a far less impressive showing. One explanation they suggest could be the longer duration of most of the early spraying programmes, compared with the recent more time-limited operations. Most of the early programmes also used "non-irritant" insecticides, which may be more lethal to mosquitoes than the "excito-repellent" pyrethroid insecticides used in current operations. These findings, the authors suggest, may make a case for resuscitation of indoor insecticide spraying or for a switch to non-irritant insecticides for bednets.

Mapping malaria for targeted intervention

Malaria doesn't just pop up anywhere. Cases tend to cluster in relation to the distance of human habitation to mosquito breeding sites: the *Anopheles* vectors of human malaria tend to "disperse" from their breeding sites generally up to a distance of not more than 5 km in South America vs less than 1 km in many parts of Africa. Clustering of malaria cases also depends on a number of risk factors present in individuals and households, including ease of entry into the house by mosquitoes, the economic circumstances and cultural habits of its occupants, and, again, the proximity of a dwelling to a mosquito breeding site. Attempts to control malaria, argue Carter et al. (pp. 1401–1411), should take advantage of this non-random spatial occurrence of malaria to map its geographic transmission patterns with a view to targeting control interventions to the most appropriate locations and human habitations. Techniques to pinpoint the patterns of occurrence of malaria can use satellite-based Global Positioning Systems technology for accurate collection and computerization of data. Remote sensing space satellite systems can be used to register vegetation and other environmental patterns associated with malaria transmission. Data from these approaches can be collated through a computer-assisted geographical information system (see paragraph below) that provides maps of real or predicted malaria risk detailed to the level of the individual household. In the light of data from these approaches, human habitation might, where possible, be placed beyond the dispersal range of mosquitoes from their breeding sites. Mosquito populations could be reduced by larviciding and by the removal or the prevention of the formation of mosquito breeding sites. Contact between mosquitoes and humans could be reduced by house spraying with insecticides, for example, or the use of insecticide-impregnated bednets, screens, mosquito repellents, suitable clothing, etc. And for populations most at risk, better access to good treatment should reduce local prevalence of malaria infection.

A computerized malaria information system in action

With the AIDS epidemic becoming a national health catastrophe in South Africa, funds for malaria and other public health problems are increasingly scarce. What little money that remains must be used with maximum efficiency. Booman et al. (pp. 1438–1444) describe how one north-eastern province bordering Mozambique revamped its malaria control programme to achieve this objective. Since its inception five decades ago, the programme had relied heavily on indoor insecticide spraying to keep malaria in check. Although empirical evidence pointed to the highly focal occurrence of the disease in the province, data were lacking to allow targeting of spraying operations to the most affected towns and villages. The centrepiece of the restructuring process was the introduction of a geographical information system (see paragraph above). This called for an improved data collection process that roped in all health care providers in the area, including private sector doctors. It also called for the right software and hardware and, most importantly, properly trained staff to run it. The outcome was an "enormously valuable" malaria information system. Malaria control staff now had "malaria risk maps" of the area that revealed a very heterogeneous pattern of annual malaria incidence rates — ranging from 0.1 to 20 cases per 1000 inhabitants — throughout the area of the province affected by malaria. There was a clear west-to-east malaria risk gradient, with a fourfold greater risk of malaria for people living within five kilometres of the Mozambican border compared with other local inhabitants living further from the border. Health authorities used the new system to focus routine spraying activities on settlements with mean annual incidence rates above 8 cases per 1000 inhabitants.

Combination antimalarial drugs — how feasible for Africa?

Resistance of malaria parasites to antimalarial drugs is threatening malaria control programmes throughout the world. In some parts of South-East Asia, switching from single-drug therapy to a combination of two drugs has, at least in the short turn, given a new lease of life to a number of malaria control programmes, notably in Thailand. Will the same ploy, ask Bloland et al. (pp. 1378–1388), work in Africa, where parasite drug resistance is building up to what has been called a "malaria disaster" and where malaria control faces major obstacles? A far greater proportion of the population, for example, is exposed to extremely intensive, year-long malaria transmission than in South-East Asia, where transmission tends to be more seasonal. In areas of intensive transmission, many people are likely to be exposed to a second infection at a time when their blood levels of antimalarial medication given for a previous infection have fallen to concentrations at which drug-resistant parasite populations can develop. Also, in such areas, many people will have acquired sufficient immunity to prevent them from developing symptomatic disease and thus seeking treatment, so that coverage of the population with antimalarial drugs will not be extensive enough to prevent resistant parasite populations from proliferating. Furthermore, the widespread absence of reliable diagnostic facilities, of supervised drug distribution and usage, together with the higher cost of combination therapy in populations often simultaneously stricken by poverty and high exposure to malaria, add to the web of circumstances likely to jeopardize the success of combination antimalarial treatment in much of Africa. Given the potential lifesaving benefits of such treatment, though, every effort should be made, the authors urge, to collect the necessary data on which appropriate decisions could be made — including those relating to policy and financing — about whether the switch from single-drug to multidrug treatment should be considered. Only in this way, would such a strategy have the best chances of success. ■

