

DRACUNCULIASIS ERADICATION: BEGINNING OF THE END

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Abstract. Beginning with the International Drinking Water Supply and Sanitation Decade (1981-1990), an increasingly broad coalition of international and bilateral agencies, organizations, private companies, and other institutions have joined forces to eradicate dracunculiasis (Guinea worm disease). From an estimated annual incidence of 10 million persons just before the campaign began, the remaining incidence of cases is now less than two million. More than 23,000 villages are known to be endemic. All 18 countries where the disease is still endemic have completed or begun nationwide searches to identify endemic villages, except Kenya. Dracunculiasis is nearly eradicated in Asia, where Pakistan found only 23 cases in 1992, and India found 1,081 cases. Cameroon and Senegal are close to achieving eradication in Africa, where the two formerly highest endemic countries, Nigeria and Ghana, reduced their combined total of cases from approximately 820,000 in 1989 to less than 240,000 in 1992. Much remains to be done, however, in francophone West Africa and especially in East Africa. The most serious current obstacles to eradicating dracunculiasis by 1995 are the civil war in Sudan, apathy of some national and international health officials, and inadequate funding for the campaign.

The intensity of the campaign to eradicate dracunculiasis (Guinea worm disease) has increased greatly since even the most recent comprehensive reviews of that global effort were published.¹⁻⁴ The purpose of this paper is to summarize the status of the Dracunculiasis Eradication Program as of March 1993, when less than three years remained until the target date for eradication: December 1995. Much has been accomplished, but much also remains to be done to make dracunculiasis only the second disease of humankind (smallpox was the first), and the first parasitic disease, to be eradicated. The general strategy of the eradication program has been summarized elsewhere.^{3, 5}

BACKGROUND

The global campaign to eradicate dracunculiasis began with the advent of the International Drinking Water Supply and Sanitation Decade (1981-1990), as a result of an initiative taken at the Centers for Disease Control (CDC).⁶ The Steering Committee of the Decade adopted dracunculiasis eradication in 1981 as a subgoal of their broader effort to bring safe drinking water to unserved populations. The World Health Assembly adopted a resolution in 1986 making dracunculiasis the first disease to be targeted by the

World Health Organization (WHO) for eradication after smallpox. Other resolutions by the African ministers of health in 1988 and by WHO again in 1991 set the end of 1995 as the target date for achieving eradication. During the past five years especially, a growing number of agencies, organizations, companies, and other institutions have come together in a broad coalition to assist national programs to eradicate dracunculiasis by 1995.

Dracunculiasis is transmitted when humans drink water from stagnant ponds, stepwells, or other sources that are contaminated with copepods containing infective larvae of *Dracunculus medinensis*. After a year's development, the thin adult worms, each measuring up to one meter long, emerge through the skin, usually on the leg or foot. When a person with an emerging worm comes into contact with water, the adult worm ejects hundreds of thousands of larvae into the water. The larvae are ingested by tiny copepods (water fleas), in which they molt twice before becoming infective to humans who drink the water. The infection rarely kills, but it is devastating to affected populations nonetheless. Individual victims are often incapacitated for weeks or months by the pain and secondary infections that usually accompany emergence of the adult worm(s). A small fraction of victims may be crip-

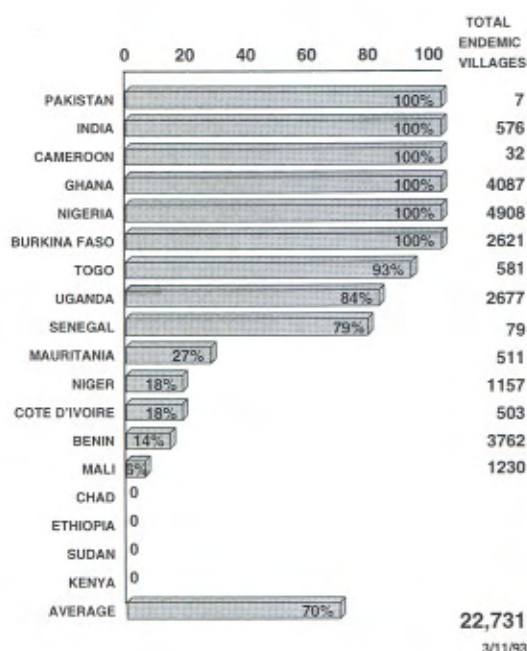


FIGURE 1. Percentage of villages with endemic dracunculiasis having one or more control interventions (trained village-based health worker, specific health education, improved drinking water supply, use of cloth filters, and/or use of Abate® (temephos) for vector control, by country, as of December 31, 1992.

pled permanently. Many villagers are prevented from farming or attending school. The disease also interferes with infant care, since affected mothers may be temporarily disabled.

There is no cure for an infected person, and people develop no immunity to the infection. The infection is vulnerable to eradication by simple methods of preventing infection: 1) provision of safe drinking water or filtration of drinking water through cloth, and 2) prevention of contamination of water supplies. Moreover, there is no animal reservoir of infection, and the individual worms live only for one year. The seasonality of the disease also facilitates targeting of interventions to prevent its transmission. Dracunculiasis can be prevented completely by teaching people not to contaminate their drinking water, to boil their drinking water (if they can afford to) or to filter it through a finely-woven cloth, by providing safe sources of water such as from a protected well, or by applying temephos (Abate®; American Cyanamid Company, Wayne, NJ) to potentially contaminated ponds periodically as a means of vector control. Three general

phases of national eradication programs are 1) ascertainment of the extent of infection by means of a nationwide survey, 2) implementation of village-based interventions in all endemic villages, and 3) institution of intensive case containment measures when the remaining numbers of cases are sufficiently low.⁵

Status of the campaign and impact on the disease

Dracunculiasis still occurs in more than 23,000 villages in 18 countries, where more than 100 million persons are estimated to be at risk of the infection.⁷ Overall, one or more specific interventions for preventing dracunculiasis are now underway in at least 70% of the known endemic villages (Figure 1). Although the full extent of dracunculiasis in Chad, Ethiopia, Kenya, and Sudan is not yet known, probably less than two million persons now suffer from this disease annually, as a result of activities carried out during the past decade. As recently as 1980, WHO estimated that the annual incidence of dracunculiasis was approximately 10 million,⁸ but Watts, in a more detailed analysis, estimated an incidence in Africa of 3.32 million as of 1986.⁷ And as late as 1986, India was still the only country to have a national Guinea Worm Eradication Program.

The four areas where dracunculiasis is still endemic are 1) Asia, 2) English-speaking West Africa, 3) French-speaking West Africa, and 4) East Africa. The current status of the program and the disease in these four zones is summarized below.

Asia. In Asia, only India and Pakistan are known to be still affected. India reported nearly 45,000 cases in 1983, but had only 1,081 cases in 249 affected villages in 1992 (Figure 2). Of the seven states of India that were endemic when that eradication program began in 1980, two (Tamil Nadu and Gujarat) have already eliminated the disease, and in 1992 the remaining affected states reported one (Maharashtra), 30 (Andhra Pradesh), 91 (Madhya Pradesh), 167 (Karnataka) and 792 (Rajasthan) cases, respectively. (Verghese T, National Institute of Communicable Diseases of India, Delhi, India, unpublished data). The main intervention strategies used in India are targeted provision of safe drinking water sources, health education and use of cloth filters, and chemical control of the copepod vector by means of temephos (Abate®) (Figure

3). In recent years, surgical extraction of mature worms has been used in parts of Rajasthan.^{9, 10} Although India did not achieve its earlier declared target dates for eradication by 1987 or 1991, it seems very likely that dracunculiasis will be eradicated in India by 1995. The United Nations Children's Fund (UNICEF) and the Swedish International Development Agency (SIDA) have provided significant external assistance for eradication efforts in parts of Rajasthan.

Pakistan, which detected an estimated 2,400 cases during a nationwide village-by-village search in 1987, may have already eliminated dracunculiasis. Only 23 cases were detected in 1992, in seven villages.¹¹ Pakistan is not expected to have any cases in 1993 (Figure 2). The main interventions used in Pakistan have been health education to promote use of cloth filters for drinking water and chemical control of copepods (Figure 3). Global 2000 and CDC assisted the program in Pakistan from 1986 to 1991, after which WHO and UNICEF have provided assistance. Thus, the eradication of dracunculiasis in Asia before 1995 seems assured.

English-speaking West Africa. Ghana and Nigeria, which were the two most highly affected nations when their eradication programs began, have reduced their combined total of cases from approximately 820,000 cases in 1989 to less than 240,000 cases in 1992 (Figure 2). The mobilization in Nigeria for its eradication program was recently described.¹² The early, prominent support given by the heads of state of Ghana and Nigeria to their countries' respective eradication programs was a key factor in the social mobilization of populations for dracunculiasis eradication in both countries. In Ghana, the rate of decrease in the number of cases in each of the last six months of 1992 as compared with the same months in 1991 was more than 70%, except in December, when the difference was 56%¹³ (Figure 4). Village-based workers in more than 84% of over 4,000 endemic villages in Ghana reported cases to the national level within 30 days of each month in 1992.¹³ Towards the end of the year, that figure exceeded 90%.

Ghana and Nigeria have pioneered the development and implementation of strategies for combating dracunculiasis in Africa, where levels of endemicity are generally much higher than in India and Pakistan. The main control measures used so far in Ghana and Nigeria are health education by village-based health workers to pro-

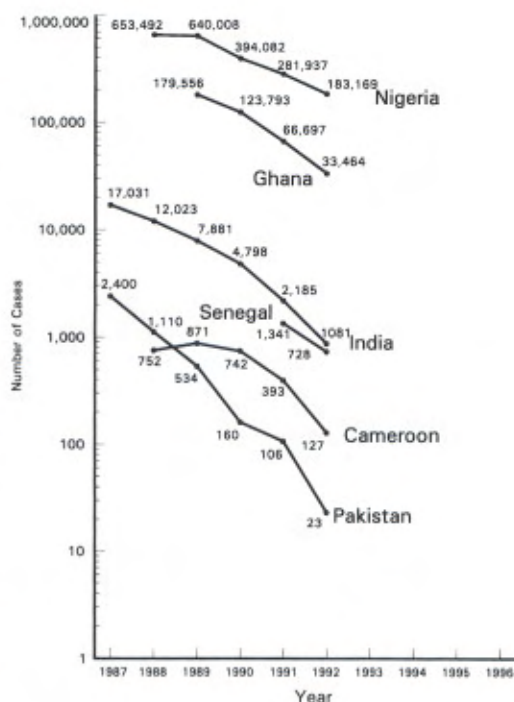


FIGURE 2. Decrease in dracunculiasis cases, 1987-1992, in six countries having data for more than one year of active surveillance.

mote use of cloth filters and to prevent contamination of water sources, and prioritized provision of safe sources of drinking water to endemic villages. Both countries have also recently begun using chemical control of copepods with temephos (Abate®, supplies of which have been donated for all affected African countries by the American Cyanamid Company) as an additional intervention in selected endemic villages (Figure 3).

The most significant external donors to these two important programs have been Global 2000 (Ghana and Nigeria), UNICEF (Nigeria), the U. S. Agency for International Development (USAID) and the Danish Bilharziasis Laboratory (Ghana), the Japan International Cooperation Agency (both countries), and the E. I. DuPont de Nemours Company (Wilmington, DE), which in collaboration with Precision Fabrics Group (Greensboro, NC) donated nylon filter material worth millions of dollars for use in these and other African countries. Achievement of eradication in these two countries by 1995 is very likely.

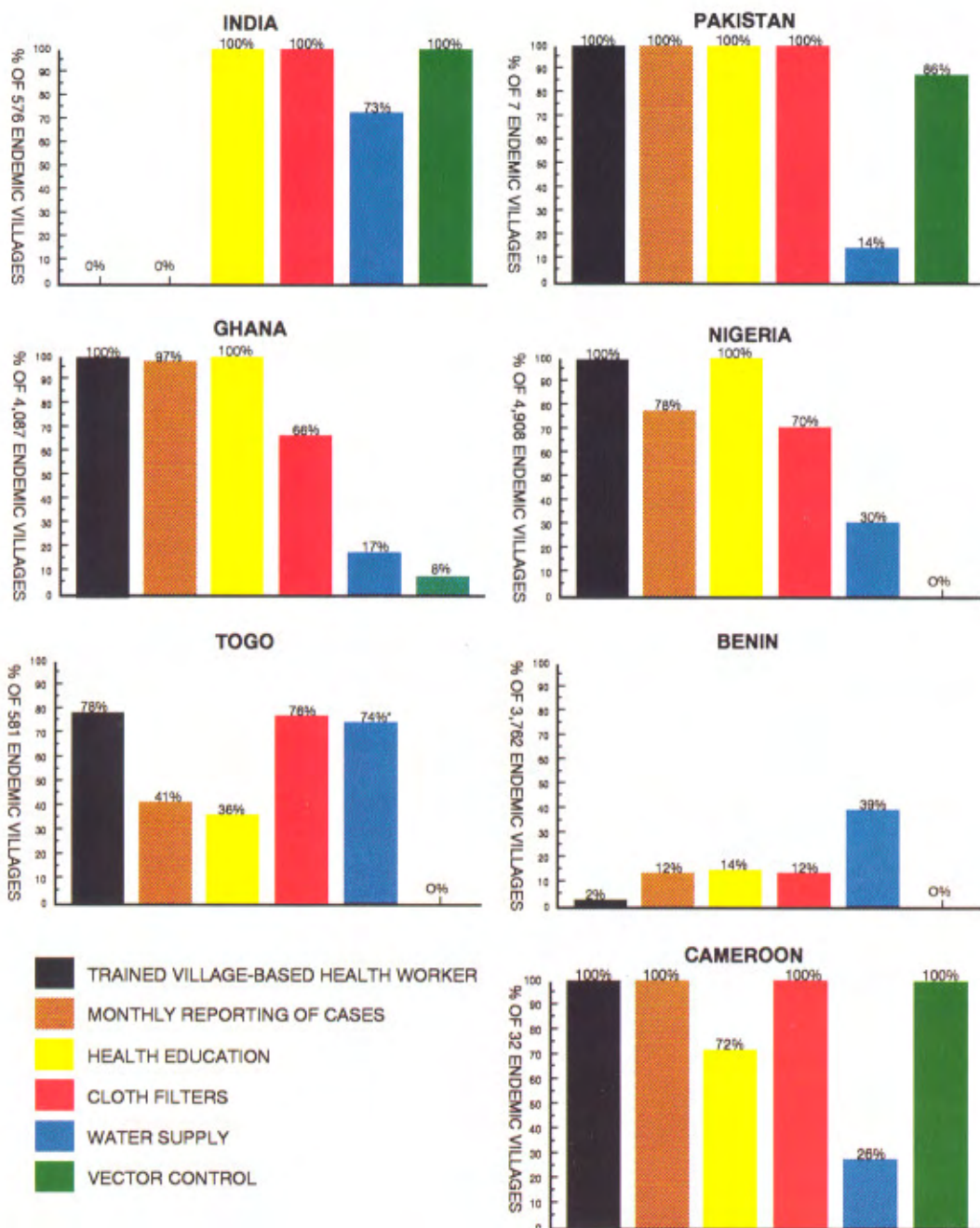


FIGURE 3. Status of interventions by country, as of the end of 1992. This does not include Chad, Ethiopia, Kenya, and Sudan, which had not begun systematic interventions. *Togo—water supply targeted for 1993; *Mali—water supply targeted by 1994; *Uganda—water supply targeted by 1994.

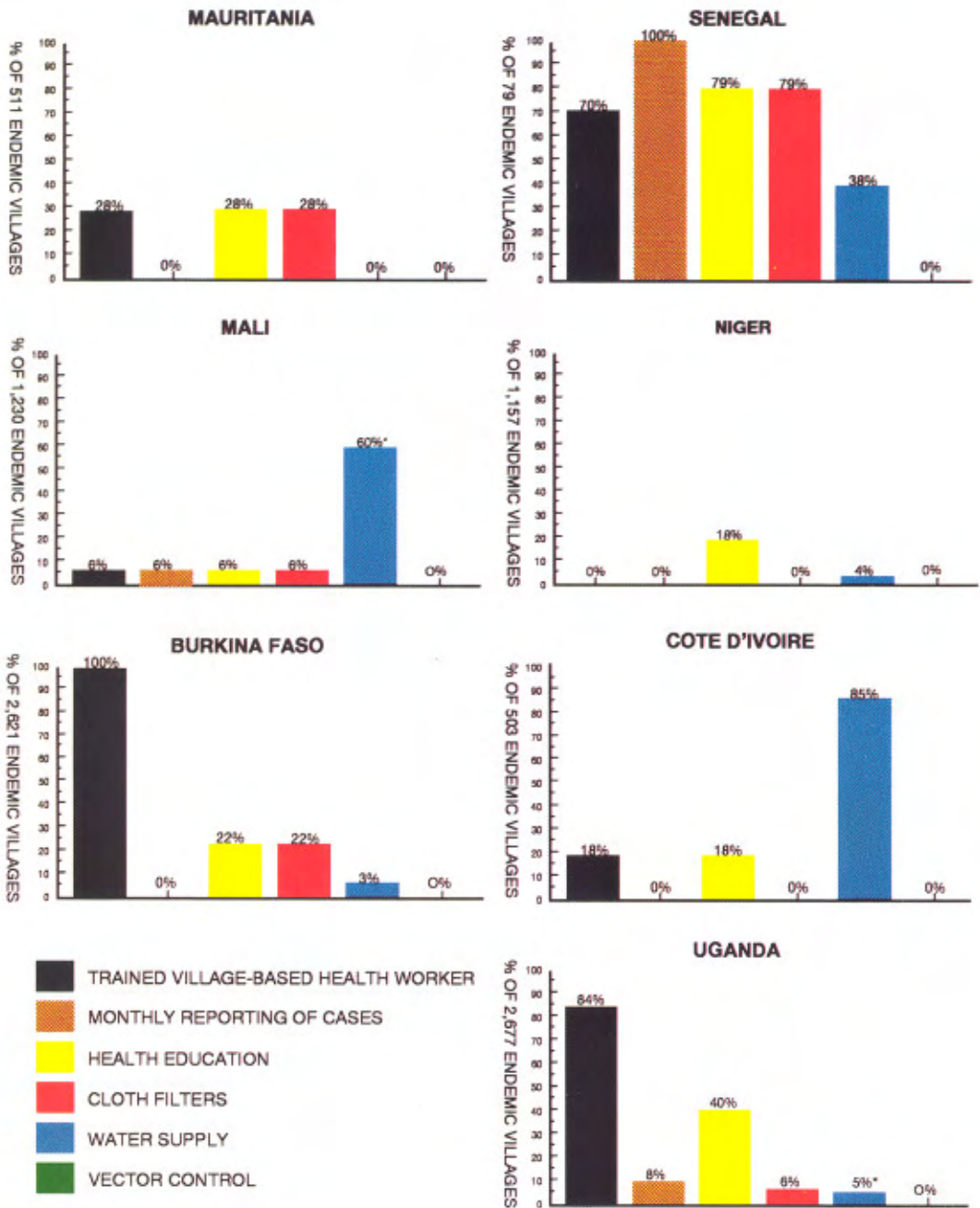


FIGURE 3. Continued.

French-speaking West Africa. This subregion includes 10 endemic countries (Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Mali, Mauritania, Niger, Senegal, and Togo). With funding provided mainly by UNICEF, in 1990–

1992 nine of these countries conducted national searches to identify affected villages, and Chad expects to complete its search in 1993.³ Among them, the nine countries found more than 160,000 cases in almost 10,900 endemic villages. With

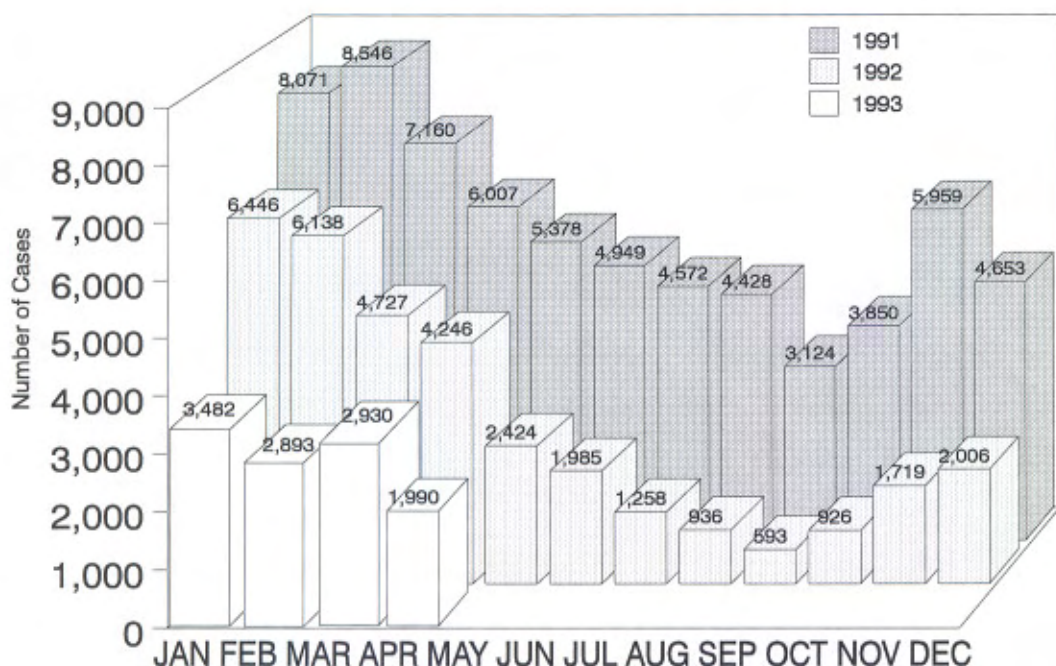


FIGURE 4. Number of cases of dracunculiasis reported by month in Ghana, 1991-1992. An average of 61% of 3,719 endemic villages reported within 30 days of the end of each reporting month in 1991, as compared with an average of 84% of 3,185 endemic villages reporting on time in 1992. Cases reported late are included in the succeeding month's total.

more than 42,000, 37,000, and nearly 33,000 cases, respectively, enumerated in their national searches, Burkina Faso, Benin, and Niger are among the six most highly endemic countries now known (Nigeria, Uganda, and Ghana are the others), and each of the former three countries may now have more cases than Ghana.³ Burkina Faso is also the only other country besides Ghana and Nigeria where the disease occurs nationwide.

All 10 countries in this subregion have appointed national program coordinators for their eradication programs, and most have now prepared national plans of action. Cameroon activated its eradication program in 1990 and is now in the case-containment phase, having detected only 127 cases in 1992 (Figure 2). However, except for Cameroon, Senegal, and Togo (which greatly intensified its interventions in 1992), the levels of interventions in countries of this subregion were generally still low at the end of 1992 (Figures 1 and 3). However, the mobilization of these endemic countries is now well underway.

Former U. S. President Jimmy Carter, who is the chairman of Global 2000, visited Benin, Bur-

kina Faso, Mali, Niger, and Togo in September 1992, and generated significant increases in eradication activities by discussing the problem of dracunculiasis with heads of state, appropriate ministers, local representatives of development assistance agencies, and nongovernmental organizations. As a result of such discussions in Mali, a highly popular former head of state, General Amadou Toumani Toure, agreed to oversee that country's Guinea Worm Eradication Program, an unprecedented arrangement that is also helping to energize the efforts of this entire subregion. A few months later, the USAID mission to Mali agreed to provide one million dollars in support of Mali's program, and Global 2000 began to directly assist the dracunculiasis eradication programs in Mali and Niger in March 1993.

On the eve of former President Carter's visit to this subregion in September 1992, UNICEF announced it would provide a total of 1.9 million dollars in supplemental funding in 1992 for the programs in Benin, Burkina Faso, Cameroon, Mauritania, and Niger, in addition to several times that amount that it was already providing

to most of the countries in this subregion, primarily for rural water supply projects in endemic areas. In October 1992, UNICEF and WHO also established a subregional technical assistance team for dracunculiasis eradication activities that is based in Burkina Faso.

With the encouragement of the World Bank, the Onchocerciasis Control Program (OCP) began providing substantial support for dracunculiasis eradication activities in Burkina Faso earlier in 1992 as a part of the OCP's devolution activities there, and similar support is being considered in other countries that are a part of the OCP. During former President Carter's visit to Burkina Faso, the president of that country presented him with samples of a cloth incorporating the name (in English and French), logo, and target date of the global eradication program. This fabric was designed and manufactured by a Burkinabe textile company in 1992 at the request of Global 2000 for use as an incentive to volunteer village health workers and other supporters of the program in Africa. More than 36,000 yards of this fabric has been provided to nine endemic countries so far. Most of these countries celebrated a National Guinea Worm Eradication Day in 1993 (nine of them on a common date [April 30]) suggested by the Organization for Coordination and Cooperation in the Control of Major Endemic Diseases in West Africa (OCCGE) to help publicize their programs and mobilize their populations. The U. S. Peace Corps has been particularly active in assisting the eradication programs in this region, especially in Benin, Cameroon, Cote d'Ivoire, Mali, Mauritania, and Togo.

The programs in this subregion critically needing additional assistance to intensify their surveillance and control measures are Benin, Burkina Faso, Chad, Cote d'Ivoire, and Mauritania. With an intensified effort beginning before the transmission seasons in 1993, achievement of eradication in this subregion by 1995 is possible.

East Africa. This subregion, where Sudan, Ethiopia, Uganda, and Kenya are affected, has been the slowest to mobilize against dracunculiasis, partly because of civil unrest in the first three countries. Global 2000 began direct assistance to Uganda in 1991, and that country completed its national search for cases and affected villages in 1992, with the assistance of Global 2000, UNICEF, and two Italian nongovernmental organizations. With more than 120,000 cases

detected, Uganda became the second highest endemic country after Nigeria, displacing Ghana, where the eradication program has reduced the disease's incidence significantly.¹⁴ So far, among the endemic countries in this zone, systematic interventions are underway only in Uganda (Figures 1 and 3). Sudan and Ethiopia began conducting their searches late in 1992, with funding from UNICEF, and both will begin control measures in 1993. Kenya, which may have only a small area affected, is expected to conduct its search sometime in 1993. Primarily because of the civil unrest in Sudan, achievement of eradication in East Africa by 1995 will be more difficult than in any other endemic subregion.

Monitoring progress

In 1991, Global 2000 and CDC conducted the first Program Reviews of the eradication programs of Ghana and Nigeria, which were based on similar in-depth annual reviews the same agencies had conducted of Pakistan's program beginning in 1988. With funding provided by the United Nations Development Program (UNDP) and the collaborative support of WHO and UNICEF, similar reviews were conducted for the first time in 1992 for all of the African programs except Ethiopia, Kenya, and Sudan. The main purposes of these reviews (usually one full day for each country) are to review the current status of dracunculiasis and of the eradication program in each country, to identify impediments and problems in program implementation, to suggest ways to increase the effectiveness of the programs, and to promote collaboration among the programs. The Centers for Disease Control and Prevention and Global 2000 have prepared Proceedings summarizing each review. These Program Reviews, which are conducted in clusters of 2-5 countries, will be carried out annually.

Meanwhile, WHO has begun preparing to certify countries as having eradicated dracunculiasis, although progress in this area has been slower than intended after the convening of an Informal Consultation on the Criteria for the Certification of Dracunculiasis Eradication at WHO headquarters in February 1990.¹⁵ Officials from WHO made the first consultative visits in connection with this process to the Islamic Republic of Iran and Pakistan (with a consultant from CDC) late in 1992. The United Nations Children's Fund also funded consultations in 1992 to the Repub-

lic of Guinea, Gambia, and the Central African Republic to help those formerly endemic countries improve surveillance of several diseases, including dracunculiasis, to begin preparing the documentation that will be required for certification of eradication. The World Health Organization held a one-day informal consultation in Benin in March 1993 to update countries on the certification process. Support for certification activities has been provided by the Organization of Petroleum Exporting Countries (OPEC) Fund for International Development and UNDP.

DISCUSSION

With interventions now underway in approximately 70% of the 23,000 villages that are known to be affected, the global initiative to eradicate dracunculiasis is positioned for the final push to December 1995. The endemic subregions of East Africa and French-speaking West Africa still have the most work to do. Among the highest priorities for the national programs are to get appropriate interventions in place in the remaining endemic villages, including completion of national searches to identify such villages in Chad, Ethiopia, Sudan and Kenya, and extension of the use of Abate® in appropriate endemic villages in Africa.

The most serious obstacles to achievement of eradication of dracunculiasis by 1995 are the civil war in southern Sudan, the continued apathy and lack of urgency of some national and international health officials, and the chronic underfunding of this eradication effort. Of the \$68 million estimated to be needed between 1989 and 1995 for eradication of dracunculiasis (not including rural water supply), about \$20 million remains to be funded.⁴ The main operational needs are intensification of public awareness/social mobilization efforts, especially in East Africa and in francophone West Africa, introduction of selective use of Abate® in all endemic countries, and initiation of intensive case containment in areas of low endemicity. Successful eradication of dracunculiasis by 1995 should help increase momentum towards eradication of polio by the year 2000.

Acknowledgments: This eradication campaign is a collaborative effort involving many persons, agencies, and private corporations, some of which are mentioned above. Much of the data presented here is from reports presented by National Program Coordinators in the

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