

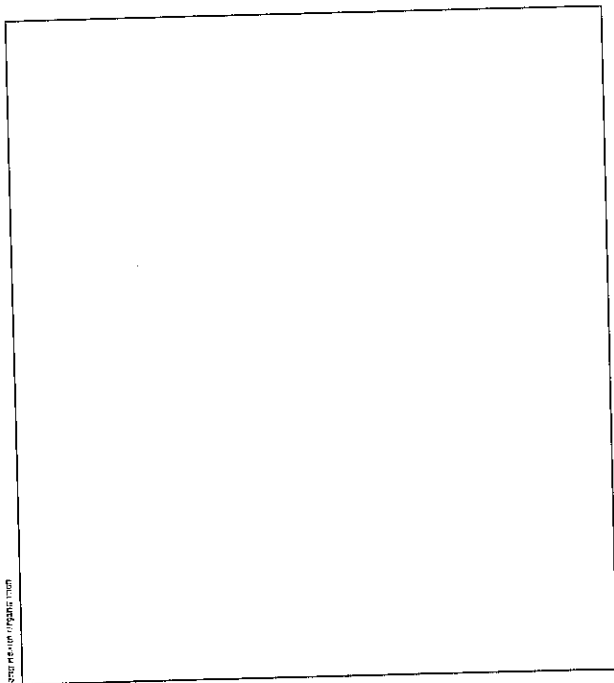


Over 34 million people are protected from the disease. Children born since 1975 no longer face the risk of blindness, and the disease has been halted in older persons. The program is now entering a five-year phase-out period (1998-2002), after which lasting control of the disease throughout the extended program area is expected.

A cost-benefit analysis using conservative assumptions, and with the benefit of additional agricultural output due to labor and land made available through onchocerciasis control, concluded that the OCP is a highly productive program. The economic rate of return of the OCP is about 20 percent, one of the better economic returns among World Bank projects in any sector over the years. OCP officers consider their project to be a model of global partnership where donors, international agencies, and participating countries unite to make the most of the comparative advantages of each. The success of the OCP also underlines the advantages of attacking disease problems regionally.

Ecological Malaria Control in Kheda District, Gujarat, India⁸

Using larvae-eating fish such as *Gambusia* is one non-chemical method of managing malaria vectors.



VECTOR CONTROL

India's National Malaria Eradication Programme has long depended on house spraying with DDT, HCH, and malathion for vector control. The resulting widespread insecticide resistance, environmental pollution, and citizen refusal of house spraying are ongoing problems. From 1983-1989, however, the Malaria Research Centre, an autonomous research organization under the Indian Council of Medical Research,

implemented an Integrated Disease Vector Control (IDVC) pilot project in Kheda District, Gujarat, which enlisted community participation for implementing an integrated, ecological malaria control strategy that eliminated insecticide use altogether.

Kheda District is rural and dominated by irrigated agriculture, with no conservation areas. Irrigation canals and channels are the most important breeding sites of the main malaria vector. The IDVC project protected up to 700,000 people living in Nadiad subdivision, which had the highest malaria incidence in Gujarat State. It did so by combining several non-chemical vector control methods with aggressive (weekly) village-level disease surveillance that ensured early-case detection and prompt treatment.

Health education was important for consciousness raising and eliciting community participation. Community members eliminated mosquito breeding habitats by



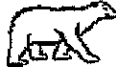
filling depressions, planting eucalyptus to dry out areas with a high water table, covering water surfaces with expanded polystyrene beads, and ensuring good drainage beneath water taps. Biological control with fish that eat mosquito larvae was another important component of the program. Guppies were distributed in permanent and semi-permanent water bodies, and commercially important food fish such as carp were also cultured in some ponds. Proceeds from tree nurseries and carp production paid for village improvements such as buildings, sewers, and playgrounds.

Malaria control in the IDVC project zone, as measured by the annual parasite incidence, was similar to that in the rest of Kheda district during the same period. This was achieved at a lower cost-per-person-protected than the conventional program, even excluding the value of the health and environmental protection provided by the project because no insecticides were applied during its tenure. From 1990–1996, after the project ended, an average of 7.7 metric tonnes of DDT was applied each year for malaria control in Nadiad subdivision.

As these DDT application figures indicate, malaria vector control in the project zone reverted to dependence on insecticides after the project's end in 1989. Rather than working through the existing state health and malaria control agencies, the project had been set up as a temporary, parallel structure that was neither institutionalized at the community level nor sustainable after outside funding stopped. On the one hand, the superior supervision and control afforded by this independence undoubtedly facilitated a clear demonstration of the relative merits of the alternative technologies. On the other, when project employees dispersed, they took most of the relevant experience with them. From its side, the state malaria control agency took no action to adopt or expand the effective pilot system for safer malaria control. The greatest impact of the IDVC project probably lies in its validation of alternative disease and vector control technologies that have contributed to the success of more recent integrated malaria control programs elsewhere in India.

The Bagamoyo Bednet Project, Tanzania⁹

Most countries in sub-Saharan Africa have no house spraying program and rely on drugs to control malaria. African studies show, however, that bednets treated with synthetic pyrethroid insecticide can reduce malaria incidence and child illness and death. The World Health Organization (WHO) and the Canadian International Development Research Centre (IDRC) have issued a call for operational research on how best to promote the use of insecticide-treated nets or bednets on a large scale.¹⁰ The main challenge is making community bednet programs sustainable, given economic constraints and competing priorities at both the government and household levels.



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Part C

1. A full report on the projects briefly profiled here, prepared by Dr. Patricia Matteson and co-authors associated with the various projects, is available from WWF.
2. In particular, Brazil has reduced malaria in the Amazon region by integrating intensified diagnosis and treatment, health education, and environmental management; see *The Malaria Control Program in Brazil*, presentation by Carlos Catao Prates at the UNEP/IFCS Subregional Awareness Raising Workshop on Persistent Organic Pollutants (POPs), Cartagena, Colombia 27-30 January, 1998.
3. Unpublished documents, *Servicio de Erradicación de la Malaria de la Secretaría de Estado de Salud Pública y Asistencia Social*, Dominican Republic.
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- Some individual programs are described in these references:
- a. Village-level production in coconuts of *B. thuringiensis israelensis* for larviciding of malaria mosquitoes in Peru, in *Of Mosquitoes and Coconuts*, IDRC Reports, Vol. 19(1):17-19 (April, 1991);