# THE GLOBAL BURDEN OF ONCHOCERCIASIS IN 1990

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*This paper documents the methods and data sources used for the estimation of the global burden of onchocerciasis in 1990 as reported in the Global Burden of Disease study (Murray and Lopez 1996a, b). It is published on the World Health Organization website at*

http://www3.who.int/whosis/menu.cfm?path=evidence,burden,burden_gbd2000docs,burden_gbd2000docs_diseasedoc,burden_gbd2000docs_diseasedoc_oncho&language=english

## INTRODUCTION

Onchocerciasis is caused by infection with the nematode *Onchocerca volvulus* for which man is the only known reservoir. The adult worms are usually found in subcutaneous nodules and have an average longevity of around 10-11 years (Plaisier et al. 1991). The adult female worm produces millions of microfilariae which migrate to the skin of the host.

The microfilariae are the main cause of the clinical manifestations of the disease. These include: dermatitis, resulting in very severe itching; papular and lychenified skin lesions; depigmentation and atrophy of the skin; and lymphadenitis, which may lead to hanging groin and elephantiasis of the genitals (Buck 1976, Murdoch 1993). The most severe complications of onchocerciasis are irreversible ocular lesions of both the anterior and posterior segment of the eye, resulting first in impaired vision and finally in total blindness (Dadzie et al. 1989). There is some evidence suggesting that onchocerciasis is a risk factor for epilepsy and that it may responsible for hyposexual dwarfism in certain areas (e.g., the Nkalanga syndrome in Uganda; Ovuga 1992).

The parasite is transmitted by blackflies, or Simuliids, which ingest microfilariae during a bloodmeal. In the fly, some of these microfilariae develop into infective larvae which can be transmitted to another person during a subsequent bloodmeal and develop into new adult worms. The blackfly breeds in rapids and fast-flowing water and consequently the transmission is most intense, and the disease most severe, in river valleys.

The epidemiological pattern of onchocerciasis, and in particular the severity of ocular disease, varies considerably between geographical zones (Duke et al. 1966). The difference in ocular pathology between the West African savanna and forest areas is well documented (Prost 1980). While onchocercal blindness can be rampant in hyperendemic communities in the savanna, virtually no blindness is found in forest villages with a comparable intensity of infection (Dadzie et al. 1989). It is believed that the explanation lies in the existence of various *O. volvulus* strains of different pathogenicity (Zimmerman et al. 1992).

The vector-parasite complex in the West African savanna is responsible for the most severe form of ocular onchocerciasis in the world. Blindness can affect over 10 per cent of the population in the most affected villages, which are located in the river valleys where the breeding sites of the vector are found, thus earning the disease the infamous name of river blindness (Remme et al., 1989). However, even within those river valleys there exists a considerable variation in the level of infection between the various communities.

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The severity of onchocerciasis is closely related to the intensity and duration of the infection (World Health Organization 1976, Prost et al. 1979, Remme et al. 1989). In the West African savanna, onchocerciasis is not apparent when the prevalence of microfilariae (mf) in the skin snip remains below 35 per cent and severe blindness rates are only found in so-called hyperendemic villages, i.e., villages which have a mf prevalence of 60 per cent or above (Prost et al. 1979). Another index of endemicity is the Community Microfilarial Load (CMFL, Remme et al. 1986). In the West African savanna the prevalence of onchocercal eye lesions and blindness are linearly related to this index. Onchocerciasis becomes an major public health problem when the CMFL reaches 15-20 mf per skin snip (mf/s), and blindness will affect more than 5 per cent of the population when the CMFL exceeds 40 mf/s (Remme et al. 1989). With such high blindness rates, the disease becomes insupportable and threatens the survival of the village itself (Prost et al. 1979). Fear of the disease has led to the depopulation of many relatively fertile river valleys in the Volta River Basin and several neighbouring river basins in the West African savanna. In this poor part of the world, onchocerciasis has been not only an important public health problem but also a major obstacle to socioeconomic development.

Outside the West and Central African savanna, with the exception of certain areas in Zaire, onchocercal blindness is not a major public health problem. However, other complications of the disease can be highly prevalent. Recent research has shown that onchocercal skin lesions can affect more than one-third of the adult population in hyperendemic communities, ranging from unsightly and itchy papular onchodermatitis to gross depigmentation of the shins (leopard skin). In such communities more than half the adult population suffers from severe itching due to onchocerciasis. For the affected population, this maddening itching is the most severe complication of onchocerciasis. It seriously affects their well being and they perceive it as an important health problem (World Health Organization 1995).

Estimates of the global burden of disease due to onchocerciasis have been provided by the World Health Organization Expert Committee on Onchocerciasis in 1987 and 1993. The Committee reports provide country and global estimates of the number of persons infected and the number blind due to onchocerciasis, but no information on the burden of onchocercal skin disease. The estimates were based on published and reported data of highly varying quality, ranging from extensive, reliable data from the area of the Onchocerciasis Control Programme in West Africa (OCP: see Table 1 for a list of countries involved) and national prevalence surveys in Liberia and Nigeria to crude estimates based on very little information for some of the endemic countries.

## DEFINITION AND MEASUREMENT

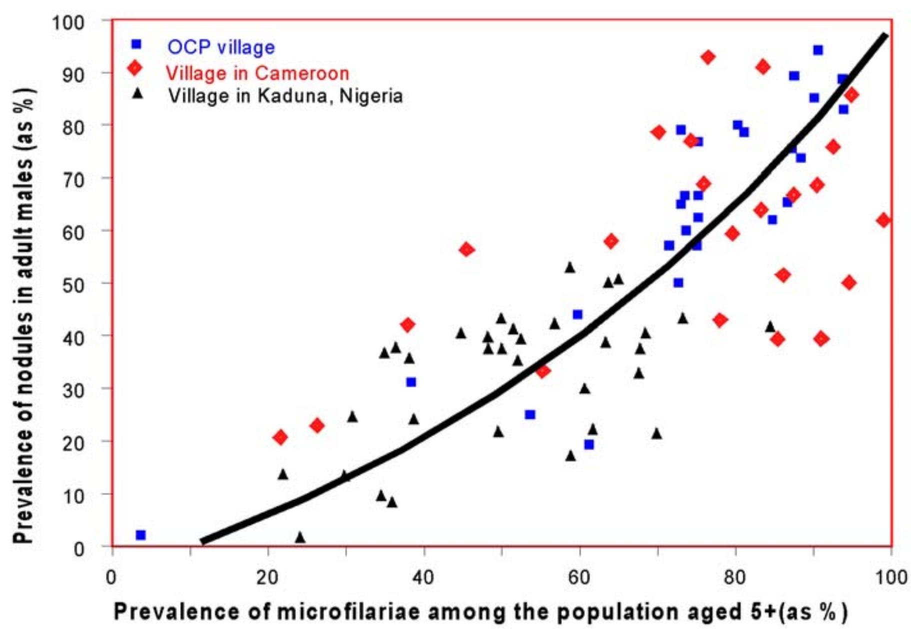
### INFECTION

The standard and most reliable method to diagnose onchocerciasis infection and to determine its intensity is through microscopic examination of skin snips for the presence and number of *O. volvulus* microfilariae (Prost and Prod'hon 1978). The method is highly specific but lacks some sensitivity in very light infections. Though sensitivity may be somewhat increased by taking as many as 6 skin snips, it is common practice to take 2 skin snips from the iliac crest which is the site with the highest concentration of skin microfilariae. Microscopic examination is done after 30 minutes to 24 hours incubation of the snips in distilled water or saline. Longer incubation will generally increase the number of microfilariae in the solution, and this needs to be taken into account when comparing information on the intensity of infection. Furthermore, the skin snips can be weighed and the number of microfilariae expressed per mg of skin. For logistical reasons, weighing was not done in the OCP and skin snip examination has been limited to examination after 30 minutes incubation in distilled water and further incubation of negative skin snips for 24 hours in saline. Research projects usually weigh all snips and incubate them for 24 hours in saline before microscopy. Conversion factors between the two methods have been developed by the OCP, which applies them in comparative analyses. Immuno-diagnostic methods are being developed but are not yet operational. Until recently, cross-sectional skin snip surveys have been the standard method to determine the level of infection and the number of infected persons.

Because the severity of onchocerciasis is related to the prevalence and intensity of infection at the community level, community diagnosis of endemicity is important in order to identify the communities most in need of treatment. Since the introduction of ivermectin, operational research has focused on the development and testing of simple and rapid methods for community diagnosis. The prevalence of palpable subcutaneous nodules is closely related to the prevalence of infection as determined by skin snips, with the prevalence of microfilariae being about twice the prevalence of nodules (Figure 1) (Taylor et al. 1992, World Health Organization 1991). Furthermore, in the West African savannah, the prevalence of blindness has been shown to be directly related to the prevalence of nodules. The rapid assessment of endemicity of a community is now usually done through palpation for nodules in a sample of 30-50 adult males per community.

The above method, though much more rapid and acceptable than skin snipping, still requires a visit and a rapid survey in all potentially endemic communities. In order to overcome this bottleneck, a method for Rapid Epidemiological Mapping of Onchocerciasis (REMO) has recently been developed and tested successfully in Cameroon (Ngoumou and Walsh 1993, 1994). With this method, surveys are required only in a special sample of 2 to 4 per cent of all communities and the results can then be extrapolated to estimate the approximate endemicity level of the remaining communities (Ngoumou et al. 1994, World Bank 1994).

**Figure 1. Rapid versus classical assessment of onchocerciasis endemicity**



### OCULAR DISEASE AND BLINDNESS

The diagnosis of onchocercal ocular disease requires a full ophthalmological examination with slit lamp and ophthalmoscope. Microfilariae may be identified in the cornea and, after positioning the patient with the head down for several minutes before the examination, in the anterior chamber of the eye (Dadzie et al. 1986). The ocular lesions due to onchocerciasis are the anterior segment lesions, sclerosing keratitis and iridocyclitis, and the posterior segment lesions, choroido-retinitis and optical atrophy. On occasion, lesions of the posterior segment of the eye may not be visible due to obstruction by anterior segment lesions. The OCP has developed a standardized classification scheme for onchocercal eye lesions and this scheme has been used in all ophthalmological surveys in the OCP (Dadzie et al. 1989, Remme et al. 1989). Other investigators do not always use the same classification, often because their examinations are more detailed than the routine ophthalmological assessments in the OCP. Observer variation can be a serious problem in the classification of the presence and severity of onchocercal ocular lesions, and an ophthalmologist with considerable experience in ophthalmological surveys of onchocerciasis is required to obtain reliable results.

Blindness is defined as visual acuity of less than 3/60 or a restriction of visual field to less than 10° of fixation in the better eye. Low vision is defined as visual acuity of less than 6/18 but equal to or better than 3/60 in the better eye. The assessment of visual impairment and blindness in epidemiological surveys of onchocerciasis is usually based on a simple visual acuity test, such as the illiterate E- or the Sjogren hand test, at defined distances. However, onchocerciasis can also cause severe reduction in peripheral visual fields, and it has been shown that some 25 per cent of those functionally blind would have been missed if the examination were limited to the visual acuity test without peripheral field assessment (World Health Organization 1983).

The main sources for data on the distribution of onchocercal ocular disease and blindness are: (a) the various publications and reports of the OCP on the pre-control and 3-year follow-up surveys to evaluate the impact of vector control, and later vector control and large-scale ivermectin treatment combined, on ocular onchocerciasis; (b) the reports and publications by teams from other countries involved in the community trials of ivermectin, especially the National Eye Centre in Kaduna, Nigeria, and the Pasteur Institute in Yaounde, Cameroon; and (c) special studies such as the classical studies in Nigeria (Budden 1963) and Cameroon (Anderson and Fuglsang 1974), and more recently in Sierra Leone (Mc Mahon 1988).

### SKIN DISEASE

The distribution and severity of onchocercal skin disease has been poorly studied to date, and at one time hardly anything was known about the perceived importance of onchocercal skin disease for the affected populations. This was due partly to the lack of a standard classification scheme for documenting skin changes in onchocerciasis, and to the fact that the available literature on onchocercal skin disease is difficult to interpret because of the variety of non-standard clinical classification and examination methods used in the past. Recently, however, there have been two important developments that have started to change this situation.

The first was the development of a simple, standard classification and grading system for cutaneous changes in onchocerciasis (Murdoch et al. 1993), which the World Health Organization Expert Committee on Onchocerciasis has adopted and recommended as the standard method to be used in surveys of onchocercal skin disease. This method classifies the main onchocercal skin lesions into Acute Papular Onchodermatitis (APOD), Chronic Papular Onchodermatitis (CPOD), Lichenified Onchodermatitis (LOD), Atrophy (ATR) and Depigmentation (DPM). The method defines grades of severity for all lesions as well as grades of activity of the reactive skin lesions APOD, CPOD and LOD. The main limitation of the method is that it is based upon the differentiation of clinical morphological groups which are consistent with cutaneous onchocerciasis but for which the cutaneous changes are not specific or diagnostic of the disease, and differential diagnosis will often be required. However, field testing has shown that the method produces reliable and reproducible results, especially if the clinicians involved first undergo a few days training in the application of the method (Murdoch et al. 1993, World Health Organization 1995).

The second development was the completion of a multi-centre study on the public health and psychosocial importance of onchocercal skin disease in Africa (World Health Organization 1995). This study used the new classification system for cutaneous changes, as well as special psychosocial research methods based on an adaptation of the Explanatory Model Interview Catalogue (EMIC) (Weiss et al. 1992) for onchocercal skin disease and related symptoms. A total of 8 study centres from Ghana, Nigeria, Cameroon, Uganda and Tanzania were involved in this study (World Health Organization 1995).

### TROUBLESOME ITCHING

Though itching is mentioned in the literature as a serious complication of onchocerciasis infection, the references tend to be anecdotal in nature and there exists virtually no quantitative information on the prevalence and severity of troublesome itching due to onchocerciasis. One reason for this lack of information is that most investigators have been reluctant to report on onchocercal itching because itching was believed to be too unspecific and attributable to too many other possible causes, even in communities endemic for onchocerciasis. The recent multi-country study on the importance of onchocercal skin disease has completely changed that point of view by demonstrating that nearly all reported itching in hyperendemic communities is attributable to onchocerciasis (World Health Organization 1995). In these communities half the population above the age of 5 years suffered from troublesome itching. The itching was often very severe and reported to be the cause of sleeplessness, fatigue and general weakness in half of those affected. The relationship between itching and onchocerciasis was established at the individual level (the odds ratio for the risk of itching among those with palpable nodules as compared to those without palpable nodules was 18.3) as well as at the community level by the demonstration of a highly significant correlation between the prevalence of troublesome itching and the level of onchocerciasis endemicity as measured by the prevalence of palpable nodules (see Figure 2).

In the multi-country study, information on itching was obtained in two ways. At the beginning of the clinical examination, each subject was asked whether he suffered from troublesome itching, and for those who replied positively, this was followed by some questions on it's location and severity. The questions on itching were camouflaged between similar questions on other health problems. Secondly, a sample of 800 subjects with skin lesions underwent a detailed psycho-social interview. After establishing rapport, the interview started off with a reference to the skin lesion of the subject and an open-ended question asking how the lesion affected his or her life. Itching had not been mentioned at this stage of the interview, but over 90 per cent of those with reactive skin lesions and 73 per cent of those with depigmentation responded spontaneously that they suffered from troublesome itching. About 50 per cent of those interviewed complained also of sleeplessness, weakness and fatigue as a result of incessant and severe itching.

**Figure 2. Prevalence of itching versus prevalence of palpable nodules in hyperendemic villages**

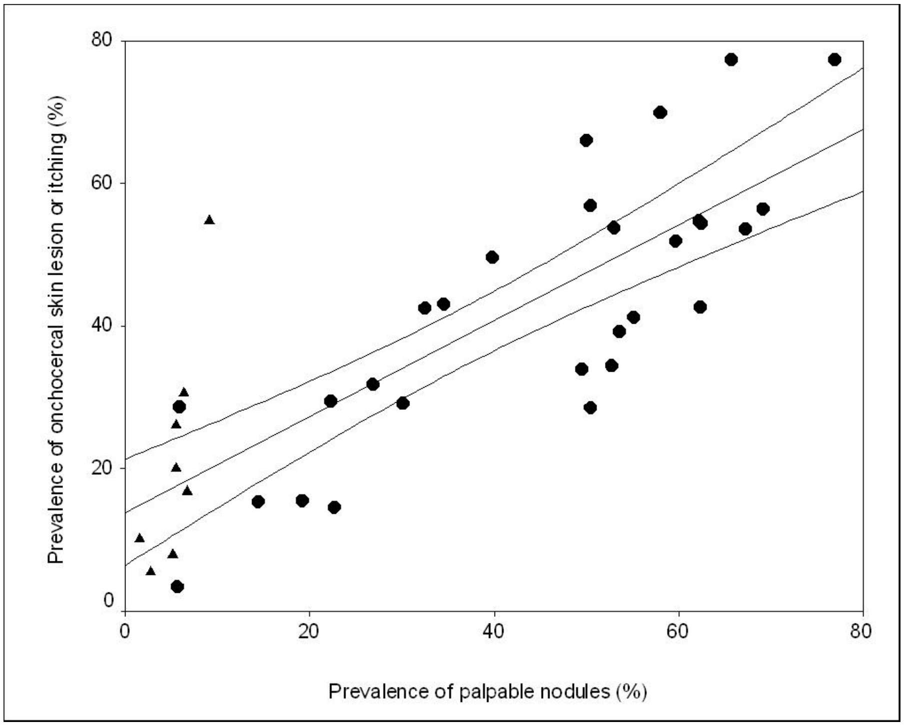
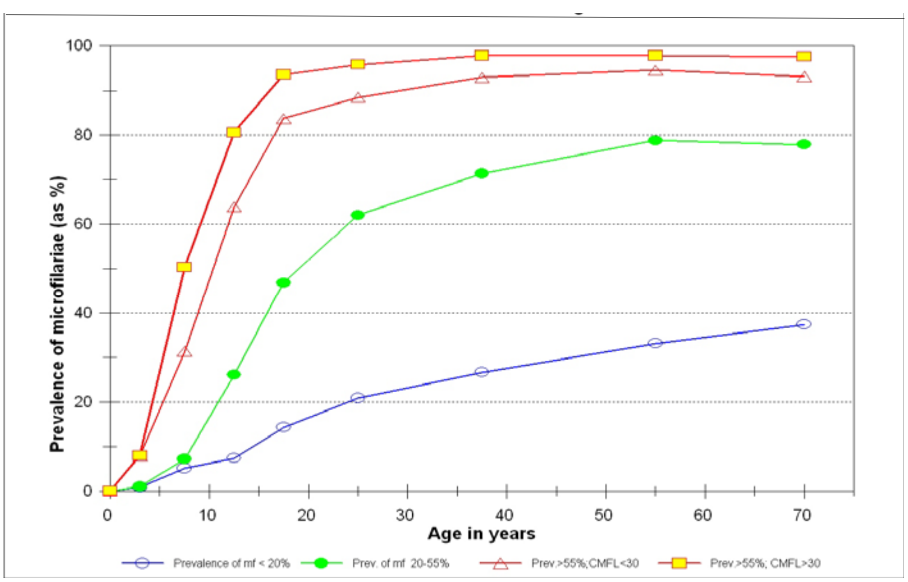



**Figure 3. Infection by age and endemicity: pre-control data for 338 OCP villages**



## Review of empirical databases by regions

Table 1 gives the estimated number infected with *Onchocerca volvulus* and blind because of onchocerciasis by country and region. The estimates were arrived at during the meeting of the World Health Organization Expert Committee on Onchocerciasis held in December 1993. The last column in the table provides information on the source of the data. The main published sources used for arriving at the various estimates are given in Table 2 with comments on the reliability of the information.

## Estimation of DALYs

### Basic disease/injury estimates

*Onchocerciasis infection*

The number of infected by age group and sex was estimated for each region on the basis of the estimated total number infected for that region as given in Table 1. This total was distributed by age group and sex on the basis of the prevalence of infection by age and sex, as available for the population of 338 endemic villages in the OCP (see Figure 3), and the population distribution by age and sex for the region in question. The results are given in the first column in Table 3.

*Ocular disease*

There are no regional or global estimates of the number of people with ocular lesions due to onchocerciasis. However, studies done in the OCP would suggest that in the absence of control, the prevalence of ocular lesions is more than 3 times the prevalence of blindness as measured by visual acuity testing. Thus, on the basis of the blindness rates determined below (see "Disability"), it can be estimated that there are close to 1 million people with onchocercal ocular lesions.

*Skin disease*

There are also no global estimates of the number of people suffering from onchocercal skin disease, and it would be difficult to make such estimates on the basis of the literature because of the different and non-standard methods used to assess skin lesions in the few studies done in the past. However, to give a indication of the number of persons with onchocercal skin lesions in the world, we have extrapolated from the results of the recent multi-country study of the importance of onchocercal skin disease in Africa (World Health Organization 1995). In this study the prevalence of onchocercal skin lesions for all endemic villages combined was 0.69 times the prevalence of palpable nodules. Since the prevalence of nodules is on average approximately equal to 50 per cent of the prevalence of microfilariae (Taylor et al. 1992, World Health Organization 1991), the number of people with onchocercal skin lesions is probably in the order of 6 million (~0.69*0.5*17 601.286). The majority of those (some 4.5 million) will have the reactive type of skin lesions (APOD, CPOD and LOD).

**Table 1 Estimated number infected and blind due to onchocerciasis by country and region**

| Country | Total population (millions) | Number infected with *O.volvulus* | Number blind due to onchocerciasis | Source of estimates |
|---|---|---|---|---|
| I. SUB-SAHARAN AFRICA | | | | |
| OCP (Onchocerciasis Control Programme) countries | | | | |
| Senegal | 7.3 | 65 000 | 2 800 | Epidemiological mapping by OCP |
| Niger | 7.7 | 32 | 300 | OCP Surveys 1989- 1992 |
| Cote d'Ivoire | 12.0 | 403 000 | 4 300 | OCP Surveys + mapping 1989- 1992 |
| Benin | 4.6 | 162 000 | 2 800 | OCP Surveys + mapping 1989- 1992 |
| Burkina Faso | 9.0 | 500 | 3 000 | OCP Surveys 1989- 1992 |
| Togo | 3.5 | 334 000 | 8 800 | OCP Surveys + mapping 1989- 1992 |
| Mali | 9.2 | 196 000 | 2 700 | OCP Surveys + mapping 1989- 1992 |
| Guinea-Bissau | 1.0 | 3 300 | 100 | Epidemiological mapping by OCP |
| Ghana | 15.0 | 123 000 | 7 400 | OCP Surveys + mapping 1989- 1992 |
| Sierra Leone | 4.2 | 701 000 | 8 300 | Epidemiological mapping by OCP |
| Guinea | 5.8 | 510 000 | 9 000 | Epidemiological mapping by OCP |
| Non-OCP countries with blinding, savanna onchocerciasis | | | | |
| Central African Republic | 3.0 | 390 000 | 19 000 | No new data; from last EC report |
| Chad | 5.7 | 870 000 | 20 000 | Ministry of Health estimate; limited surveys |
| Cameroon | 11.8 | 1 300 000 | 26 000 | Ministry of Health estimate; mapping ongoing |
| Nigeria | 99.0 | 3 302 000 | 100 000 | National sample survey 1988/ 1989 |
| Sudan | 25.8 | 620 000 | 10 000 | EC87 estimate multiplied by population growth rate |

**Table 1 (continued): Estimated number infected and blind due to onchocerciasis by country and region**

| Country | Total population (millions) | Number infected with *O.volvulus* | Number blind due to onchocerciasis | Source of estimates |
|---|---|---|---|---|
| Other endemic countries in Africa | | | | |
| Gabon | 1.2 | 60 000 | (a) | No new data; from last EC report |
| Angola | 10.0 | 100 000 | 2 000 | Last info '62; estimate from EC87 |
| Zaire | 35.6 | 4 565 000 | 37 500 | EC87 estimate multiplied by population growth rate |
| Congo | 2.3 | 50 000 | 600 | Revised Ministry of Health estimates |
| Eq. Guinea | 0.4 | 60 000 | (a) | Extensive surveys |
| Liberia | 2.6 | 600 000 | 2 600 | No new data; from last EC report |
| Ethiopia | 49.2 | 929 000 | (a) | Revised Ministry of Health estimates |
| Malawi | 8.8 | 150 000 | (a) | Surveys 1987- 1992 |
| Burundi | 5.5 | 143 000 | (a) | Extensive surveys |
| Uganda | 18.8 | 1 200 000 | (a) | Preliminary estimate; mapping ongoing |
| Tanzania | 27.3 | 650 000 | (a) | Little information; mapping just started |
| Total Africa | 162 | 17 486 832 | 267 200 | |
| II. MIDDLE EASTERN CRESCENT | | | | |
| Yemen | 12.5 | 30 000 | (a) | No new data; from last EC report |
| III. LATIN AMERICA AND THE CARIBBEAN | | | | |
| Brazil | 150.4 | 707 | (a) | Ministry of Health 1993 |
| Colombia | 33.0 | 70 | (a) | Ministry of Health 1993 |
| Ecuador | 10.6 | 5 930 | 36 | Ministry of Health 1992 |
| Guatemala | 9.2 | 62 961 | 600 | No new data; from last EC report |
| Mexico | 85.9 | 26 182 | 105 | Ministry of Health 1993 |
| Venezuela | 19.7 | 44 605 | 9 | Ministry of Health 1993 and from last EC report |
| Total America | 308.8 | 140 455 | 750 | |
| Global total | 483.0 | 17 657 287 | 267 950 | |

(a) No estimate of the number blind available, but onchocercal blindness not believed to be a public health problem

**Table 2 Main studies on the distribution of onchocerciasis**

| Year | Country | Type of measurement | Data type | Results | Reference | Comments |
|---|---|---|---|---|---|---|
| 1973 | Burkina Faso<br>Niger<br>Benin<br>Togo<br>Ghana<br>Cote d'Ivoire<br>West Mali | Prevalence of infection and onchocercal blindness | Review of historical community-survey data | Out of 2 956 510 persons reported examined, 14.8 per cent were estimated infected. By extrapolation it was estimated that over 1 million were infected, 35 000 blind and at least as many with severely impaired vision in the savanna area of these countries. | World Health Organization (1973) | First estimate of disease burden in the original OCP area. Though based on historical data and various non-standardized examination methods, the estimates proved fairly accurate according to later standardized surveys by the OCP. |
| 1975 to 1994 | Burkina Faso<br>Niger<br>Benin<br>Togo<br>Ghana<br>Cote d'Ivoire<br>West Mali | Cross-sectional baseline surveys in 338 villages and longitudinal surveys at 3 year intervals in 179 indicator villages to evaluate the impact of vector control | Prevalence of infection and blindness. Incidence/ regression of infection, trend in microfilarial load; incidence/ regression of eye lesions; incidence of onchocercal blindness | Arrest of the development of ocular lesions and blindness after 5-7 years of vector control; Virtual elimination of the parasite reservoir in man after 14 years of vector control in the Central OCP area;<br>Unsatisfactory results in border areas of the OCP which were reinvaded by infective flies from outside the Programme. | De Sole et al (1991); Dadzie et al (1990); Remme et al (1990); various OCP reports; OCP data base | Reliable data on prevalence of infection and onchocercal blindness, and on the epidemiological impact of vector control. |
| 1989, 1990 | Senegal<br>East Mali<br>Guinea Bissau<br>Guinea<br>Sierra Leone | Cross-sectional skin snip surveys in a stratified random sample of 215 communities | Prevalence of infection; Community Microfilarial Load; indirect estimates of the prevalence of onchocercal blindness | On the basis of the parasitological results for 215 sample villages, supported with the survey results for 700 other villages, it was estimated that 1 831 335 were infected and that 33 348 were blind due to onchocerciasis. | De Sole et al (1991) | Good estimates because of proper sampling method. Surveys did not include ophthalmological examination and blindness is estimated indirectly using relationship between prevalence of oncho blindness and CMFL (see Remme et al 1989). |
| 1990-1991 | Southern Benin<br>Southern Togo<br>Southern Ghana | Cross-sectional surveys in a stratified random sample of 99 communities | Prevalence of infection; Community Microfilarial Load; indirect estimates of the prevalence of onchocercal blindness | On the basis of the parasitological results for 99 sample villages, supported with the survey results for 87 other villages, it was estimated that 590 468 were infected and that 11 715 were blind due to onchocerciasis | De Sole et al (1992) | Good estimates because of proper sampling method. Surveys did not include ophthalmological examination and blindness is estimated indirectly using relationship between prevalence of oncho blindness and CMFL |

| Year | Country | Type of measurement | Data type | Results | Reference | Comments |
|---|---|---|---|---|---|---|
| 1991 | Nigeria | National prevalence survey based on a random sample of village to be surveyed in each state. | Prevalence of infection by state | Total number infected in the country estimated at 3.3 million. | Ministry of Health (1993) | Previous estimate was about 7 million infected; The validity of the results has been questioned for several states. REMO is being undertaken and is expected to provide more reliable estimates. REMO should be completed before end 1994. |
| 1968-1971 | Liberia | National prevalence survey based on skin snip surveys in 121 communities. | Prevalence of infection by county | 38 per cent infected out of 10 885 examined. Estimated total infected in the country: 400 000 | Frentzel-Beyme (1975) | Not clear how sample villages were selected. Large number of people (1 per cent of population) examined using standard parasitological methods. Applying population growth rate of 3.4 per cent would give 780 000 infected in 1990 (instead of 600 000 as in table 1) |
| 1985 | Zaïre | Review of historical data | Prevalence of infection and blindness | Total infected estimated at 3 395 104 | Fain (1991) | Though Zaïre is one of the countries with the largest number of cases, there exists very little information about the distribution of the disease. The estimate of the total number infected is therefore very crude. |
| 1970 | Tanzania | Cross-sectional survey | Prevalence of infection and skin disease | 2 082 infected out of 6 537 examined from 6 foci. Estimated total infected was 317 970 | Wegesa (1970) | First national estimates for Tanzania. Survey was limited to known foci and excluded suspected foci, some of which proved later infected. Sampling methodology not clear. |
| 1972 | Malawi | Cross-sectional survey | Prevalence of infection | 467 patients infected (460 from Cholo district) out of 3380 examined. | Ben-Sira et al (1972) | First systematic and nationwide study of Malawi. Sampling methodology not clear |

| Year | Country | Type of measurement | Data type | Results | Reference | Comments |
|---|---|---|---|---|---|---|
| 1989 | Ecuador | Community skin snip surveys in all endemic river valleys | Prevalence of the number of infected persons | 5 930 (36.8 per cent) infected out of 16 099 examined. | Guderian and Shelley (1989) | Very good estimates of the number of infected persons through examination of most inhabitants of the endemic areas. |
| 1986 | All endemic countries | Review of available data + reports from the Ministry of Health's of the endemic countries | Prevalence of infection and blindness by country | Global estimates: 17.8 million infected and 336 400 blind due to onchocerciasis. Results reported by country | World Health Organization (1987) | Reliability of the estimates is very variable |
| 1993 | All endemic countries | Review of available data + reports from the Ministry of Health's of the endemic countries | Prevalence of infection and blindness by country | Global estimates: 17.6 million infected and 267 000 blind due to onchocerciasis. For results by country see Table 1. | World Health Organization (1994) | Reliability of the estimates is very variable for the reasons similar to those described above. |
| 1994 | Ghana, Nigeria, Cameroon, Uganda, Tanzania | Cross-sectional clinical and psychosocial surveys in meso- to hyper-endemic communities | Prevalence, severity and psychosocial importance of onchocercal skin disease and troublesome itching | 27.6 per cent of the 5 459 examined in the endemic villages had onchocercal skin lesions. In hyper-endemic communities over 50 per cent suffer from troublesome itching due to onchocerciasis. Itching was severe and the cause of sleeplessness, fatigue, weakness etc. Skin lesions and itching had important psychosocial effect in those affected and their families and communities. | World Health Organization (1995) | Unique information on the public health and psychosocial importance of onchocercal skin disease. . Results on itching are especially significant and show that most itching in endemic communities is due to onchocerciasis, and that itching constitutes an important disease burden. |

## DISABILITY

*Blindness*

The estimates of blindness given in Table 1 refer only to blindness defined as visual acuity of less than 3/60 in the better eye, as determined by simple visual acuity testing. It does not include persons with visual acuity equal to or better than 3/60 but who have a restriction of visual field to less than 10° of fixation, and who would have been classified blind if peripheral visual field assessment had been done. About one-quarter of all blind people in the West African savanna fall into this category, according to a study in the OCP in which both visual acuity and visual field testing were done (World Health Organization 1983). To correct for this factor in the calculation of the burden of blindness by region, the regional blindness estimates derived from Table 1 were multiplied by a factor of 1.33

The number of onchocercal blind by age, sex and region in Table 4 was estimated following a procedure similar to that used for infection. The basis for the calculation was the estimated total number of onchocercal blind per region as given in Table 1 but multiplied by 1.33, the prevalence of blindness by age and sex in the 338 OCP villages, and the population distribution by age and sex.

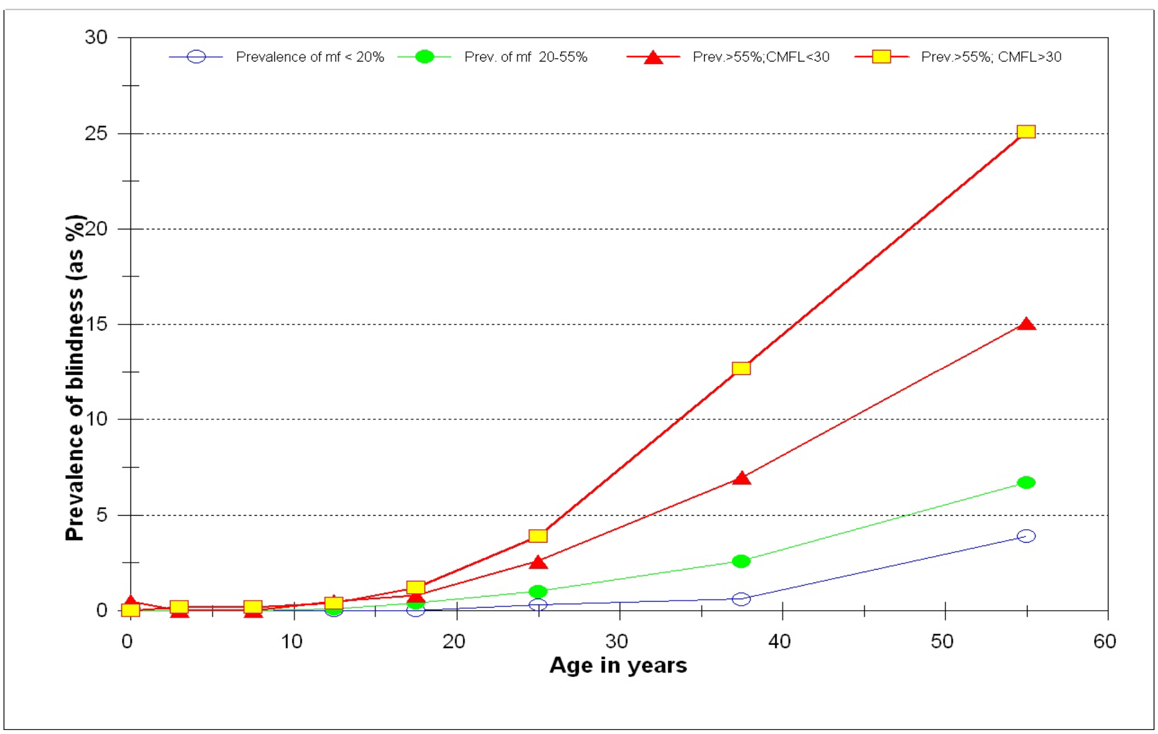
There exist no regional estimates for the number of people with low vision. To obtain such estimates, we used information on the relationship between the prevalence of low vision and the prevalence of blindness in the OCP area. Table 3 gives the prevalence of blindness and low vision by age for the 338 OCP villages. On average, the prevalence of low vision is 1.78 times the prevalence of blindness as measured by visual acuity alone, and there is no statistically significant trend with age in the ratio between the prevalence of low vision and of blindness. To obtain estimates (Table 4) of the prevalence of low vision for each age group and sex, the corresponding prevalence of blindness as defined by visual acuity alone was multiplied by 1.78.

Figure 4 shows that the prevalence of blindness is very high in the most endemic communities, reaching 25 per cent in the oldest age group. Nevertheless, these results still underestimate the extent of the blindness problem because of the significant excess mortality among the blind. On average, mortality among the blind population may be 3 to 4 times higher than among non-blind of the same age. Prost and Vaugelade (1981) estimate on the basis of a 5-year follow-up of some 11 000 persons from endemic villages in the OCP that mortality among the blind is 3.71 times mortality among those with normal vision. Another analysis for 7 661 persons in the OCP over the same period showed that the mortality among blind males was 3.13 times and among blind females 3.56 times as high as among those with normal vision (Kirkwood et al. 1983). In the first study, the mortality ratio declined slowly from the age of 30 years onward but in the second study there was no trend with age. Based on these findings, we have used mortality rates among the blind which are 3.5 times the mortality rates for the total population in the same age and sex group.

**Table 3 Prevalence of blindness and low vision in 338 OCP villages before the start of control**

| Age in years | Examined | Low vision | | Blindness (visual acuity of less than 3/60) | | Ratio of prevalence of low vision to prevalence of blindness |
|---|---|---|---|---|---|---|
| | | Number | Percentage | Number | Percentage | |
| 0-4 | 1 475 | 2 | 0.14 | 3 | 0.20 | 0.67 |
| 5-9 | 8 353 | 16 | 0.19 | 6 | 0.07 | 2.67 |
| 10-14 | 10 651 | 33 | 0.31 | 8 | 0.08 | 4.13 |
| 15-19 | 5 849 | 30 | 0.51 | 22 | 0.38 | 1.36 |
| 20-29 | 9 544 | 107 | 1.12 | 66 | 0.69 | 1.62 |
| 30-44 | 12 296 | 365 | 2.97 | 256 | 2.08 | 1.43 |
| 45-65 | 8 247 | 855 | 10.37 | 475 | 5.76 | 1.80 |
| 65+ | 2 423 | 653 | 26.95 | 321 | 13.25 | 2.03 |
| Total | 58 838 | 2 061 | 3.50 | 1157 | 1.97 | 1.78 |

**Figure 4. Blindness by age and endemicity level: pre-control data for 338 OCP villages**



*Troublesome itching*

The multi-country study (World Health Organization 1995) has shown that for the affected people, the most serious consequence of onchocercal skin disease is itching, which is often very severe, and according to those affected is the cause of sleeplessness, fatigue and weakness. This in turn affects their ability to work and to concentrate. Troublesome itching also leads to scratching, often with stones, twigs or knives, and results in bleeding wounds, sores and pain in the affected parts of the body. Therefore, troublesome itching due to onchocerciasis is definitely disabling.

The estimation of the number of cases suffering from troublesome itching due to onchocerciasis has been based on the results of the multi-country study. Figure 2 shows that there is a linear relationship between the prevalence of itching and the level of endemicity as measured by the prevalence of palpable nodules. The regressing line describing this relationship has an intercept of 9 per cent and a slope of 0.66. If we assume that the intercept reflects the prevalence of itching which would be observed in the absence of onchocerciasis (i.e., when the prevalence of nodules is 0 per cent), it may be concluded that the prevalence of itching due to onchocerciasis is approximately equal to 0.66 times the prevalence of palpable nodules. There exists also a semi-linear relationship between the prevalence of nodules and the prevalence of onchocerciasis infection as measured by the standard skin snip method, and on average the prevalence of nodules is about half the prevalence of infection (Taylor and Duke 1992, World Health Organization 1991). Thus, the prevalence of itching may be estimated as equal to 0.66*0.5 = 0.33 times the prevalence of mf, and this factor has been used to estimate the number of persons suffering from onchocercal itching shown in Table 5. Furthermore, to reflect the variation in severity of the itching, a second column has been introduced with the estimated number of persons who suffer from sleeplessness, fatigue or weakness as a result of onchocercal itching. For this estimation, the finding from the multi-country study was used: of those who complained of itching and who had been interviewed, some 60 per cent complained of sleeplessness, weakness and fatigue. Half of those complained of these conditions in the first open-ended question and the other half after further probing.

## OTHER CONSIDERATIONS IN CALCULATING BURDEN

Although skin lesions have not been included in the calculation of DALYs, the multi-country study on the importance of onchocercal skin disease has shown that they are a significant burden because of their psychological and social impact on the affected individuals, as well as on their families and communities (World Health Organization 1995). The reactive skin lesions (APOD, CPOD and LOD) are a serious cause of stigma in most of the endemic communities and affect people’s self-esteem and self-respect. More than 30 per cent of those with reactive skin lesions had low self-esteem and 33 per cent found it difficult to marry because of their skin condition. Stigma was more an issue for younger affected persons, and the level of stigmatization increased with the study subject’s level of education.

Onchocercal skin disease limits the range of social involvement of affected persons. Individuals feel ashamed of themselves, worry a lot over their skin condition, fear that the disease might kill them, and experience low morale. In addition, affected persons feel socially uprooted from their communities.

**Table 4 Estimated incidence of low vision, blindness and itching, by region, 1990**

| | Incidence | | | | | |
|---|---|---|---|---|---|---|
| | **Blindness** | | **Low vision** | | **Itching** | |
| **Age group** *(years)* | **Number** *('000s)* | **Rate** *per 100 000* | **Number** *('000s)* | **Rate** *per 100 000* | **Number** *('000s)* | **Rate** *per 100 000* |
| ***Sub-Saharan Africa (SSA)*** | | | | | | |
| **Males** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 42 | 87 |
| 5-14 | 0 | 0.3 | 0 | 0.6 | 201 | 287 |
| 15-44 | 5 | 4.1 | 9 | 8.2 | 335 | 323 |
| 45-59 | 11 | 49.5 | 20 | 99.0 | 123 | 605 |
| 60+ | 12 | 81.2 | 13 | 122.7 | 19 | 183 |
| *All Ages* | 27 | 10.9 | 42 | 16.6 | 720 | 286 |
| **Females** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 34 | 72 |
| 5-14 | 0 | 0.2 | 0 | 0.4 | 165 | 236 |
| 15-44 | 3 | 2.6 | 6 | 5.3 | 273 | 257 |
| 45-59 | 7 | 28.3 | 13 | 59.7 | 99 | 446 |
| 60+ | 6 | 35.7 | 7 | 52.9 | 16 | 126 |
| *All Ages* | 16 | 6.3 | 26 | 10.0 | 586 | 227 |
| **Total** | 44 | 8.5 | 68 | 13.3 | 1,307 | 256 |
| ***Latin America and the Carribean (LAC)*** | | | | | | |
| **Males** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 0 | 0.5 |
| 5-14 | 0 | 0.0 | 0 | 0.0 | 1 | 1.3 |
| 15-44 | 0 | 0.0 | 0 | 0.0 | 1 | 1.2 |
| 45-59 | 0 | 0.1 | 0 | 0.2 | 0 | 2.0 |
| 60+ | 0 | 0.1 | 0 | 0.1 | 0 | 0.4 |
| *All Ages* | 0 | 0.0 | 0 | 0.0 | 3 | 1.2 |
| **Females** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 0 | 0.4 |
| 5-14 | 0 | 0.0 | 0 | 0.0 | 1 | 1.1 |
| 15-44 | 0 | 0.0 | 0 | 0.0 | 1 | 1.0 |
| 45-59 | 0 | 0.1 | 0 | 0.1 | 0 | 1.6 |
| 60+ | 0 | 0.0 | 0 | 0.0 | 0 | 0.3 |
| *All Ages* | 0 | 0.0 | 0 | 0.0 | 2 | 1.0 |
| ***Total*** | 0 | 0.0 | 0 | 0.0 | 5 | 1.1 |

**(continued)**

**Table 4 (continued): Estimated incidence of low vision, blindness and itching, by region, 1990**

| | Incidence | | | | | |
|---|---|---|---|---|---|---|
| | **Blindness** | | **Low vision** | | **Itching** | |
| **Age group** | **Number** | **Rate** | **Number** | **Rate** | **Number** | **Rate** |
| *(years)* | *('000s)* | *(years)* | *('000s)* | *(years)* | *('000s)* | *(years)* |
| ***Middle Eastern Crescent (MEC)*** | | | | | | |
| **Males** | | | | | | |
| 0-4 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 5-14 | 0 | 0 | 0 | 0 | 0 | 0.5 |
| 15-44 | 0 | 0 | 0 | 0 | 1 | 0.5 |
| 45-59 | 0 | 0 | 0 | 0 | 0 | 1.0 |
| 60+ | 0 | 0 | 0 | 0 | 0 | 0.2 |
| *All Ages* | 0 | 0 | 0 | 0 | 1 | 0.5 |
| **Females** | | | | | | |
| 0-4 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| 5-14 | 0 | 0 | 0 | 0 | 0 | 0.4 |
| 15-44 | 0 | 0 | 0 | 0 | 0 | 0.5 |
| 45-59 | 0 | 0 | 0 | 0 | 0 | 0.8 |
| 60+ | 0 | 0 | 0 | 0 | 0 | 0.1 |
| *All Ages* | 0 | 0 | 0 | 0 | 1 | 0.4 |
| | | | 0 | 0 | | |
| ***Total*** | 0 | 0 | 0 | 0 | 2 | 0.5 |
| ***World*** | | | | | | |
| **Males** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 42 | 13.0 |
| 5-14 | 0 | 0.0 | 0 | 0.1 | 202 | 36.7 |
| 15-44 | 5 | 0.4 | 9 | 0.7 | 337 | 27.0 |
| 45-59 | 11 | 3.6 | 20 | 6.4 | 123 | 39.5 |
| 60+ | 12 | 5.3 | 13 | 5.9 | 19 | 8.8 |
| *All Ages* | 27 | 1.0 | 42 | 1.6 | 724 | 27.3 |
| **Females** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 34 | 11.0 |
| 5-14 | 0 | 0.0 | 0 | 0.1 | 166 | 31.5 |
| 15-44 | 3 | 0.2 | 6 | 0.5 | 274 | 22.9 |
| 45-59 | 7 | 2.2 | 13 | 4.3 | 99 | 31.9 |
| 60+ | 6 | 2.3 | 7 | 2.5 | 16 | 6.0 |
| *All Ages* | 16 | 0.6 | 26 | 1.0 | 589 | 22.5 |
| ***Total*** | 44 | 0.8 | 68 | 1.3 | 1314 | 24.9 |

Source: Murray and Lopez (1996)

**Table 5 Estimated prevalence of low vision, blindness and itching, by region, 1990**

| | Prevalence | | | | | |
|---|---|---|---|---|---|---|
| | Blindness | | Low vision | | Itching | |
| **Age group** *(years)* | **Number** *('000s)* | **Rate** *per 100 000* | **Number** *('000s)* | **Number** *('000s)* | **Rate** *per 100 000* | **Number** *('000s)* |
| ***Sub-Saharan Africa (SSA)*** | | | | | | |
| **Males** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 74 | 157 |
| 5-14 | 1 | 1.5 | 1 | 2.0 | 656 | 934 |
| 15-44 | 57 | 54.7 | 76 | 73.2 | 1,683 | 1,622 |
| 45-59 | 80 | 391.6 | 106 | 524.1 | 525 | 2,584 |
| 60+ | 76 | 722.6 | 102 | 969.7 | 236 | 2,244 |
| *All Ages* | 213 | 84.5 | 286 | 113.2 | 3174 | 1,258 |
| **Females** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 61 | 129 |
| 5-14 | 1 | 1.0 | 1 | 1.3 | 537 | 769 |
| 15-44 | 38 | 35.6 | 51 | 47.6 | 1,377 | 1,296 |
| 45-59 | 53 | 239.7 | 71 | 320.8 | 429 | 1,942 |
| 60+ | 51 | 397.7 | 68 | 534.7 | 193 | 1,515 |
| *All Ages* | 142 | 55.1 | 191 | 73.9 | 2597 | 1007 |
| ***Total*** | 355 | 69.6 | 476 | 93.3 | 5,771 | 1,131 |
| ***Latin America and the Carribean (LAC)*** | | | | | | |
| **Males** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 0 | 0.9 |
| 5-14 | 0 | 0.0 | 0 | 0.0 | 2 | 4.5 |
| 15-44 | 0 | 0.2 | 0 | 0.3 | 6 | 6.1 |
| 45-59 | 0 | 0.8 | 0 | 1.1 | 2 | 8.5 |
| 60+ | 0 | 1.0 | 0 | 1.4 | 1 | 5.5 |
| *All Ages* | 1 | 0.2 | 1 | 0.3 | 12 | 5.3 |
| **Females** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 0 | 0.8 |
| 5-14 | 0 | 0.0 | 0 | 0.0 | 2 | 3.8 |
| 15-44 | 0 | 0.2 | 0 | 0.2 | 5 | 5.0 |
| 45-59 | 0 | 0.7 | 0 | 0.9 | 2 | 6.6 |
| 60+ | 0 | 0.7 | 0 | 0.9 | 1 | 3.8 |
| *All Ages* | 0 | 0.2 | 1 | 0.3 | 10 | 4.3 |
| ***Total*** | 1 | 0.2 | 1 | 0.3 | 21 | 4.8 |

**(continued)**

**Table 5 (continued): Estimated prevalence of low vision, blindness and itching, by region, 1990**

| | Prevalence | | | | | |
|---|---|---|---|---|---|---|
| | Blindness | | Low vision | | Itching | |
| **Age group** *(years)* | **Number** *('000s)* | **Rate** *per 100 000* | **Number** *('000s)* | **Number** *('000s)* | **Rate** *per 100 000* | **Number** *('000s)* |
| ***Middle Eastern Crescent (MEC)*** | | | | | | |
| **Males** | | | | | | |
| 0-4 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| 5-14 | 0 | 0 | 0 | 0 | 1 | 1.7 |
| 15-44 | 0 | 0 | 0 | 0 | 3 | 2.6 |
| 45-59 | 0 | 0 | 0 | 0 | 1 | 3.9 |
| 60+ | 0 | 0 | 0 | 0 | 0 | 2.7 |
| *All Ages* | 0 | 0 | 0 | 0 | 5 | 2.1 |
| **Females** | | | | | | |
| 0-4 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| 5-14 | 0 | 0 | 0 | 0 | 1 | 1.5 |
| 15-44 | 0 | 0 | 0 | 0 | 2 | 2.3 |
| 45-59 | 0 | 0 | 0 | 0 | 1 | 3.2 |
| 60+ | 0 | 0 | 0 | 0 | 0 | 1.9 |
| *All Ages* | 0 | 0 | 0 | 0 | 4 | 1.8 |
| | 0 | 0 | 0 | 0 | | |
| ***Total*** | 0 | 0 | 0 | 0 | 10 | 2.0 |
| ***World*** | | | | | | |
| **Males** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 75 | 23 |
| 5-14 | 1 | 0.2 | 1 | 0.3 | 660 | 120 |
| 15-44 | 57 | 4.6 | 76 | 6.1 | 1,692 | 135 |
| 45-59 | 80 | 25.5 | 107 | 34.2 | 528 | 169 |
| 60+ | 76 | 34.8 | 102 | 46.6 | 237 | 108 |
| *All Ages* | 214 | 8.1 | 286 | 10.8 | 3,191 | 120 |
| **Females** | | | | | | |
| 0-4 | 0 | 0.0 | 0 | 0.0 | 61 | 20 |
| 5-14 | 1 | 0.1 | 1 | 0.2 | 540 | 103 |
| 15-44 | 38 | 3.2 | 51 | 4.2 | 1,385 | 116 |
| 45-59 | 53 | 17.1 | 71 | 22.9 | 432 | 139 |
| 60+ | 51 | 18.8 | 68 | 25.3 | 194 | 72 |
| *All Ages* | 143 | 5.5 | 101 | 7.3 | 2,611 | 100 |
| ***Total*** | 356 | 6.8 | 478 | 9.1 | 5,802 | 110 |

Source: Murray and Lopez (1996)

The reaction of the non-affected is complex: while society feels sorry for and pities those who suffer from the condition, they also avoid, despise, and make fun of the sick. Affected people are stereotyped as weak, emotionally dull and cold, and unable to perform their duties, let alone feed themselves. They are considered dangerous and dirty and are avoided for fear that they might pass on their disease to others. People would not elect them to positions of leadership because onchocerciasis-affected individuals are believed to think less of themselves, lack self-confidence, and might embarrass the people they would represent.

A person who suffers from onchocercal skin disease is likened to an animal on the basis of his or her skin and behaviour. The individual is considered unmannered and his or her behaviour distracting, interfering and embarrassing for others. The dignity of the onchocerciasis -affected person is thus severely lowered (World Health Organization 1995).

## BURDEN AND INTERVENTION

The strategies for onchocerciasis control are largely determined by the focal nature of severe onchocercal disease and the availability and affordability of intervention tools in different epidemiological and economic settings. The two principal intervention tools or methods are vector control through larviciding and chemotherapy using ivermectin. Other possible interventions are of very limited practical value for onchocerciasis control: e.g. personal protection from exposure to vector biting by adequate clothing (usually impractical) or deodorants (of limited effectiveness and too expensive), or large scale nodulectomy campaigns. The latter are said to have had a significant impact on the control of the parasite reservoir in Mexico, but it is generally accepted that large scale nodulectomy is not a practical alternative in most endemic areas, especially in Africa.

### VECTOR CONTROL

Experiences in East and West Africa have shown that vector control can be a very effective method to achieve the interruption of transmission and the virtual elimination of the parasite reservoir. This was demonstrated in Kenya in the 1950s (Roberts et al. 1967) and on a much larger scale by the OCP in West Africa. In the OCP, vector control has been very effective, notably in savanna areas where the breeding sites are relatively easy to identify, limited in number and fairly accessible by helicopter (Philippon 1989) However, vector control is expensive and, at least in the many foci where *S. damnosum* s.l. is the vector, it has to be maintained over a very large area in order to reduce the risk of reinvasion by infective vectors from outside the zone under control. In general, this implies that vector control is only feasible through a multinational effort such as the OCP, and is beyond the means of the endemic countries themselves.

### IVERMECTIN

Since 1987, when it was registered for the treatment of human onchocerciasis, chemotherapy through ivermectin treatment has proven to be a practical alternative to vector control. Ivermectin is a highly effective microfilaricide and, since the pathology in onchocerciasis is caused by the microfilariae, ivermectin treatment is of great and direct benefit to the infected patient. However, because of the repopulation of the skin by microfilariae and the limited effect of ivermectin treatment on transmission, treatment has to be given at regular intervals, the current recommendation being annually. Community trials have indicated that repeated annual treatment has a significant impact on onchocercal lesions of the anterior segment of the eye, but that it may take many years before the effect on posterior segment disease becomes evident (World Health Organization 1993). The effect of ivermectin treatment on onchocercal skin lesions is much less clearly documented and there remains uncertainty as to the best treatment interval for skin disease. Some studies suggest that 6-monthly treatment may be more appropriate while other informal opinion suggests treatment at only 3-month intervals (World Health Organization 1992). The Tropical Disease Research Programme (TDR) of the World Health Organization has therefore undertaken a multi-country study to determine the effect of ivermectin treatment at different intervals on onchocercal skin disease and troublesome itching. The study showed a significant reduction in the prevalence and severity of reactive skin lesions and troublesome itching after ivermectin treatment, but no difference in the effect of annual, 6-monthly and 3-monthly treatment (Brieger et al. 1998).

At the current doses and recommended treatment interval of one year, ivermectin appears to have only a limited effect on the adult worm and its reproductive capacity. Although follow-up data for a period of 6 years with annual ivermectin treatment in the OCP suggest that repeated treatment does have a cumulative effect on the viability of the adult parasite population, or at least on worm reproductivity (Plaisier et al. in press), the effect of ivermectin treatment on the adult worm population remains incomplete and after 6 annual treatments, repopulation of the skin by microfilariae was still observed.

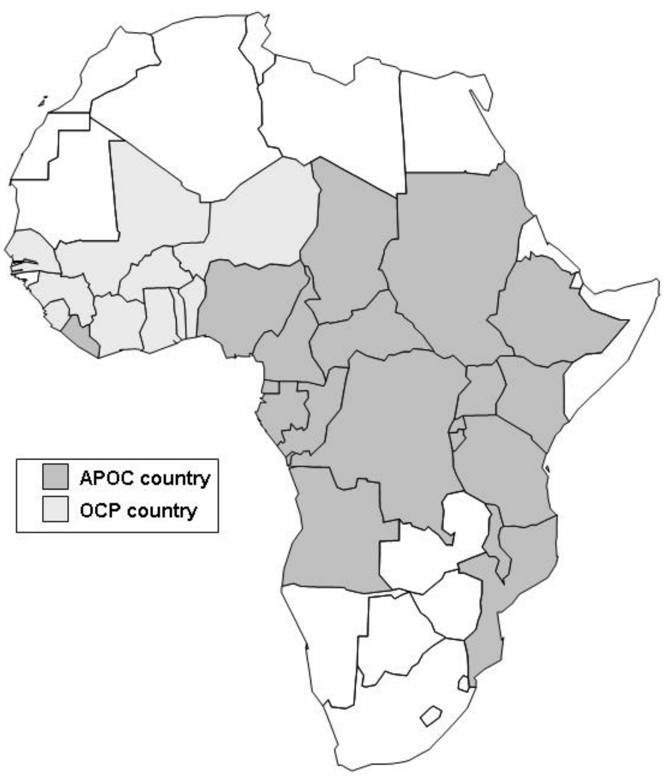
The main strategy consists of large-scale annual ivermectin treatment in high-risk communities. Such large-scale treatment is considered a must for communities with a prevalence of infection greater than 60 per cent or a prevalence of palpable nodules in adult males greater than 40 per cent, and highly desirable for communities with a prevalence of infection over 40 per cent or a nodule prevalence in adult males of more than 20 per cent (World Health Organization 1991, 1992). No lower limits have been set below which large scale ivermectin treatment should not be given, as such a lower limit will vary according to the resources available for control and the pathogenicity of the parasite strain involved. However, it is generally concluded that below a mf prevalence of 20 per cent, onchocerciasis is rarely associated with severe complications.

While the strategy has been clearly defined, there have been major difficulties in its implementation, and it is estimated that at present only 15 per cent of the infected population outside the OCP is receiving regular ivermectin treatment. The major problems are related to lack of resources and poor health care systems in most of the endemic areas.

In addition to the problem of affordability of large-scale ivermectin treatment, there is the major issue of its sustainability. Most external support has been offered for a limited period of time. This was partly due to an initial misunderstanding of the effect of ivermectin treatment on transmission when it was hoped that large-scale treatment could interrupt transmission and thus eliminate the parasite reservoir and achieve a definite solution within a limited period. Recently, there has been a shift to more realistic approaches and there is an increasing emphasis on the development and implementation of ivermectin delivery methods that can be integrated into the existing health care systems or sustained at the community level.

A new African Programme for Onchocerciasis Control (APOC) outside the OCP sub-region was launched in 1995 (World Bank 1994, (Remme, 1995). The objectives of the Programme are to establish effective and self-sustainable community-based ivermectin treatment throughout the remaining endemic areas in Africa within a period of 10 years (see Figure 5) and to eliminate the disease by vector control in selected foci. If this goal is reached, onchocerciasis will be eliminated as a public health and socioeconomic problem throughout Africa.

**Figure 5. Countries included in the African Programme for Onchocerciasis Control (APOC) and the Onchocerciasis Control Program for West Africa (OCP), 1995**




## DISCUSSION AND CONCLUSIONS

The quality of the information on which the estimates of the burden of onchocerciasis are based is extremely variable and ranges from extensive and reliable data for the OCP countries and Ecuador to only sketchy information for some of the largest endemic countries in Africa. For example, there is very little information on the distribution of onchocerciasis in Zaire, even though this country probably has more than 25 per cent of all cases of onchocerciasis in the world. Much better information on the distribution of onchcerciasis in Africa should become available within the next few years as a result of the recent development and successful testing of a method for Rapid Epidemiological Mapping of Onchocerciasis (REMO) (Ngoumou and Walsh 1993). Currently REMO is being used for the nationwide mapping of onchocerciasis endemicity in Nigeria and Cameroon, and it will soon be applied for the mapping of the infection in most of the other endemic African countries that are participanting in APOC (World Bank 1994).

Because of the focal nature of onchocerciasis, the burden of the disease is very unevenly distributed in the endemic regions. Although the burden of onchocerciasis is relatively small at the global level, at the local level it can be the most important health problem for endemic communities and in some situations it may threaten the survival of the community itself.

Until recently, the burden of onchocerciasis has been mainly assessed in terms of the burden of onchocercal blindness (World Health Organization 1987). This is understandable as blindness is the most serious complication of the disease. Blindness has also been the direct cause of the most severe socioeconomic consequence of onchocerciasis: the depopulation of relatively fertile river valleys in the savanna area of the OCP region. However, the skin disease, which affects many millions more, did not get much attention until recently. A large multi-country study has now demonstrated that for the affected population onchocercal skin disease and itching pose a very serious burden. The importance of onchocercal skin disease is not fully reflected in the DALYs which take only blindness, visual impairment and itching into account. But the skin lesions themselves have significant psychosocial repercussions that contribute considerably to the burden of onchocerciasis.

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