

# Policy development in malaria vector management in Mozambique, South Africa and Zimbabwe

Julie Cliff,<sup>1\*</sup> Simon Lewin,<sup>2,3</sup> Godfrey Woelk,<sup>4</sup> Benedita Fernandes,<sup>5</sup> Alda Mariano,<sup>6</sup> Esperança Sevene,<sup>6</sup> Karen Daniels,<sup>2</sup> Sheillah Matinhure,<sup>4</sup> Andrew Oxman<sup>7</sup> and John Lavis<sup>8</sup>

<sup>1</sup>Department of Community Health, Faculty of Medicine, Eduardo Mondlane University, Maputo, Mozambique, <sup>2</sup>Health Systems Research Unit, Medical Research Council of South Africa, Tygerberg, South Africa, <sup>3</sup>Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, London, United Kingdom, <sup>4</sup>Department of Community Medicine, University of Zimbabwe, Avondale, Harare, Zimbabwe, <sup>5</sup>National Institute of Health, Ministry of Health, Maputo, Mozambique, <sup>6</sup>Department of Pharmacology, Faculty of Medicine, Eduardo Mondlane University, Maputo, Mozambique, <sup>7</sup>Norwegian Knowledge Centre for Health Services, St Olavs Plass, Oslo, Norway and <sup>8</sup>Department of Clinical Epidemiology and Biostatistics and Department of Political Science, McMaster University, Hamilton, Ontario, Canada.

\*Corresponding author. Department of Community Health, Faculty of Medicine, Eduardo Mondlane University, CP 257, Maputo, Mozambique. Tel: +258 82 3215640. Fax: +258 21 325255. E-mail: [julie.cliff@gmail.com](mailto:julie.cliff@gmail.com)

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**Introduction** Indoor residual spraying (IRS) and insecticide-treated nets (ITNs), two principal malaria control strategies, are similar in cost and efficacy. We aimed to describe recent policy development regarding their use in Mozambique, South Africa and Zimbabwe.

**Methods** Using a qualitative case study methodology, we undertook semi-structured interviews of key informants from May 2004 to March 2005, carried out document reviews and developed timelines of key events. We used an analytical framework that distinguished three broad categories: interests, ideas and events.

**Results** A disparate mix of interests and ideas slowed the uptake of ITNs in Mozambique and Zimbabwe and prevented uptake in South Africa. Most respondents strongly favoured one strategy over the other. In all three countries, national policy makers favoured IRS, and only in Mozambique did national researchers support ITNs. Outside interests in favour of IRS included manufacturers who supplied the insecticides and groups opposing environmental regulation. International research networks, multilateral organizations, bilateral donors and international NGOs supported ITNs. Research evidence, local conditions, logistic feasibility, past experience, reaction to outside ideas, community acceptability, the role of government and NGOs, and harm from insecticides used in spraying influenced the choice of strategy. The end of apartheid permitted a strongly pro-IRS South Africa to influence the region, and in Mozambique and Zimbabwe, floods provided conditions conducive to ITN distribution.

**Conclusions** Both IRS and ITNs have a place in integrated malaria vector management, but pro-IRS interests and ideas slowed or prevented the uptake of ITNs. Policy makers needed more than evidence from trials to change from the time-honoured IRS strategy that they perceived was working. Those intending to promote new policies such as ITNs should examine the interests and ideas motivating key stakeholders and their own institutions, and identify where shifts in thinking or coalitions among the like-minded may be possible.

**Keywords** Malaria vector management, indoor residual spraying, insecticide-treated nets, policy

#### KEY MESSAGES

- Pro-IRS interests and ideas slowed or stopped the uptake of ITNs for malaria prevention in Mozambique, South Africa and Zimbabwe.
- Policy makers needed more than evidence from trials to change from the time-honoured IRS strategy that they perceived was working.

## Introduction

Malaria remains a major cause of disease and death in Africa, with an estimated 801 000 deaths (with a wide uncertainty interval) in 2006 (WHO 2008). Currently, the two principal strategies recommended for vector management are indoor spraying of houses with residual insecticides (IRS) and insecticide-treated bed nets (ITNs) (Morel *et al.* 2005). Lengeler and Sharp (2003), in a review of evidence from trials, concluded that both interventions are effective across a large range of settings and that costs are similar. A comparison by Curtis and Mnzava (2000) had previously concluded that ITNs were at least as efficacious as IRS.

Indoor house spraying began in South Africa in 1931, using short-acting pyrethrum. The residual insecticide bis (4-chlorophenyl)-1,1,1-trichloroethane (DDT) became available in the 1940s, and IRS quickly became the favoured malaria control strategy (Mabaso *et al.* 2004). In the 1950s and 1960s, IRS with DDT was the principal measure used in the attempt to eradicate malaria (Packard 1998). Eradication was not attempted in most of sub-Saharan Africa, but the World Health Organization (WHO) did support the use of IRS in southern Africa. In this region, the epidemiology of malaria was different from other parts of the continent and health infrastructure was more developed (Alilio *et al.* 2004).

Bed nets were first recommended for malaria prevention in 1910 by Ronald Ross. Later, World War II saw the development of insecticide treatment of mosquito netting by the military (Mabaso *et al.* 2004). Much later, in the 1980s and 1990s randomized controlled trials (RCTs) confirmed that ITNs were effective in reducing morbidity and mortality from malaria (Lengeler 1998; Lengeler 2004).

In 1998, WHO initiated the Roll Back Malaria (RBM) partnership with the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP) and the World Bank, thus establishing malaria control as a high priority. The RBM Strategic Framework recommended large-scale distribution of ITNs, with subsidies for vulnerable groups such as pregnant women and children under 5 years of age, and commercial markets providing ITNs at the lowest possible price for others (WHO 2002). Meeting in Abuja in 2000, African heads of government pledged to attain 60% coverage of high-risk groups with ITNs by the year 2005.

In southern Africa, IRS continued as the main vector control strategy, although implementation varied depending on local capacity. Acceptance of ITNs by national policy makers was

slow. In this article, we explore the factors driving decision making for malaria vector control policy in three southern African countries: Mozambique, South Africa and Zimbabwe. We look in depth at the factors that influenced decisions to use IRS and ITNs, and attempt to answer the question of why one policy was favoured over another and the resulting implications for malaria control in the region and more widely.

## Methods

We selected the three countries for study as each has differing malaria burdens, malaria transmission patterns and vector management strategies (Table 1). As a regional group, the countries have influenced each other's policies and have shared skills and expertise across their borders. The research team consisted of four researchers in Mozambique, and two each in South Africa and Zimbabwe. The study took place between May 2004 and March 2005, using a qualitative case-study approach (Hammersley 1992). We present findings regarding the factors influencing policy development up to March 2005, when the study ended.

### Data collection

We used two data collection methods: key informant interviews and document reviews. In addition, we constructed timelines of key events, drawing on these data. Combining these methods facilitated triangulation of data (Denzin 1989).

We selected the key informants on the basis of their knowledge of or influence on policy making in malaria vector control in the three countries. Table 2 shows the categories of national respondents. In addition we interviewed three international experts with substantial knowledge of country policies. For sampling, we used both purposive and snowballing approaches (Green and Thorogood 2004). Recruitment was stopped once we felt we had reached data saturation. Using an iterative approach, we explored themes and issues emerging from early interviews further in later interviews. We also attempted to further explore where respondents' opinions diverged.

The team developed an interview guide to explore the factors influencing policy making, focusing on the use of IRS and ITNs. In Mozambique, this guide was translated into Portuguese and we conducted most interviews in this language. English was used for the interviews in South Africa and Zimbabwe. Each interview was audio recorded and later transcribed in its

**Table 1** Malaria epidemiology and vector management strategy in the study countries in 2004

<b>Epidemiology and vector management strategy</b>	<b>Mozambique</b>	<b>South Africa</b>	<b>Zimbabwe</b>
Estimated annual malaria deaths, 2006 (WHO 2008)	19211	146	1342
Malaria transmission	Year-round and stable in the whole country, with a peak following the rainy season. Some epidemic-prone areas.	Seasonal in small areas in three provinces near the Mozambique and Swaziland borders. Large malaria-free areas.	Year round or seasonal, depending on the area. Some malaria-free areas.
National strategy	IRS in cities and rural areas with economic potential. ITNs in other rural areas, typically distributed by NGOs.	IRS only, in transmission areas. ITNs as a preventive measure at an individual level.	IRS and ITNs (typically distributed by NGOs) in transmission areas.

**Table 2** Categories of respondent

<b>Position</b>	<b>Mozambique</b>	<b>South Africa</b>	<b>Zimbabwe</b>
Government official	4	8	4
Researcher	7	6	2
International/bilateral agency	5	1	4
NGO	3	2	0

original language. From the Mozambican data, select interviews and passages from interviews were translated into English to facilitate analysis and reporting across the three countries.

For the document reviews, we sought out copies of all contemporary documents on malaria vector management policy in each country, often with the help of our key informants. These included formal policy documents, other official documents and relevant published and unpublished literature.

The timelines of key events were initially drafted based on the documents we had available and on our knowledge of each policy context. Each timeline was then refined using information gained from the document review and interviews. We further corroborated dates and events through internet-based research and consultation with colleagues outside of the key informant list, but who were otherwise familiar with the events.

### Analysis

We began our analysis with the data generated from the key informant interviews, reading and annotating each transcript to identify preliminary themes. These themes reflected issues arising from all three data sources. We then held a joint workshop where we discussed broad themes emerging across the country data from all three sources, thus devising a preliminary coding scheme to guide the further thematic analysis. These steps were taken to harmonize the analysis process and to facilitate the later cross-country analysis.

For further analysis, we modified the political science framework used by Lavis *et al.* (2002), distinguishing three broad categories which influence policy making: interests, ideas and events. The framework was a useful tool for exploring and understanding the range of factors influencing the decisions to use IRS and ITNs. Data extracts were identified on the basis of

being representative and/or interesting illustrations of the key factors influencing these decisions.

Ethics permission was granted by the Comité Nacional de Bioética para a Saúde in Mozambique, the Medical Research Council of South Africa, the Medical Research Council of Zimbabwe and the Ethics Committees of the London School of Hygiene and Tropical Medicine and the WHO. Free and informed consent was obtained from all respondents following a verbal explanation and provision of an information sheet.

## Results

### Malaria vector management policies

All three countries had used IRS as their principal vector control strategy since the 1940s, as shown in Table 3. Both Mozambique and Zimbabwe had recently introduced ITNs, but South Africa had not. Table 1 shows the individual country strategies. In addition, a regional initiative, the Lubombo Spatial Development Initiative, led by the governments of Mozambique, South Africa and Swaziland, exclusively used IRS. At the time of the study, this initiative operated in the border regions of these three countries (Sharp *et al.* 2007). In 2003, the Global Fund to fight AIDS, Tuberculosis and Malaria had approved a grant of US\$32 million for the initiative.

In both Mozambique and Zimbabwe, ITNs were principally distributed by non-governmental organizations (NGOs), with pregnant women and children under 5 years of age entitled to highly subsidized prices. Others were expected to purchase nets from the private sector at slightly subsidized prices, except in emergencies when nets were provided free to affected households.

### The role of domestic interests in shaping malaria control policies

In all three countries, policy making was led by malaria control programme managers located in Ministries of Health. These managers, who mostly favoured IRS and showed reluctance to introduce ITNs, had significant discretionary authority in decision making. The influence of advisory expert groups and national research institutes and researchers varied between countries.

In Mozambique, policy making was firmly in the hands of senior malaria programme managers in the Ministry of Health

**Table 3** Key events influencing malaria vector management policy in the study countries

Year	Key events	Vector management policy	
		Mozambique	Zimbabwe
1931–4			South Africa First testing of indoor spraying with short-lived pyrethrum.
1945–9		IRS begins in capital city. Later expanded to surrounding areas and other selected urban and rural areas (Schwalbach and de la Maza 1985).	Large-scale programme using IRS launched. Pilot project using IRS launched, followed by Malaria Control Programme.
1955	WHO Global Programme for the Eradication of Malaria (based on IRS) launched.		
1951–60		IRS expanded in southern Mozambique as part of malaria eradication experiment.	Large-scale IRS launched.
Late 1950s	Harmful environmental effects of DDT documented.		
1969	Goal of malaria eradication abandoned by WHO.		
1972		Large-scale IRS abandoned after failing to reach target. IRS halted.	
1975	Independence achieved in Mozambique.		
1976–9	Liberation war intensifies in Zimbabwe. Malaria epidemic occurs in previously sprayed areas in Maputo province, Mozambique.	IRS undertaken in limited areas.	DDT use in agriculture banned. IRS disrupted.
1980	Independence achieved in Zimbabwe.		
1981–2	South Africa begins war against Mozambique.	IRS disrupted.	IRS resumes country-wide.
1989	Cold war ends.		
1990	Apartheid in South Africa ends.		
1991	Successful ITN trial in the Gambia published (Alonso and Lindsay 1991).		
1992	WHO Global Malaria Control Strategy endorsed by Ministerial Conference on Malaria in Amsterdam. War ends in Mozambique.		
1994	Regime change in South Africa. Economic Structural Adjustment Programme (ESAP) initiated in Zimbabwe.	IRS begins again in selected suburban areas of most provincial capitals. Malaria Advisory Group formed by the Department of Health.	Blanket spraying ends as a number of areas declared malaria free.

(Continued)

Table 3 Continued

Year	Key events	Vector management policy	
		Mozambique	Zimbabwe
1995			Discussions in Malaria Advisory Group on use of ITNs. Not adopted.
1996		ITN pilot project begins in Boane.	IRS in South Africa switched from DDT to pyrethroid (deltamethrin) in staged fashion.
1998	RBM partnership formed, recommending ITNs. Cochrane Review concludes that ITNs are effective in reducing mortality (Lengeler 1998). Malaria epidemic in South Africa, later shown to be associated with pyrethroid resistance of <i>Anopheles funestus</i> vector.	Targets set for ITN introduction. IRS continues in urban areas.	
2000	Abuja Declaration by African Heads of State. Floods and cyclones occur in Mozambique and Zimbabwe. 'Fast track' land reform initiated in Zimbabwe, followed by capital flight and rapid economic decline.	Widespread ITN distribution in flooded areas. Scattered ITN programmes begun by NGOs and promoted by UNICEF. LSDI begins, using IRS, in southern Mozambique.	International negotiating committee meetings on POPS Convention. South Africa representatives take lead on DDT exemption for vector control in public health. IRS with DDT re-introduced in traditional houses.
2002	GFATM makes funds available for malaria control.	Successful GFATM application for malaria control activities, including IRS in 10 districts.	Rapid ITN distribution in flooded and cyclone-hit areas by NGOs, highlighting the need for a policy.
2004	Increased advocacy for free nets. POPS Convention banning DDT use except for limited public health purposes comes into effect.	ITN use expands, with substantial donor funding.	ITN policy launched; standardizes NGO practice, distribution and pricing/cost recovery for sustainability.

Notes: GFATM = Global Fund to fight AIDS, Tuberculosis and Malaria; LSDI = Lubombo Spatial Development Initiative; POPS = Persistent Organic Pollutants.

**Table 4** Outside interests in policy development for malaria vector management

Interest group	Nature of interest in policy decisions
International research networks	Calling for action based on the findings of RCTs on ITNs.
Regional policy networks	Promoting IRS—an intervention familiar to local policy makers—rather than ITNs.
Multilateral agencies, bilateral donors, international NGOs	Promoting a new strategy—the use of ITNs—that had been shown to work in RCTs and which also provided a role for NGOs.
Manufacturers of insecticides other than DDT for IRS	Promoting IRS as an intervention that used their products rather than ITNs which did not.
Net manufacturers	Promoting their product (ITNs).
Environmentalists	Expressing concerns regarding insecticide use in IRS, particularly the use of DDT.
Neoconservative anti-environmentalists	Criticizing environmentalists and government regulation for their perceived position regarding IRS with DDT.

(MoH). Respondents from outside the Ministry argued that the MoH policy makers preferred IRS, and were prepared to devote considerable state resources to the intervention. At the same time, they failed to approve an ITN implementation policy, despite donor pressure, and handed ITN distribution over to NGOs. The MoH itself acknowledged that weak government participation in net distribution had led to weak coordination and direction of the ITN programme (Ministry of Health 2002).

Although a younger generation of researchers favoured ITNs, they had little influence on decisions about which intervention to use:

*“Within the MoH, the older experts are very much in favour of spraying and the younger ones like spraying, but they would also like to see other methods of control used.”* (Researcher, Mozambique)

Researchers were, however, able to influence policy on net pricing by producing research evidence (Dgedge 2000; Brentlinger *et al.* 2007). In South Africa, there was much greater reliance on the Malaria Advisory Group, a body set up by the National Department of Health:

*“We felt that we needed to bring and call on expertise from the country to advise us on policy—and that’s the main reason why the decision was taken to put an advisory group together.”* (Government official, South Africa)

The Malaria Advisory Group discussed ITNs and research was commissioned on their effectiveness, in comparison with IRS (Mnzava *et al.* 1999). Attempts were made later to introduce an ITN programme on a very small scale, but consideration of ITNs was overshadowed by the spraying programme:

*“In this huge focus on running the spray programme, in fact, we gave very little attention to bed nets.”* (Government official, South Africa)

In Zimbabwe, relationships were close between the Ministry of Health and Child Welfare (MoHCW) and the national research institute, whose representative chaired the Ministry Vector Control Committee. Both groups were pro-IRS.

Many respondents spoke of the strong influence of politicians. In South Africa, politicians saw benefits to tourism and the economy from malaria control. In particular, the Lubombo

Spatial Development Initiative had strong support at the highest levels of government in Mozambique and South Africa:

*“We have political personalities who realize the importance of it. Then we have things like the Lubombo Spatial Development Initiative that says, we have to have malaria control to realize our economic development goals in those areas in terms of tourism.”* (Researcher, South Africa)

### The role of outside interests in shaping malaria control policies

Many outside interests jostled for influence on government policy, as summarized in Table 4.

#### International research networks

Researchers in Mozambique appeared to be more integrated into international research networks than those in South Africa and Zimbabwe. This may have been because the malaria burden in Mozambique is higher and political isolation had ended earlier. In addition, Mozambique had a greater shortage of personnel and was therefore more open to external technical assistance. From the mid-1980s, many Mozambicans trained at leading international malaria research centres, such as the London School of Hygiene and Tropical Medicine, and collaborations developed from these contacts. Integration into international networks was further strengthened when the University of Barcelona opened a field research centre in Mozambique. These networks were at the forefront of research on ITNs, and contact with them influenced a generation of Mozambican researchers in their favour.

Following the 1994 regime change that ended their isolation, South African researchers became more involved in international research and policy networks. Our respondents indicated that they were not influenced at this time to adopt ITNs. They did, however, lobby widely against a complete ban on DDT during the international Persistent Organic Pollutants (POPs) Convention negotiations so as to ensure that DDT could continue to be used for vector control purposes (*British Medical Journal* 2000).

#### Regional policy networks

With the end of apartheid in South Africa, the regional networks of researchers and policy makers, which had fallen into abeyance after Mozambican and Zimbabwean

independence, rapidly reformed. The South African Medical Research Council played a key role in forming a Regional Malaria Control Commission, composed of researchers, programme managers and policy makers who were mostly strongly pro-IRS. The South African representatives came from the Medical Research Council, the University of Cape Town and provincial malaria control programmes. The Mozambican representatives were all from government institutions. The Lubombo Spatial Development Initiative came out of the meetings of this group. Zimbabwe was not part of this initiative, but its policy makers and researchers had close links with the South Africans, in part because some South African policy makers had trained at the Blair Institute in Harare.

The South African malariologists were wedded strongly to IRS, and pushed for it in the region. Some respondents argued that their influence set back ITN uptake in Mozambique:

*“The South African influence has probably saved many lives by having helped people to introduce IRS in some areas, as well as in Mozambique where otherwise maybe nothing would have been done. But I think the South African influence has been one of the factors constraining the development of a solid ITN programme and policy in Mozambique.”* (International expert)

#### **Multilateral agencies and bilateral donors**

Following the lead of the RBM Partnership, multilateral agencies and bilateral donors promoted ITNs and influenced their adoption in Mozambique, a heavily donor-dependent country. To some extent, this was also the case in Zimbabwe. South Africa was able to make independent decisions, as it could fully fund its malaria control programme.

UNICEF, a RBM partner, was a strong advocate of ITNs. In Mozambique, the agency sourced funding for ITNs, which enabled it to influence the government to accept ITN distribution by NGOs.

WHO's influence was complicated by an apparent difference of opinion between its Geneva headquarters, which promoted ITNs, and its inter-country office for southern Africa in Harare, which was more sympathetic to IRS and advocated strongly for DDT (WHO-SAMC, undated). The pro-IRS position was shared by the WHO focal official for vector control in Zimbabwe.

This pro-IRS position fitted with the sentiments of local policy makers, while the Geneva position clashed:

*“A lot of documents put up by WHO-Geneva have had to be altered because people in southern Africa have considered that they haven't included their major vector control measure.”* (Government official, Mozambique)

The RBM Strategic Framework for scaling up ITNs did, however, influence implementation in Mozambique, as it formed the basis of the MoH strategic plan. The UK Department for International Development also used the Strategic Framework as a basis for designing a major ITN project (budgeted at £8 million over 5 years from January 2004) in Mozambique.

The Japanese bilateral development agency, JICA, promoted ITNs and financed ITN programmes in both Mozambique and Zimbabwe, due partly to an interest in promoting a technology developed by the Japanese firm Sumitomo. This firm had developed ITNs impregnated with long lasting insecticides and later transferred the technology to an African manufacturer (UNICEF 2003).

#### **International NGOs**

International NGOs were in favour of ITNs. They took the view that ITN distribution was an intervention that they could feasibly carry out, while IRS was not:

*“Bed nets are...more along the lines of what [this NGO] does anyway. We'd be less likely to be exposed to IRS programmes, because we don't really have an advantage in helping the Ministry to do that.”* (NGO official, Mozambique)

#### **Insecticide and net manufacturers**

The manufacturers of insecticides used in spraying and net manufacturers lobbied for their respective products, and insecticide manufacturers supported trials of insecticides for IRS in Mozambique (Franco 1994; Martinenko *et al.* 1995). In Zimbabwe, a representative of an insecticide manufacturer supplying products for IRS was a member of the Vector Control Committee.

#### **Lobby groups**

Lobby groups were most active around the use of DDT and those who were pro-DDT also tended to be pro-IRS. Several groups aligned to neoconservative agendas on environmental control took up the cause of DDT for malaria control (Pesticide Action Network, undated), in opposition to environmental groups such as the International POPS Elimination Network, which had supported the ban on the pesticide. Many environmental groups did, however, support the use of DDT (with strict monitoring) for malaria control.

#### **The role of ideas in shaping malaria control policies**

All respondents defended the position that the choice between IRS and ITNs depended on factors such as local epidemiology and cultural acceptability, and none said explicitly that they favoured one intervention above the other. But in the course of the interviews, strong positions often emerged, and the respondents generally fell neatly into two camps, pro-IRS and pro-ITNs. As one respondent stated when referring to a colleague: “He is a nets man”.

Although they often admitted that the other intervention was also effective, members of each camp tended to be more positive about its own favoured intervention, and to make disparaging comments about the other.

*“So there are more controversies maybe with insecticide-treated nets and less with IRS. So with insecticide-treated nets, where do you put them, whom do you protect? How do you know that they are being used, for example, how do you exactly target the under fives? So those against nets have asked all those questions and from a programme point of view.”* (International/bilateral agency official, Zimbabwe)

**Table 5** Reasons given for attitudes to IRS and ITNs

Reason	Attitude to each intervention			
	Pro-IRS respondents (all three countries)		Pro-ITN respondents (Mozambique only)	
	IRS	ITNs	ITNs	IRS
Research evidence	Cited history and surveillance data		Cited trials	
Local conditions	Suit IRS	Reason for not taking up ITN trial results		Reason for not using IRS in tropical Mozambique
Logistic feasibility		Needs developed health system and excellent logistics		Difficult in rural areas
Past experience	Weighed heavily	Little experience of ITN use		
Reaction to ideas from outside the country	Defensiveness regarding DDT use (South Africa)	Lack of ownership (Mozambique and Zimbabwe)	Engagement with international debates on ITNs	Concerns about regional pressure for IRS
Community acceptability	Admitted problems (South Africa)	Culturally unacceptable	Admitted problems	Invasion of privacy. Irritative effect of DDT on other biting insects
Role of government and NGOs	Public health intervention controlled by government	Individual intervention, often implemented by NGOs	Role for NGOs	Appeals to those who favour government control
Harm from insecticides				Danger of insecticides, particularly if fall into wrong hands

The arguments used by respondents to support their positions regarding each intervention are summarized in Table 5 and each is discussed in more detail below.

**Research evidence**

We found that use and interpretation of research evidence were conditioned by attitudes towards IRS and ITNs. IRS proponents were more likely to cite the evidence from history and surveillance data:

*“Historical evidence—there was plenty...50 years of spraying in South Africa and in Zimbabwe with large areas free from malaria that previously had been malarious areas.”* (Researcher, Mozambique)

In contrast, many proponents of ITNs cited evidence from RCTs. In South Africa, researchers did not feel ownership of ITNs, as they had not been involved in producing the evidence from trials. The trial comparing IRS and ITNs (which showed similar results for both interventions) had been started (Goodman *et al.* 2001), but was stopped early owing to a malaria epidemic that was seen to demand immediate intervention. In Mozambique, the involvement of researchers in the production of evidence around ITN pricing helped create a sense of local ownership (Dgedge 2000; Brentlinger *et al.* 2007).

**Local conditions**

Many pro-IRS respondents referred to the importance of local results and conditions in influencing their decision not to take up ITNs, despite the trial results:

*“I mean, so many ITN trials in Africa, and here we’re doing something with DDT and seeing very dramatic results. So I think*

*that was one of the main things that swung it.”* (Government official, South Africa)

In arguing for the use of IRS in the Lubombo Spatial Development Initiative, one respondent stated:

*“The same ecological zone, the same seasonality, same climate systems in all the southern areas. So really a contiguous area and no reason to think it wouldn’t work.”* (Researcher, Mozambique)

The same respondent expressed doubt about using IRS on a wide scale in northern Mozambique, and pro-ITN respondents argued that the South African experience with IRS could not be applied to parts of Mozambique with more stable transmission.

**Logistic feasibility**

Most respondents considered logistic feasibility to be crucially important. Each camp recognized the logistic difficulties of its preferred intervention, but tended to emphasize more the difficulties of the other. Pro-IRS respondents pointed out that successful trials under ideal conditions did not necessarily translate into successful scaling up of an intervention.

*“But now once it gets beyond the trial stage and run by local management, the nets deteriorate and are not replaced.”* (Government official, South Africa)

*“Also after 5 years of investment in the Gambia (teams, money, very high cost), when they left it [the ITN programme] all fell apart.”* (Government official, Mozambique)

In Mozambique, the pro-ITN camp argued that logistic difficulties limited the use of IRS which, they argued, required highly organized teams for appropriate implementation. They



suggested that ITNs were the only alternative for rural areas which spraying teams could not reach.

### **Past experience**

In all three countries, past experience weighed heavily in the preference for IRS, the tried and tested strategy in the region. Respondents in South Africa noted that nets were not seen as having a 'tradition' in the country and that policy makers were also wary of change:

*"These [approaches to malaria control] are working, so unless really good evidence comes up on the contrary, we're going to do what we're doing."* (Researcher, South Africa)

### **Reactions to ideas from outside the study countries**

Respondents raised concerns about the imposition of ideas from outside. In South Africa, this was compounded by defensiveness regarding the use of DDT. In Mozambique and Zimbabwe, respondents had experienced constantly changing donor 'fashions', which meant that they viewed with scepticism new ideas promoted by donors. From this perspective, ITNs appeared to be just another donor fad and the result was a lack of ownership by these governments. But at the same time, the ITN programmes were accepted because of donor dependence.

*"Insecticide treated nets are a recent introduction. . . Nets, to begin with, I think were an outside sort of influence and they took their time to gain ground in Zimbabwe."* (International/bilateral agency official, Zimbabwe)

This feeling that ITN policies had been imposed was sometimes expressed strongly:

*"The tension is brought about by the feeling of people in southern Africa that things are being imposed on them and that the people in Geneva have very little practical experience in running malaria control programmes and understanding the situation in southern Africa."* (Government official, Mozambique)

In Mozambique, some respondents expressed concern regarding South African pressure to use IRS with DDT.

### **Community acceptability**

Community acceptability loomed large in the arguments, with both camps speaking of the difficulty in gaining community acceptance of their own favoured policy, but tending to emphasize more the difficulty with the other.

In Mozambique, IRS had run into difficulties:

*"People need to believe in the spraying teams, because they come into the house to 'paint' it with a product that people don't know. . . People thought that we were part of the secret police and that we were investigating what they had inside their houses."* (Researcher, Mozambique)

Similar concerns were voiced in South Africa, where both research and routine programme monitoring had highlighted community dissatisfaction with DDT because it left a residue on

house walls and stimulated nuisance insects such as bedbugs (Mnzava *et al.* 1998).

*"Another concern was that DDT doesn't kill bedbugs. In fact, it stimulates them so that they feed more and they lay more eggs. So the spraying of DDT is generally followed by an outbreak of bedbugs. So it's not popular in the community. As soon as it's sprayed we have people just replastering over it because it is preferable to have the mosquitoes than the bedbugs. . . So the community doesn't like it. And anything that the community doesn't like will not work."* (Government official, South Africa)

These concerns regarding DDT had led to a switch to pyrethroids, but when pyrethroid resistance was established and a malaria outbreak occurred, the government switched back to DDT. ITNs were not considered as an option.

Pro-ITN respondents readily admitted the problems with the new intervention:

*"We have the answers on whether nets work, but we don't know whether people will accept them and why they won't. And what measures need to be taken for acceptance."* (Researcher, Mozambique)

They also spoke of cost. With the policy of commercial distribution, albeit at subsidized prices, householders had to not only accept nets, but also to pay for them. Even subsidized prices of between US\$2.50 for a rectangular net and US\$4.00 for a conical one had proved too expensive for the poorest households (Brentlinger *et al.* 2007).

Pro-IRS respondents in Zimbabwe reported that users felt that nets interfered with air circulation. In Mozambique, one respondent considered that sleeping habits might also negatively influence the uptake of nets:

*"As an example. . . nets in Tete are a failure because people don't sleep inside. They sleep outside because it is so hot."* (Government official, Mozambique)

### **The role of government**

Attitudes to the role of the public and private sectors permeated the interviews. Many respondents considered that the pro-IRS government camp favoured the intervention because it gave the public sector a prominent role. Government carried out spraying and could therefore control it, in contrast to ITNs, which depended more on NGOs and community participation.

*"As I've said, spraying is driven by governments and I don't see many government programmes handing out bed nets for everyone to sleep under a bed net."* (Government official, Mozambique)  
*"Bed nets are still considered to be useful for individual personal protection rather than disease control."* (Government official, South Africa)

In Mozambique, differing positions around the role of government were also reflected in opinions around distribution and pricing policies, which initially held up development of an ITN policy. In Zimbabwe, the government became concerned about its lack of control over ITN pricing and distribution, and

therefore developed a policy which specifically sought to regulate the activities of NGOs.

Some NGOs and bilaterals were keen to build the role of the private sector:

*“The private sector has a big role to play. Demand-creation has a big role to play and NGOs such as ourselves should be engaged further in those objectives.”* (NGO official, Mozambique)

### **Harm from insecticides**

Ideas around harm to the environment and individuals from using insecticides, particularly DDT, were important in shaping attitudes. Respondents from the pro-ITN group spoke of the danger of insecticides used in spraying, particularly if they fell into the wrong hands. The neoconservative groups who lobbied for IRS with DDT (Pesticide Action Network, undated) disliked government regulation, in this case regarding environmental protection. Taking up the cause of DDT for malaria control gave them a means to criticize environmentalists who had supported the ban on DDT.

### **The role of events in shaping malaria control policies**

Decisions regarding malaria control policy were highly influenced by local, regional and international events. Table 3 shows the key events that influenced policy.

In Mozambique and Zimbabwe, a major local event that influenced the implementation of ITNs was the severe floods of 2000. It was relatively easy to add ITN distribution to the emergency relief operation, and thus the logistic issue was resolved. Funding was also available, and UNICEF seized the opportunity to distribute ITNs on a large scale. Although these were temporary measures and there was no immediate change in policy, in both countries they contributed to the acceptance of ITNs as a control measure.

In Zimbabwe, economic decline influenced IRS implementation policy, first limiting IRS to priority areas, and then influencing a switch back to DDT.

Regionally, the end of apartheid in South Africa and the subsequent election of a majority government in 1994 led to increased regional contacts, with a strongly pro-IRS South Africa influencing the region.

Changes in international policies (Table 3) also influenced national policies. Increasing international interest in malaria control and shifts in donor policies in the 1990s were particularly influential in the uptake of ITNs in Mozambique and Zimbabwe. In the 2000s, funding for malaria control increased rapidly, both from bilateral donors, who supported ITNs, and from new multilateral initiatives, such as the Global Fund to fight AIDS, Tuberculosis and Malaria (Alilio *et al.* 2004).

## **Discussion**

The main strength of this study lay in its comparison of policy development across three countries in southern Africa: Mozambique, South Africa and Zimbabwe. The study had several limitations. The short time period (less than a year in 2004–05) meant that we could not show the evolution of vector

control policy over several years. The interviews were limited by the absence of NGOs in Zimbabwe and insecticide manufacturers, and the scale and costs of all interventions described were not included.

Our results showed that local policy makers were reluctant to embrace the new malaria control strategy of ITNs, as they trusted IRS, the time-honoured strategy that they knew, from experience, to be effective. A review by Noor *et al.* (2009) of ITN use in Africa for the period 2000–07 showed that in all three countries ITN use continued to be low in children under 5 years: 7% in Mozambique in 2007, <5% in at-risk provinces in South Africa and 3% in Zimbabwe in 2005–06. Overall, for children living in stable malaria endemic conditions in Africa, ITN use improved from 1.8% in 2000 to 18.5% in 2007.

The position of local policy makers put them at odds with interests who promoted ITNs, such as the international research networks, the multilateral agencies and bilateral donors and international NGOs. As Bradley (1998) noted, heated debates and contested views regarding the options for malaria control go back to the beginning of the 20th century. Beginning with arguments about mosquito control versus other methods and continuing through the debates around eradication feasibility mid-century (Dobson *et al.* 2000), the history of malaria control has been littered with ‘dichotomous pairs of concepts’. Emotions have been carried over from one argument to another, as the successive pairs are similar. Our findings show another carryover, this time to IRS and ITNs. Policy makers in southern Africa lined up again on the side of IRS, as they had previously on the side of eradication (Dionne 2007).

Arguments were particularly strong around the local applicability of ITNs, with IRS proponents reluctant to accept findings from ITN trials. Such caution appears justified for southern Africa, where the conditions of malaria transmission are different from those in the settings where the ITN trials were conducted. Also, scaling up of trial results of preventive interventions depends on the feasibility and cost-effectiveness of delivery in local conditions. Respondents could argue that this had not yet been proved for ITNs.

ITN proponents also used the ‘local’ argument against IRS, contending that the southern African experience with IRS was not necessarily applicable to tropical Africa, in a continuation of the debates around eradication 50 years previously (Dobson *et al.* 2000). In our interviews, IRS proponents were cautious regarding the applicability of IRS in more tropical rural areas. However, the late Brian Sharp and Mozambique malaria programme managers, when reporting on the success of IRS in southern Mozambique, stated that there were no obvious circumstances that prevented IRS being replicated elsewhere (Conteh *et al.* 2004). A review of trial evidence by Lengeler and Sharp (2003) had previously reached a similar conclusion.

As they had been in the debates around eradication, southern African malariologists were again active participants and not passive actors in international debates. The ‘huge local pride’ in southern Africa at the success of IRS was also noted in a *Lancet* World Report, which spoke of the frustration with WHO and powerful donors, who favoured ITNs (Kapp 2004). Ultimately, the southern African example and successful lobbying led WHO to renew its emphasis on IRS with DDT for malaria control (WHO 2006).

In Mozambique there was also contestation around net pricing. Local research later contributed to a policy change to free distribution to target groups (Brentlinger *et al.* 2007). A movement for free nets had also been building internationally (Curtis *et al.* 2003) and in 2007, WHO recommended that net distribution should be free or highly subsidized (WHO 2007).

The arguments over policy in southern Africa were thus reflected on the wider stage, with country policies becoming accepted internationally: a return to IRS with DDT, and distribution of free nets.

## Conclusions

Our results suggest that, for new policies to be successfully introduced, local ownership is vital. In this case, exclusion of southern Africa from the development of the evidence base for ITNs resulted in a reluctance to accept the intervention. Policy makers need more than evidence from RCTs to convince them to change policies that they consider to work in their situation and that they have used successfully for many years. A new intervention that requires creating a new infrastructure and complex logistics will not be accepted unless the benefits appear overwhelming. Government policy makers may also be reluctant to embrace an intervention that they do not control; in this case, ITN distribution by NGOs.

Steering between camps and avoiding taking sides is fundamental to evidence-based policy making. Those intending to promote new policies such as ITNs should examine the interests and ideas motivating key stakeholders and their own institutions, and identify where shifts in thinking or coalitions among the like-minded may be possible.

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