Summary of the Eighteenth Meeting of the
International Task Force for Disease Eradication (II)
April 6, 2011

The Eighteenth Meeting of the International Task Force for Disease Eradication (ITFDE) was convened at The Carter Center from 8:30am to 4:15pm on April 6, 2011 to discuss control and possible elimination of onchocerciasis and lymphatic filariasis in Africa. The Task Force members are Sir George Alleyne, Johns Hopkins University; Dr. Stephen Blount, Centers for Disease Control and Prevention (CDC); Dr. Mickey Chopra, UNICEF; Dr. Donald Hopkins, The Carter Center (Chair); Dr. Adetokunbo Lucas, Harvard University; Dr. Montserrat Meiro-Lorenzo, The World Bank; Professor David Molyneux, Liverpool School of Tropical Medicine (retired); Dr. Mark Rosenberg, Task Force for Global Health; Dr. Lorenzo Savioli, World Health Organization (WHO); Dr. Harrison Spencer, Association of Schools of Public Health; Dr. Dyann Wirth, Harvard School of Public Health; and Dr. Yoichi Yamagata, Japan International Cooperation Agency (JICA). Seven of the Task Force members (Blount, Hopkins, Lucas, Meiro-Lorenzo, Molyneux, Rosenberg and Yamagata) attended this meeting, and two others were represented by alternates (Dr. Dirk Engels for Savioli, Dr. Rownak Khan for Chopra).

Presenters at this meeting included Dr. Ed Cupp (retired) of Auburn University, Dr. Mark Eberhard of the Centers for Disease Control and Prevention, Dr. Mounkaila Noma of the African Program for Onchocerciasis Control (APOC), Dr. Adiele Onyeze of the WHO Regional Office for Africa, Dr. Eric Ottesen of the Lymphatic Filariasis Support Center of the Task Force for Global Health, Dr. Frank Richards of The Carter Center, Dr. Yao Sodahlon of the Mectizan® (ivermectin) Donation Program of the Task Force for Global Health, Dr. Mark Taylor of the Liverpool School of Tropical Medicine, Dr. Gary Weil of the Washington University School of Medicine, and Mr. Honarat Gustave Zoure of the African Program for Onchocerciasis Control. Dr. Noma, Mr. Zoure, and Dr. Laurent Yameogo of APOC participated in the meeting by telephone, from Ouagadougou.

In its published report in 1993, the ITFDE became the first international body to recognize the potential eradicability of lymphatic filariasis.[1] More recently, the ITFDE reviewed lymphatic filariasis again in 2002 and 2008, and onchocerciasis in 2001 and 2007. In 2002, The Carter Center and WHO also co-sponsored a conference that considered the eradicability of onchocerciasis.[2] These respective meetings concluded that lymphatic filariasis was probably eradicable, and that onchocerciasis could probably be eliminated in the Americas but could not be eliminated in all affected areas of Africa with currently available tools, and because of concern about treatment complications associated with the parasite *Loa loa*.

[1] Centers for Disease Control and Prevention (CDC), 1993. Recommendations and Reports: Recommendations of the International Task Force for Disease Eradication. *Morbidity and Mortality Weekly Report*, 42:RR-16.
[2] Dadzie Y, Neira M, Hopkins D. Final Report of the Conference on the Eradicability of Onchocerciasis. *Filarial Journal* 2003:2.

Current extent of onchocerciasis, lymphatic filariasis and loiasis in Africa

Onchocerciasis occurs predominantly in Africa, where the parasite *Onchocerca volvulus* is transmitted to humans by *Simulium* sp. black flies. More than 112 million persons are at risk for onchocerciasis in Africa as of 2009 (Table 1). About 70% of the total population at risk of onchocerciasis are in only five of the 24 endemic African countries: Nigeria (33 million at risk), Democratic Republic of Congo (DRC; 27 million), Cameroon (6.4 million), Ethiopia (5.8 million) and Sudan (5.6 million). The African Program for Onchocerciasis Control (APOC) originally used the REMO (rapid epidemiological mapping of onchocerciasis) process to define populations at risk for community-directed treatment with ivermectin (CDTI); REMO determined areas that were hyper- or meso-endemic (i.e., where onchocerciasis nodule prevalence in adult males was at or above 20% estimated to be equivalent to a parasite prevalence of 40%), based on the frequency of palpable onchocercal nodules. Areas below 20% nodule prevalence were not believed to be at significant risk of morbidity from onchocerciasis, and hence were not eligible for mass treatment under APOC. APOC is now seeking to re-define its target areas for mass treatment from high morbidity areas to "transmission zones", using a geostatistical method ("kriging") involving interpolation of original REMO nodule data, in view of APOC's new focus on interrupting transmission of onchocerciasis. It is considered likely that the existing APOC project areas will overlap much but not all of the new transmission zones, meaning that there are likely onchocerciasis transmission areas not currently eligible for mass drug administration (MDA) under the old APOC strategy that was designed to control onchocerciasis. APOC's latest map showing the predicted prevalence of onchocerciasis in Africa may be viewed at http://www.who.int/apoc/oncho_elimination_report_english.pdf.

In Africa lymphatic filariasis (LF) is caused by the parasite *Wuchereria bancrofti*, which in rural areas is transmitted to humans by the bites of *Anopheles* sp. mosquitoes that also transmit malaria and in urban and coastal settings in East Africa by *Culex* sp. Over 405 million persons are at risk for lymphatic filariasis in 35 endemic African countries (Table 1). The distribution of this infection is estimated by using immunochromatographic card tests (ICT) to detect circulating *W. bancrofti* antigen, or by microscopic examination of nocturnal blood smears to detect microfilariae. LF distribution has been fully mapped in about two-thirds of the endemic African countries, but doubts have been raised about the quality of the mapping undertaken in some areas. Nigeria (70.7 million at risk), Democratic Republic of Congo (49.1 million), Tanzania (37.4 million), and Ethiopia (30.0 million) account for nearly one-half (46%) of the population at risk of LF in Africa. No estimate is available yet of the population at risk for LF in Sudan.

Another filarial parasite in Africa is *Loa loa*, which is transmitted by the bite of *Chrysops* sp. (Tabanid) flies and causes Tropical Eye Worm and Calabar Swelling. High prevalence of loiasis and high *Loa loa* microfilarial loads in endemic communities have been associated with serious adverse reactions when such persons are treated with ivermectin for onchocerciasis. Serious adverse reactions would presumably occur as well if ivermectin and albendazole were given for LF in *Loa loa* endemic areas. *Loa loa* infection is a serious constraint to mass treatment for onchocerciasis and/or LF in parts of 11 African countries (Table 1), where APOC estimates about 14.3 million persons are believed to be at risk of such serious adverse events in its project areas. These estimates are based on a rapid method for assessing the prevalence of *Loa loa* by asking a sample of adults about history of a worm migrating across the subconjunctivae of their

eye. A map showing the estimated prevalence of loaiasis in Africa may be seen at http://www.who.int/apoc/raploa/Africa_EN_map.jpg.

Interventions for onchocerciasis and lymphatic filariasis in Africa

The Onchocerciasis Control Program (OCP) began in 1974 and used vector control alone until 1988 when Merck & Co. Inc donated ivermectin (Mectizan®) for mass drug administration of ivermectin, to reduce morbidity and reduce duration of vector control to eliminate transmission of onchocerciasis almost completely in 11 West African countries before the OCP ended in 2002. The few exceptions were "special intervention zones" where transmission continued broadly in Sierra Leone, and in foci in small parts of Benin, Ghana, Guinea and Togo where transmission had continued due to various epidemiological situations—e.g., low coverage, difficulties of vector control (access to breeding sites), high initial community microfilarial loads, or migratory populations. The African Program for Onchocerciasis Control (APOC) began in 1995 with the goal of helping the remaining endemic countries in West, Central and East Africa to establish sustainable programs to control the disease by mass drug administration, health education and community mobilization. In 2009, 82.8 million ivermectin treatments were provided (Table 1), 73.7% of the total population at risk, with estimations that the burden of onchocerciasis in Africa has been reduced considerably. APOC is scheduled to end in 2015. After assessing new evidence of the impact of mass drug administration in Africa over several years (see below), and considering the challenges of maintaining MDA indefinitely, APOC recently began to shift its strategy from control to "elimination" of onchocerciasis (elimination defined by APOC as "Reduction of *O. volvulus* infection and transmission to the extent that interventions can be stopped, but post intervention surveillance is still necessary"[3]).

Under its new "elimination" strategy, APOC is assessing current transmission of onchocerciasis and validating reported treatment coverage in the 107 projects it assists or has assisted, in order to determine "when and where ivermectin treatment can be safely stopped and to provide guidance to countries on preparing to stop ivermectin treatment where feasible"[3]. APOC's provisional estimates based on eight or more years of adequate reported annual treatment coverage, are that 36 of the projects will be able to stop MDA by the end of 2012, and another 41 projects by the end of 2015, with 30 projects unable to safely stop MDA by the time APOC closes. Delineation of the remaining transmission zones for onchocerciasis that extend outside of current project areas has just begun, however, and the extent of the population with onchocerciasis yet untreated is not known. Great concern was expressed during the Task Force meeting at the proposed rapid scale down of MDA now being contemplated by APOC, in light of the perceived inadequate preparedness of most endemic countries to assume the necessary activities after APOC ends, the disconnect between APOC's current "project areas" and the still un-delineated "transmission zones" necessary for planning how to stop transmission, and the fact that large populations in the existing APOC target areas still have not received any treatment at all for the disease (e.g., in parts of DRC, Angola, Liberia and Sudan) (Table 1). Some Task Force members questioned whether endemic countries and their partners were truly committed to

[3] WHO/APOC. Informal consultation on elimination of onchocerciasis transmission with current tools in Africa-"shrinking the map". Ouagadougou, Burkina Faso; 25-27 February 2009.

the new elimination strategy and prepared to support its implementation financially, as APOC has requested.

In contrast to onchocerciasis treatments in Africa, only about 18% of the population at risk of LF received MDA for that disease in Africa in 2009 (Table 1), and compared to the rest of the world where MDA for LF has been scaled up rapidly over the past decade, Africa has lagged badly. Exceptions are Burkina Faso, Malawi, Mali and Togo, which were providing >70% MDA coverage of their at risk populations with MDA for LF as of 2009. The disease has not yet been fully mapped in nearly one-third of the endemic countries (as described above) and more mapping is especially needed to ascertain more precisely the overlap in treatment areas for LF and onchocerciasis, as well as overlap with *Loa loa* endemicity. In general, MDA with ivermectin and albendazole for LF is expected to be needed in larger areas that overlap much or most of the areas where onchocerciasis is endemic, including many hypoendemic areas not treated with ivermectin under the old APOC strategy. Thus in non *Loa* areas where ivermectin based MDA can be used, scaling up for LF will help cover as yet untreated onchocerciasis in transmission zones that extend beyond current APOC project areas. In addition it would be important to consider whether LF treatment is needed in areas long treated for onchocerciasis, as ivermectin treatment alone may already have had an impact on LF transmission.[4]

Options for intervening against LF and onchocerciasis in areas where loiasis is co-endemic are limited, but not non-existent. The Task Force heard evidence from a study conducted by The Carter Center and funded by the Bill & Melinda Gates Foundation in southeast Nigeria that vector control by means of long-lasting insecticidal bed nets can interrupt transmission of LF in an area where MDA cannot be used safely because of co-endemic loiasis. Other studies (also supported by the Gates Foundation) conducted by the Anti-Wolbachia Consortium based at the Liverpool School of Tropical Medicine suggest that 4-8 weeks of doxycycline treatment has significant macrofilaricidal activity against LF and onchocerciasis without provoking *Loa loa* associated adverse events. The Gates Foundation also is about to support studies to investigate the impact of using albendazole alone to treat LF infections in areas where loiasis is co-endemic, since persons treated with albendazole monotherapy are not at increased risk of serious adverse effects in such areas. Because of the constraint posed by co-endemic loiasis, which is most prevalent in parts of Central Africa, it was suggested that perhaps a sub-regional elimination approach should be used, focusing first on interrupting transmission of LF and onchocerciasis in East and West Africa with ivermectin based MDA. The importance of beginning interventions as early as possible in the endemic areas of highest prevalence was also raised in this connection, because of the associated morbidity, because such areas will require MDA for the longest periods before transmission will be interrupted, and because treating them will reduce the risk of infections being exported to lesser or non-endemic areas.

As the African country with the most cases of onchocerciasis and LF, Nigeria (population ~150 million) was cited as an example of the complexity of overlapping distribution of LF, onchocerciasis and loiasis. Of the 33 million Nigerians at risk of onchocerciasis, 77% (25.6 million) were treated in 2009. Most (26 of 27) APOC project areas in Nigeria are currently classified as being "feasible" to stop MDA for onchocerciasis by 2015. At least 70 million

[4] Kyelem D *et.al*., 2005. Impact of long-term (14-years) bi-annual ivermectin treatment on *Wuchereria bancrofti* microfilaraemia. *Tropical Medicine and International Health* 10:1002-1004.

persons are at risk of LF in Nigeria, however, of which only 3.8 million (5.4%) were treated with ivermectin and albendazole in 2009. However, 28 million LF treatments have been approved for a massive scale effort of LF MDA in Nigeria in 2011. About 64% (497/774) of Nigeria's Local Government Areas had been mapped for LF as of February 2011. About 254,000 Nigerians are considered to be at risk of adverse reactions to MDA for LF or onchocerciasis, due to co-endemic *Loa loa* infection in some southern states. Although only 14% of Nigerian households were estimated to have at least one insecticidal bed net in 2009, by the beginning of 2011, Nigeria had distributed 52% (32.8m) of the 63.2 million bed nets needed to provide an average of two bed nets per household, with a goal to provide the remaining bed nets by the end of 2011. Given that the complexities observed in Nigeria are also evident in other African countries, it was stressed that national programs to eliminate LF and onchocerciasis must be flexible and tailor their strategies, since "one size does not fit all".

Peace in several endemic African countries previously plagued by civil war (e.g., Angola, Democratic Republic of Congo, Liberia, Sierra Leone, Sudan) favors scaling up interventions against LF and onchocerciasis. Moreover, in addition to wider MDA with ivermectin and albendazole for LF, the increased distribution of long-lasting insecticidal bed nets for malaria that is now underway in Africa will help reduce LF transmission.

Evidence of impact of interventions

Since the previous ITFDE meetings that considered onchocerciasis, there is further evidence that annual and twice per year MDA with ivermectin can eliminate transmission of onchocerciasis in Africa after several years. Most important is the study by Diawara *et. al.*[5] who found that annual or six-monthly treatments with ivermectin in three hyper-endemic foci in Mali and Senegal eliminated onchocerciasis transmission after 15-17 years. MDA was halted in these foci, and later studies showed no recrudescence of infection after three years of post-treatment surveillance.[6] However, Katabarwa *et.al.*[7] found that 10-13 years of annual MDA in hyper-endemic communities of Cameroon and Uganda did not interrupt transmission, although the intervention reduced prevalence by 90%. A similar study[8] of eight sentinel communities in southeast Nigeria found that 14 years of annual MDA had not yet interrupted transmission. In the Americas, modeling by Cupp and Cupp[9] using data from published Guatemala studies showed that twice per year MDA eliminates onchocerciasis transmission in 6.5 years, and four times per year MDA, in five years. These data suggest that shorter treatment intervals might be useful in certain circumstances in Africa. The Government of Sudan launched an elimination effort in 2006 using a twice per year MDA strategy, aimed at the isolated focus of Abu Hamad. In 2007, the Government of Uganda announced its plan to eliminate onchocerciasis nationwide by using MDA with ivermectin twice per year and vector control in selected foci.

[5] Diawara L, et. al,, 2009. Feasibility of onchocerciasis elimination with ivermectin treatment in endemic foci in Africa: first evidence from studies in Mali and Senegal. *PloS Neglected Tropical Diseases* 3(7):e497.
[6] Anonymous. Onchocerciasis: Elimination is feasible. *Wkly Epidemiol Rec* 2009, 84:382-384.
[7] Katabarwa M, et. al., 2008. After a decade of annual dose mass ivermectin treatment in Camerooon and Uganda, onchocerciasis transmission continues. *Tropical Medicine and International Health* 13(9):1196-1203.
[8] Emukah et.al., 2010. Impact assessment of repeated ivermectin on ocular and clinical onchocerciasis after 14 years of annual mass drug administration in eight sentinel villages, Southeast Nigeria 2008. Meeting of the American Society of Tropical Medicine and Hygiene, Atlanta 2010.
[9] Cupp E, Cupp M, 2005. Short report: Impact of ivermectin community-level treatments on elimination of adult *Onchocerca volvulus* when individuals receive multiple treatments per year. *Am J Trop Med Hyg* 73(6):1159-1161.

For LF, studies in Egypt show that five years of treatment with diethylcarbamazine (DEC) and albendazole at high coverage appears to have interrupted transmission of LF in all endemic areas.[10] Togo is believed to be close to eliminating transmission of LF nationwide after 6 or more years of annual MDA using the ivermectin albendazole combination.[11] However, results from study of annual MDA with ivermectin and albendazole for 6-10 years in ten sentinel villages of Plateau and Nasarawa States in Nigeria show that LF transmission was interrupted in only five of the ten villages.[12]

Research needs

The 2007 ITFDE meeting on onchocerciasis[13], and the conference co-sponsored by The Carter Center and WHO in 2002[2] have stressed the high priority for an effective, practical macrofilaricide to help eliminate transmission of the disease. This meeting heard of promising studies being supported by the Bill & Melinda Gates Foundation in pursuit of that goal. The DOLF project ("Death to Oncho and LF") is conducting trials of annual vs. twice per year MDA with ivermectin and albendazole against LF and onchocerciasis, as well as trials of new combinations and schedules of existing drugs. The Anti-Wolbachia Consortium at the Liverpool School of Tropical Medicine is investigating the macrofilaricidal effects of doxycycline in 4-6 week daily drug administration programs in a large community-directed treatment trial in Cameroon; a four day course of triple combinations of drugs is also being investigated on a smaller scale. Meanwhile, the Onchocerciasis Elimination Program for the Americas (OEPA) is accumulating experience in Brazil, Mexico, and Venezuela using ivermectin MDA four times per year (at 3 monthly intervals). The need for reliable and practical diagnostic tests to detect viable adult worms was also considered important. Other topics discussed briefly included the need to find ways to reduce systematic noncompliance with MDA, a review of criteria for stopping MDA as outlined by the 2001 WHO guidelines,[14] and post MDA surveillance for recrudescence. Further study of the clinical, therapeutic and other features of the severe adverse effects associated with the use of ivermectin in cases of *Loa loa* infection would also seem to be warranted.

Participants expressed their sadness at learning of the passing of the outstanding onchocerciasis clinical researcher, Dr. Kwablah Awadzi. Dr. Awadzi, a Ghanaian, conducted clinical pharmacological studies on key drugs used for onchocerciasis, including diethylcarbamazine, suramin, ivermectin, amorcarzine, and moxidectin.

[10] Molyneux D, 2006. Elimination of transmission of lymphatic filariasis in Egypt. *Lancet* 367:966-968.
[11] Dorkenoo et.al., 2010. Is Lymphatic Filariasis transmission interrupted in Togo? Meeting of the American Society of Tropical Medicine and Hygiene, Washington, DC 2009.
[12] Richards F et.al. 2008. Sentinel village epidemiological and entomological evaluations after six years of annual mass drug administration with ivermectin and albendazole (Abstract). Annual meeting of the American Society of Tropical Medicine and Hygiene.
[13] Anonymous. Meeting of the International Task Force for Disease Eradication—11 January 2007. *Wkly Epidemiol Rec*. 2007, 82:197-202.
[14] WHO, Guidelines. Certification of elimination of human onchocerciasis: criteria and procedures. Geneva. 2001. WHO/CDC/CPE/CEE/2001.18a.

Conclusions and Recommendations

1. Onchocerciasis mass drug administration (MDA) coverage (74%) in Africa is considerably better than that of LF, for which only about 18% of the African population at risk benefited from MDA in 2009. However, the ITFDE believes elimination of lymphatic filariasis from the African continent is still possible by the global target year of 2020 set by the World Health Assembly in 1997 (WHA 50.29). Achieving this however, will require complete mapping of LF distribution within the next year or two, and rapid scale up of mass drug administration or other interventions to all endemic areas by 2015. Concurrent increases in distribution of long-lasting insecticidal bed nets in Africa to prevent malaria will also help stop transmission of lymphatic filariasis.
2. The ITFDE welcomes the African Program for Onchocerciasis Control's (APOC) recent transition towards a policy of onchocerciasis elimination. However, successful attainment of this bold objective by 2015 is not feasible. The ITFDE is concerned about the rapid pace of reduction in MDA for onchocerciasis being considered by APOC, given current uncertainty about the extent of zones where onchocerciasis is being transmitted, and the likely lack of treatment so far in parts of those transmission zones. Linking an APOC goal to eliminate onchocerciasis to the LF elimination date of 2020 would be more feasible, but still will require surmounting several challenges, including: finding effective strategies to stop transmission of onchocerciasis in areas that are co-endemic for loiasis where ivermectin based MDA cannot be used; delineation of untreated zones where transmission of onchocerciasis is still occurring (instead of the project areas that have defined APOC-supported control measures up to now); extending mass drug administration to all such transmission zones where this can be done safely, with priority to reaching as soon as possible the highly endemic areas and populations at risk of onchocerciasis that have never received mass drug administration.
3. The ITFDE considers it imperative that the two initiatives to eliminate lymphatic filariasis and onchocerciasis work much more closely together to coordinate mapping and mass drug administration activities in Africa at continental, national and district levels. Lymphatic filariasis elimination programs and malaria control programs should also join forces to benefit mutually from village-based drug administration and bed net distribution. The World Health Organization should help ensure that these three programs work together as much as possible, beginning immediately. Mass administration of ivermectin and albendazole for LF and onchocerciasis, and distribution of long-lasting insecticidal bed nets are cost-effective interventions that will have highly synergistic beneficial impact on lymphatic filariasis, malaria, and onchocerciasis. These medicines also have an impact on soil-transmitted helminths.
4. APOC and the LF Elimination Program should prioritize the 4-6 African countries that contain a large share of the respective at risk populations for rapid scale up of appropriate interventions.
5. In devising and implementing coordinated activities against onchocerciasis and LF in Africa, the ITFDE stresses the need for flexibility in order to account for complex differences among countries as well as within countries. A single approach will not address the needs and epidemiological conditions of all countries, or all transmission zones within countries.

Providing better overlay maps of LF, onchocerciasis,and *Loa loa* areas will help in the design of more integrated LF and onchocerciasis elimination programs.

6. The ITFDE acknowledges the beneficial impact by LF and onchocerciasis programs and especially the onchocerciasis programs (OCP and APOC) in reducing the burden of disease in Africa. The ITFDE notes however that APOC treatment coverages are under 70% in several countries. Treatments in these difficult untreated areas need to be launched immediately (security permitting), and treatments more frequent than annually may be needed in some recalcitrant areas, or to "catch up" with areas that have been treated for longer periods already.
7. To facilitate comparisons of impact of MDA on LF or onchocerciasis, ideally one would want to know the baseline prevalence of infection, the frequency and duration of MDA, the coverage attained by the MDA, prevalence of infection after MDA, and the results of entomological as well as epidemiological assessments.
8. Participants endorsed the views of previous meetings that development of a practical macrofilaricide deserves the highest priority for research related to onchocerciasis. Developing an effective diagnostic for detecting viable adult worms is another high priority.
9. The ITFDE expresses its gratitude for the valued donations by Merck and GlaxoSmithKline of the drugs that have advanced the fight against these two parasitic diseases so remarkably.

Table 1

2009 Status of Onchocerciasis and Lymphatic Filariasis mapping and treatments and proportion of households owning at least one insecticide treated bed net (ITN) in 41 African Countries (* indicates countries endemic for *Loa loa*)

Country	Onchocerciasis (2009)				Lymphatic Filariasis (2009)				% Household with
	Mapped?	At-Risk Pop.	Treated	% treated	Mapped?	At-Risk Pop.	Treated	% treated	≥1 ITN (2009)
Angola*	Y	843,375	428,630	50.8%	In Progress	12,090,000	0	0.0%	22
Benin (OCP/SIZ)	Y	2,619,395	2,227,808	85.1%	Y	5,282,204	908,775	17.2%	61
Burkina Faso (OCP)	Y	168,239	139,601	83.0%	Y	15,411,849	12,326,907	80.0%	55
Burundi	Y	1,406,983	1,044,371	74.2%	Y	Not Endemic	MDA not required	--	27
Cameroon*	Y	6,373,612	4,809,225	75.5%	In Progress	14,305,000	616,160	4.3%	19
Cape Verde	N	Not Endemic	MDA not required	--	Y	Not Endemic	MDA not required	--	--
Centr. Afr. Rep*	Y	1,399,294	1,080,962	77.3%	In Progress	3,300,000	0	0.0%	26
Chad*	Y	1,871,174	1,513,713	80.9%	N	7,270,000	0	0.0%	9
Comoros	N	Not Endemic	MDA not required	--	Y	514,110	0	0.0%	14
Congo*	Y	760,793	616,192	81.0%	Y	2,600,000	0	0.0%	8
Cote D'Ivoire (OCP)	Y	1,419,466	1,037,481	73.1%	In Progress	14,000,000	914,720	6.5%	9
D. R. Congo*	Y	27,036,661	17,503,381	64.7%	In Progress	49,140,000	0	0.0%	53
Egypt	N	Not Endemic	MDA not required	--	Y	No longer endemic	MDA stopped	--	--
Equatorial G.*	Y	80,206	56,902	70.9%	Y	420,000	0	0.0%	47
Eritrea	N	Not Endemic	MDA not required	--	N	3,577,000	0	0.0%	59
Ethiopia*	Y	5,756,141	4,613,362	80.1%	In Progress	30,000,000	77,442	0.3%	91
Gabon*	Y	Not Endemic	MDA not required	--	Y	1,290,600	0	0.0%	66
Gambia	N	Not Endemic	MDA not required	--	Y	1,200,000	0	0.0%	49
Ghana (OCP/SIZ)	Y	2,081,644	2,405,510	115.6%	Y	11,587,953	7,204,038	62.2%	47
Guinea (OCP/SIZ)	Y	3,103,166	2,514,299	81.0%	Y	6,067,135	0	0.0%	10
Guinea Bissau	Y	100,479	76,145	75.8%	Y	1,311,741	0	0.0%	41
Kenya	Y	Not Endemic	MDA not required	--	Y	3,031,878	1,092,068	36.0%	70
Liberia	Y	2,176,273	1,224,359	56.3%	In Progress	3,600,000	0	0.0%	44
Madagascar	N	Not Endemic	MDA not required	--	Y	17,948,748	5,046,639	28.1%	57
Malawi	Y	1,978,306	1,638,355	82.8%	Y	12,887,248	10,805,518	83.8%	38
Mali OCP	Y	3,938,222	3,203,383	81.3%	Y	13,798,000	9,730,857	70.5%	87
Mauritius	N	Not Endemic	MDA not required	--	--	Not Endemic	MDA not required	--	--
Mozambique	Y	Not Endemic	MDA not required	--	Y	15,538,610	1,607,688	10.3%	36
Niger	Y	N/A	N/A	--	Y	11,465,194	6,523,176	56.9%	63
Nigeria*	Y	33,352,380	25,589,513	76.7%	In Progress	70,650,902	3,849,412	5.4%	14
Rwanda	Y	Not Endemic	MDA not required	--	Y	Not Endemic	MDA not required	--	58
Sao Tome and Principe	N	Not Endemic	MDA not required	--	Y	410,000	0	0.0%	64
Senegal (OCP)	Y	N/A	OCP	--	Y	5,314,600	412,461	7.8%	50
Seychelles	N	Not Endemic	MDA not required	--	--	Not Endemic	MDA not required	--	--
Sierra Leone (OCP/SIZ)	Y	1,498,310	1,134,958	75.7%	Y	5,319,758	3,476,726	65.4%	38
Sudan*	Y	5,605,726	2,974,226	53.1%	In Progress	Endemic/No Data	0	0.0%	19
Tanzania	Y	2,207,132	1,616,757	73.3%	Y	37,369,939	4,396,112	11.8%	45
Togo (OCP/SIZ)	Y	3,668,546	3,144,643	85.7%	Y	411,766	329,660	80.1%	71
Uganda	Y	2,947,581	2,239,902	76.0%	Y	13,264,445	3,140,683	23.7%	49
Zambia	N	Not Endemic	MDA not required	--	In Progress	8,780,000	0	0.0%	77
Zimbabwe	N	Not Endemic	MDA not required	--	In Progress	6,000,000	0	0.0%	54
Total		**112,393,104**	**82,833,678**	**73.7%**		**405,158,680**	**72,459,042**	**17.9%**	41
Mapping Summary			100% onchocerciasis endemic countries are fully mapped for morbidity risk (but not for transmission zones)				22/37 LF endemic countries (69%) fully mapped for transmission zones, with 11 (30%) in progess, and 3 (11%) not started		

Sources of Information

Onchocerciasis data for APOC assisted Countries was obtained from WER 2010, 85, 23-28 supplemented by APOC Progress Report for 2010, presented at JAF 16 (Report JAF 16.5).

Supplemental data on onchocerciasis in ex-OCP countries was provided by Drs. T Ukety, WHO-Geneva, and Yao Sadahlon (for Togo).
LF population at risk was obtained from the WHO Report (2010) - *Global Programme to Eliminate Lympatic Filariasis: Progress Report (2000-2009) and Strategic Plan (2010-2020)*.
Data related to LF country treatments from *WER* 2010, 85, p367, with exception of *WER* 2009, 84, p439 (for Kenya, Nigeria, and Uganda).
Y= Mapping completed
N= Mapping not done
LF mapping in Sudan provided by the Uganda technical team assisting the Government of Southern Sudan.
SIZ = Special Intervention Zone (ex OCP areas that had continued interventions after OCP closure in 2002).
United Republic of Tanzania Zanzibar reports transmission of LF interrupted and MDA stopped. It reports having no onchocerciasis.
ITN ownership data (source: WHO *World Malaria Report*, 2010).