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CARTER CENTER

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Summary
2010 Program Review for The Lions-Carter Center SightFirst

RIVER BLINDNESS PROGRAMS

Cameroon, Ethiopia, Nigeria, OEPA, Sudan, and Uganda

28 February – 2 March 2011
The Carter Center
Atlanta, GA

Lions Clubs International
FOUNDATION

THE CARTER CENTER
RIVER BLINDNESS PROGRAM

September 2011

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And to many others, our sincere gratitude.

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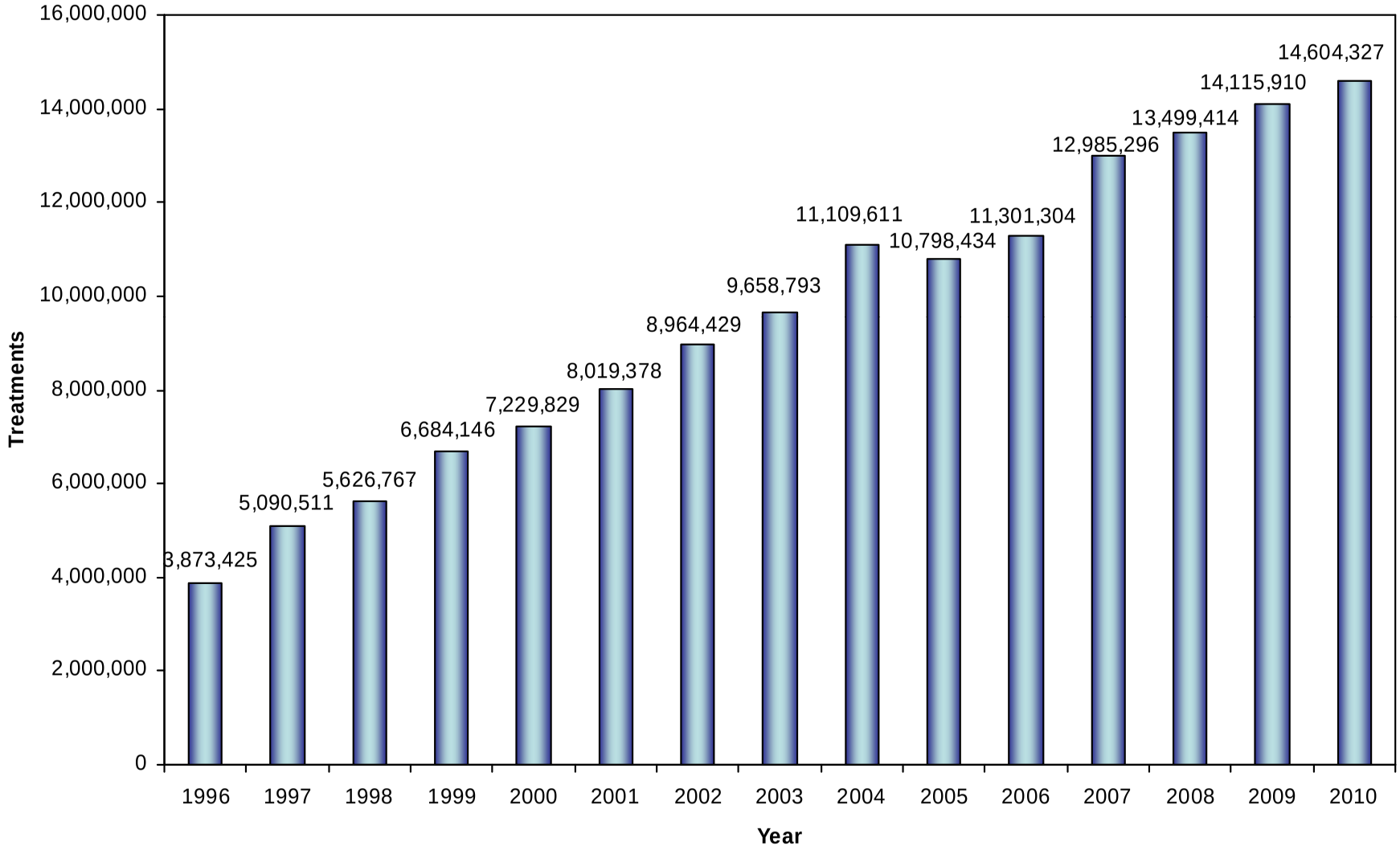

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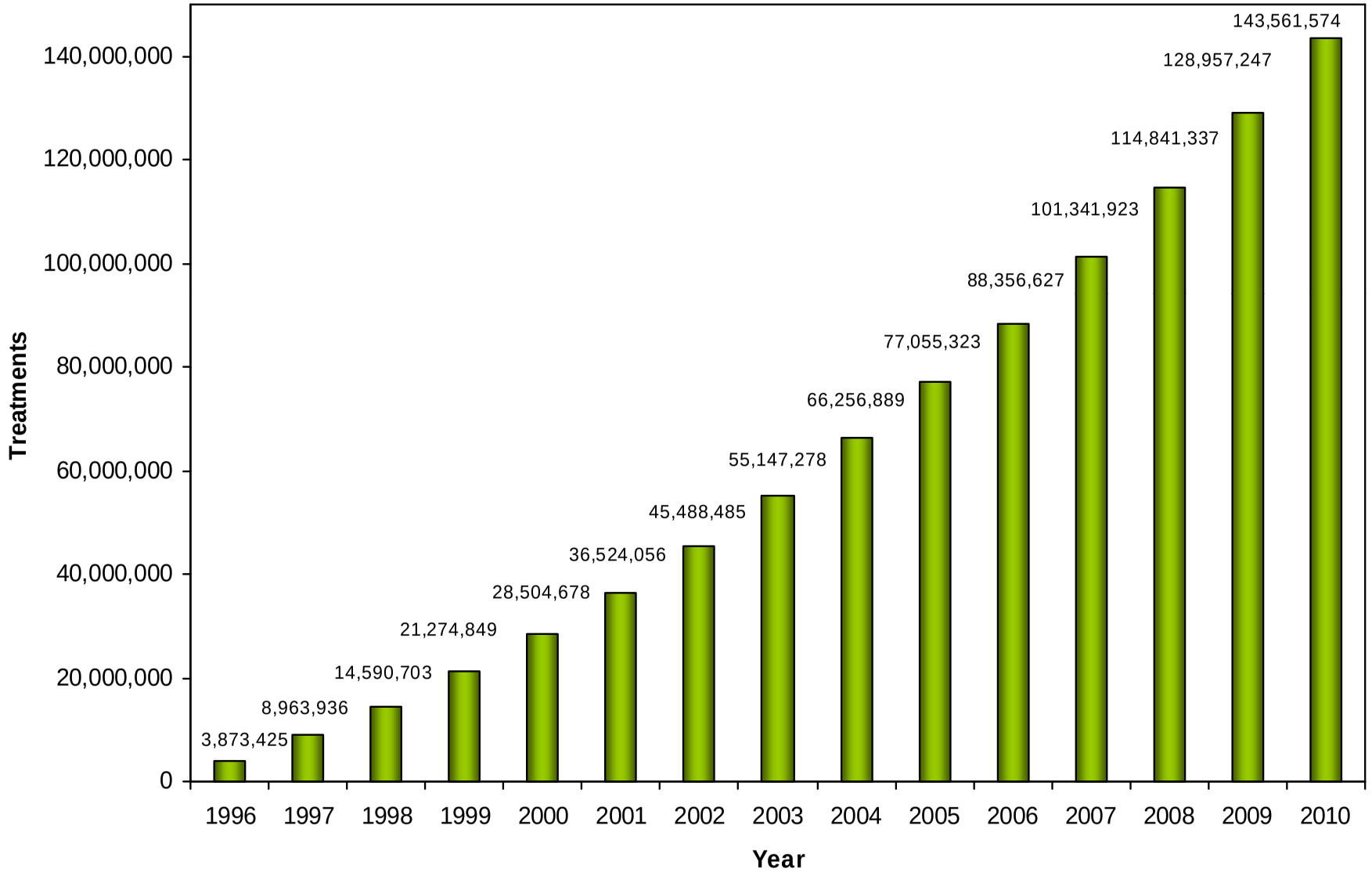

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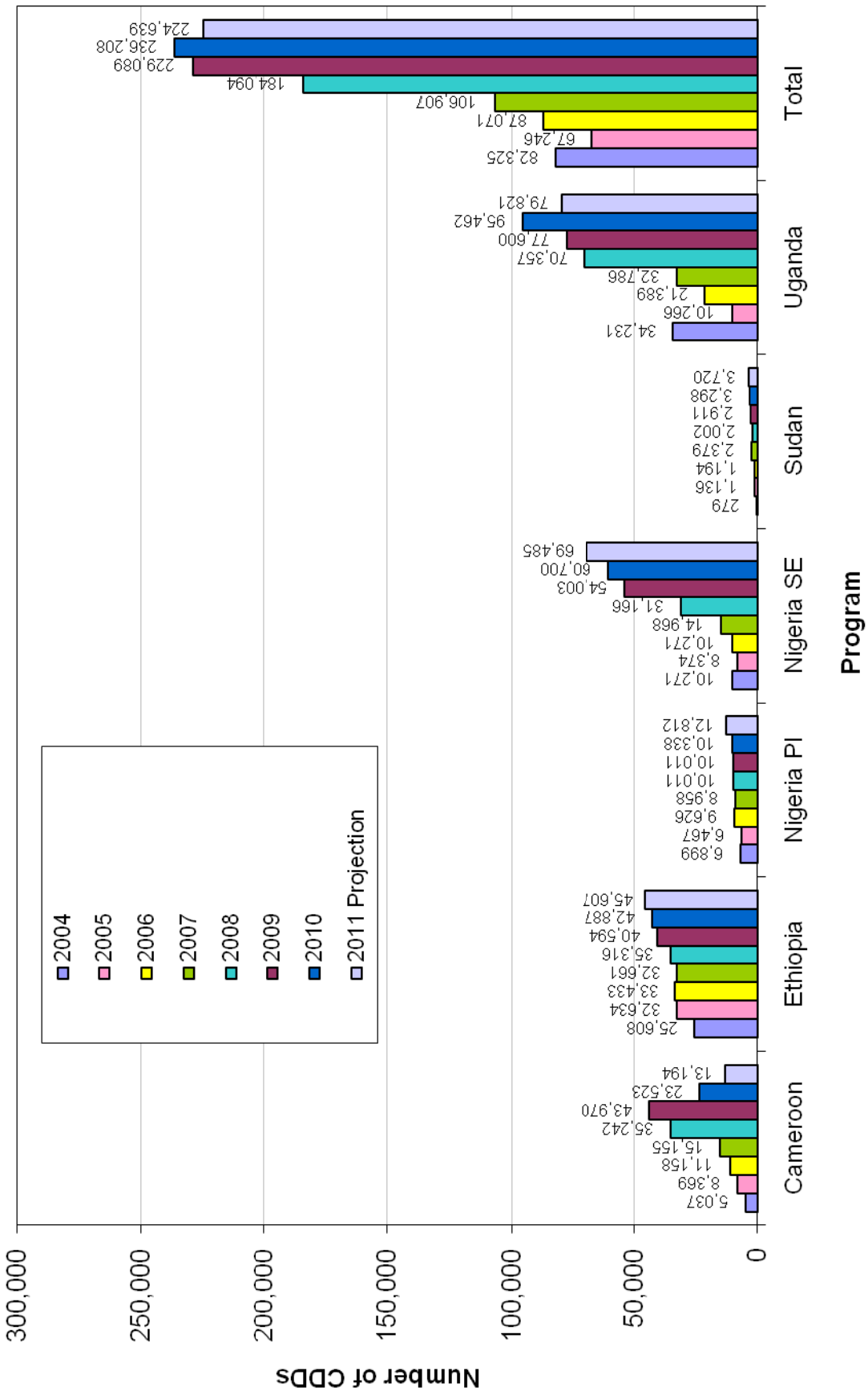

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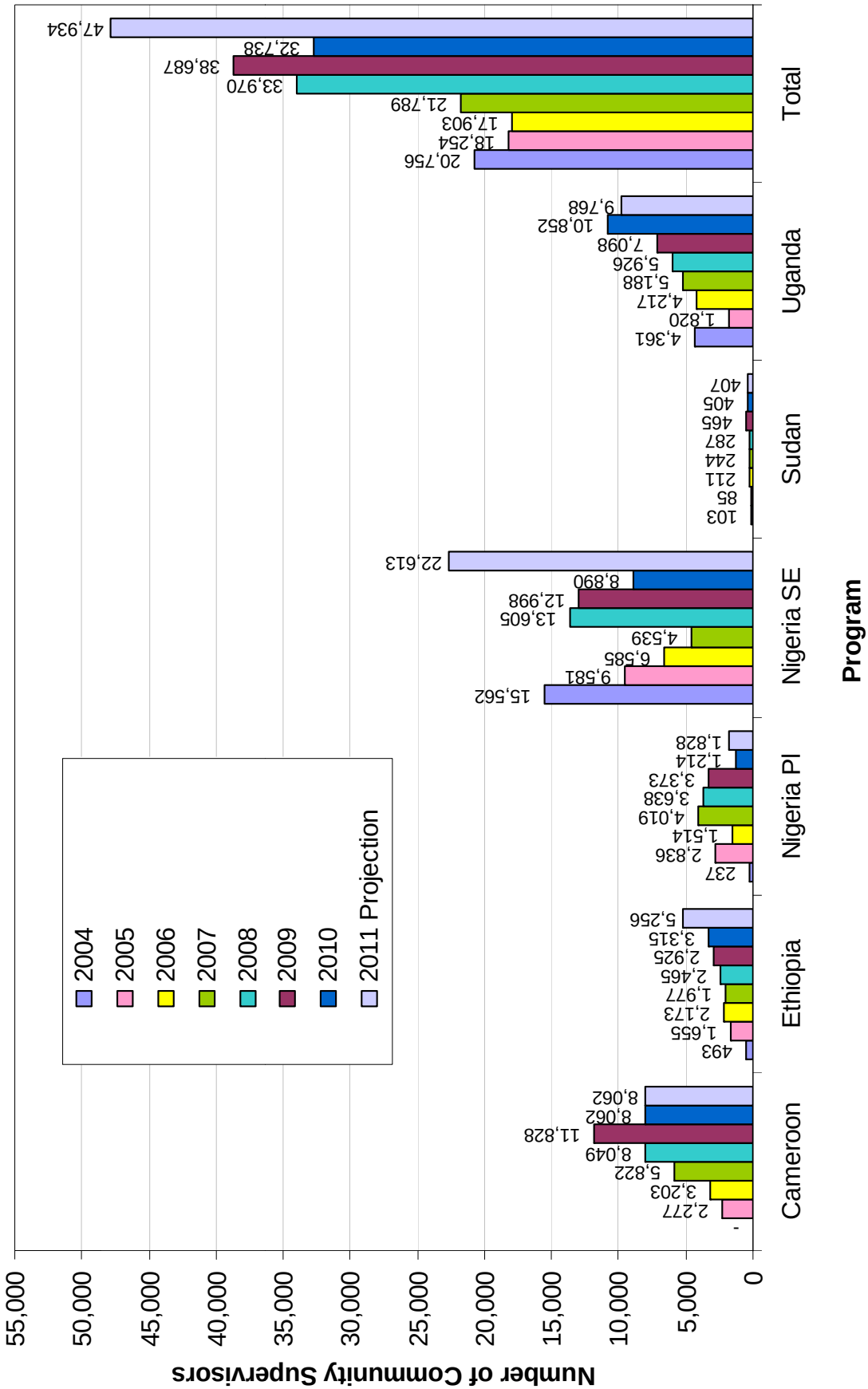

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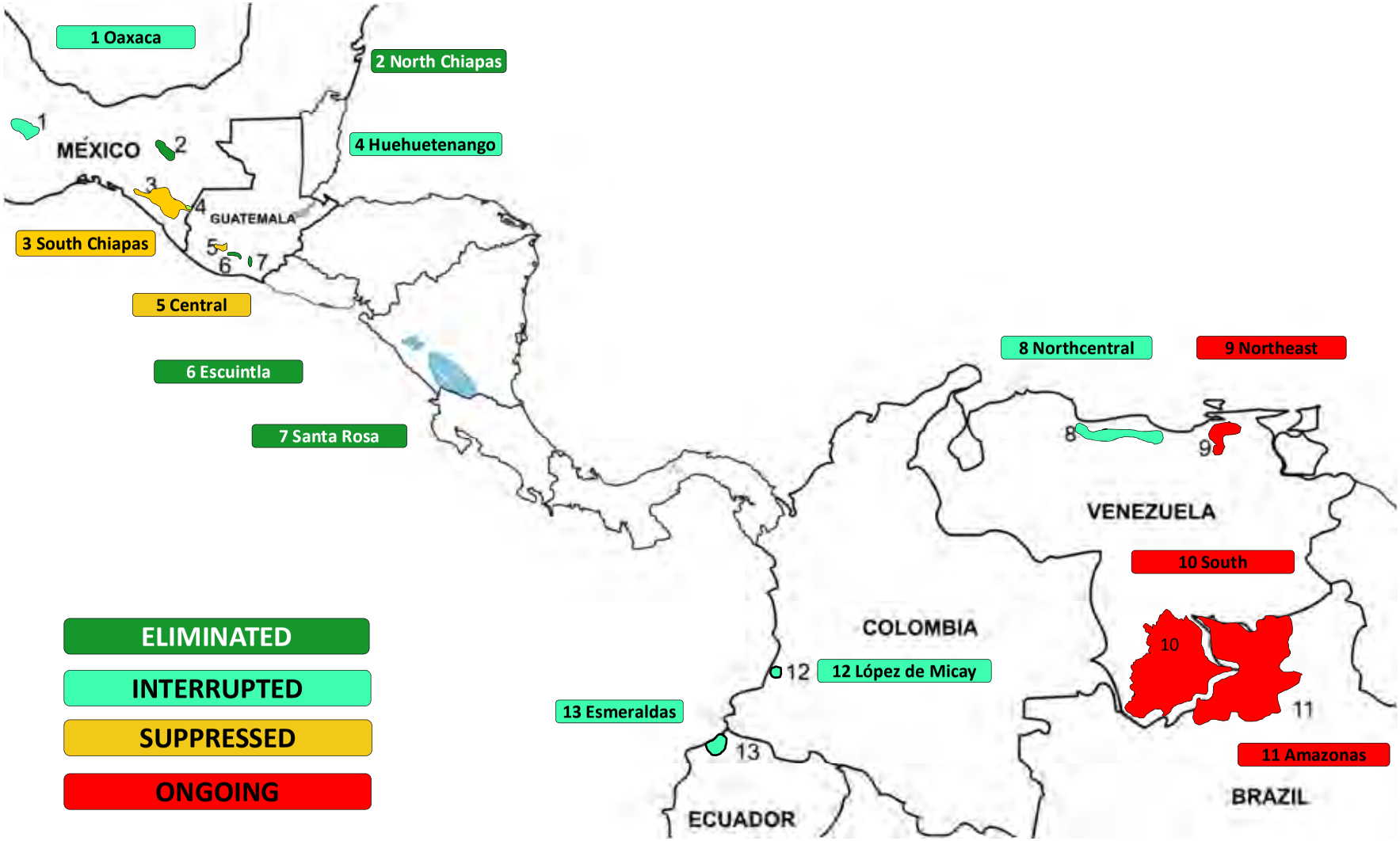

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No *Simulium neavei* Vector Captured Since June 2008 in Elgon Focus, Uganda (Data through January 2011)

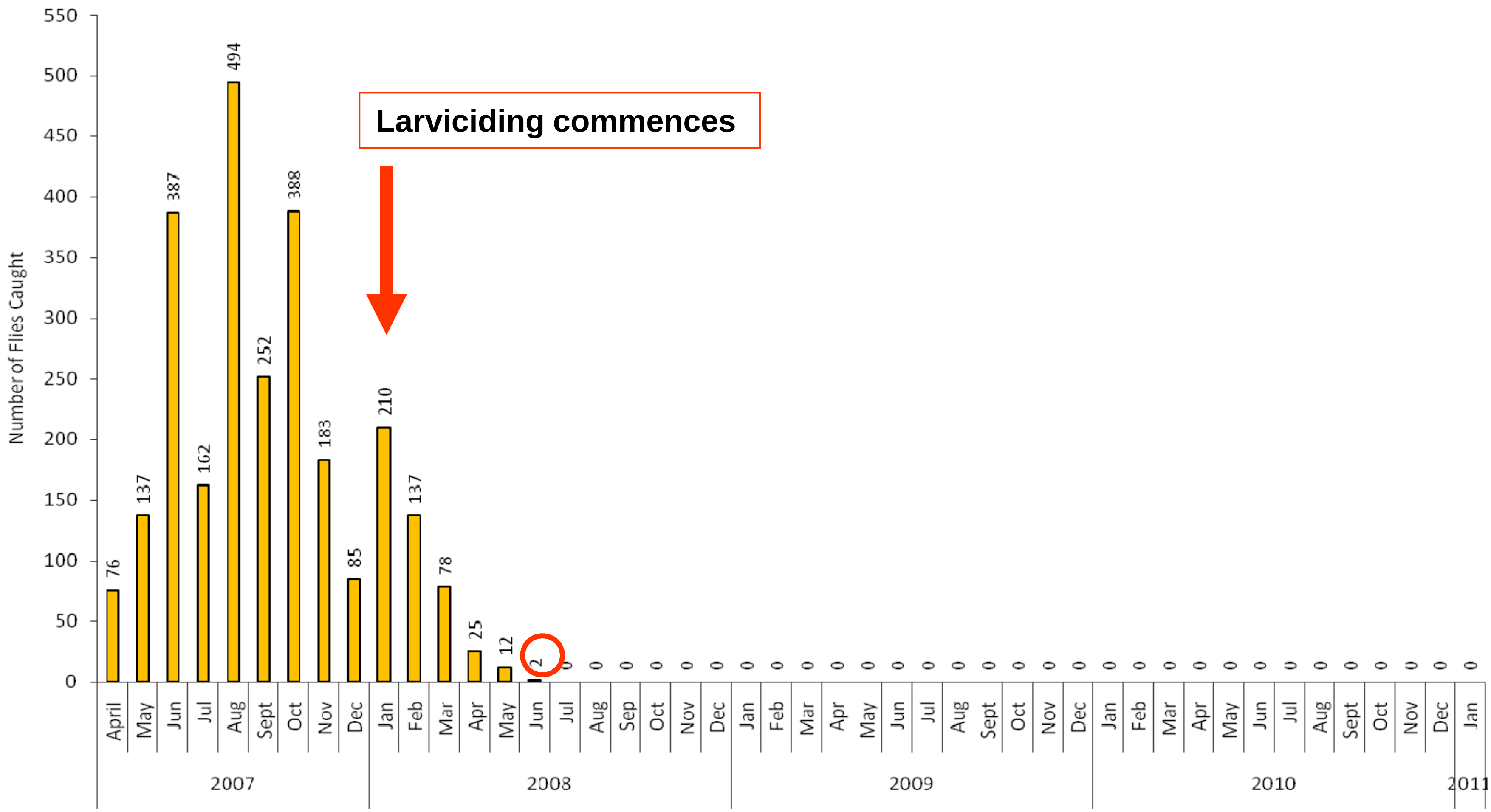


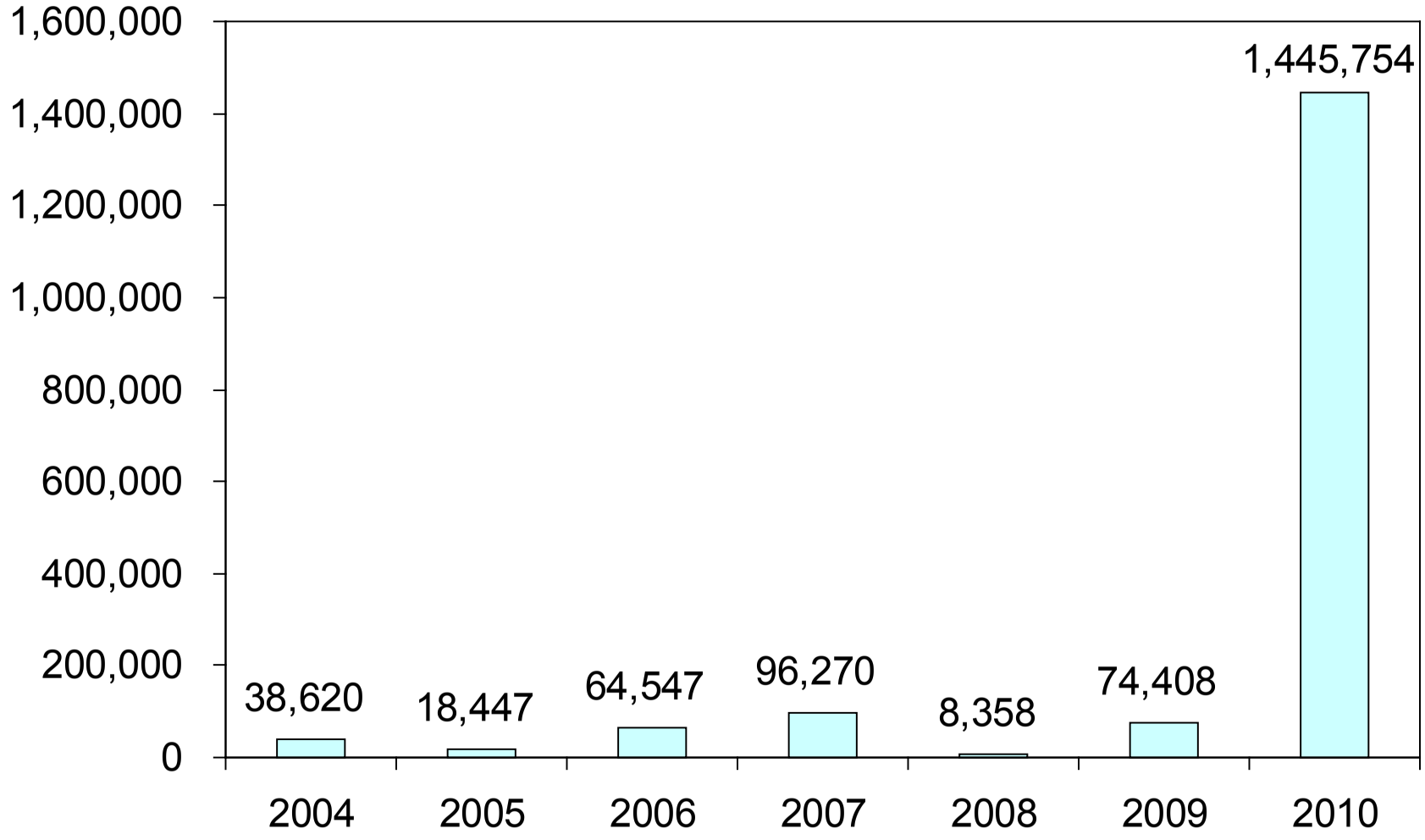
Figure H

Virtual Absence of Onchocerciasis Exposure in Serological Assessment (OV 16) of Children in the Elgon Focus (Uganda): 2010

District	No. of Communities	Age Group	No. Screened	Positive IgG4	% positive
Bududa		1 to <5	478	0	0
		> 5 and ≤ 10	498	0	0
		> 10 and ≤ 14	397	0	0
Sub total	**6**		**1,373**	**0**	**0**
Manafua		1 to <5	149	0	0
		> 5 and ≤ 10	115	0	0
		> 10 and ≤ 14	100	0	0
Sub total	**3**		**364**	**0**	**0**
Mbale		1 to <5	280	0	0
		> 5 and ≤ 10	190	0	0
		> 10 and ≤ 14	188	1	0.6
Sub total	**4**		**658**	**1**	**0.2**
Sironko		1 to <5	206	0	0
		> 5 and ≤ 10	229	0	0
		> 10 and ≤ 14	221	0	0
Sub-total	**4**		**656**	**0**	**0**
Entire focus		1 to <5	1,113	0	0
		> 5 and ≤ 10	1,032	0	0
		> 10 and ≤ 14	906	1	0.1
Grand total	**17**		**3,051**	**1**	**0.03**

Figure I

Nigeria: Insecticide Treated Bednet (ITN) Distribution in 2010 in Plateau and Nasarawa States*



* All ITN distributed in 2010 were Long Lasting Insecticidal Nets (LLIN)

ABSTRACT

The River Blindness Program (RBP) of The Carter Center assists the ministries of health (MOHs) of 11 countries[1] to distribute Mectizan® (ivermectin, donated by Merck & Co., Inc.) through programs whose goals are either to control or eliminate onchocerciasis. Most of these activities are undertaken in collaboration with LCIF under the Lions-Carter Center SightFirst Initiative. In 2010, the RBP and its partners provided more than 14.6 million Mectizan® treatments, the most since the launching of the program in 1996 (Frontispiece A). Cumulative RBP-assisted Mectizan® treatments since 1996 have reached 143 million (Frontispiece B). The RBP also helps countries integrate river blindness efforts with lymphatic filariasis, malaria, schistosomiasis, trachoma, and Vitamin A supplementation when feasible.

EXECUTIVE SUMMARY

Human onchocerciasis, an infection caused by a parasitic worm called *Onchocerca volvulus,* causes chronic skin disease and severe itching, as well as eye lesions that can progress to visual loss or complete blindness. The worms live in fibrous 'nodules' that often can be felt just under the skin. Onchocerciasis is transmitted by small black flies that breed in rapidly flowing rivers and streams, thus leading to the common name for the disease, "river blindness" (RB). The World Health Organization (WHO) estimates that approximately 37.2 million people are infected and 770,000 are blinded or severely visually impaired in 37 endemic countries. Approximately 123 million people live in endemic areas worldwide and are therefore at risk of infection; more than 99% of those at risk reside in Africa. Periodic mass treatment with Mectizan® prevents eye and skin disease caused by *O. volvulus* and may also be used to reduce or even interrupt transmission of the disease depending on the duration and frequency of treatment per year and the geographic extent of the distribution programs. (See Annex 1 and 2 for further details.)

The Carter Center's RBP is dedicated to safe and sustainable mass distribution of Mectizan® with health education to control or eliminate onchocerciasis. The distinction between control and elimination is important. In control, Mectizan® distribution likely will need to continue indefinitely because onchocerciasis transmission persists and people continue to get new infections; sustainability of control programs is vital and integration with other similar disease control activities for cost savings is an important element in this scenario. In elimination, Mectizan® treatment is used more intensively so that it can eventually be halted when evidence indicates that transmission of the parasite has ceased and the worm population has disappeared. Trying to eliminate onchocerciasis where feasible is an important goal of the RBP, and current RBP elimination efforts include all six endemic countries in the Americas and designated foci in Uganda and Sudan. In these eight countries, onchocerciasis elimination is a stated goal of the governments and their MOHs.

[1] Brazil, Cameroon, Colombia, Ecuador, Ethiopia, Guatemala, Mexico, Nigeria, Sudan, Uganda and Venezuela

Local Lions Clubs and the Lions Clubs International Foundation (LCIF) are special partners of The Carter Center in the battle against RB. When The Carter Center assumed the functions of the River Blindness Foundation (RBF) in 1996, it also entered into RBF's collaboration with local Lions Clubs in Cameroon and Nigeria. Since 1997, LCIF has generously provided grants to The Carter Center for the control or elimination of RB through their SightFirst I and Sightfirst II Initiatives. Through the Lions SightFirst I Initiative, LCIF and The Carter Center expanded their partnership to encompass controlling RB in five countries in Africa (Cameroon, Ethiopia, Nigeria, Sudan, and Uganda) and eliminating RB altogether in the six endemic countries of the Americas. The SightFirst II Initiative does not cover Nigeria, but provides generous support to all other countries we assist, including the more recent elimination efforts in Sudan and Uganda.

In 2003, The Carter Center's RBP received its first support from the Bill & Melinda Gates Foundation (BMGF) for the Onchocerciasis Elimination Program for the Americas (OEPA) through a matching grant mechanism that drew additional funding from LCIF; Merck & Co., Inc.; and more than 70 other donors. In 2006, the Gates Foundation began providing support to The Carter Center's integrated programs (which include RB) in Nigeria; the remainder of that support will conclude in 2011. Other external RBP partners include the U.S. Centers for Disease Control and Prevention (CDC), WHO, the African Program for Onchocerciasis Control (APOC)[2], and The World Bank, as well as other foundations, corporations, governments, and nongovernmental development organizations (NGDOs). Of course, the RBP would not be possible without the Merck & Co. donation of Mectizan®.

A major focus of The Carter Center is treatment coverage, and routine monthly reporting by assisted programs (Figure 1). The reader is referred to Annex 2 for a discussion of this reporting process and treatment indices used by the program and in this report. Important coverage terms include the **Ultimate Treatment Goal** (**UTG**), which is the treatment-eligible population in a program area (healthy persons >5 years of age); the **UTG(2)**, which is used by elimination programs where semiannual treatments are delivered; the **Annual Treatment Objective** (**ATO**), which is an interim target population in programs that are not operating at full scale due to financial or resource constraints; and **full coverage**, which is defined as 90% achievement of the UTG established for active mass treatment, or, for elimination programs, 90% of the UTG(2) (85% for OEPA). Passive treatments are Mectizan® treatments for onchocerciasis provided through health care units located in hypoendemic communities (where estimated onchocerciasis nodule prevalence is under 20%) in the control program strategy. In elimination programs, hypoendemic villages receive mass treatment (not passive). Refer to Figure 2 to see program performance on treatment goals over time; this figure demonstrates the impressive progress each program has made towards the high coverage we are now seeing annually.

[2] Carter Center RB projects no longer enjoy substantial APOC support since they are beyond the 5 year APOC project horizon.

Mectizan® tablets are distributed in Africa at the community level by grassroots community volunteers known as Community Directed Distributors (CDDs), through a process known as Community Directed Treatment with Ivermectin (CDTI), which was introduced with APOC support in the late 1990s. A focus of The Carter Center RBP is on "kinship-enhanced CDTI," an approach that seeks to train more CDDs than classic CDTI. In kinship-enhanced CDTI, decisions and activities are taken at the level of each kinship within a community, that is, grouping CDDs and those they serve within their own kinship or residential areas. This strategy seeks to increase the active participation of members of the affected communities over the years by: 1) training as many inhabitants of endemic villages as possible to serve as distributors; 2) encouraging the involvement of women; 3) reducing the demand for "incentives"; and 4) letting community members choose their own health workers and the location of treatment centers. The monitoring indices of the kinship approach include: 1) attaining at least 1 CDD per 100 persons to be treated in all communities; 2) sustaining treatment coverage of at least 90% of treatment-eligible persons; and 3) increasing involvement of women as CDDs and community supervisors. The costs of the kinship strategy and the demands of supervision of many CDDs have been major concerns expressed by partners about the kinship approach, and as a result these are areas of active RBP research. The CDDs and community supervisors are often highly engaged in other community based health interventions, such as water provision and sanitation, malaria control, immunization, and integrated neglected tropical disease (NTD) control efforts,. See Frontispiece C and for the growing numbers of CDDs and Community Supervisors over time working in RBP assisted efforts.

Summary of the Meeting

The River Blindness Program hosted its 15th annual Program Review meeting 28 February - March 2, 2011, at Carter Center headquarters in Atlanta, Georgia. The meeting focused on the achievements, challenges and research of Carter Center-assisted onchocerciasis control and elimination programs in 2010. The Review also addressed other diseases and public health initiatives in which The Carter Center helps countries integrate river blindness efforts with lymphatic filariasis, malaria, schistosomiasis, trachoma, and Vitamin A supplementation. A major goal of this meeting was to provide recommendations for each program. The Review is modeled after similar reviews developed by The Carter Center and CDC for national Guinea Worm Eradication Programs since 1988.

Program Review participants included Carter Center country representatives Dr. Nabil Aziz (Sudan), Dr. Albert Eyamba (Cameroon), Mr. Teshome Gebre (Ethiopia), Ms. Peace Habomugisha (Uganda), Dr. Emmanuel Miri (Nigeria) and Dr. Mauricio Sauerbrey (Director, OEPA). Other technical staff members included Dr. Abel Eigege and Dr. Emmanuel Emukah (Nigeria); and Dr. Zerihun Tadesse, Dr. Tekola Endeshaw and Mr. Abate Tilahun Habtemariam (Ethiopia). MOH representatives included Dr. Biholong Didier (Cameroon); Dr. Tizita Hailu Gudeta (Ethiopia); Dr. Benjamin Chukwuemaka Nwobi (Nigeria); and Dr. Kamal Hashim Osman and Dr. Asam

Mohamed Zroug (Sudan); and Dr. Richard Ndyomugyenyi and Mr. Thomson Lakwo (Uganda). Special guests included Honorable Dr. Med. World Laureate Tebebe Y. Berhan (Lions – Ethiopia); Ms. Kristen Eckert (LCIF); Dr. Julie Jacobson (BMGF); Dr. Yao Sodahlon and Dr. Kisito Ogoussan (Mectizan® Donation Program - MDP); Ms. Minne Iwamoto (GlaxoSmithKline); Dr. Grace Fobi (APOC); Ms. Eliza Petrow (Izumi Foundation) and Ms. Natalia Machuca (USAID). Also present were representatives from CDC, Emory University, Sightsavers International, the Task Force for Global Health, and the University of South Florida. The Review was opened by Dr. Donald R. Hopkins, Vice President, Health, The Carter Center. Dr. Frank Richards (Director of The Carter Center's Malaria, RB, Lymphatic Filariasis and Schistosomiasis Programs) chaired the meeting. (See Frontispiece Figure E for the photo from this meeting and Annexes 3, 4 and 5 for a complete participant list, contact list, and agenda).

In 2010, The Carter Center assisted 14,604,327 Mectizan® (donated by Merck & Co., Inc.) treatments in 11 countries, reaching 97% of the 2010 UTG (Figure 1). Overall, 143,561,574 cumulative treatments have been provided since the RBP was launched in 1996. Approximately 59% of the 2010 treatments were supported by Lions. About 40% of 2010 treatments took place in Nigeria. See Figure 3 for an illustration of treatments over the years by project. Approximately 200,000 CDDs working at the grass roots community level were trained during the year to accomplish the 2010 treatments. Areas where the goal is onchocerciasis control (characterized by annual Mectizan® treatments in hyperendemic areas to prevent the most eye disease) accomplished about 12 million treatments in 2010. In areas where complete elimination of the disease is the goal (twice per year treatment in all endemic areas to interrupt transmission), over 2.5 million treatments took place. Elimination is the target for the Abu Hamad focus in northern Sudan, seven foci in Uganda, and all six countries in the Americas where the disease is endemic.

The Carter Center-assisted programs have worked continually to enhance sustainability. One strategy is to include more women in the training sessions so that they can participate in community-directed treatment. Figure 4 shows the progress of these efforts; in 2001, 19% of CDDs were female. That number rose to 36% in 2010. Figure 5 shows an increasing percentage of female Community Supervisors as well, especially in Ethiopia and Nigeria. While the goal of community-directed programs is ultimately for countries to sustain them, much more progress remains to be made in order for these programs to be self-sufficient. See Figure 6 for funding sources of four RBP assisted African countries, by partner (APOC, government and The Carter Center) over time. See individual country sections for sources of this data. The spike in Carter Center funding in 2008-2009 is due to increased research/monitoring/evaluation (Nigeria, Ethiopia, Cameroon and Uganda) and the increased expenditures of RB elimination efforts (Uganda and Sudan). The APOC and government expenditures are based on 'best possible' determinations by our Carter Center country representatives and may not be completely accurate.

Americas: The aim of the Onchocerciasis Elimination Program for the Americas (OEPA) is to interrupt onchocerciasis transmission in the region of the Americas by

2012. The OEPA coalition includes MOHs of the six countries, The Carter Center, Lions Clubs and LCIF, Gates Foundation, Pan American Health Organization (PAHO)/WHO, MDP and the CDC. By the end of 2010, of the thirteen endemic foci in six countries (Frontispiece F), eight foci are no longer providing Mectizan® treatment. The first of three foci in Venezuela (the Northcentral focus) stopped mass treatment activities at the end of 2010. Three foci in 2010 passed successfully through three years of post treatment surveillance (PTS) and are deemed to have 'eliminated' onchocerciasis. The 80,000 persons living in those three foci are now no longer considered at risk of contracting the illness. When all foci in a country have successfully completed PTS (meaning it has demonstrated no transmission for three years in the absence of active interventions), it may request certification of elimination from the PAHO/WHO. Colombia could be the first such country to make such a request in late 2011.

Mass treatments for onchocerciasis are still ongoing in 5 foci in four countries; a total of 616,360 treatments were given in 2010, 94% of the goal. Since 2007, active eye disease attributable to onchocerciasis was found only in Brazil and Venezuela, and since 1995 no new cases of blindness attributable to onchocerciasis have been reported by MOHs in the Americas.

Uganda: The Lions-Carter Center Uganda River Blindness Program treatment figures continue to climb as more areas move to an elimination (twice per year treatment) strategy supported by Uganda MOH policy (Figure 3). The program assisted 2,555,894 treatments in 2010. Of the 2010 treatments, 865,302 were annual treatments in control areas and 1,690,592 were twice per year treatments in elimination areas (Figure 1). Uganda achieved 97% of its treatment targets. During 2010, the program trained 77,249 CDDs, and hosted the third Ugandan Onchocerciasis Elimination Expert Advisory Committee meeting in August 2010. The program and its partners discussed and agreed upon national guidelines for focal elimination of onchocerciasis transmission, and recommended that ivermectin treatments be halted and Post-Treatment Surveillance (PTS) started in Wadelai focus. Priority studies for 2010 – 2011 in other key foci (Imaramagambo and Itwara) were also recommended by the Advisory Committee to determine if transmission had been interrupted there. The Carter Center is supporting impact assessments (including entomological, serological and parasitological studies) in those foci. Most exciting is the Elgon focus, bordering Kenya, where no black fly vector has been observed since June 2008 and serological (antibody) studies in children show no infection or exposure to onchocerciasis (Frontispiece G and H). Also, a new area in northern Uganda that was previously inaccessible due to insecurity, with a total population of 548,918 (464,748 eligible for treatment) was found to be meso/hyperendemic, with river blindness related eye disease. The government of Uganda and the affected districts are planning for semi-annual treatment for river blindness elimination in this area, and have requested Carter Center assistance.

Sudan: The Sudan Lions-Carter Center effort, based in Khartoum, reported Mectizan® treatment figures that included annual treatments in control areas, and twice per year treatments in the Abu Hamad elimination focus, in accord with the policy of the MOH.

The reported 119,519 annual treatments in 2010 in control areas and 210,326 twice per year treatments in the elimination focus of Abu Hamad achieved 100% of overall treatment targets (Figure 1). Sudan also trained 3,270 CDDs. Assessments (including serological, parasitological, and entomological studies) are progressing to determine if onchocerciasis transmission has been interrupted in Abu Hamad.

Cameroon: A total of 1,823,700 persons in North and West region received Lions-Carter Center assisted mass Mectizan treatments in 2010, 96% of the UTG (Figure 1). Trained CDDs numbered 23,623. Cameroon reported on its recent impact studies (see *Eye of the Eagle* Volume 12, number 1, February 2011). Various onchocerciasis transmission studies conducted in Carter Center areas between 2008 – 2010 were reviewed, including a study in North region of Cameroon which showed that after 17 years of annual treatment with ivermectin, transmission was still continuing, and stopping mass treatment could result in disease recrudescence.

Nigeria: Over 5.4 million Mectizan® mass treatments for river blindness were assisted by the program in Nigeria in 2010 (99% of the UTG), as well as 531,365 passive treatments provided through clinics in the seven assisted states in the southeast. Nigeria trained or re-trained over 45,000 CDDs to accomplish the distribution. Assessments of RB transmission interruption were favorable in Plateau and Nasarawa, but showed evidence of ongoing transmission in the southeastern states. In 2010, Carter Center-assisted praziquantel treatments (for schistosomiasis) reached the highest level ever, at 1,328,886 treatments, and exceeded 1 million praziquantel treatments for the third year in a row. Much of the increase in treatments was due to an expansion to a fourth state, Edo, made possible with funding from the Izumi Foundation. The majority of the praziquantel used in Nigeria has been donated to The Carter Center through the World Health Organization (WHO) by Merck KGaA (E-Merck), Germany, with the remainder having to be purchased.

In Plateau and Nasarawa states, the River Blindness Program is integrated with the Lymphatic Filariasis (LF) Elimination Program (with funding from the Gates Foundation and GlaxoSmithKline), and Mectizan® treatments for river blindness were combined with albendazole (to interrupt LF transmission); about 3.2 million combined treatments with Mectizan and albendazole were assisted. This is a reduction from years past, because in 2010 the program did not treat in five Local Government Areas (LGAs) that appear to have successfully interrupted LF transmission. Lymphatic filariasis is transmitted by *Anopheles sp* mosquitoes, so the Lymphatic Filariasis Elimination Program benefits from the national effort of the MOH Nigeria Malaria Program to distribute over 63 million long-lasting insecticidal bed nets (LLINs) with the support of multiple donors, including The Global Fund to Fight AIDS, Tuberculosis and Malaria. The Carter Center assisted in the distribution of over 1.4 million LLINs in Plateau in late 2010 (Frontispiece I), and 1 million LLIN were distributed in early 2011 in Nasarawa. As a result of this and >7 years of LF mass drug administration (MDA), it is likely that LF transmission will be interrupted throughout the two state region in 2011.

Ethiopia: The Lions-Carter Center partnership in Ethiopia assisted in treating 3,298,195 persons to prevent onchocerciasis in 2010, 95% of the UTG. The Carter Center-assisted Malaria Program continued integrated efforts with the River Blindness Program in 2010, with CDDs there trained to monitor bed net use and provide behavior change communication related to their use and care. During 2010, 42,887 CDDs were trained.

Thanks to GSK support, combined Mectizan/albendazole treatments were provided for the second year for LF elimination in onchocerciasis endemic areas of Gambella Region. With this funding, the Ethiopia program assisted in 73,435 combined treatments in 2010, 87% of the UTG. LF mapping activities inside of Carter Center-assisted onchocerciasis areas was completed with the help of researchers at Addis Ababa University.

2011 GENERAL RECOMMENDATIONS FOR THE CARTER CENTER'S RIVER BLINDNESS PROGRAM

All Carter Center-assisted African programs should continue to show annual coverage data since 1996, related to the 90% eligible population (UTG) coverage goal for ivermectin distribution in Africa. OEPA should continue to use at least 85% UTG coverage as its goal.

Work to delimit the precise borders of African onchocerciasis foci targeted for elimination. Encourage WHO (APOC, PAHO) to assist us in evaluating cross border issues related to elimination, since these need to be addressed in ministerial meetings.

Seek to increase training, supervision, involvement of kinship groups, and gender balance among CDDs and community supervisors. Work toward a target ratio of at least 1 CDD:100 people and 1 community supervisor:5 CDDs in our assisted African programs.

Expansion of Carter Center programs into other disease control efforts requires formal Carter Center Board of Trustees approval, adequate funding to participate, and possibly Emory Institutional Review Board (IRB) approval. If the government wants to support integration in areas where The Carter Center assists, we will not refuse to participate since these are government-owned programs. However, without Board approval, funding and IRB review, The Carter Center can only be involved in coimplementation activities within designated river blindness Mectizan® distribution areas where we are already working, and within the time period when such distributions are scheduled.

Government leadership is essential in directing the process for integrated NTD expansion. [and in establishing national policy on compensation (or not) for CDDs]

Seek more Lions participation to help maintain program visibility and support wherever possible.

Apply The Carter Center monitoring protocol annually in Carter Center-assisted African programs to assess and validate coverage, health education, community involvement, and ownership.

Submit drug applications as early as possible, and no later than August of the year before the drug is needed. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year. Changes in denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and MDP should be advised accordingly. Changes in numbers of treatments to be administered (numerators) require discussion and approval by the MOH/NOTF, MDP and TCC HQ.

Carter Center program staff must complete or renew the Emory IRB certification if they are to be involved with research programs.

Overall Treatment Objective for onchocerciasis for 2011: 15,578,899

Quarterly UTG(4):	**249,500 treatments**
Semiannual UTG(2):	**4,305,633 treatments**
Annual UTG:	**11,023,766 persons**

Training Objective for 2011:

CDDs:	**222,329 (40,918 new)**
Community supervisors:	**43,424 (12,563 new)**

Figure 1

2010 Mectizan® Mass Treatment Figures for Carter Center River Blindness Program (RBP)-Assisted Areas in Nigeria, Uganda, Cameroon, Ethiopia, and Collaborative Programs in Latin America (OEPA) and Sudan

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL	% UTG
NIGERIA	***UTG=**	**5,500,208**		**UTG(arv)=**	**7,917**									
Treatments	0	0	0	0	0	403	605,062	979,363	1,765,259	1,317,540	383,433	392,740	**5,443,800**	99%
Villages treated	0	0	0	0	0	7	836	943	2,396	2,846	503	292	**7,823**	99%
UGANDA	***UTG=**	**885,043**		**UTG(arv)=**	**2,813**									
Treatments	0	0	0	0	403,368	201676	259,854	404	0	0	0	0	**865,302**	98%
Villages treated	0	0	0	0	796	221	367	0	0	0	0	0	**1,384**	49%
UGANDA ELIMI	****UTG(2)=**	**1,759,108**		**UTG(arv)=**	**1,917**									
Treatments	0	0	0	19693	730,156	89,166	0	0	0	734,884	741	115,952	**1,690,592**	96%
Villages treated	0	0	0	60	1,633	179	0	0	0	1,777	0	140	**1,895**	99%
CAMEROON	***UTG=**	**1,893,821**		**UTG(arv)=**	**4,297**									
Treatments	0	0	0	0	0	0	431,368	88,848	1,071,398	232,086	0	0	**1,823,700**	96%
Villages treated	0	0	0	0	0	0	796	379	2,233	889	0	0	**4,297**	100%
OEPA	****UTG(2)=**	**652,506**		**UTG(arv)=**	**1,422**									
Treatments	0	0	0	0	0	0	303,578	0	0	0	0	312,782	**616,360**	94%
Villages treated	0	0	0	0	0	0	1,405	0	0	0	0	1,411	**1,408**	99%
ETHIOPIA	***UTG=**	**3,465,107**		**UTG(arv)=**	**14,065**									
Treatments	0	0	0	0	0	0	1,855,165	1,106,326	336,704	0	0	0	**3,298,195**	95%
Villages treated	0	0	0	0	0	0	8,757	4,138	1,170	0	0	0	**14,065**	100%
SUDAN	***UTG=**	**122,154**		**UTG(arv)=**	**221**									
Treatments	0	0	0	0	0	18948	0	0	0	66,541	33344	686	**119,519**	98%
Villages treated	0	0	0	0	0	19	0	0		130	0	0	**149**	67%
SUDAN ELIMINA	****UTG(2)=**	**206,550**		**UTG(arv)=**	**147**									
Treatments	0	0	0	0	12866	102,343	2,160	2,284	2,284	2,284	20,826	65,279	**210,326**	102%
Villages treated	0	0	0	0	0	147	0	0	0	0	0	147	**147**	100%
TOTALS	***UTG=**	**14,484,497**		**UTG(arv)=**	**32,799**									
Treatments	**0**	**0**	**0**	**19,693**	**1,146,390**	**393,588**	**3,457,187**	**2,177,225**	**3,175,645**	**2,286,794**	**405,000**	**886,753**	**14,067,794**	**97%**
Villages treated	**0**	**0**	**0**	**60**	**2,429**	**554**	**12,161**	**5,460**	**5,799**	**5,512**	**503**	**1,990**	**31,168**	**95%**

Cumulative RBP-assisted treatments (1996 - 2010) = 143,561,574

2010 Mass Treatments	14,067,794
2010 Passive Treatments	536,533
2010 TOTAL TREATMENTS	**14,604,327**

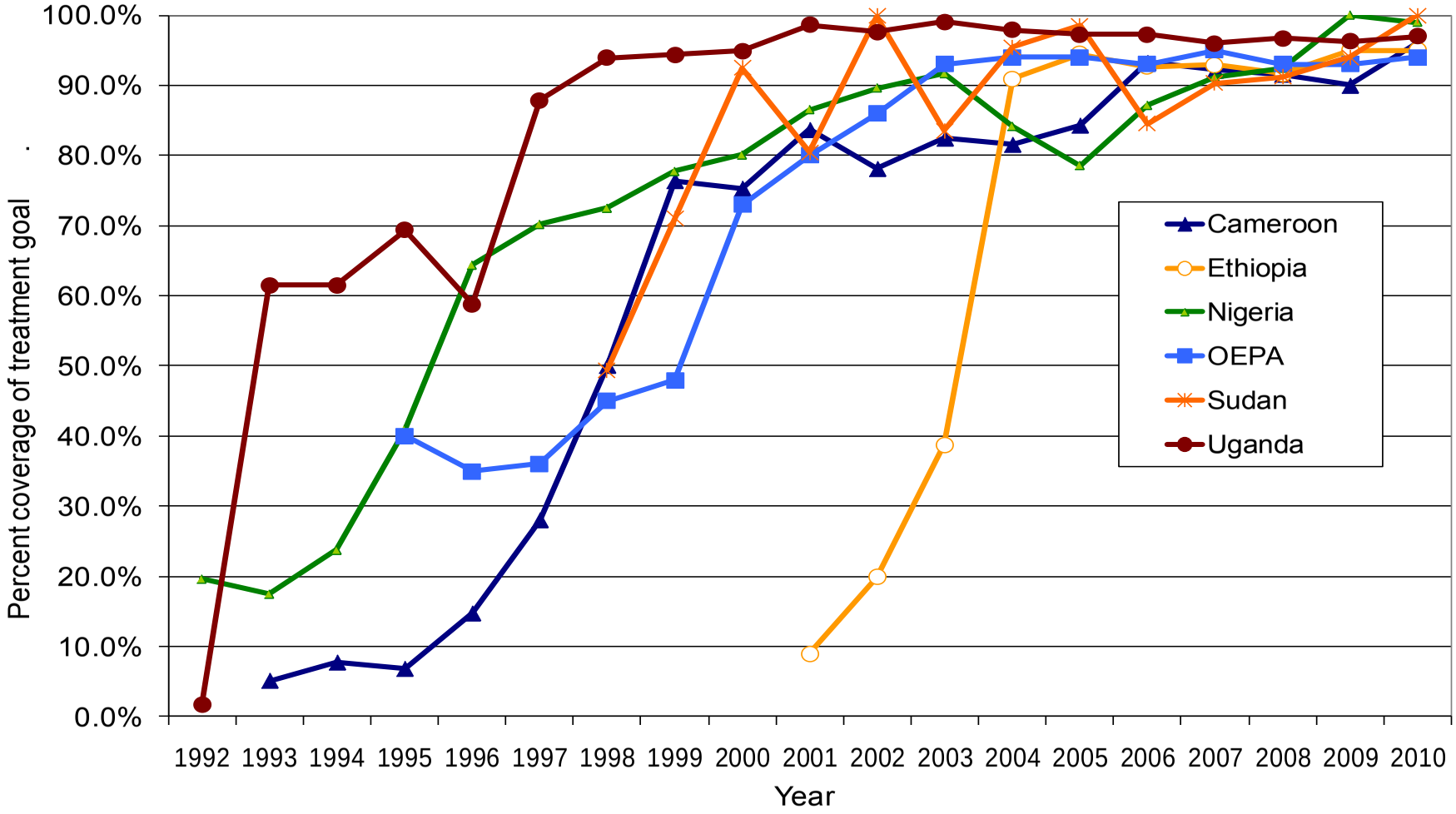
***UTG**: Ultimate Treatment Goal

OEPA figures reported quarterly, **UTG(2) is the Ultimate Treatment Goal times 2, since OEPA treatments are semiannual

Cumulative (includes passive)														
1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3,873,425	5,090,511	5,626,767	6,684,146	7,229,829	8,019,378	8,964,429	9,658,793	11,109,611	10,798,434	11,301,304	12,985,296	13,499,414	14,115,910	14,604,327

Figure 2

River Blindness Program: Annual coverage of eligible population by project: UTG or UTG(2), 1992 – 2010



* 1992 – 1995 treatments were provided by River Blindness Foundation

Figure 3

Carter Center-Assisted Programs: 1996 – 2010 Mectizan® Treatments by Program

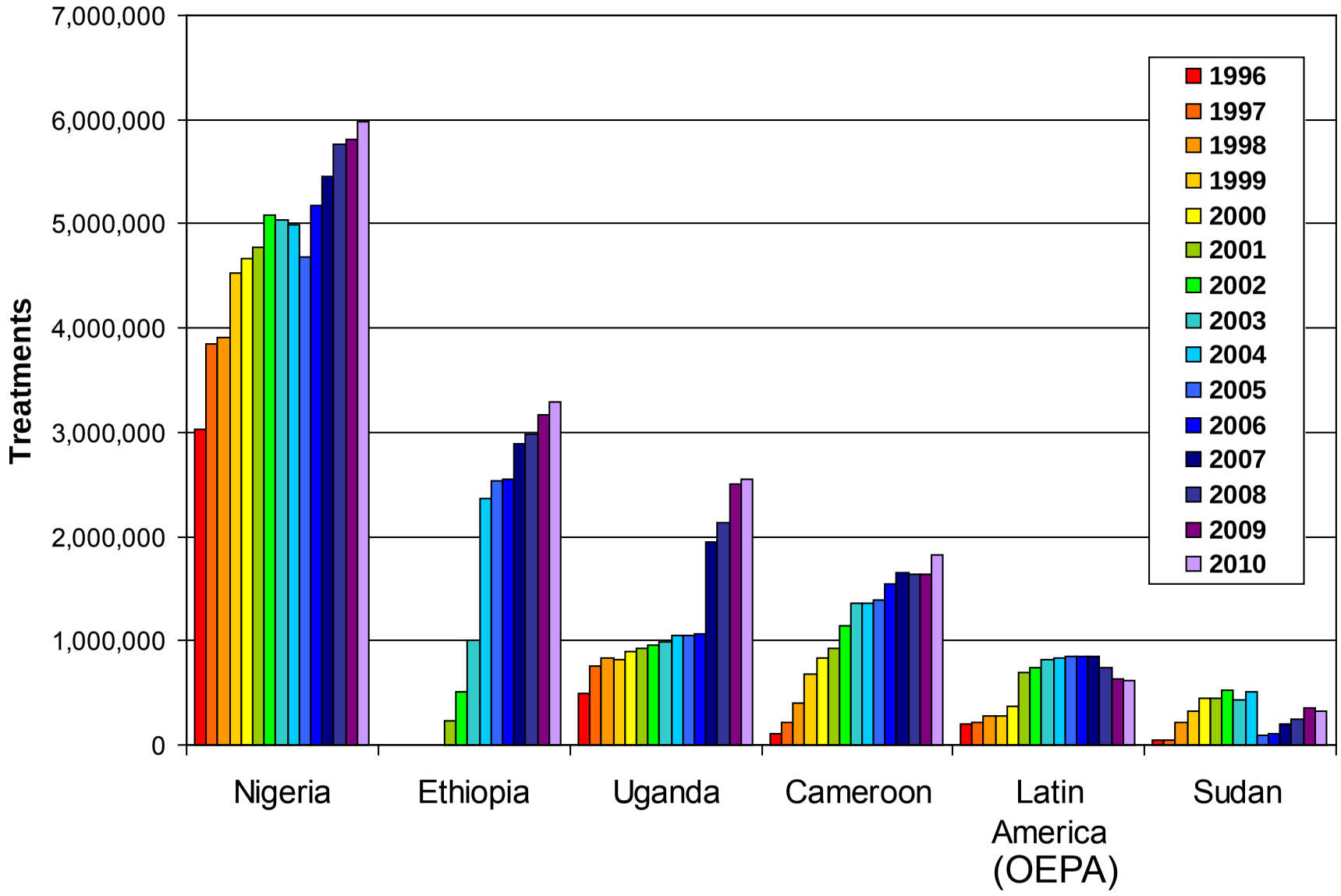


Figure 4

Increasing Percentage of Female Community Distributors in Carter Center-assisted River Blindness Programs in Africa 2001 – 2010

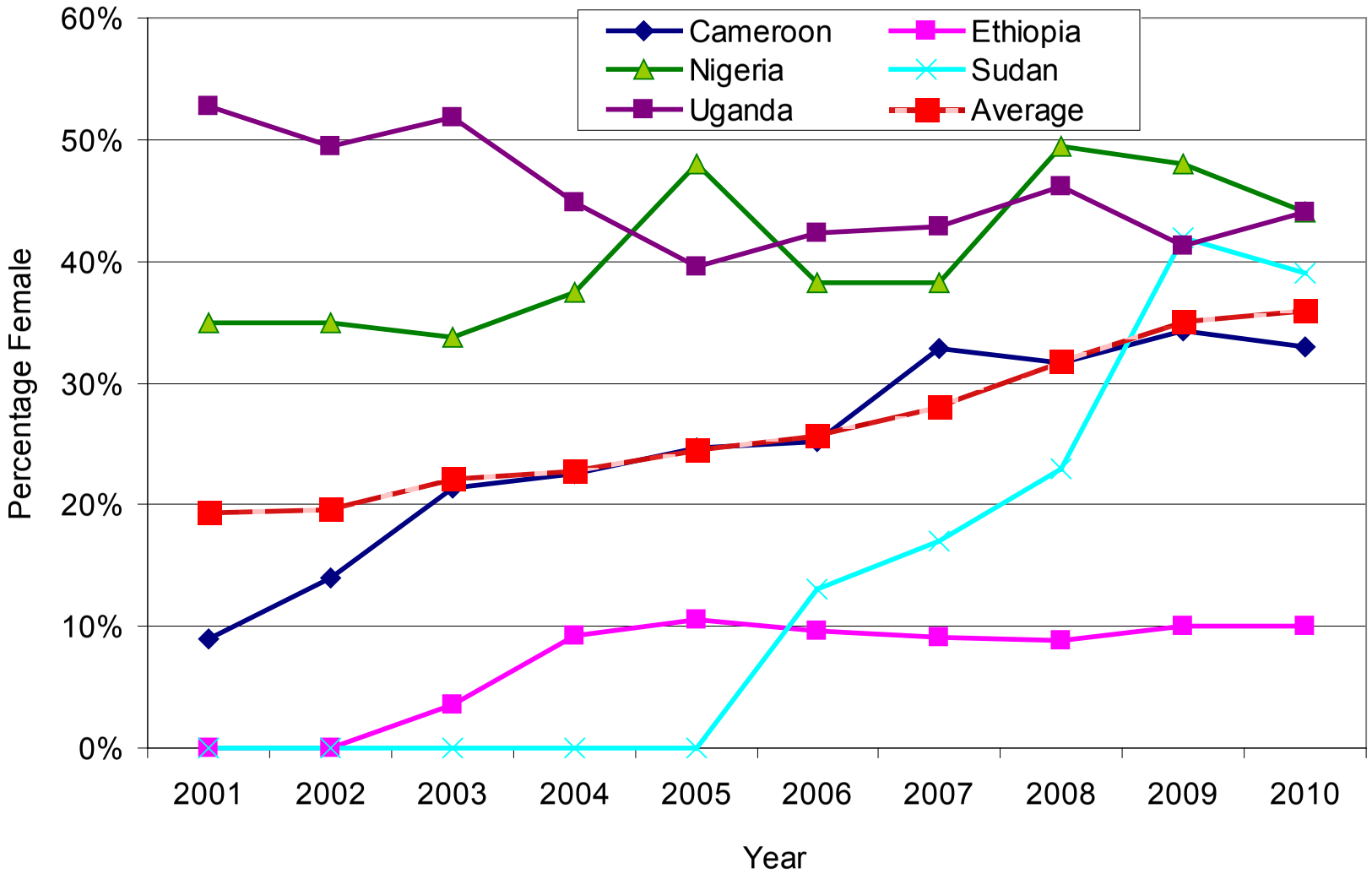
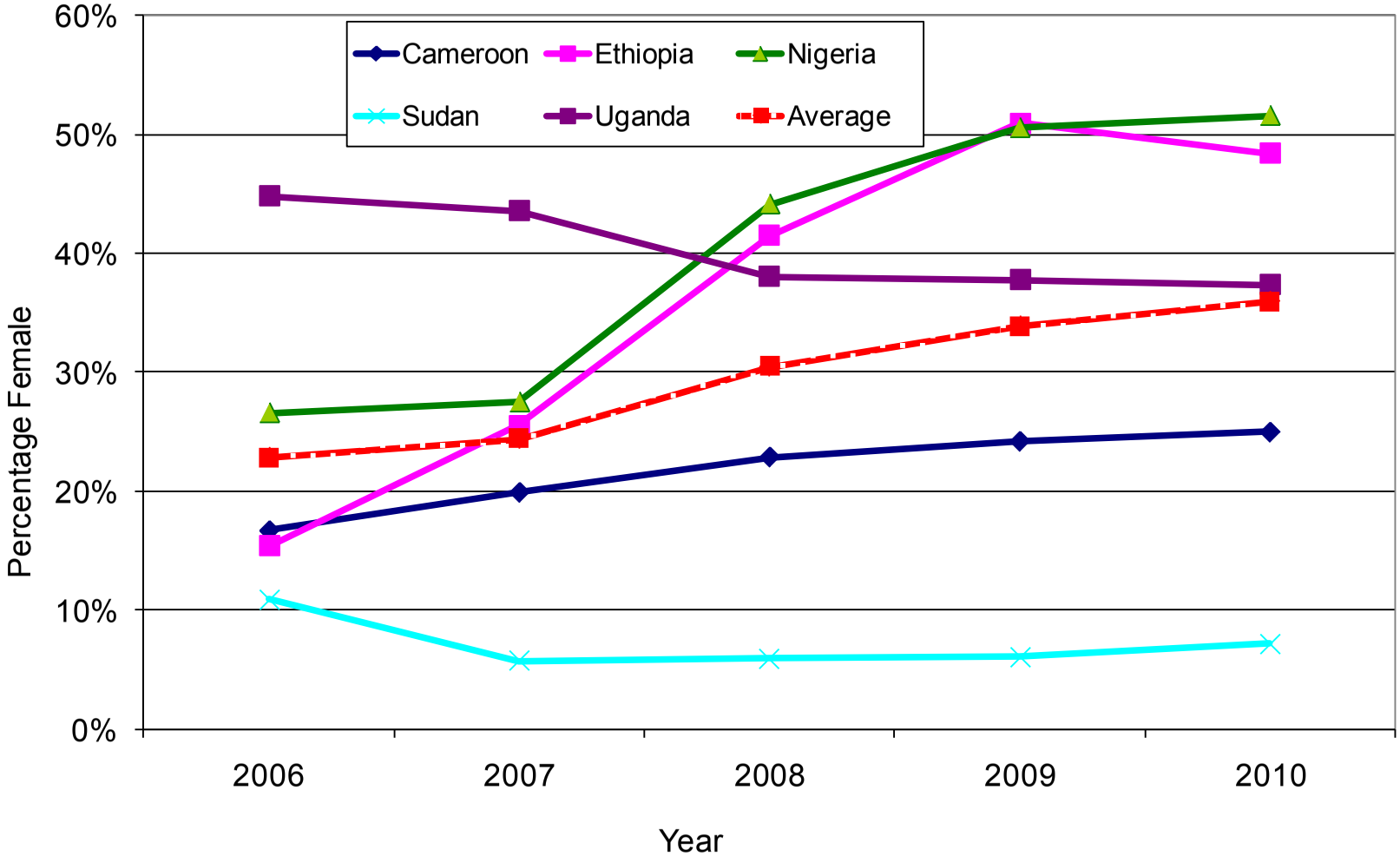


Figure 5

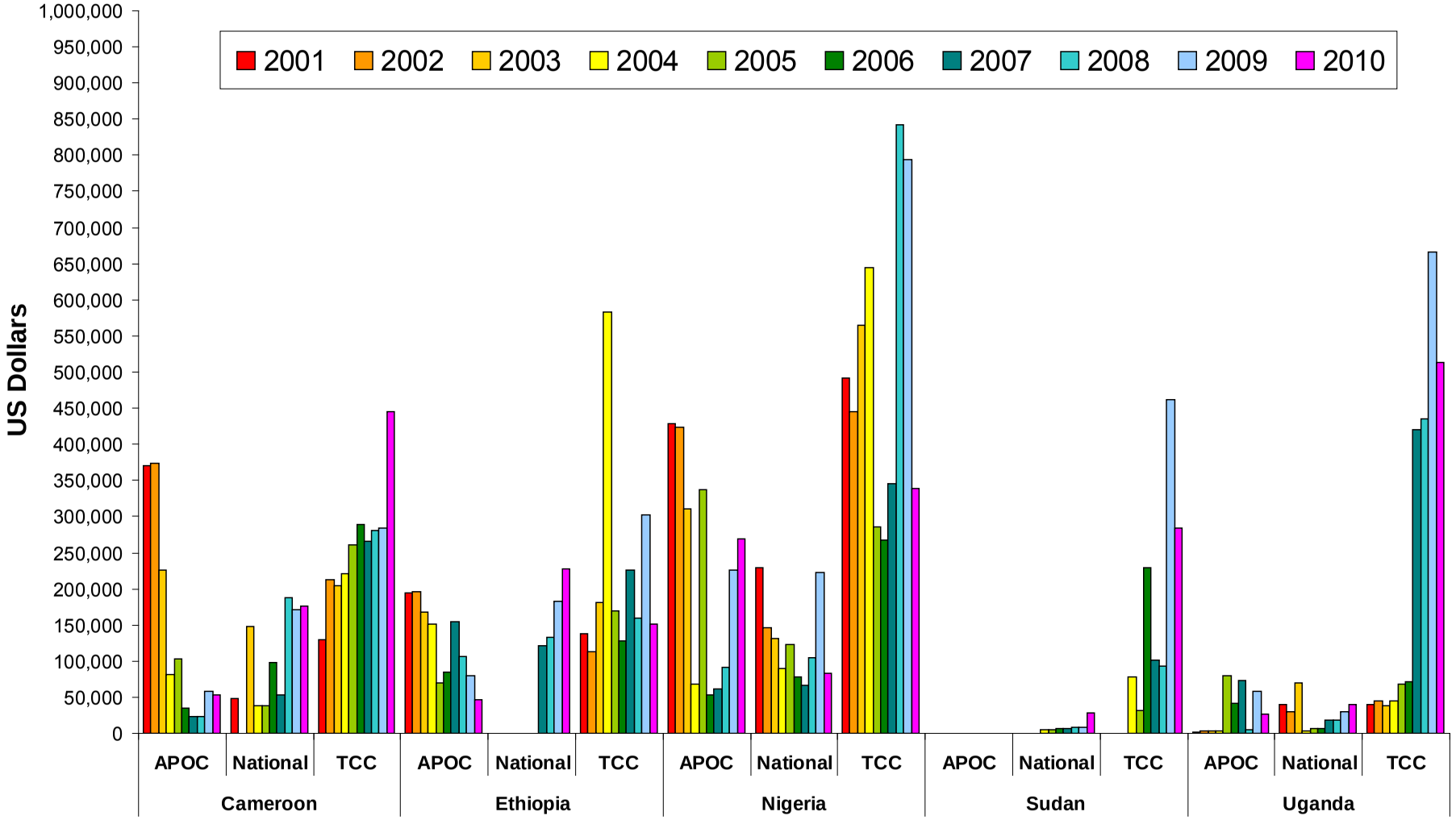
Percentage of Female Community Supervisors in Carter Center-assisted River Blindness Programs in Africa 2006 – 2010*



* Data not available in all countries prior to 2006.

Figure 6

Increasing Investment in River Blindness by The Carter Center (TCC), Compared to Other Partners in Africa: Cameroon, Ethiopia, Nigeria, Sudan* and Uganda (2001 – 2010)



* Sudan data available from 2004 and beyond only.

ONCHOCERCIASIS ELIMINATION PROGRAM FOR THE AMERICAS (OEPA)

The Onchocerciasis Elimination Program for the Americas (OEPA) is a Carter Center-led program that serves as the vanguard of the regional initiative working to eliminate both morbidity and transmission of onchocerciasis from the Americas through semiannual distributions of Mectizan® (every 6 months) in the endemic areas of the region. The initiative was launched by the River Blindness Foundation in 1993 in response to the 1991 Resolution XIV of the 35th Pan American Health Organization (PAHO) Assembly, which called for the elimination of onchocerciasis morbidity from the Americas by the year 2007. The Carter Center assumed administrative responsibilities for OEPA in 1996. In 2008, PAHO renewed the call to eliminate onchocerciasis (Resolution CD48.R12) and set a goal to interrupt transmission of the parasite throughout the region by 2012[3].

In addition to The Carter Center, the OEPA coalition includes ministries of health (MOHs) of the 6 countries with onchocerciasis in the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela), the Lions Clubs International Foundation (LCIF) and local Lions Clubs, the Bill & Melinda Gates Foundation, PAHO/World Health Organization (WHO), the Mectizan® Donation Program (MDP) and the U.S. Centers for Disease Control and Prevention (CDC). A Program Coordinating Committee (PCC) serves as a steering committee for Carter Center OEPA staff and office, based in Guatemala City, Guatemala. Technical and financial assistance to the 6 countries flows through the OEPA office. Merck donates the drug Mectizan®.

The WHO certification guidelines for onchocerciasis elimination recommend that where transmission is deemed 'interrupted' and MDA is halted, post-treatment surveillance (PTS) should be conducted for a minimum of 3 years. If no recrudescence of infection is detected during this time, then *O. volvulus* can be declared to have been "eliminated" (Figure 7). Eight of the original 13 American foci had interrupted or eliminated onchocerciasis in 2010. As a result, the total number of ivermectin treatments administered in the Americas has decreased by 28% from a peak of 852,721 in 2006 (when all 13 foci were under treatment) to 616,360 in 2010 (Figure 8). In 2010, the Americas region reported 94 % of the 2010 coverage target (UTG(2)) of 652,506 treatments. Treatment coverage by focus is shown in Figure 9.

For the first time since the start of the initiative, 3 foci qualified in 2010 to be moved to the category "eliminated" (North Chiapas in Mexico, and Escuintla and Santa Rosa in Guatemala). The WHO certification of elimination, however, can be considered by PAHO/WHO only for entire countries, not for individual foci. The PTS phase continues for the remaining 4 foci where MDA has been halted (Huehuetenango in Guatemala, Oaxaca in Mexico, López de Micay in Colombia and Esmeraldas in Ecuador). Epidemiological indicators from 2010 monitoring studies showed that transmission had been interrupted in the Northcentral focus of Venezuela. For that reason, in 2010 the OEPA steering committee (the Program Coordinating Committee—PCC) and IACO 2010 recommended to Venezuelan health authorities that MDA be halted there in 2011.

[3] http://www.paho.org/english/gov/cd/cd48.r12-e.pdf, accessed 28 July 2010

Venezuelan authorities accepted this recommendation, and as a result, in 2011, only 5 foci are under MDA: Central in Guatemala, South Chiapas in Mexico, Amazonas in Brazil, and Northeast and South in Venezuela (Frontispiece Figure F.)

National Programmatic activities in 2010 are described below:

Yanomami Area of Brazil and Venezuela

Transmission of onchocerciasis and new onchocerciasis related ocular morbidity continue to be found in the Yanomami area. This transmission zone consists of Brazil's single endemic region (the Amazonas focus) that extends through remote and densely forested regions of Amazonas and Roraima states into the Bolivarian Republic of Venezuela's South focus. The vast but sparsely populated transmission zone is named for the Yanomami people, a migratory indigenous group that routinely moves across the border and has a UTG(2) of of 32,432. Overall, the Yanomami Area reached 88.9 % of its UTG(2) in 2010 (with 28,842 treatments provided). Brazil provided 17,079 treatments, reaching 90 % of its UTG(2) of 18,890, and surpassing the 85% treatment coverage goal for the 10th consecutive year. Brazil took the decision to treat every 3 months (e.g., 4 times per year) in three hyperendemic (>60% prevalence) treatment zones where there is a population at risk of 1,742 people. For the third and fourth quarters, 2010 coverage was reported to be 100% and 97.5% respectively in these treatment areas. Ivermectin given at 3-month intervals leads to a more rapid attrition of female worms, and significantly reduces the mean numbers of live male worms in nodules which lowers the proportions of inseminated females. In addition to Brazil, three other foci in the region engaged in 4 times per year treatment in 2010 (Figure 10.)

Venezuela's side of the Yanomami Area (the South focus) delivered 11,763 treatments, attaining 87% of its UTG(2) of 13,542. This is only the 5th consecutive year for this focus to reach the 85% coverage goal. To advance elimination efforts, the Venezuelan program launched a 4 times per year treatment regimen in 66 hyperendemic communities. The eligible population for this regimen in these communities is 2,297 people. Treatment coverage in 2010 was excellent: 98% during the first quarter, 96% during the second quarter, 100% during the third quarter and 99% during the fourth quarter. However, seven new and previously untreated hyperendemic Yanomami communities (total population 565 persons) were identified for the first time in 2010.

Colombia

Colombia has a single endemic focus (López de Micay, Cauca) where the Ministry of Health halted MDA in 2008, based on a 2007 PCC recommendation. If the 3-year PTS evaluation, concluding in 2011, is favorable, Colombia could become the first country in the Americas to request certification of elimination from the PAHO/WHO in 2012.

Ecuador

The country's single endemic focus is the Esmeraldas–Pichincha focus in Esmeraldas Province. After 23 rounds of treatment with coverage >85%, the Ministry of Health halted MDA in 2010, based on a 2009 PCC recommendation. Ecuador is in its second

year of PTS and could become the second country in the Americas to request certification of elimination from the PAHO/WHO in 2013.

Guatemala

Guatemala originally had 4 endemic foci: Central, Escuintla–Guatemala, Huehuetenango, and Santa Rosa. Two of these foci (Santa Rosa and Escuintla–Guatemala) have eliminated onchocerciasis. In 2009, MDA was stopped in Huehuetenango, which remains under PTS. The Central focus is the only one that remains under treatment. Twice per year treatments there have surpassed the 85% coverage goal for 19 consecutive semiannual treatment rounds. In 2010, 204,971 treatments were administered (94 % of a UTG(2) of 216,998). Annual treatments have been provided in parts of the Central focus since 1990. Transmission is currently classified as being suppressed in the Central focus. Additional assessments are planned in 2011 to determine if transmission has been interrupted.

Mexico

Mexico originally had 3 endemic foci: Oaxaca, Northern Chiapas, and Southern Chiapas. Onchocerciasis has been eliminated from Northern Chiapas. In Oaxaca, MDA was halted in 2009 and PTS continues. MDA is being administered in the Southern Chiapas focus where, in 2010, 193,843 ivermectin treatments were provided, reaching 94 % of the UTG(2) of 205,334. Coverage has been >85% for 22 consecutive rounds. In 2003, due to continued transmission in mesoendemic (>20% prevalence) and hyperendemic (>60% prevalence) areas in Southern Chiapas, the Ministry of Health launched quarterly (every 3 months) MDA in 50 villages to hasten elimination. Based on the success of this trial, the quarterly program was expanded in 2009 to include another 113 communities. In areas where quarterly treatment was given, coverage for each round in 2010 surpassed 92%. (See Figure 10) In the Southern Chiapas focus, transmission is currently classified as suppressed. Additional assessments are planned in 2011 to determine if transmission has been interrupted.

Venezuela

The country has 3 endemic foci (Northcentral, Northeast and South). The South focus, which forms part of the Yanomami Area, has been discussed above. Venezuela was the last of the six endemic countries to initiate MDA treatment with ivermectin. The Northcentral and Northeast foci reached their treatment coverage goals for the eighth consecutive year in 2010 (16 consecutive rounds). Overall, in 2010, Venezuela provided 200,467 treatments, 95% of its UTG(2) of 211,284. In the Northeast focus, quarterly treatment was launched among 4,841 persons at risk, i.e. residents of the 40 most highly endemic communities in the focus (35 hyperendemic and 5 mesoendemic). Coverage in each of the four treatment rounds were 11.0%, 91.8%, 83.0% and 92.4% respectively. (See Figure 11.)

A summary of the status of each focus for 2011, and populations targeted for treatment are shown in Figure 11. As noted above, transmission status of three of the 13 foci in the Americas (North Chiapas in Mexico, Escuintla and Santa Rosa in Guatemala) was moved from “transmission interrupted” to “transmission eliminated”. This conclusion

was based on completing the 3 years post treatment surveillance (PTS) phase during which no recrudescence of transmission was documented. Those foci have a population of 81,923 persons who now, thanks to the OEPA initiative, are no longer considered to be at risk of acquiring onchocerciasis.

The Program Coordinating Committee: The PCC of OEPA met twice in 2010. During its June meeting, PCC reviewed Post Treatment Surveillance data analysis from field studies that indicated no evidence of recrudescence in three foci (Santa Rosa and Escuintla-Guatemala foci in Guatemala, and the North Chiapas focus in Mexico). The PCC made the 'historic' decision of 'passing' these three foci on from the 'interrupted' column to the 'eliminated' column. Later in the year, the PCC recommended to the Venezuela MOH that ivermectin interventions be stopped in the Northcentral focus. The Ministry of Health agreed with the PCC recommendation to suspend MDA in 2011 in the Northcentral focus, and begin PTS there for a 3 year period. The PCC also requested that PAHO provide OEPA with more in-country assistance in channeling OEPA financial and administrative support to the Venezuelan MOH.

The PCC also worked on revising the Post Treatment Surveillance (PTS) guidelines for OEPA countries using the 'Evolution of Recrudescence' theory (see Figure 12): based on this review, the PCC recommended that PTS focus on the first signal of recrudescence which is positive *O. volvulus* DNA (detected by PCR) in the black fly vector. Carter Center and OEPA staff drafted the annual WHO/WER report for IACO 2009 which was approved by PCC, published in 2010. (*Onchocerciasis (river blindness): Report from the nineteenth InterAmerican Conference on Onchocerciasis. Wkly Epidemiol Rec. 2010; 85:321-7.*) The focus of the article was the interruption of transmission in Ecuador. The importance of having peer-reviewed publications for each focus as transmission is interrupted was stressed by the PCC. These publications are key documents which will be included in the 'country dossier' for WHO certification teams. Guatemala has published articles reporting interruption of transmission in two of its three foci, and a third report is in draft form. Mexico published in 2010 in the AJTMH on both of its foci now off treatment (North Chiapas and Oaxaca). Ecuador is beginning to draft its report. Because Colombia is likely to be the first country to request certification from WHO/PAHO, completing a publication on this focus is very important.

IACO 2010: The Inter-American Conference on Onchocerciasis (IACO) is an annual event where OEPA stakeholders present information on progress of the national programs and discuss challenges. The 20th annual conference was held in November 2010 in Antigua Guatemala, Guatemala. The meeting was organized by the Ministry of Health of Guatemala and OEPA and was attended by over 80 participants. As in previous years, Lions from each endemic country were important participants in the meeting (Figure 13) IACO agreed with the PCC recommendation that MDA be halted in 2011 in the Northcentral focus of Venezuela. With this recommendation, five of the six countries have stopped MDA in at least one of their original onchocerciasis endemic foci, with the exception being Brazil (Figure 11). Ivermectin treatments have stopped completely in two countries (Colombia and Ecuador).

At the Conference participants were greatly impressed with a demonstration by the local acting troupe “Art as a Bridge to Health.” Music and dances by costumed actors (some on stilts) show how the troupe promoted health education, community participation and better ivermectin coverage in the last remaining focus under treatment in Guatemala by involving children and adults in role playing (Figure 14).

The costs of the OEPA initiative since its launching have been just over USD$119 million (Figure 15). The largest donors to the effort are the MDP in-kind costs of Mectizan® ($48.5 million) and the 6 governments of the endemic countries ($42.3 million).

IACO 2010 noted that the Yanomami Area on the Brazil-Venezuela border was the greatest challenge remaining to meeting the ambitious goal set by Resolution CD48.R12 of interrupting transmission throughout the Region of the Americas by 2012. Little progress was seen during 2010 in better bi-national coordination of onchocerciasis activities, and the discovery of new hyperendemic, but previously untreated communities on the Venezuelan side, was discouraging news. It was concluded that every effort should be made in 2011 to ensure that all endemic communities of the focus are promptly indentified and placed on treatment. Four times per year ivermectin treatment targeting all hyperendemic areas of Venezuela and Brazil at minimum, also was recommended. Based on the progress made, it appears likely that the Yanomami Area (containing Brazilian and Venezuelan foci), and perhaps the Northeast focus in Venezuela, will be the last in the region to halt MDA. Even with the most optimistic projection – that transmission could be interrupted and MDA halted in all foci by 2012 – the need to maintain 3 years of surveillance means that it would be 2016 when all countries would have requested that WHO certify elimination.

2011 RECOMMENDATIONS FOR OEPA

Secure funds for continuing support of OEPA activities (2011-2016).

To hasten interruption of transmission continue to implement 4-times-per-year treatment in Southern Chiapas focus, Mexico, and launch or expand 4-times-per-year treatment in Venezuela and Brazil, with emphasis on hyper-endemic communities.

Encourage execution of the bi-national agreement between Venezuela and Brazil regarding strengthening of the health infrastructure in the shared focus of the Yanomami Area.

Conduct Colombia fly PCR evaluations as soon as possible. If results are favorable, help the national program in Colombia to prepare a dossier requesting formal WHO/PAHO certification of onchocerciasis elimination. Consider (in consultation with the PCC) establishing national committees to assist with preparing these dossiers.

Complete evaluations as soon as possible in the Central (Guatemala) and South Chiapas (Mexico) foci, aiming to obtain a PCC resolution/recommendation to stop treatment there after 2011, if indicated. Carry out in-depth epidemiological evaluations in Amazonas focus (Brazil) and the Northeast focus (Venezuela).

Complete and circulate the post treatment surveillance (PTS) guidelines, and continue to implement the guidelines in all foci that have stopped treatment. Complete PTS PCR in flies in Oaxaca (Mexico) and Huehuetenango (Guatemala) foci. Maintain OEPA capacity in mathematical modeling as applied to PTS activities.

Maintain regional laboratory support in serology, entomology, and parasitology (including PCR testing in vectors and skin snips) led by University of Southern Florida (Dr. Thomas Unnasch).

Encourage and assist the national programs to publish evaluations that show interruption and elimination of transmission. Publish results of studies that led to the PCC recommendations to stop treatment in Ecuador and Colombia as soon as possible.

Encourage heads of state to maintain or increase political and financial engagement in the effort.

Encourage Ministries of Health to consider integration of onchocerciasis programs with other health activities, especially deworming activities, to sustain the infrastructure these programs have created.

In areas where governments are considering doxycycline treatment to accelerate interruption or elimination of transmission (in Brazil, Mexico and Venezuela), OEPA should remind MOHs that doxycycline treatment should not be given to pregnant women or children under 10 years.

Seek more local Lions Clubs involvement to help maintain program visibility and support wherever possible.

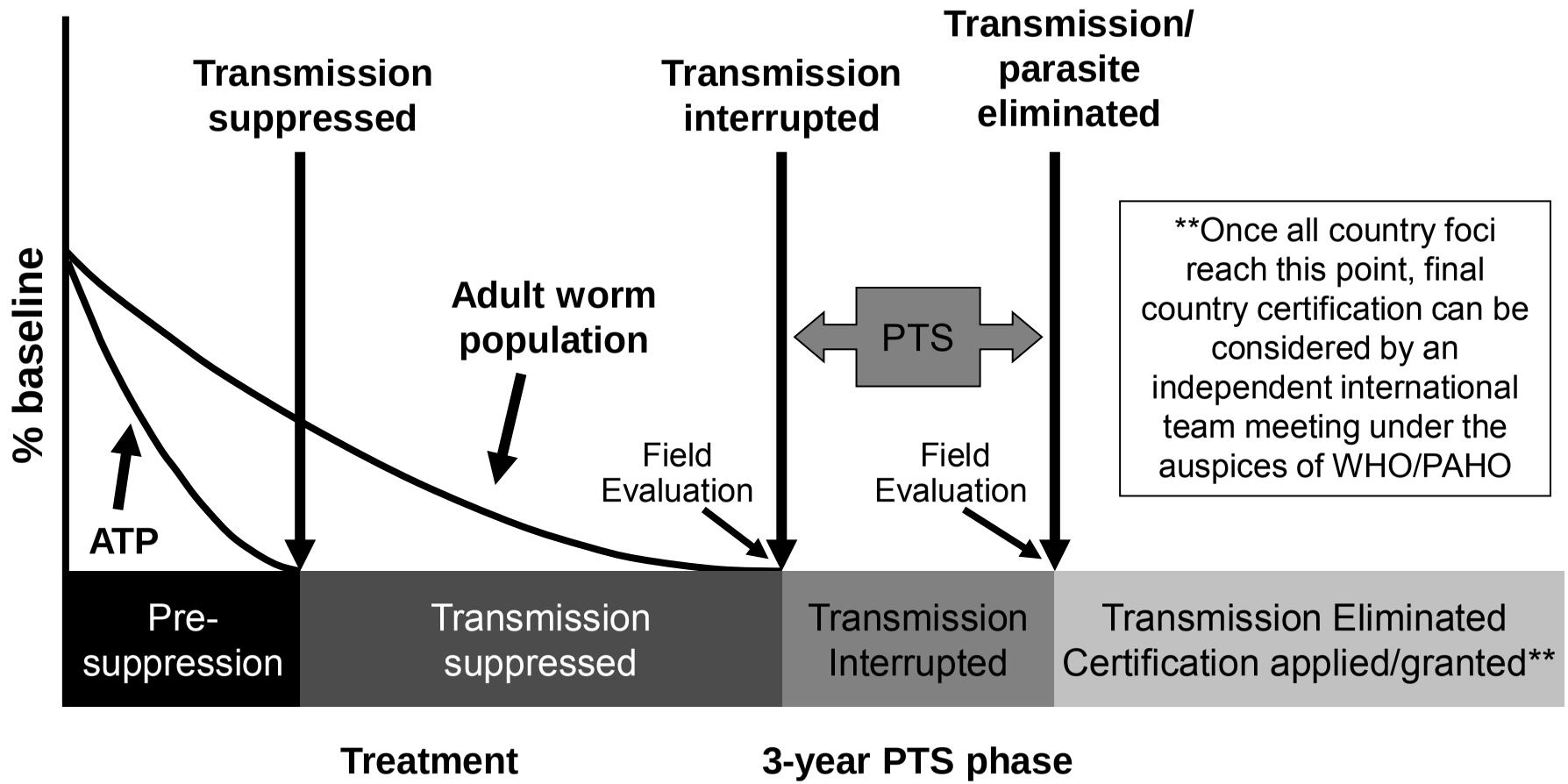
Carter Center program staff must complete or renew the Emory IRB certification if they are to be involved with research programs.

Treatment Objectives for onchocerciasis for 2011:

UTG(2): 521,404 treatments
UTG(4): 249,500 treatments

Figure 7

Phases of the Elimination of Onchocerciasis (Based on WHO Certification Guidelines 2001*)



*WHO Report, (2001). *Certification of elimination of human onchocerciasis: Criteria and procedures*. Following a WHO meeting on "Criteria for Certification of interruption of transmission/elimination of human onchocerciasis" (document WHO/CDS/CPE/CEE/2001.18a). Geneva, World Health Organization.

Figure 8

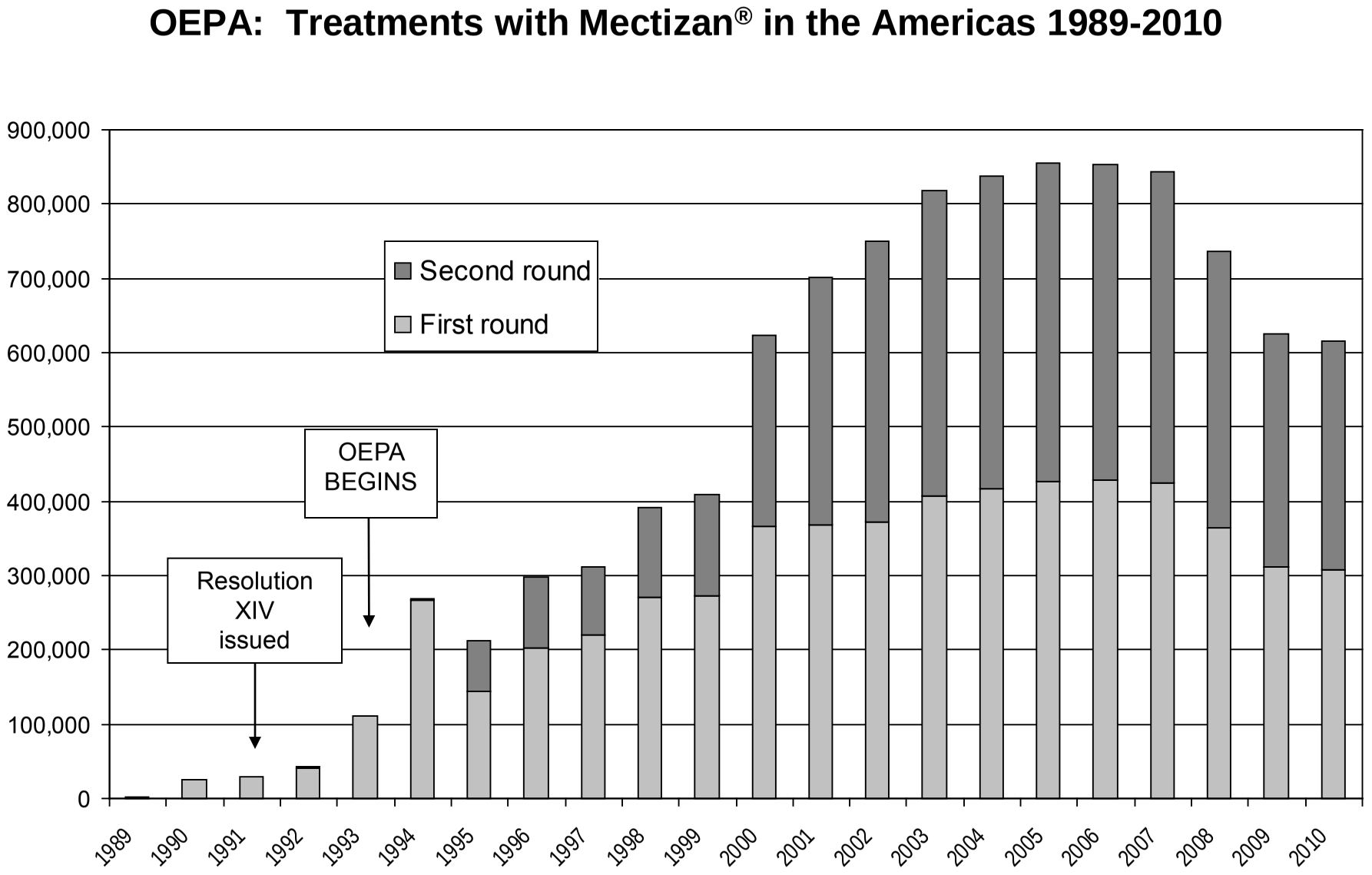

OEPA: Treatments with Mectizan® in the Americas 1989-2010
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Second round
First round
OEPA BEGINS
Resolution XIV issued
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

Figure 9

OEPA: Treatment Coverage 2010

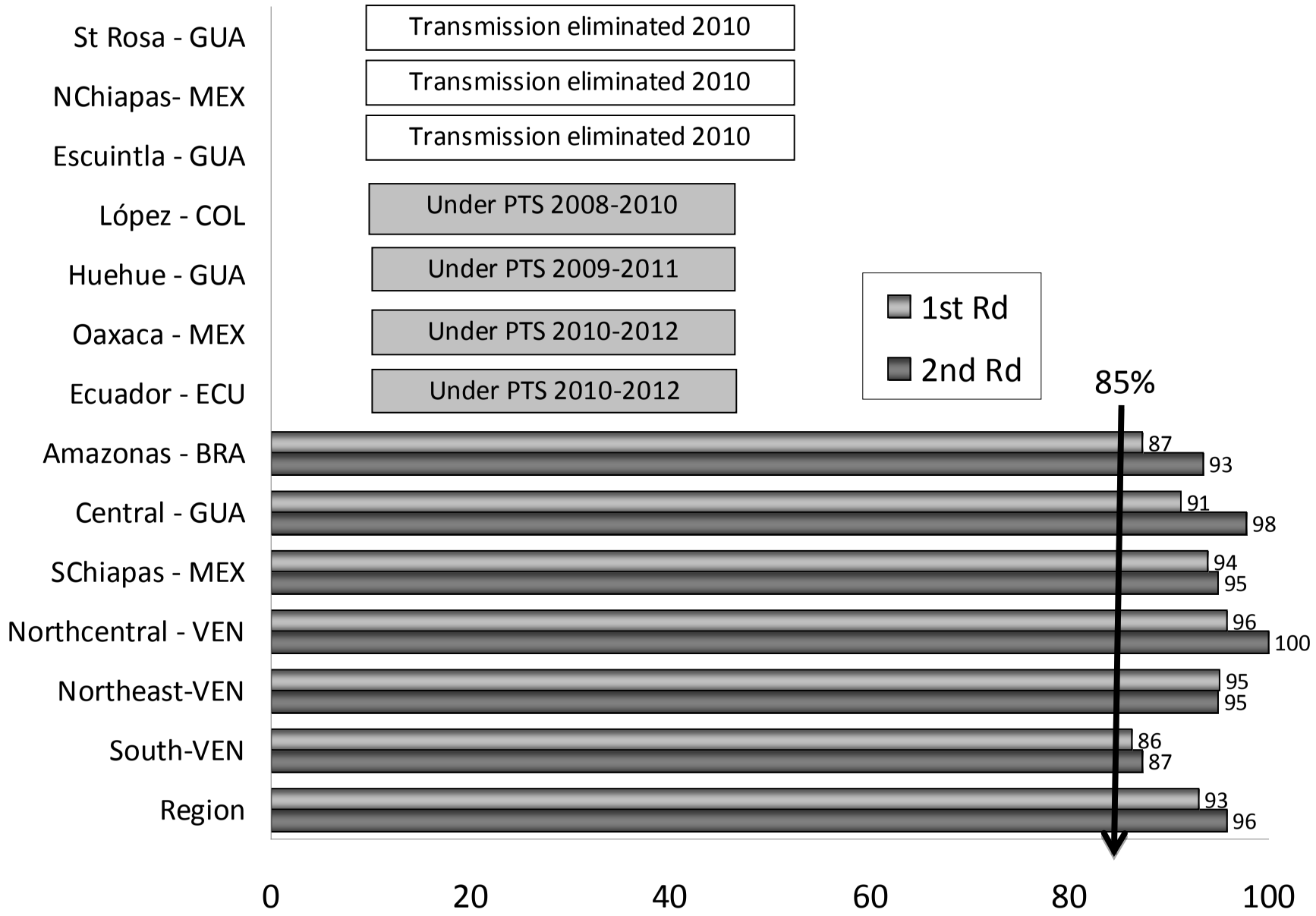


Figure 10

OEPA: Four Times Per Year Mectizan® Treatments in 2010

Focus	Communities		# treatment rounds >85% coverage up to 2010	# communities under 4x/year in 2010 (%)	# hyper-endemic communities under 4x/year tx in 2010 (%)	2010 Transmission status
	Total # communities	Hyper-endemic				
South Chiapas, MX	559	39	22	163 (29%)	39 (100%)	Suppressed
Northeast, VZ	465	35	16	40 (8.6%)	35 (100%)	Ongoing
Amazonas, BR*	22	7	20	3 (13.6%)	3 (42.9%)	Ongoing
South, VZ *	10	5	10	2 (20%)	2 (40%)	Ongoing
TOTAL	**1,056**	**86**		208(20%)	79 (92%)	

*South Focus – VZ and Amazonas - BR refer to geographic areas, not communities.

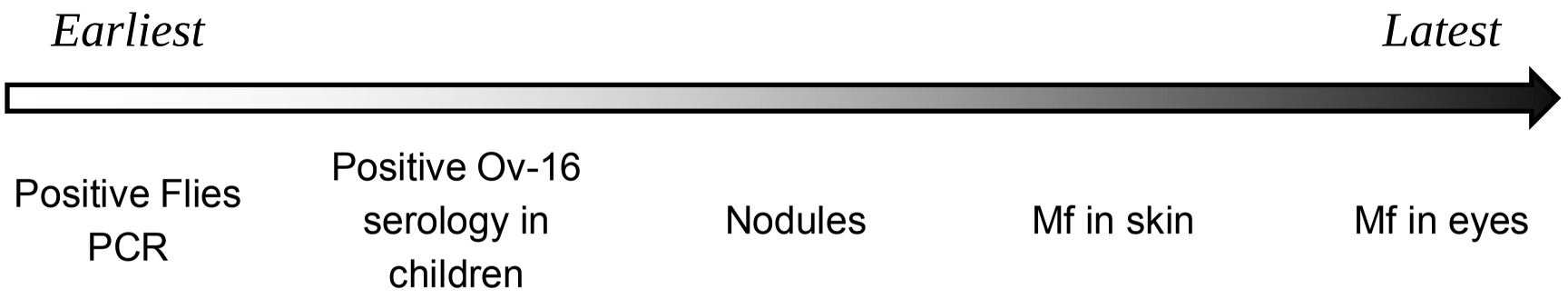
Figure 11

Population at Risk, No Longer at Risk, Under PTS and Eligible for Treatment in the Americas in 2011, by Focus

Focus (map number)	Population at risk (%)	Population no longer at risk (%)	Population under post-Treatment Surveillance	Population eligible for Treatment	Transmission Status
Escuintla-GUA (6)		62,590 (11%)			Eliminated
Santa Rosa-GUA (7)		12,208 (2%)			Eliminated
North Chiapas-MEX (2)		7,125 (1%)			Eliminated
Lopez de Micay-COL (12)	1,366 (0.2%)		1,366		Interrupted
Esmeraldas-ECU (13)	25,863 (4.7%)		25,863		Interrupted
Huehuetenango-GUA (4)	30,239 (5.5%)		30,239		Interrupted
Oaxaca-MEX (1)	44,919 (8%)		44,919		Interrupted
Northcentral-VEN (8)	14,385 (2.6%)		14,385		Interrupted
Central-GUA (5)	124,498 (22%)			112,388	Suppressed
South Chiapas-MEX (3)	114,024 (21%)			106,615	Suppressed
Amazonas-BRA (11)	12,521 (2%)			9,839	Ongoing
Northeast-VEN (9)	93,239 (17%)			86,567	Ongoing
South-VEN (10)	9,168 (1.7%)			7,668	Ongoing
Total	**470,222**	**81,923**	**116,772**	**323,077**	

Figure 12

Evolution of Onchocerciasis Recrudescence



(Based on 18 months required from inoculation of L_3s to production and release in the skin of microfilariae [mf] by gravid *O. volvulus* worms)

Figure 13

Lions at IACO 2010

From right to left: Representatives of the local Lions Clubs and Lions Clubs International Foundation along with colleagues from the Guatemalan Ministry of Public Health and Social Assistance, PAHO and The Carter Center. Dr. Steven Ault, Dr. Ricardo Araujo Gurgel and Mrs. Vania Araujo Gurgel, Mrs. Margarita Peña Constante, Ms. Kristen Eckert, Dr. Donald Hopkins, Dr. Libardo Bastidas Passos, Dr. Mauricio Sauerbrey, Dr. Florencio Cabrera Coello, Mr. Ramiro Peña Constante, Mr. Alfonso Barahona Herrarte, Dr. Salomón López, and Mrs. Kathryn Cabrera.

Figure 14

"Art as a Bridge to Health" is an organization that is aiding OEPA in innovative ways to promote health education, community participation, and highest possible Mectizan® treatment coverage in Guatemala.

Figure 15

Total Cost of the OEPA Regional Initiative (in Millions of USD) and Contributions by Partners: 1991-2010

Source	1991-2010	%
Countries (counterpart funding from MOHs)*	42.28	35%
The Carter Center and its generous donors: Lions Clubs International Foundation, Bill & Melinda Gates Foundation, Merck, IDB, River Blindness Foundation, USAID, OPEC Fund for International Development, and others	28.20	24%
Mectizan® Donation Program (in-kind)	48.54	41%
Total	**119.02**	**100%**

* Financial information provided by partner countries

UGANDA

Background: Onchocerciasis affects 32 of the 111 districts in Uganda. In 2010, The Carter Center RBP assisted community-directed treatment with ivermectin (CDTI) in 24 (75%) of those endemic districts (Figure 16): Kabale, Kanungu, Kasese, Kisoro, Rubirizi, Buhweju, Kamwenge and Ibanda (in Southwest Uganda); Adjumani, Moyo, Nebbi, and Zombo (in the West Nile region bordering Sudan and the Democratic Republic of the Congo or DRC); Amuru, Gulu, Nwoya and Oyam Districts (in the Middle North areas); and Bududa, Manafua, Mbale, and Sironko (in the Mount Elgon focus in the east, bordering Kenya). The Carter Center supports technical services and vector elimination activities in Bulisa, Kibaale, Hoima, and Masindi, in partnership with Sight Savers International (SSI), which operationally supports these districts. In 2010, The Carter Center assisted 78% of the national treatments delivered by the ministry of health in 2010 (see Figure 17).

Lions have supported the Uganda effort through the Lions Club International Foundation (LCIF) SightFirst program. The first phase of LCIF funding to Uganda ended in 2005. In 2010, with support from Noor Dubai, LCIF provided additional funding to the program. Ugandan Lions Clubs are very active participants in and advocates for the Carter Center-assisted river blindness control and elimination activities, including engaging and mobilizing members of parliament and other government officials. The Carter Center's Country Representative in Uganda, Ms. Peace Habomugisha, is a Lions Club member.

Onchocerciasis control in Uganda began in 1991 and was based on annual, mass treatment with Mectizan®. The original ministry of health program enjoyed financial support from The River Blindness Foundation (RBF) and SSI. In 1996, The Carter Center assumed the activities of RBF. In 1997, the African Programme for Onchocerciasis Control (APOC) began supporting some Ugandan efforts and introduced the community-directed approach to Mectizan® distribution. APOC also supported successful vector elimination efforts in 2 foci (Itwara and Mpamba-Nkusi) that used ground-based focal larvicide application together with annual Mectizan® distribution. In 2006, The Carter Center helped launch semi-annual treatments (every 6 months) to eliminate onchocerciasis from the Wadelai focus in Nebbi District, with support from Merck (administered by the Non-Governmental Development Organization Group, or NGDO Group). The first Uganda focus to successfully eliminate the disease was Victoria, which claimed victory in the 1970s following a vector control campaign and liberating 3 million people from the threat of the disease. Wadelai's success was confirmed in 2010 and treatment may soon be halted. The Itwara, Mpamba-Nkusi, and Imaramagambo foci are each suspected of having eliminated transmission.

The Uganda Ministry of Health (MOH) was emboldened by these separate APOC and Lions-Carter Center-assisted elimination successes, Accordingly, in 2007 the

government of Uganda announced a national elimination policy that was to be based on twice-per-year treatment and vector elimination/control where feasible (using ground-based larviciding). The new policy was immediately applauded and supported technically and financially by the Lions-Carter Center partnership and SSI. The government prioritized 7 endemic areas in Uganda (Budongo focus in Bulisa, Hoima and Masindi districts; Bwindi focus in Kabale, Kanungu and Kisoro districts; Kashoya-Kitomi focus in Buhweju, Ibanda, Kamwenge, and Rubirizi districts; Mt. Elgon focus in Bududa, Mbale, Manafua, and Sironko districts; Mpamba-Nkusi (Kibaale District); Wadelai focus in Nebbi district; and Wambabya-Rwamarongo focus in Hoima District) with an ultimate goal of eliminating onchocerciasis from all of Uganda. A new laboratory to support heightened epidemiological and entomological surveys was established at the Uganda Ministry of Health with support from The Carter Center. The Mectizan Donation Program (MDP) has provided sufficient Mectizan® for twice-per-year treatments.

Uganda laboratory activity: In support of the elimination effort, The Carter Center has funded equipment, reagents and training for the new laboratory to provide state-of-the-art diagnostic support to the MOH onchocerciasis elimination program. The laboratory is located at the MOH Vector Control Division in Kampala and provides polymerase chain reaction (PCR) testing for black flies and skin snips, and serologic enzyme-linked immunosorbent assay (ELISA) testing for OV16 antibodies. Technical backup and reference lab support is provided by Dr. Tom Unnasch's lab at the University of South Florida in Tampa, FL.

Expert advisory committee for national onchocerciasis elimination: To ensure that the elimination decisions are supported with the best scientific and technical advice, the Uganda MOH established the Ugandan Onchocerciasis Elimination Expert Advisory Committee (UOEEAC). Its responsibilities are to review programmatic activity reports from each elimination-targeted focus in Uganda, advise the MOH on focus-specific monitoring, review the results from monitoring and evaluation activities, and make recommendations to the MOH on activities needed to reach the national elimination goal. In addition to MOH representatives, the UOEEAC includes several members-at-large who are recognized for their international expertise in onchocerciasis (Dr. Unnasch, Professor Rolf Garms, Dr. Frank Walsh), and institutional representatives from the Carter Center, SSI and APOC. The World Health Organization (WHO) Uganda representative attends these meetings as an observer since WHO will likely coordinate future certification of the elimination activities. Local Lions, MDP and other donors also attend as observers.

The UOEEAC held its third meeting on August 10 – 12, 2010, with support from The Carter Center. The meeting was opened by Dr. Kenya-Nathan Mugisha, the Ministry of Health's acting director general of health services. Dr. Frank Walsh, a seasoned medical entomologist and former director of entomology of the WHO Onchocerciasis Control Program, chaired the meeting. The UOEEAC reviewed in detail a draft document of the proposed national criteria for interruption of transmission, and accepted an edited version which it later presented to the MOH. Based on this document, the

UOEEAC concluded that onchocerciasis transmission had been interrupted and disease eliminated in Wadelai focus. The UOEEAC recommended to the MOH that interventions be halted in Wadelai focus and that post-treatment surveillance begin. In Imaramagambo and Itwara, the UOEEAC requested additional information, but noted that interventions in these foci might also soon be stopped, as well.

Treatments: The Ultimate Treatment Goal (UTG) for 2010 in Carter Center-assisted areas using a control strategy with annual ivermectin treatment was 885,043 (Figure 18). In the areas targeted for elimination the UTG(2) was 1,759,108 (Figures 19 & 20). Since the strategy in these areas is semiannual treatment, the UTG(2) represents the total coverage goal, i.e., twice the UTG. The Carter Center Uganda assisted in a total of 2,561,961 treatments in 2010 (865,302 annual treatments, 1,690,592 semi-annual and 6,067 passive and visitor treatments). Uganda reached 97% of its ultimate treatment goals and provided CDTI in all 3,853 villages targeted (100% geographic coverage). This was the 13th straight year of more than 90% coverage of the UTG in Carter Center-assisted areas. In elimination areas, UTG coverage was 96% in both the first and second rounds of treatment. The overall Carter Center Uganda treatment goal for 2011 dramatically increases by 56% for 2011 to 4,081,455 treatments due to expected launching of semi-annual treatment in two foci (Nyagak-Bondo focus, formerly an annual treatment area, and a new area known as Northern I focus which has never before been systematically treated due to past insecurity (only “passive” treatments have reached small numbers of people through clinics). In the Northern I focus, microfilaria prevalence is very high, and twice-per-year treatment is needed to advance the national elimination goal and bring onchocerciasis prevalence in line with the rest of Uganda faster. Semiannual treatment in this area accounts for 1,553,381 of the additional treatments planned for 2011. With this increase in treatment activities, Uganda will have the second largest 2011 treatment objective of any country in the Carter Center’s River Blindness Program, surpassing Ethiopia and nearly reaching the treatment levels assisted by The Carter Center in Nigeria.

Training and Health Education: Uganda trained or retrained 95,462 Community-Directed Distributors (CDDs) and 10,852 Community-Directed Health Supervisors (CDHSs) in 2010 (Figure 21). Of these, 44% of the CDDs and 37% of the CDHSs were female. The current ratio of CDDs to population served is the best of any Carter Center-assisted program, at 1 CDD to 28 persons served. In 2010, all 3,853 affected communities in districts with annual and semi-annual districts implemented kinship-enhanced CDTI.

Financial Contribution: Figure 22 shows APOC, Carter Center, and government (district and national) financial contributions to onchocerciasis control/elimination in areas assisted by the RBP. The Carter Center has dramatically increased its funding as the result of the new elimination program. While all districts completed their five years of core APOC funding by the end of 2005, some APOC support continues to be provided. In 2010, APOC transferred funds to Uganda for community-directed treatment activities mainly in control districts. The financial contribution from APOC was received by the national onchocerciasis control program (NOCP) secretariat. The

national government's contribution has always been in the form of absorbing import taxes for supplies and medicines brought in by The Carter Center, in addition to salary support for dedicated government health staff (though this is not reflected in the figures shown in Figure 22).

Sustainability and Integration: While political support for onchocerciasis control activities within the primary healthcare system is strong, cash from the national government for CDTI activities has been neither regular nor sufficient to sustain CDTI activities without outside support.

The RBP-assisted CDTI program actively co-implements with the national lymphatic filariasis elimination effort in Adjumani and Moyo districts, reaching 260,258 persons with combination ivermectin and albendazole treatments in 2010 for UTG coverage of 98%. Also, in other onchocerciasis endemic districts (Kabale, Kanungu, Manafua, and Mbale), RBP co-implements with intestinal helminth control (through semiannual albendazole distribution to school aged children) and Vitamin A supplement distribution (also semiannual to children 6 months to 59 months of age). Albendazole treatments totaled 95,299 in the 2 rounds, while Vitamin A supplements totaled 51,859, reaching 87% and 86% of the respective targets.

2011 RECOMMENDATIONS FOR CARTER CENTER UGANDA

Elimination Efforts

Onchocerciasis interventions could be halted in Mt. Elgon, Imaramagambo, Itwara, and Wadelai foci if the UOEEAC's elimination guidelines and recommendations are accepted by the Ugandan Government. If interventions are stopped, there should be a post-treatment surveillance (PTS) period to monitor for recrudescence of transmission.

Work with the MOH and other partners to publish elimination experiences of Wadelai, Mt. Elgon and Imaramagambo.

The program should maintain the detailed table of epidemiological indicators (the "oncho flag") for each focus targeted for elimination. The foci numbers on the flag should correspond to those on the accompanying map. A new page of the flag should be developed that has all baseline data and the most recent epidemiological and entomological indices. Track the cumulative number of rounds with >90% UTG coverage, by focus.

At the 2010 UOEEAC meeting it was determined that the annual capacity of the Vector Control Division (MOH) laboratory was 17,500 blood spots per year and 5,000 PCR tests. The Carter Center, through Dr. Thomas Unnasch and the University of South Florida lab, will supply the required reagents and materials to process this number of specimens. If such lab supplies are insufficient, three months' advance notice is required to review justification for additional materials.

To keep all stakeholders informed and to ensure that any problems are solved promptly, lab staff should prepare a monthly report showing what was accomplished in terms of numbers of specimens tested, the results obtained, and reagents used. The report should also outline any challenges.

Control Efforts

If funding allows, assist the MOH and other partners to improve onchocerciasis control in northern Uganda, where recent mapping studies have shown infection levels and ocular disease to be a major problem.

Other Recommendations

Encourage the national secretariat for onchocerciasis elimination to submit accurate Mectizan® applications as early as possible, and no later than August of the year before the drug is needed. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year. Changes in denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and Mectizan Donation Program (MDP)

should be advised accordingly. Changes in numbers of treatments to be administered (numerators), and frequency of administration (once versus twice per year) require discussion with Carter Center headquarters and approval by the MOH/NOTF and MDP.

Maintain Lions involvement to help maintain program visibility and support.

Monitor government and APOC financial contributions to control and elimination efforts.

Conduct Carter Center monitoring protocol annually in a sample of districts to assess and validate coverage, health education, community involvement and ownership.

Seek to increase training, supervision, involvement of kinship groups, and gender balance among CDDs and community supervisors as appropriate, especially in districts previously not under The Carter Center's assistance, and ensure that training is done in a cost-efficient fashion. Conduct research to measure costs and supervisory demands of conversion to the kinship strategy. The ratio of community supervisors to CDDs should be 1:5 or better.

Uganda program staff must complete or renew the Emory Institutional Review Board certification if they are to be involved with research programs.

Treatment Objective for onchocerciasis for 2011: 4,081,455

Semiannual UTG(2):	**3,588,935**
Annual UTG:	**492,520**

Training Objective for 2011:

CDDs:	**79,821 (16,600 new)**
Community supervisors:	**9,768 (1,438 new)**

Figure 16

Uganda: Carter Center-Assisted Districts, 2010

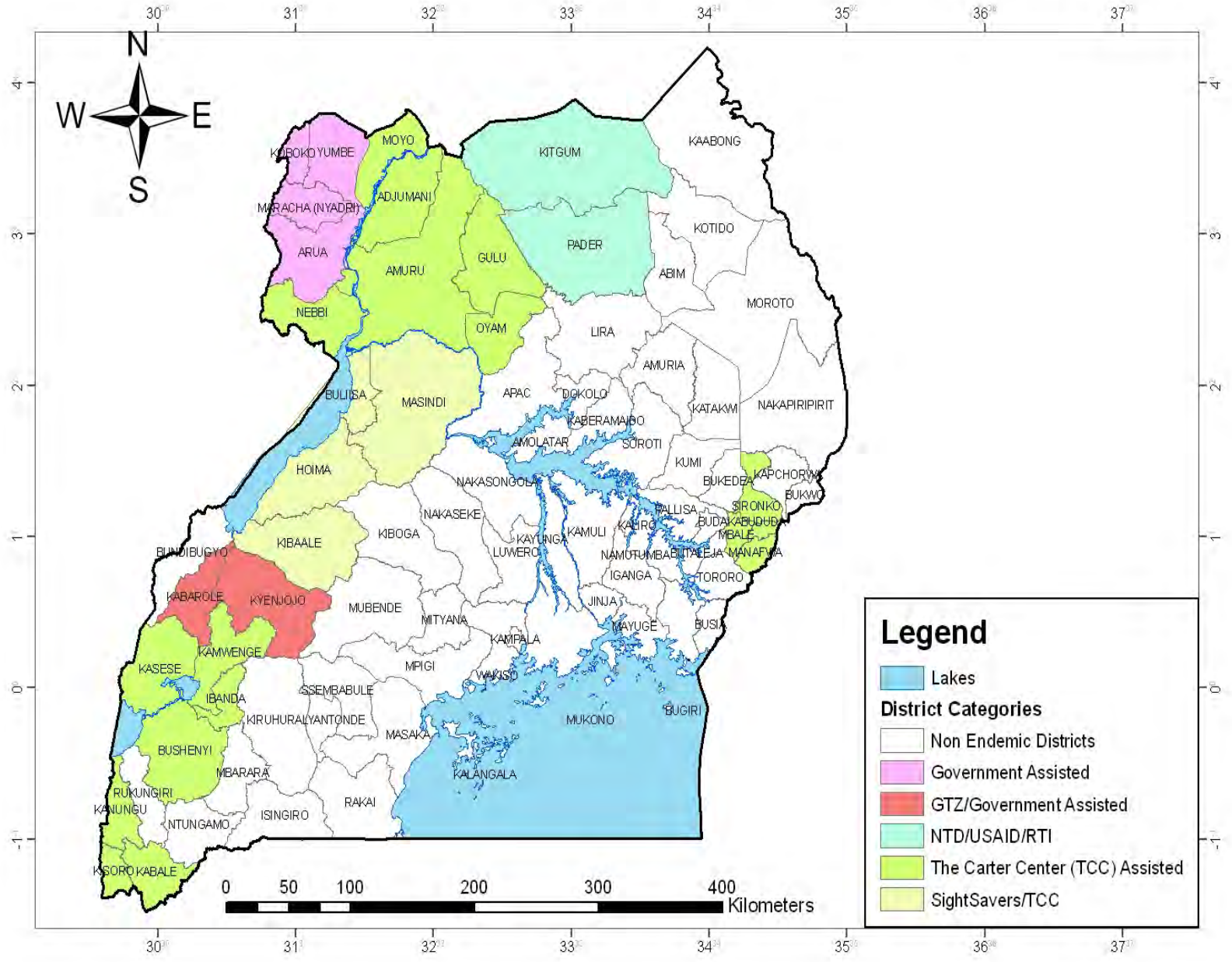
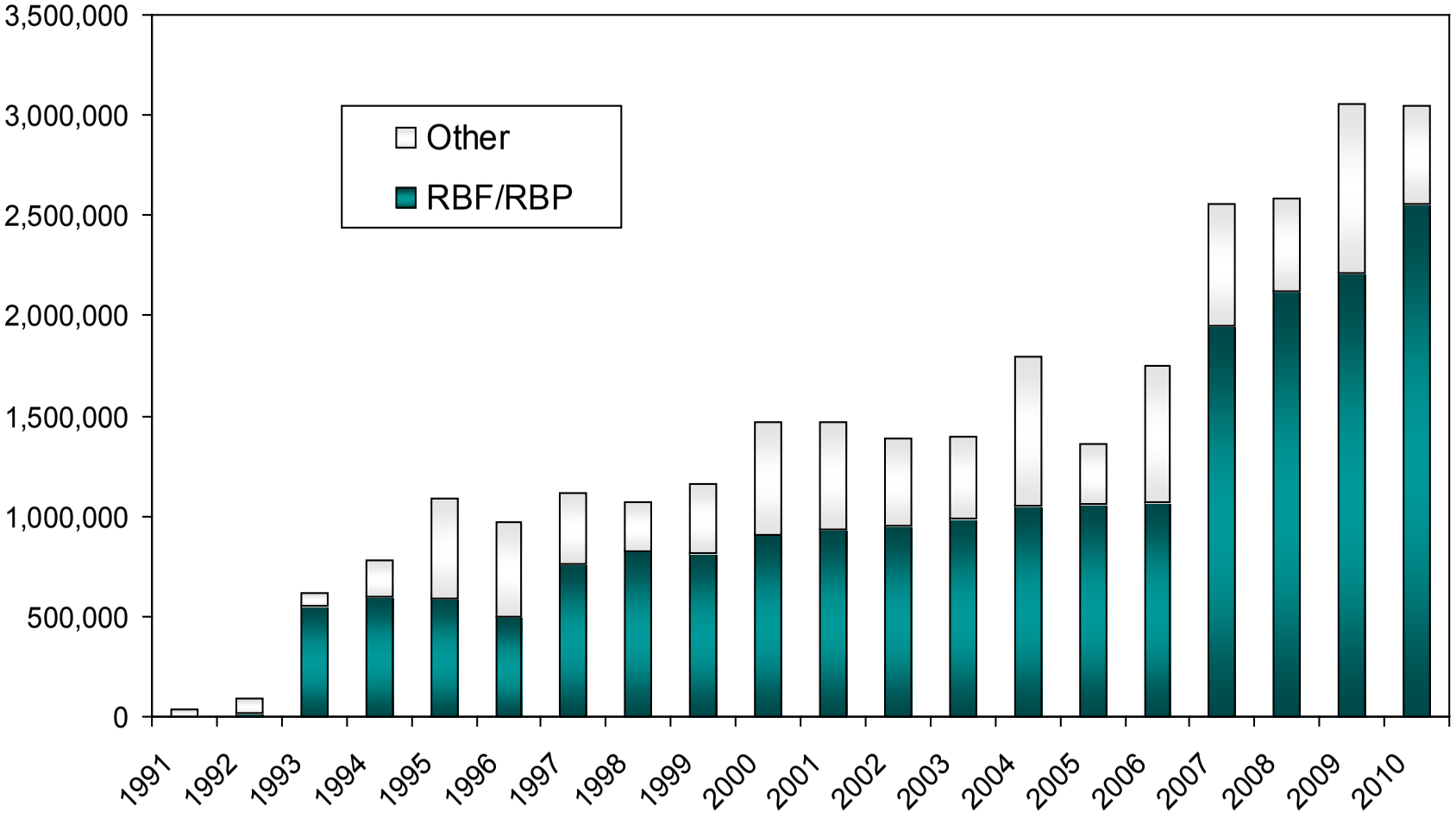


Figure 17

Uganda: Carter Center-Assisted Treatments and Total Mectizan® RB Treatments Provided, 1991-2010*



* Treatments in 1992-1995 assisted by River Blindness Foundation.

Figure 18

Uganda: Foci where Onchocerciasis Elimination Policy is Being Implemented*

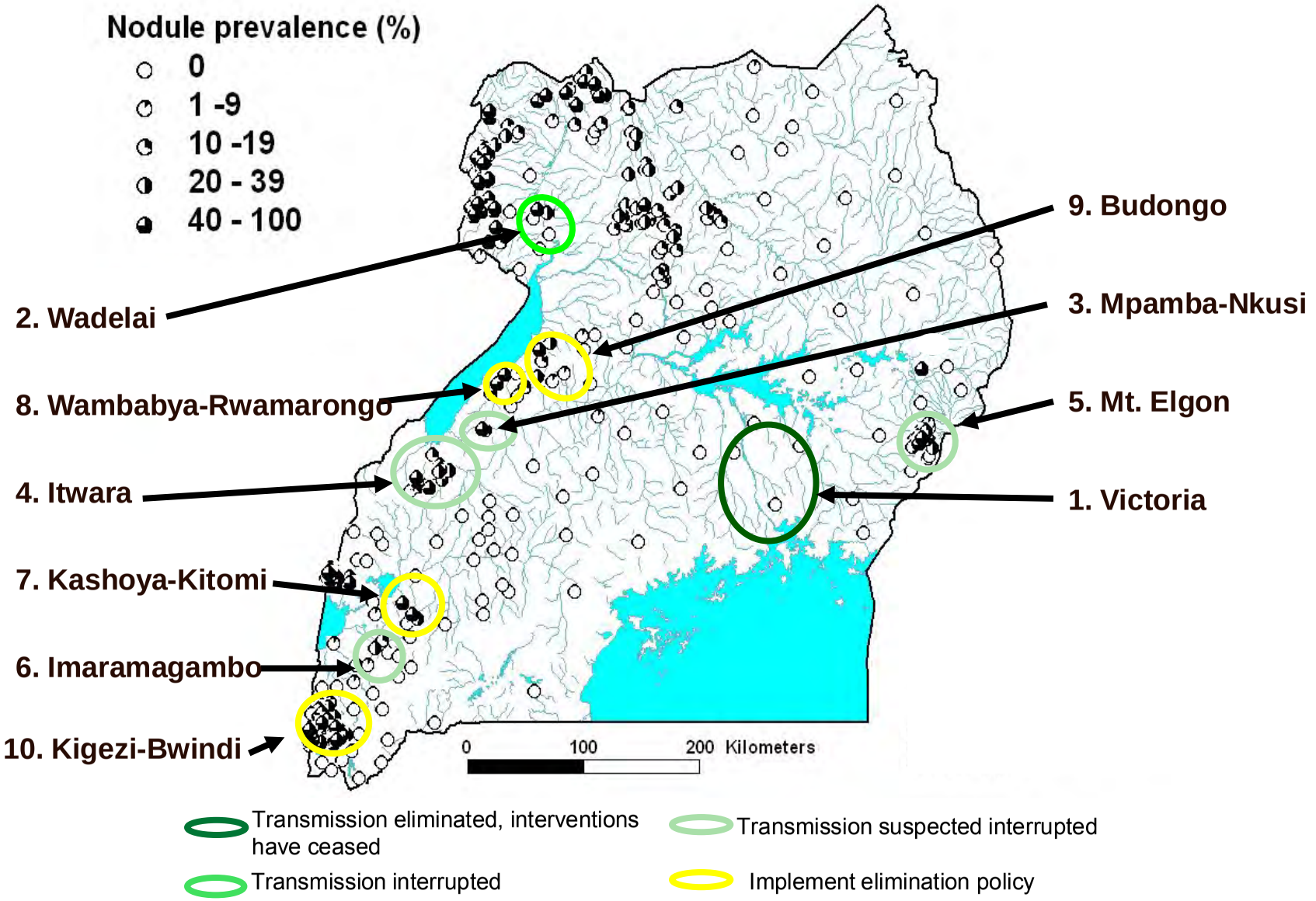


Figure 19

Uganda: Treatment Coverage, 2010: Annual Treatment Areas

District	Total Popn (Projection)	Popn treated cumulative for 2010	Ultimate Tx Goal (UTG) for 2010	Total Popn Tx % for 2010	% Tx cov. of UTG 2010	Active villages cumulative for 2010	Active villages UTG for 2010	Active villages % for UTG for 2010
Adjumani	164,780	137,799	140,208	84	98	178	178	100
Amuru	151,098	116,368	120145	77	97	79	79	100
Gulu	117,510	90,957	94,872	77	96	90	90	100
Kasese	130,585	110,719	114,218	84	97	131	131	100
Moyo	154,288	122,459	124,658	79	98	189	189	100
Nebbi	338,697	270,918	273,931	80	99	682	682	100
Oyam	20,345	16,082	17,011	79	94	35	35	100
Total	**1,077,303**	**865,302**	**885,043**	**80**	**98**	**1384**	**1384**	**100**

Figure 20

Uganda: Treatment Coverage, 2010: Semiannual Treatment Areas

Name of Focus	Name of District	Total Popn 1-Projection	Popn treated cumulative for 2010for 1st rd	Popn treated cumulative for 2010 for 2nd rd	Popn treated cumulative for both rounds	Ultimate Tx Goal (UTG 1) for 2010	Ultimate Tx Goal (UTG 2) 2010 for both rounds	% TX cov of (UTG 1) for 2010st round	% TX cov of (UTG2) for 2010 2nd round	% TX cov of UTG 2 2010 for both Rounds	Active villages cumulative for 2010		Active villages UTG for 2010	Active villages % for UTG for 2010	
											1st Rd	2nd Rd		1st Rd	2nd Rd
	Bududa	156,164	131,443	132,314	263,757	134,933	269,866	97.4	98.1	97.7	412	412	412	100	100
	Manafwa	39,231	32,035	32,193	64,228	32,558	65,116	98.4	98.9	98.6	98	98	98	100	100
	Mbale	49,720	39,867	40,313	80,180	40,392	80,784	98.7	99.8	99.3	131	131	131	100	100
Elgon	Sironko	75,016	62,606	63,224	125,830	63,247	126,494	99.0	100	99.5	179	179	179	100	100
Wadelai	Nebbi	17,979	14,308	14,575	28,883	14,727	29,454	99.0	99.0	99.0	34	34	34	100	100
	Bushenyi	130,855	103,605	104,052	207,657	107,830	215,660	96.1	96.5	96.3	207	207	207	100	100
	Ibanda	24,778	19,693	19,958	39,651	20,541	41,082	95.9	97.2	96.5	60	60	60	100	100
Kashoya-Kitomi	Kamwenge	41,798	33,031	33,822	66,853	34,540	69,080	95.6	97.9	96.7	53	53	53	100	100
	Kabale	27,604	20,981	21,013	41,994	22,499	44,998	93.3	93.4	93.3	38	38	38	100	100
	Kanungu	54,416	41,482	41,499	82,981	44,242	88,484	93.8	93.8	93.8	105	105	105	100	100
Bwindi	Kisoro	35,141	26,560	27,094	53,654	28,894	57,788	90.9	93.8	92.8	45	45	45	100	100
Sub-Total		**652,702**	**525,611**	**530,057**	**1,055,668**	**544,403**	**1,088,806**	**96.6**	**97.4**	**97**	**1362**	**1362**	**1362**	**100**	**100**
Wambabya-Rwamarongo	Hoima	72,077	56,465	57,972	114,437	60,918	121,836	92.7	95.2	93.9	70	70	70	100	100
	Hoima	73,069	56,399	57,981	114,380	61,326	122,652	92.0	94.5	93.3	70	70	70	100	100
	Buliisa	25,139	19,859	20,080	39,939	21,595	43,190	92.0	93.0	93.0	30	30	30	100	100
Budongo	Masindi	44,763	35,161	35,607	70,768	37,227	74,454	94.5	95.7	95.1	60	60	60	100	100
Mpamba-Nkusi	Kibaale	185,842	145,520	149,881	295,401	154,085	308,170	94.4	97.3	95.9	325	325	325	100	**100**
Sub-Total		**395,335**	**313,404**	**321,521**	**634,925**	**335,151**	**670,302**	**93.5**	**95.9**	**94.7**	**555**	**555**	**555**	**100**	**100**
Grand Total		**1,048,037**	**839,015**	**851,578**	**1,690,592**	**879,554**	**1,759,108**	**95.4**	**96.8**	96.1	**1917**	**1917**	**1917**	**100**	**100**

NOTE: The Carter Center provides technical and financial support for elimination to Buliisa, Hoima, Kibaale, and Masindi districts Under Sight Savers International assistance.

Figure 21

Uganda: Number of CDTI Workers Available at the Community Level (2004-2010)

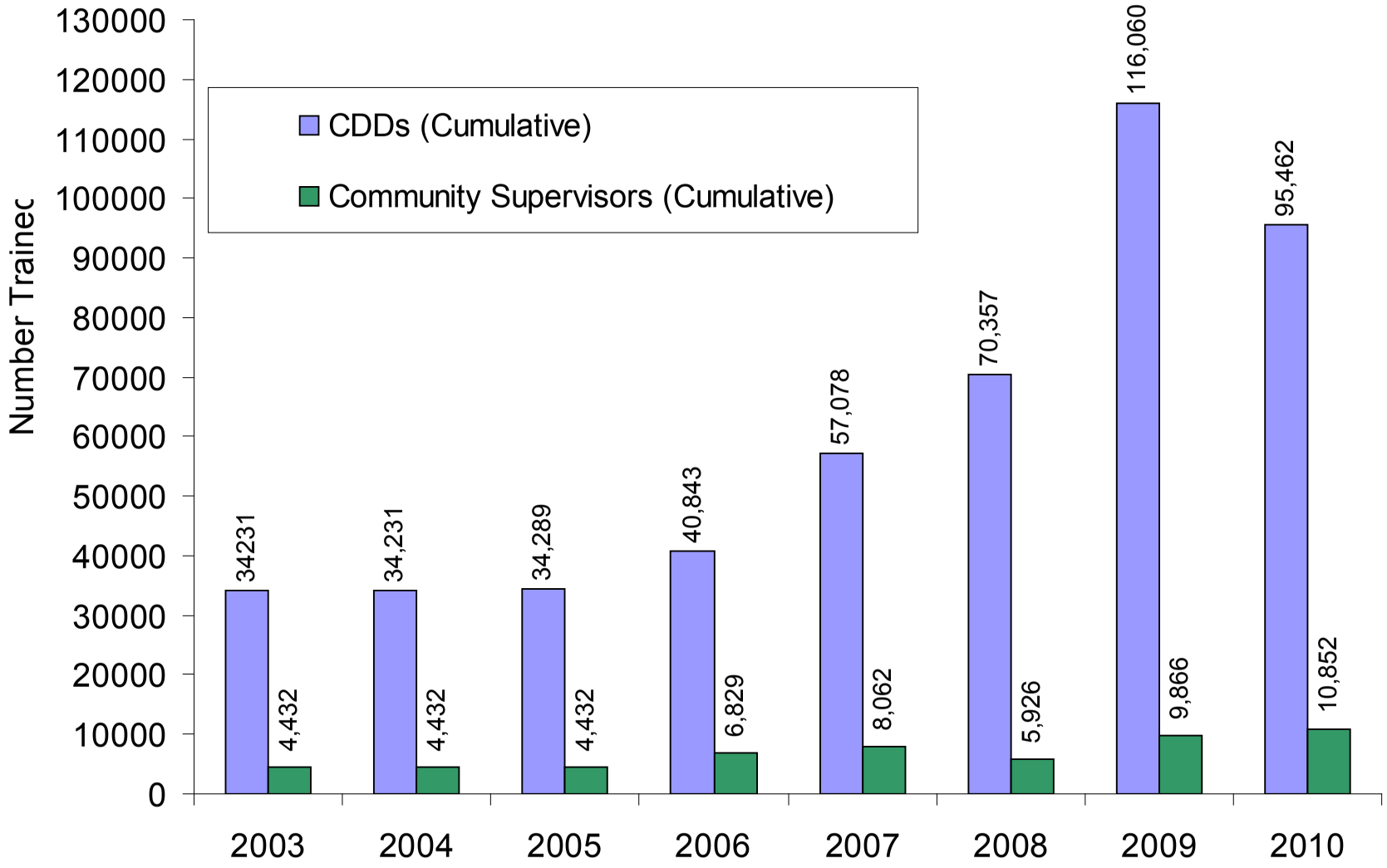
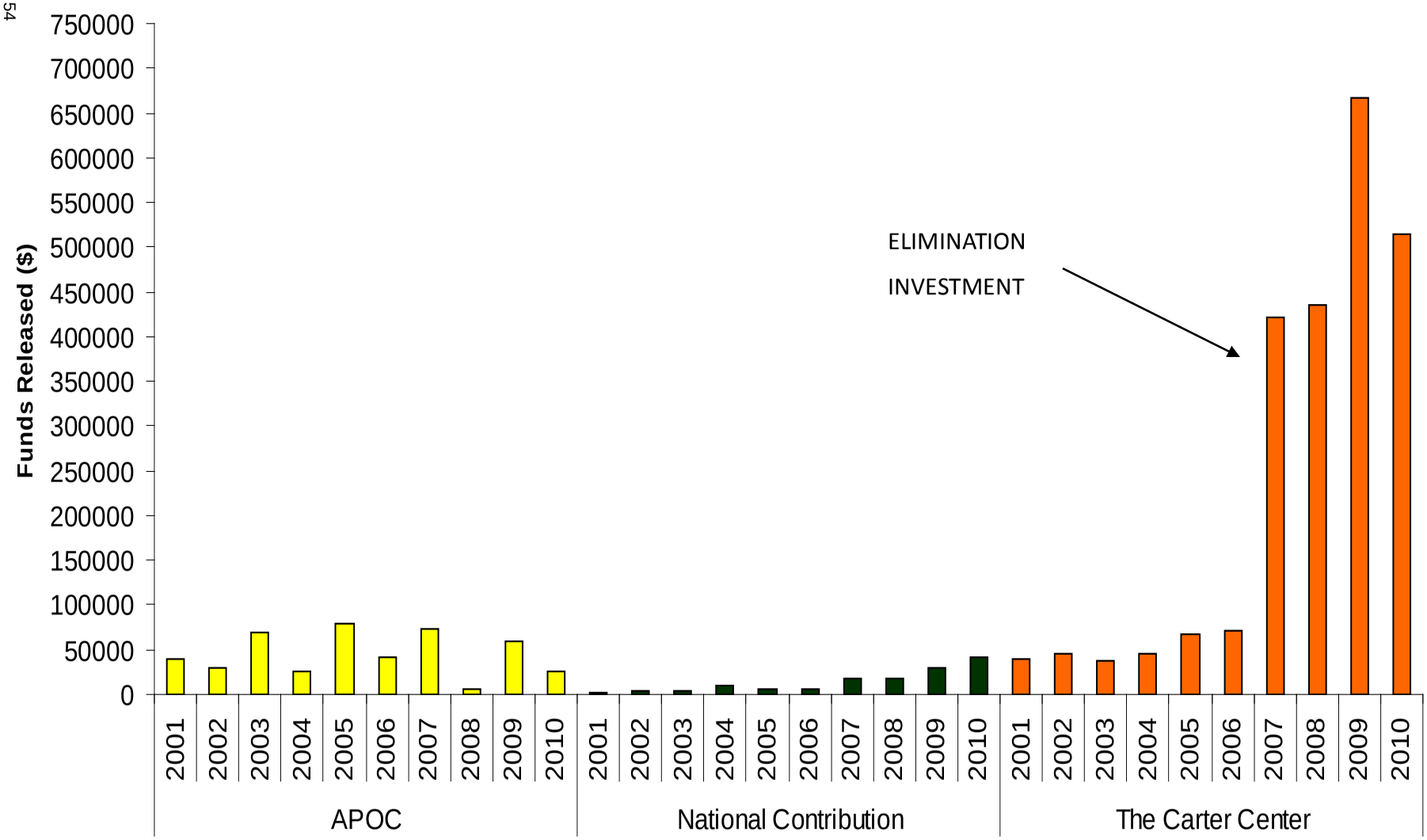


Figure 22

Uganda: Financial Contributions in US Dollars (2001-2010)



NOTE: The above contribution does not include staff salaries and benefits for all the partners.

NORTH SUDAN

Background: After the 2005 Comprehensive Peace Agreement (CPA) ended the decades-old civil war and created the semi-autonomous Government of South Sudan (GOSS), The Carter Center RBP ceased its activities in South Sudan at the request of the new GOSS. Though river blindness activities ceased there, Carter Center Guinea worm eradication and trachoma elimination efforts continue in partnership with GOSS. In North Sudan, the RBP has continued river blindness activities with Lions Clubs International Foundation support in three foci: Abu Hamad (River Nile State), Radom (South Darfur state), and Galabat (Gedarif state) (Figure 23).

In December 2006, the government of Sudan (GOS) launched a new onchocerciasis elimination policy concentrating initially on the isolated desert focus of Abu Hamad in River Nile state. The strategy was based on increasing Mectizan® distribution from annually to every six months ('semi-annual treatment'). At the invitation of GOS, the Lions-Carter Center SightFirst Initiative expanded RBP technical and financial assistance to the new elimination effort. Although for the last few years the RBP focus has been on Abu Hamad elimination, some assistance is also given for annual Mectizan® distribution to control onchocerciasis in Radom and Galabat. Progress in Abu Hamad has been excellent in the field as well as in establishing a functional lab in the capital, Khartoum, to complete the analysis of the backlog of Abu Hamad fly specimens (Figures 24 & 25). Baseline PCR entomological data support the contention that that transmission was close to being interrupted in Abu Hamad prior to launching twice-per-year treatment, and this was published by an RBP consultant in early 2011 (Tarig Higazi et al. Onchocerciasis elimination in Abu Hamed focus, North Sudan: A 2007 entomological survey. *Am J Trop Med Hygiene* 85, 2011; 84: 753-6). Assessment of over 30,000 black flies for *O. volvulus* L3 larvae showed that black fly infectivity rates were 0.84 (95% CI 0.0497 -1.88) per 10,000 flies for Abu Hamed (Figure 26). A large follow up assessment is being completed in 2011.

A complication in the Abu Hamad elimination effort was flooding of endemic communities that resulted from the closure of the new Merowe Dam in 2008. This displaced thousands of (potentially infected) Abu Hamad residents, many to a new state (Northen state) that until then had not been part of the national onchocerciasis program. The RBP has assisted the ministry of health with this new challenge of finding and treating displaced people as part of the elimination effort. In 2009 and 2010, the program made progress in tracking the displaced, and over 11,000 are now receiving treatment in their new communities.

Treatments: A total of 329,845 total treatments were delivered in the North Sudan program in 2010. In Abu Hamad, where twice-per-year treatment is provided, 210,326 treatments were delivered (including to displaced persons), representing 102 percent of the UTG(2) of 206,550 for that focus area. In the first round, 103,959 persons were treated (101 percent of the UTG), and 106,367 persons were treated in round two (103 percent). Annual doses of Mectizan® were delivered in Radom and Galabat, resulting in 18,948 and 100,428 treatments, respectively (for 98% UTG coverage).

See Figure 27 for Carter Center-supported treatments from 1997 to 2010 in North Sudan, and see Figures 28 and 29 for details on treatments in Sudan in 2010. The dramatic decrease of treatments in 2005 resulted from the departure of infected or at-risk persons from refugee camps for displaced persons in Khartoum. They repatriated to Southern Sudan after the 2005 peace agreement.

Training and Health Education: The program trained 1,349 new community-directed distributors (CDDs) and retrained 1,949 CDDs in 2010 in Abu Hamad, Galabat and Radom. The number of CDDs per person averaged 1:80 in 2010, an improvement from an already positive ratio of 1:109 in 2009. About 39 percent of the CDDs were female, relatively unchanged from 2009 (Figure 30). Health education covered all 319 communities in the Abu Hamad, Galabat, and Radom foci.

Mectizan®: During 2010, 927,010 tablets were distributed in the Abu Hamad, Galabat, and Radom foci with an average of 2.8 tablets per person. No severe adverse effects were reported. The program began 2010 with a balance of 1,464,216 tablets.

Sustainability and Integration: In late 2007, the program began focusing on involving kinship/family groups in all the foci in mobilization and health education, selection and training of CDDs, and distribution of Mectizan®. This policy has improved training figures and UTG coverage, reducing demand for monetary incentives.

2011 RECOMMENDATIONS FOR THE CARTER CENTER SUDAN

Abu Hamad

The Lions-Carter Center SightFirst support for the Sudan program will focus on completing the assessment (skin snip, entomology and OV16) of onchocerciasis transmission in the Abu Hamad focus. Include the population displaced by the Merowe Dam and the population immediately outside the limits of Abu Hamad focus.

Track the cumulative number of rounds with >90 percent UTG coverage. Assess treatment coverage by village.

Create and maintain detailed tables and maps of epidemiological indicators for Abu Hamad, as is done with the OEPA foci.

General

The Sudan program should continue to track government and Carter Center funding figures in 2011, including any additional funds coming in from APOC, and from the Government of Sudan.

Work towards a target of a minimum 1 CDD to 100 population ratio. Seek to increase training, supervision, involvement of kinship groups, and gender balance among CDDs and community supervisors as appropriate. The ratio of community supervisors to CDDs should be at least 1:5.

Ensure that the NOCP submits accurate Mectizan® applications as early as possible, and no later than August of the year before the drug is needed. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year. Changes in denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and the Mectizan Donation Program (MDP) should be advised accordingly. Changes in numbers of treatments to be administered (numerators), and frequency of administration (once versus twice per year) require discussion with Carter Center headquarters and approval by the MOH/NOTF and MDP.

Sudan program staff must complete or renew the Emory Institutional Review Board certification if they are to be involved with research programs.

Help to strengthen the Sudan Lions Club and maintain its involvement with the program.

Treatment Objective for onchocerciasis for 2011: 493,297

Semiannual UTG(2): 473,574 treatments

Annual UTG: 19,723 persons

Training Objective for 2011: CDDs: 3,720 (490 new)

Community supervisors: 407 (63 new)

Figure 23

North Sudan Program Areas

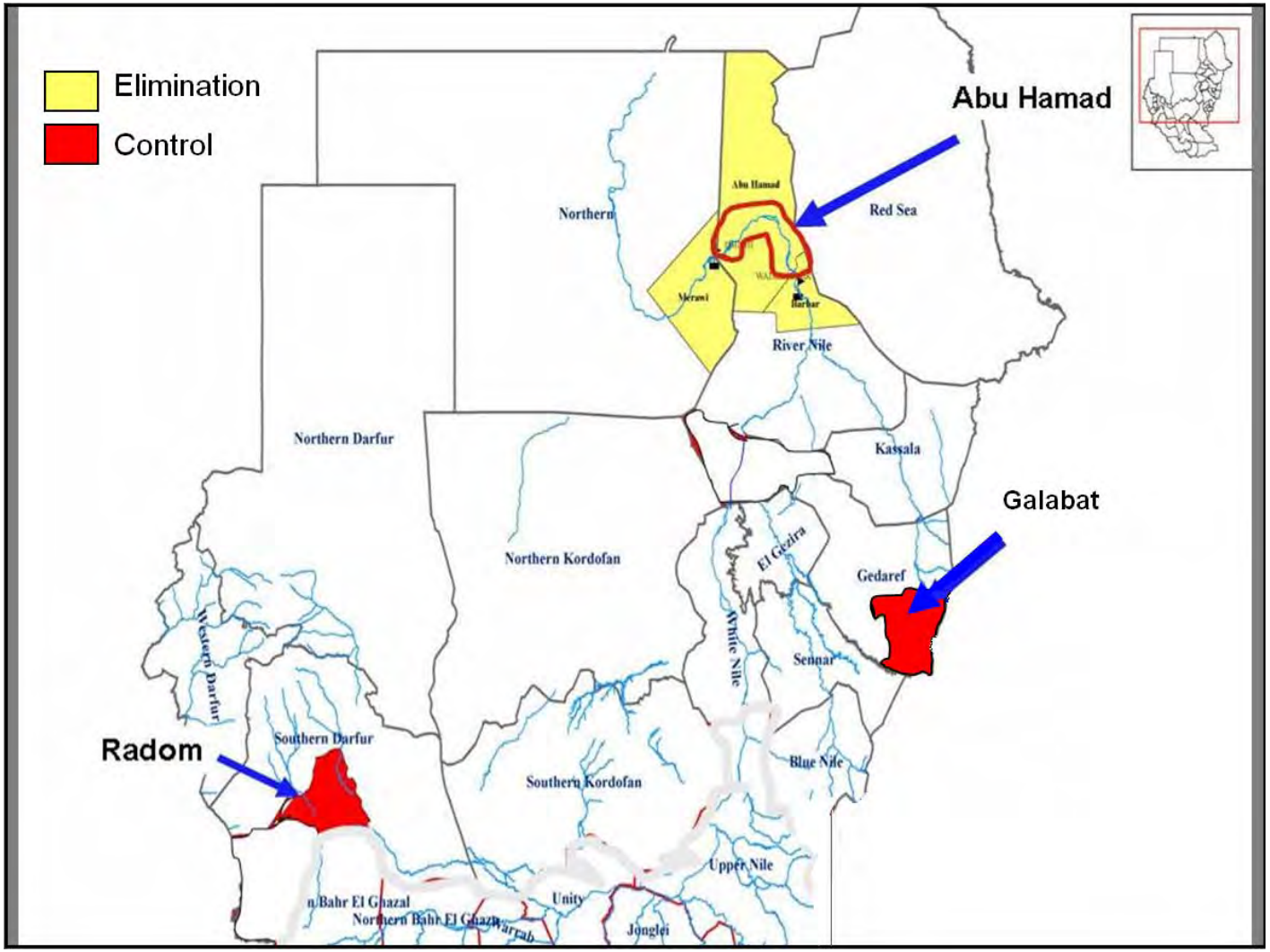


Figure 24

Ms. Wegdan Mohammed, a senior laboratory technician in the molecular laboratory at the Federal Ministry of Health in Khartoum supported by The Carter Center/LCIF.

Figure 25

Ms. Wegdan Mohammed (left) with Dr. Hanan Mohamed (right), a parasitologist with the onchocerciasis elimination program in the Federal Ministry of Health, Khartoum in the molecular laboratory supported by The Carter Center/LCIF .

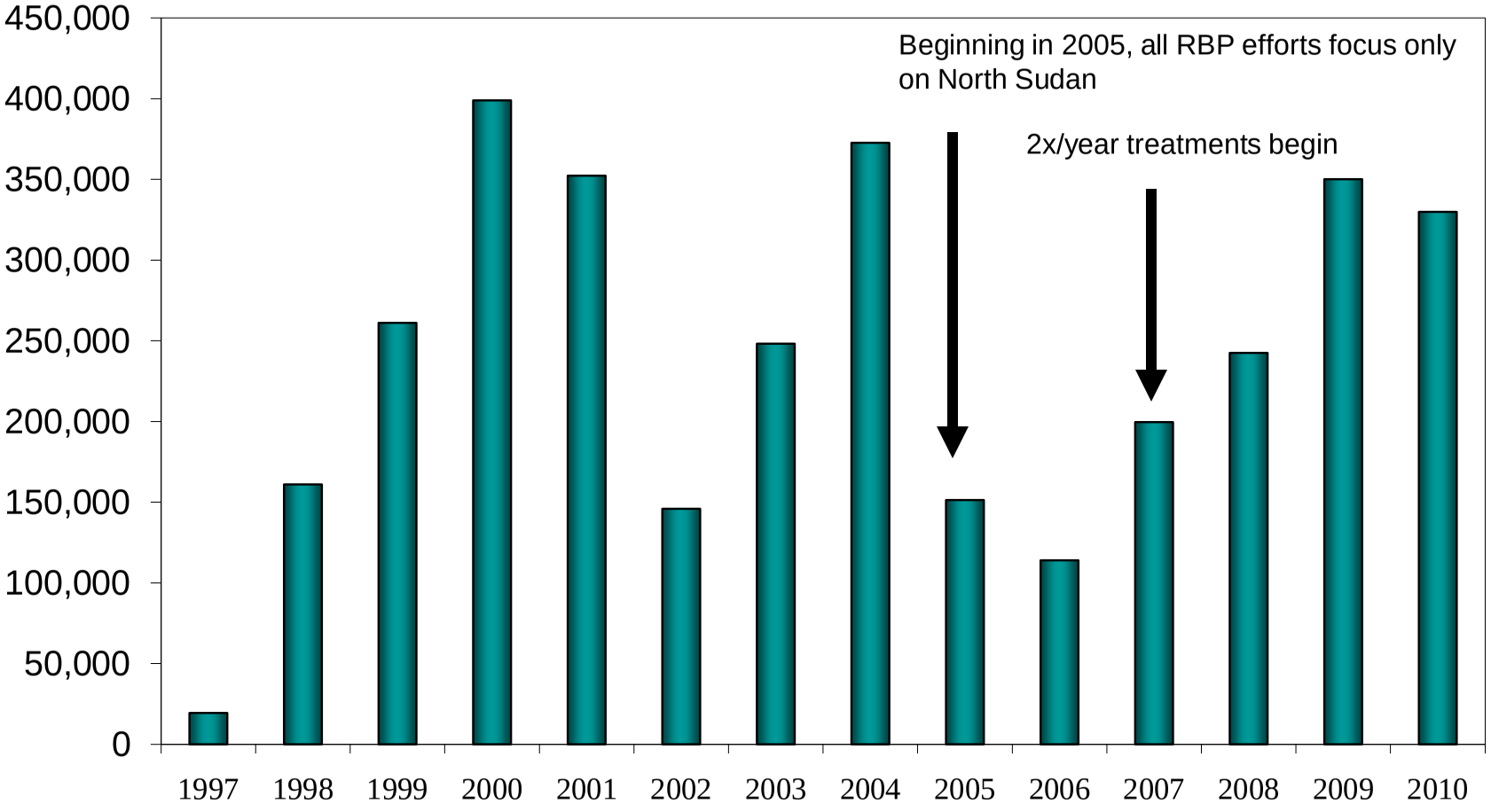
Figure 26

North Sudan: Results of Entomological Assessments in 2007

Focus	Black fly Infectivity rate	Remarks
Abu Hamad	0.84/1000 95% CI (0.0497-1.88)	Suppressed *O.volvulus* transmission
Galabat	6.9/1000 95% CI (1.1-16.4)	Moderate Transmission Rate

Figure 27

North Sudan: Lions-Carter Center-Assisted Mectizan® Treatments, 1997-2010*



* Since 1997, Carter Center activities in Sudan have been supported by Lions Clubs International Foundation.

Figure 28

North Sudan: Annual treatment areas, 2010

Focus	Total Popn 2010	Ultimate Tx Goal (UTG) 2010	Popn treated cumul. for 2010	Total Popn Tx % 2010	Popn Tx % of UTG 2010	Active villages treated 2010	Active villages cumul. 2010	Active villages of UTG for 2010	% of active villages covered 2010
Galabat	77,270	65,680	65,577	85%	100%	130	130	130	100%
Galabat Extension (2010)	43,236	36,751	34,851	81%	95%	23	23	23	100%
Galabat Subtotal	120,506	102,431	100,428	86%	98%	153	153	153	100%
Radom	23,203	19,723	18,948	82%	96%	20	19	19	95%
Passive treatments	0	0	143	0	0	0	0	0	0
Total	**143,709**	**122,154**	**119,519**	**86**	**98%**	**173**	**172**	**172**	**99%**

NOTE: UTG decreased by 54,877 from the 2010 objective reported in 2009 Program Review Proceedings (177,031). The planned extension was reduced based on lower-than-anticipated nodule prevalence data.

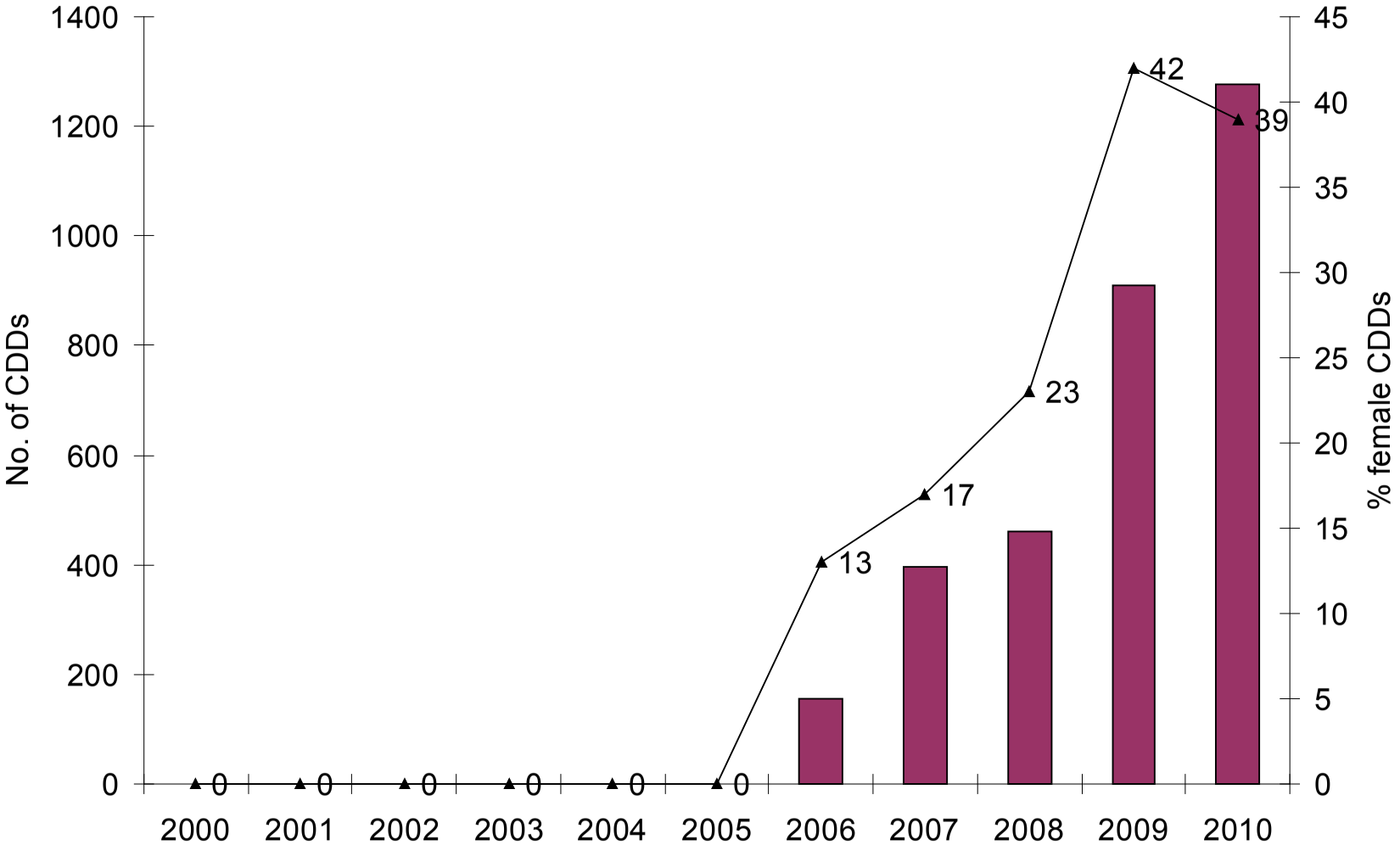
Figure 29

North Sudan: Treatments in Semi-Annual (Elimination) Areas, 2010

Focus	Total Population	UTG 1	Treated in R1	Treated in R2	UTG Covered R1	UTG Covered R2	Total Treated	UTG 2	% covg UTG 2	Active Villages treated 2010	% active villages covered 2010
Abu Hamad	101,185	88,953	90,114	91,963	105%	107%	182,077	177,906	102%	137	100%
Almkabra b (Displaced Persons)	9,894	8,410	8,114	8,692	96%	103%	16,806	16,820	100%	3	100%
Alfeda (Displaced Persons)	3,800	3,230	3,540	3,288	110%	102%	6,828	6,460	106%	4	100%
Amry (Displaced Persons)	3,155	2,682	2,191	2,424	82%	90%	4,615	5,364	86%	3	100%
	118,034	103,275	103,959	106,367	101%	103%	210,326	206,550	102%	147	100%

Figure 30

North Sudan: CDD Gender Breakdown by Year



CAMEROON

Background: The Lions-Carter Center partnership assists the Ministry of Health (MOH) of Cameroon to battle onchocerciasis in North and West regions (Figure 31). In 2010, the Carter Center's treatments in Cameroon accounted for 34% of the national treatments, and showed no significant changes from the previous year, as other partner onchocerciasis control programs maintained their treatment coverage.

The Lions-Carter Center SightFirst Initiative project is supervised by Lions District 403B. Major support for program implementation from the African Program for Onchocerciasis Control (APOC) was phased out in North region in 2003, and in West region in 2008, although supplemental funding does continue to be provided. 2010 was the last year for LCIF support for Carter Center programs in Cameroon, although local Lions District 403B members remain strong advocates for continued onchocerciasis control, and LCIF continues to support Mectizan distribution for onchocerciasis in other parts of the country.

A major new Neglected Tropical Disease (NTD) effort is trying to be scaled up in Cameroon, assisted by Helen Keller International (HKI) and RTI/USAID. As part of this effort, new funds are being offered to provide treatment to the entirety of North province. The initial launching of lymphatic filariasis (LF) elimination through mass drug administration (MDA) using combined Mectizan®/albendazole was in RBP assisted onchocerciasis areas. Albendazole treatments (combined with Mectizan®) were launched in the six health districts where RBP assists for onchocerciasis, with the plan that another four health districts that are outside CDTI areas will also need to be treated.

Treatments: Carter Center-assisted areas in Cameroon received 1,823,700 treatments in 2010 (Figures 32 and 33), or 96% of the UTG of 1,893,821. This included 1,385,562 treatments in West region and 438,138 treatments in North region. The North region achieved UTG coverage of 98%, while the West region achieved 96% UTG coverage. Mass treatment in North region for onchocerciasis is in its eighteenth year.

No severe adverse events (SAEs) were reported as a result of Mectizan® treatments in Cameroon in 2010. Monitoring potential adverse reactions is given high priority in West region because of the presence of *Loa loa* in that part of the country. *Loa loa* is a filarial parasite (similar to *O. volvulus)* that can rarely provoke SAEs shortly after Mectizan® is administered. There have been no cases of SAEs potentially related to *Loa loa* in West region for the past eight years. Mass treatment in West region is in its fifteenth year.

Mectizan®: The Lions-Carter Center-assisted program received a total of 4,978,142 Mectizan® tablets from the Mectizan® Donation Program (MDP) for 2010 treatments. The program assisted in distributing 4,845,308 of these, with 5,212 tablets (0.1% of the total available) lost or expired during the period of distribution. The balance of 127,568 tablets was returned through the health system to the Drug Procurement and Delivery

Agency (DPDA). The program reported an average of 2.7 tablets per treatment. The program also delivered 438,138 albendazole treatments for lymphatic filariasis in the North region within the community-directed treatment with ivermectin (CDTI) program areas.

Training and Health Education: Ivermectin distribution by community directed distributors (CDDs) has used the kinship strategy since 2004. This strategy calls for training more CDDs (to serve their kinship group rather than the larger community). Training is followed by close supervision: CDDs are supervised by community-selected supervisors in their respective communities, and health workers at frontline health units are supervised by the regional and Carter Center teams. In 2010, the Program trained a total of 23,523 CDDs in the West and North regions (59% of the 2010 training objective); of these 13,695 were newly trained (58%). This is a 47% decrease from the 53,242 trained in 2009. The reason for the dramatic decrease in training was unclear and potentially related to entry of a new NTD program into RBP assisted onchocerciasis treatment areas that espoused a different approach to MDA activities that does not encompass CDTI/kinship. Despite these partnership challenges, the RBP Cameroon program still exceeded the goal of having 1 CDD per 100 persons served (Figure 34).

Roughly 32% of the CDDs trained in West region and 10% in North region were female. Overall, 25% of the CDDs trained were female, which was unchanged from 2009.

Financial Contribution: This was the last year of support from LCIF. The regional governments invested $176,775 in the community-directed treatment with ivermectin (CDTI) program in 2010, which was roughly equal to 2009 government support. See Figure 35 for APOC, Carter Center, and national (including state and local) financial contributions from 2001 to 2010. The APOC financial contribution information was obtained from the national onchocerciasis control program (NOCP) secretariat and regional offices.

Integration of Mectizan® Distribution with Other Activities: CDDs and community supervisors are involved with other community health activities, such as LF, national immunization days, an expanded program of immunization, family planning, HIV/AIDS prevention, bed net distribution, Vitamin A distribution, tuberculosis control, and water and sanitation activities.

2011 RECOMMENDATIONS FOR THE CARTER CENTER CAMEROON

Follow developments on Ministry statements related to its onchocerciasis control and elimination policies.

The program should assess the status of onchocerciasis transmission in West region.

TCC Cameroon should indicate in its monthly reports all co-implementation activities related especially to lymphatic filariasis (LF) elimination, but also to include other NTD developments taking place in Carter Center-assisted areas in North and West regions, as well as at national level. Based on the request by the MOH, The Carter Center's RB program will co-implement RB and LF activities in CDTI areas. However, expansion of Carter Center programs requires formal Carter Center Board of Trustees approval. The Carter Center can only be involved in integration/co-implementation activities within designated RB Mectizan® distribution areas where TCC is already assisting and within the time period that distributions are scheduled.

The Cameroon program should continue to track government and Carter Center funding figures in 2011, including any additional funds coming in from APOC.

Conduct Carter Center monitoring protocol annually to assess and validate coverage, health education, community involvement and community ownership.

Seek to increase training, supervision, involvement of kinship groups, and gender balance among CDDs and community supervisors as appropriate. Continue research to evaluate challenges of increasing CDD numbers beyond 1:100 total population, with focus on supervisory issues and data flow. The ratio of community supervisors to CDDs should be at least 1:5.

Continue to evaluate training costs of CDDs and supervisors.

Ensure that the National Onchocerciasis Task Force (NOTF) submits accurate Mectizan® applications as early as possible, and no later than August of the year before the drug is needed. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year. Changes in denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and MDP should be advised accordingly. Changes in numbers of treatments to be administered (numerators), and frequency of administration (once versus twice per year) require discussion with HQ and approval by the MOH/NOTF and MDP.

Seek more Lions involvement to help maintain program visibility and support wherever possible.

Cameroon program staff must complete or renew the Emory IRB certification if they are to be involved with research programs.

Treatment Objective for onchocerciasis for 2011: 1,382,508 persons

Training Objective for 2011:

CDDs:	**13,194 (8,594 new)**
Community supervisors:	**8,062 (4,099 new)**

Figure 31

Cameroon
Lions-Carter Center - Assisted Regions

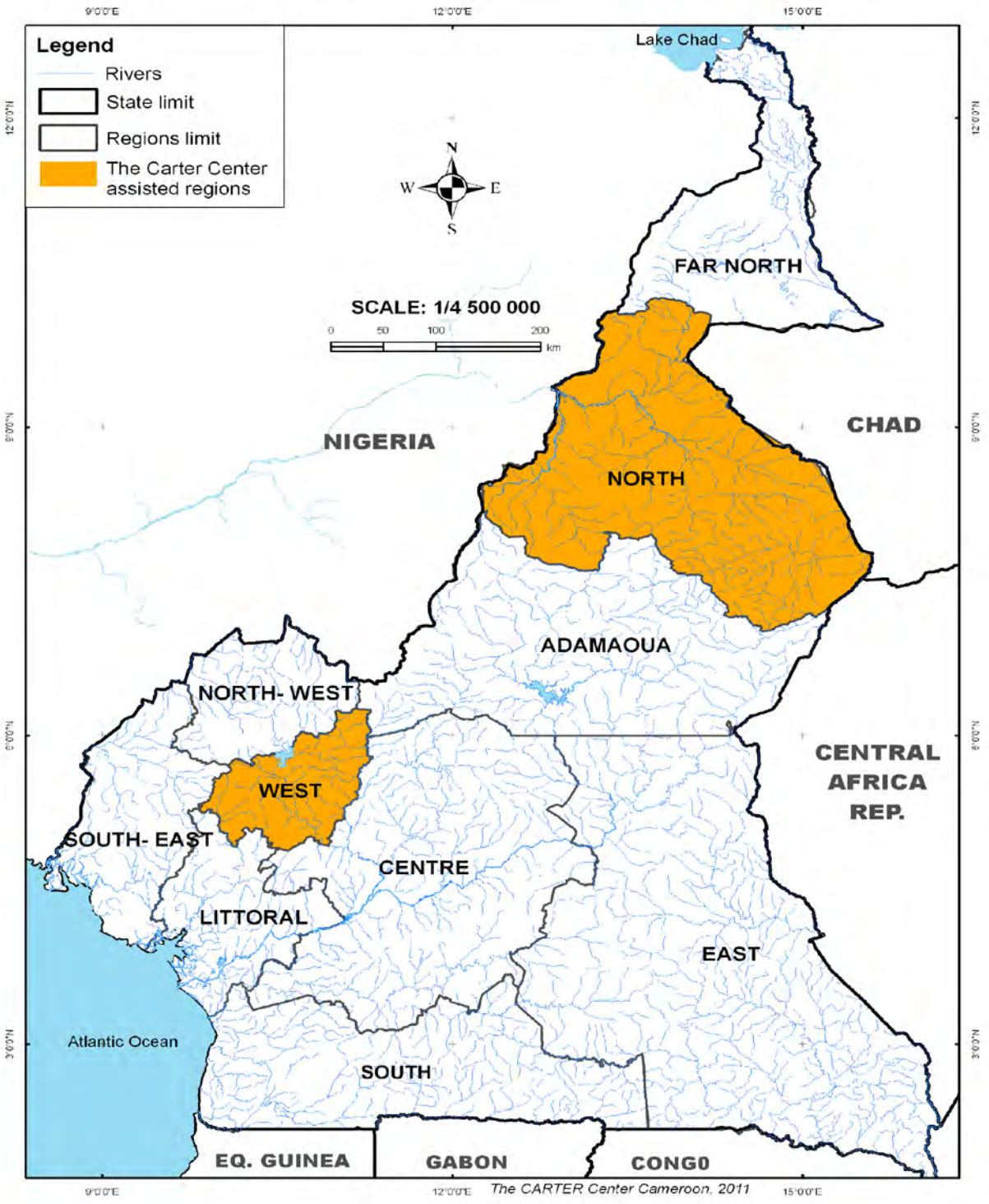
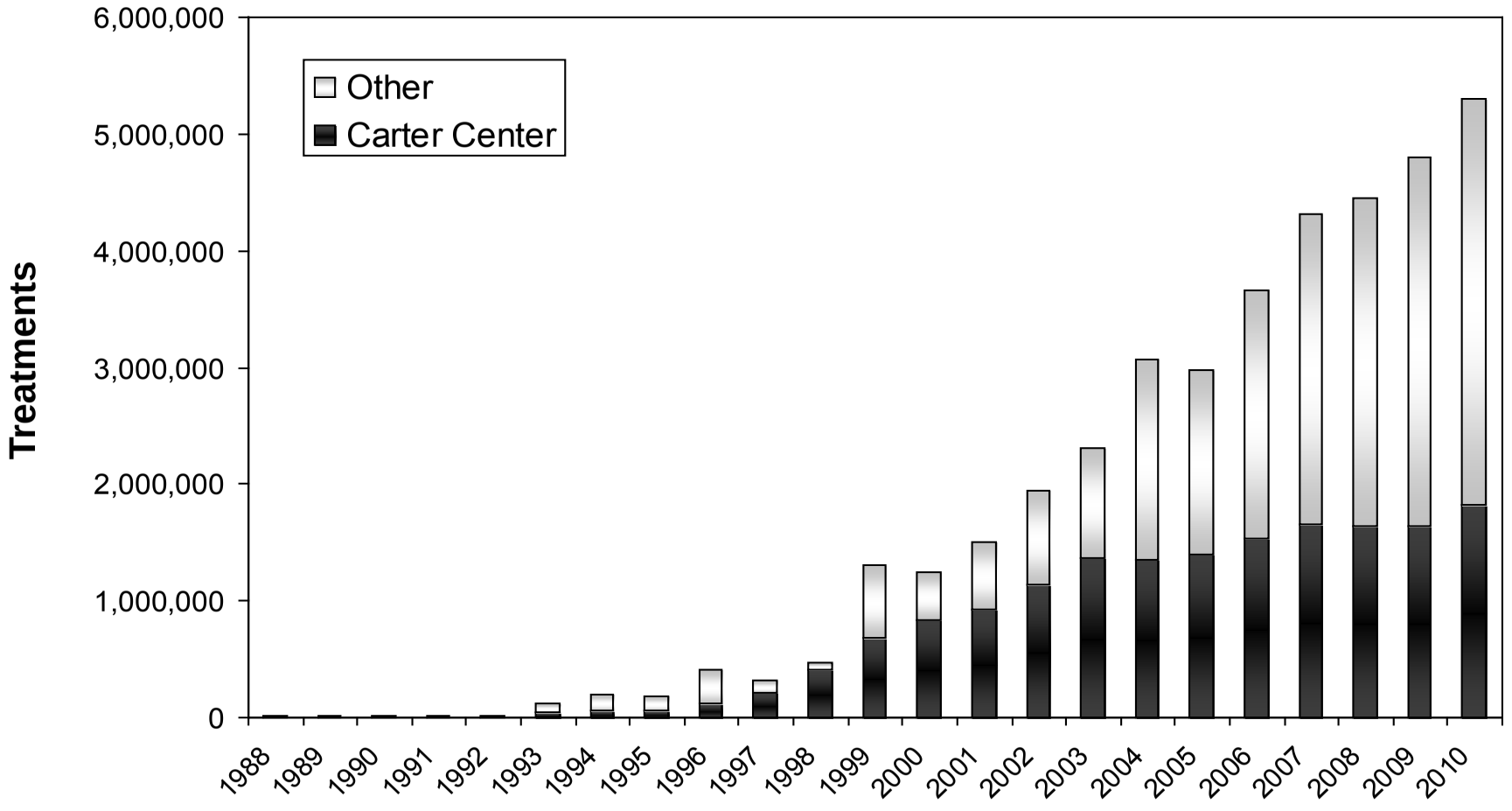


Figure 32

Cameroon: Lions-Carter Center-Assisted Mectizan® Treatments as Part of Total Treatments Provided, 1988-2010*



*Treatments in 1993-1995 by RBF. Source of provisional national figures: NGDO coordinating office.

Figure 33

Treatment coverage (2010)

Regions	Total population	UTG for 2010	Population treated cumulative for 2010	%Total pop. Treated	% UTG Treated	Active Comm. Treated in 2010	Active Comm. UTG for 2010	% Comm UTG Treated
West	1,699,552	1,444,619	1,385,562	82	96	2,651	2,651	100
North	528,473	449,202	438,138	83	98	1,646	1,646	100
Total	2,228,025	1,893,821	1,823,700	82	96	4,297	4,297	100

Comm=Communities

Figure 34

Cameroon: CDDs and Community Supervisors Trained (2005-2010)

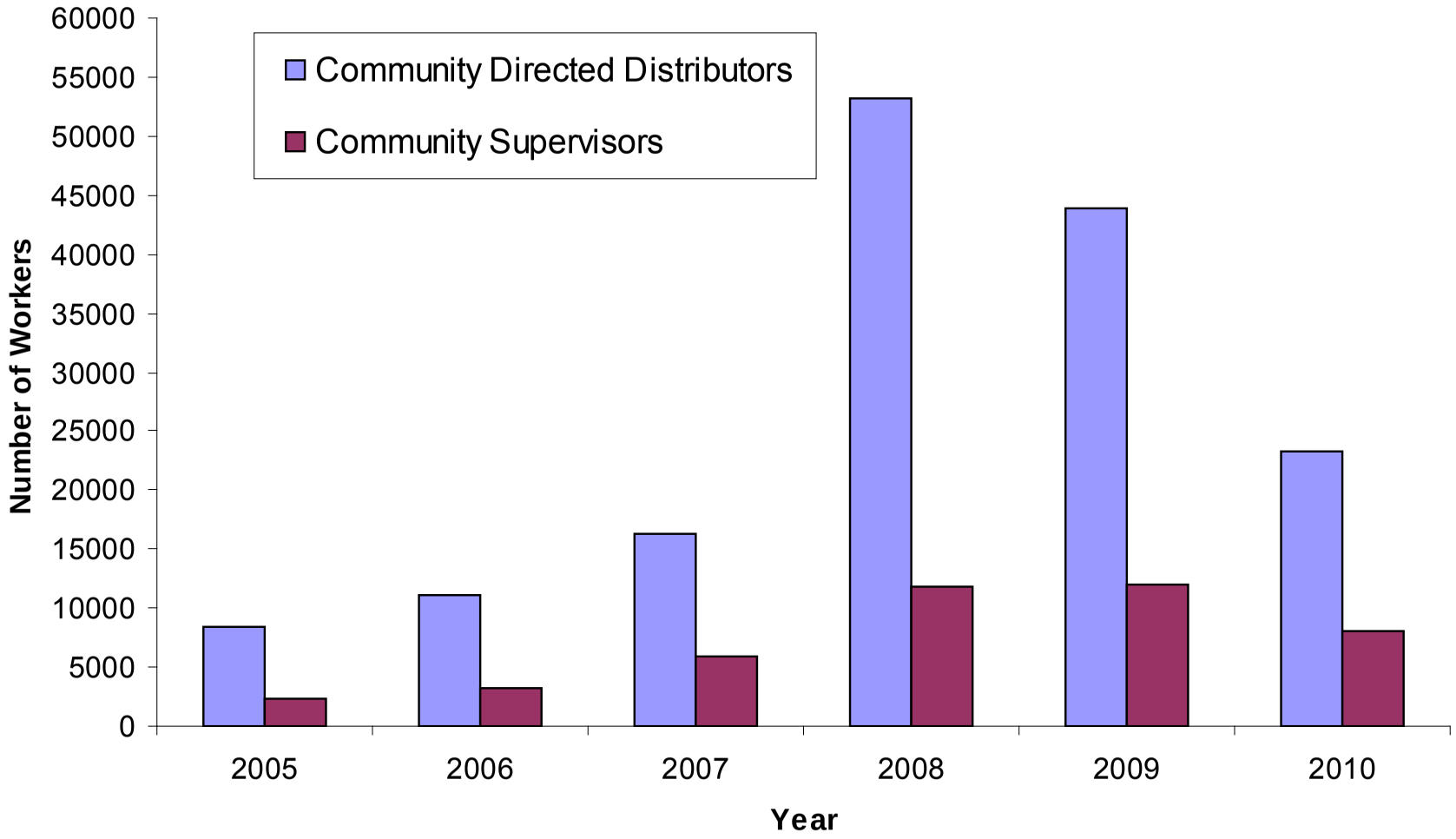
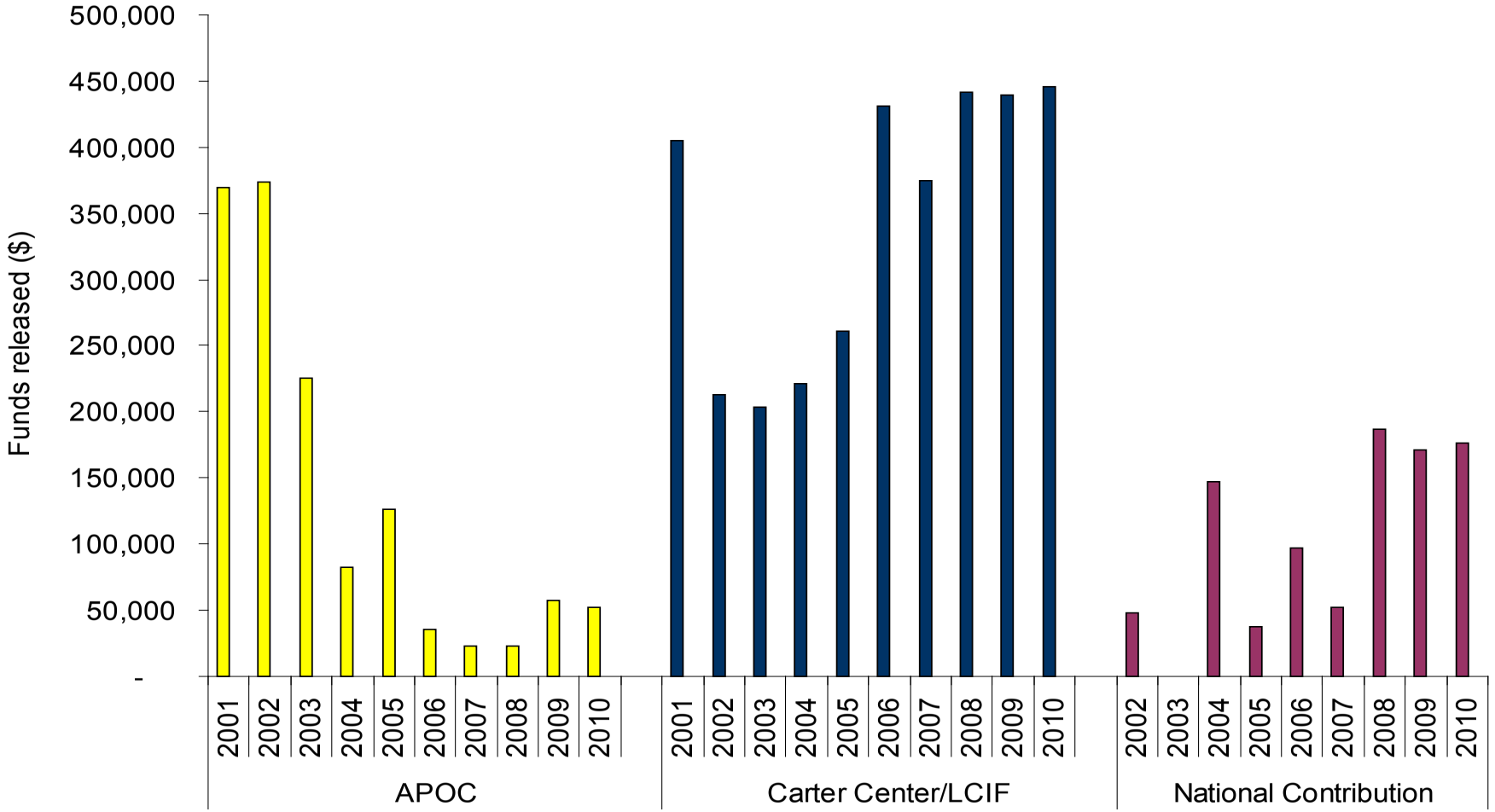


Figure 35

Cameroon: Financial Contributions (in USD), 2001 – 2010



NOTE: The above contribution does not include staff salaries and benefits for all the partners.

NIGERIA

Background: Nigeria is the most endemic country in the world for river blindness (RB), with as much as 40% of the global onchocerciasis disease burden. It is estimated that up to 27 million Nigerians living in 32 endemic states need curative or preventative treatment with Mectizan® (ivermectin) for RB. The National Onchocerciasis Control Program (NOCP) is the largest Mectizan® distribution program in the world. According to Federal Ministry of Health (FMOH) estimates, NGOs and the NOCP have provided between 20 and 24 million treatments annually throughout Nigeria for the last five years. The treatments assisted by The Carter Center have represented approximately 25-30% of the total Nigeria treatments for this period (Figure 36).

The Carter Center program in Nigeria has its headquarters in Jos, Plateau state, with supporting sub-offices in Benin City, Enugu, Lagos, and Owerri. The program assists treatment activities in 9 RB endemic states: Abia, Anambra, Delta, Ebonyi, Edo, Enugu, Imo, Nasarawa, and Plateau (see Figure 37). These projects enjoyed LCIF support from 1999 to 2008 and core APOC from 2000 to 2005. Local Lions (District 404) have been active participants in the Carter Center-assisted RB control activities in Nigeria since 1996 and remain involved in RB advocacy efforts.

Treatments: In 2010, the Carter Center-assisted program in Nigeria provided health education and Mectizan® treatments to 5,975,165 persons (Figure 38); 5,443,800 of those were mass (active) treatments; 531,365 passive treatments were delivered in hypo-endemic areas in the 7 states located in the southeastern part of the country. Mectizan® was delivered to 9,941 villages.

The Carter Center Nigeria Program had approximately 24.7 million Mectizan® tablets available for 2010, and the average number of Mectizan® tablets per person treated was 3.0. There were 1,708,888 Mectizan® tablets remaining at the end of 2010.

No severe adverse events (SAEs) were reported as a result of Mectizan® treatments in Nigeria in 2010. Particularly close monitoring for adverse reactions is done in the southeastern states because of the presence of *Loa loa* in that part of the country. *Loa loa* is a parasite similar to *Onchocerca volvulus*, but it can rarely provoke SAEs when Mectizan® is administered. Fortunately, no treatment-related SAEs have ever been reported in TCC assisted areas in Nigeria.

Training and Health Education: The 9 states assisted by The Carter Center conducted training or retraining for 60,700 health workers involved in Mectizan® distribution in 2010. Kinship-enhanced training in the Southeast, which utilizes the extended family structure to provide treatment to small groups of related persons, included 54,081 Community-Directed Distributors (CDDs), 8,039 Community Supervisors (CS), and 5,726 Frontline Health-Level Workers. The ratio of CDDs to population was 1 CDD per 111, close to the goal of 1:100. In the Southeast states, nearly 50% of CDDs were female, versus 8% in Plateau and Nasarawa states. Supervision of CDDs in the Southeast has been challenging and more CS are needed if

CDD numbers are to be further expanded. Overall in the program, each CS supervises 6-7 CDDs (1:6.7).

Financial Contribution: The Carter Center-assisted river blindness programs in Nigeria received APOC core funding during 1998-2003 (Figure 39). Since then, some funding has been received through special APOC initiatives, especially 2008 – 2010. The Nigeria RBP-assisted areas have had chronically insufficient government contributions. Capital equipment replacement provided by APOC, and government salaries are not considered in Figure 39. The increase in funding by The Carter Center in recent years is due to funding from two Bill & Melinda Gates Foundation (BMGF) grants to RBP for integrated NTD research ("Proof of Concept for Integrated Health Interventions in Nigeria" and "Loa loa Paralyzes LF MDA in Central Africa: Integration of LF and Malaria Programs Can Resurrect a Continental Initiative"). These grants are described in more detail below. This funding will end in 2011.

At the community level, 4,266 villages (or 43% of all at-risk villages receiving mass treatment) supported their CDDs with direct monetary support. Total village-level contributions were considerable and equaled approximately 7.8 million Naira ($52,113 USD at 150 Naira to the dollar). This contribution was 58% of 2009 village level contributions. When that amount is averaged over the large number of CDDs in the program, it amounts to $3.84 USD/CDD/year. Community contributions are not included in government contribution figures.

LGA-level contributions in 7 of the 9 states (neither Nasarawa nor Plateau LGAs contributed) totaled approximately 3.15 million Naira ($20,967 USD), a 55% decrease from 2009 and less than 50% of the aggregate support provided at the village level. State-level contributions in 7 of the 9 states (Plateau and Nasarawa did not contribute) was similar to funding at LGA level and totaled approximately 3.2 million Naira ($21,507 USD). Government monetary contributions described here do not contemplate the core salary costs of MOH personnel working in the program.

The Integrated Program in Plateau and Nasarawa: The Carter Center-assisted program in Nigeria pioneered the concept of integrated mass treatment in for River Blindness, Lymphatic Filariasis and Schistosomiasis in 2000, in which the logistics of a mass drug administration (MDA) program are shared across several programs. The program began in 1999 with integrated RB and urinary schistosomiasis interventions, expanding into LF in 2000.

Integration presumably results in broader services, lower costs and higher efficiency among disease programs that use similar strategies. 2011 will be the final year of a grant (entitled "Proof of Concept for Integrated Health Intervention in Nigeria") from the Bill & Melinda Gates Foundation that is aimed at supporting that presumption with data. The Gates funding enabled further expansion of the scope of the program to include assessing costs as well as management issues related to integrated interventions. The Center partners with Emory University and the CDC in the execution of the cost and managerial dimensions (respectively) of the integration study.

The initiative's central platform is an infrastructure and logistical system to deliver annual combination of Mectizan® and albendazole community-based mass treatment with health education for lymphatic filariasis (LF) to the entire population (about 4.7 million) throughout the two-state area (Figure 40). The LF treatment combination is also highly effective against several soil transmitted helminths (STH). The effort also has demonstrated a dramatic and effective scale-up of state wide interventions for schistosomiasis (in 2008—Figure 41), trachoma (in 2010—Figure 42) and malaria (in 2010—Frontispiece Figure I). Other partners include Merck, Merck KGaA (E-Merck)/WHO, GlaxoSmithKline, and Clarke Mosquito Company.

Lymphatic Filariasis:

The goal of the LF program in Plateau and Nasarawa states is to demonstrate that LF transmission can be interrupted with annual combination MDA consisting of Mectizan® and albendazole. Background information on LF and urinary schistosomiasis is provided in Annex 6. The WHO elimination strategy is based on the assumption that 4 – 6 years of MDA will interrupt LF transmission. LF is widespread in Plateau and Nasarawa states, and mass treatment and health education are necessary in all cities and villages in the 30 LGAs. After 5 years of treatment, in 2008, a survey for LF prevalence was conducted using the Filariasis Immunochromatographic Card Tests (ICT) to establish if LF had been eliminated by the MDA program. Of the 30 LGAs comprising the 2 state area, 10 had achieved an LF antigenemia rate of <2 %, the (then) indicator for halting mass treatment (this threshold approach is now being revised). The Federal MOH approved cessation in 5 'LF-only' LGAs (Langtang South, Jos North, and Barkin Ladi in Plateau State, and Keffi and Keana in Nasarawa State) on the condition that long lasting insecticidal nets (LLIN) were distributed first in those LGAs to prevent recrudescence. During 2010, some 2.3 million LLINs were distributed throughout Plateau and Nasarawa states covering every household and allowing for treatment to be stopped in those LGAs that same year. Accordingly, a total of 3,213,244 persons in the 2 states received health education and mass treatment for LF in 2010 (Figure 43), a decrease of 7% compared to 2009 due to withdrawal of treatment in these five LGAs. Approximately 690,000 albendazole tablets remained at the end of 2010.

Lymphatic Filariasis Elimination and River Blindness Elimination: Another 5 LGAs among the 10 that interrupted LF transmission were co-endemic for both LF and river blindness. One option is that Mectizan® MDA alone (e.g., as monotherapy without albendazole) could continue to be administered for onchocerciasis in those LGAs. Another option would be to stop both drugs if we can demonstrate that onchocerciasis transmission also had been interrupted. Accordingly, in 2009 we conducted assessments to determine the status of onchocerciasis transmission. Our skin snip study for microfilaridermia consisted of 2 elements: 1) sampling of school-age children resident in the 5 co-endemic LGAs where LF transmission had been interrupted to determine if any recent onchocerca infections had taken place, and 2) community-wide surveys conducted in 6 sentinel villages and 4 'spot check' villages located in 4 other

co-endemic LGAs where 1992 baseline surveys showed a mean skin snip prevalence of 72%. In the school surveys in 5 LGAs, preliminary analysis showed that only 1 (0.04%) skin snip positive child was found among 2,788 children (Figure 44). In the sentinel and spot check villages, we found 11 (0.3%) infections among 3,333 persons (Figure 45). This represents a 99% decrease compared to the 1992 river blindness baseline. In addition to the microfilaridermia tests, antigen tests (OV16) also are being used to determine if recent infections have occurred in children. To date, there have been 23 positives out of 3,664 children (0.6%); 16 children (70% of child positives) were in a single community. In the remaining communities, OV16 rates were <0.1% in children. We believe that interruption of transmission of onchocerciasis throughout most of the two-state area has likely been achieved, and that both ivermectin and albendazole can be stopped in the many of LF/onchocerciasis co-endemic LGAs. Entomologic results are currently being processed. Discussions with the FMOH and state authorities on how to proceed will take place once final data analysis is available. Ideally, the next step would be to stop all MDA for RB and LF where appropriate and implement integrated post treatment surveillance (PTS) for recrudescence of both RB and LF.

Malaria: In Africa, the same anopheline mosquitoes that transmit LF also transmit malaria. LLINs are one of the most important prevention tools for malaria and should also be useful as an adjunct to mass drug treatment in the LF elimination program. During 2010, The Carter Center partnered with the Nigerian Ministry of Health and others to distribute 1.45 million LLINs, donated through The Global Fund, in Plateau state, providing every household with two nets. Nasarawa state, with support from UNICEF, similarly distributed over 840,000 nets providing blanket coverage in both states. If the LLINs delivered are <u>used,</u> then LF transmission in the two-state area is likely to be a thing of the past in 2011! Continued health education (in the form of behavior change communication-BCC) to get people to use these LLIN appropriately is essential in the two-state area in 2011.

Schistosomiasis in Plateau and Nasarawa State*s:* In 2010, due to a large donation of praziquantel from Merck KGaA (E-Merck), through WHO, The Carter Center-assisted Schistosomiasis Control Program was once again able to treat more than 1 million persons (1,328,886, mostly children) in one year (Figure 43). Praziquantel has been shown to be safe for combined treatment with Mectizan® and albendazole. The Carter Center launched extended Triple Drug Administration (TDA) treatment throughout the Plateau and Nasarawa integrated program areas in 2007, after a successful safety and implementation TDA monitoring trial in 5 communities in 2006 (Eigege et al., Annals of Tropical Medicine and Hygiene, March 2008). In 2010, the integrated program conducted TDA in all LGAs where separate rounds of treatment with praziquantel had already been given at least once, per WHO guidelines. In total, 25 of the 30 LGAs in the two states received TDA (887,687 persons) while 5 received stand-alone praziquantel and ivermectin+albendazole treatments. This has resulted in a cost savings of 41% over the stand-alone distributions. To date, The Carter Center has delivered over 2.04 million TDA treatments in the two states (Figure 41). In 2011, TDA will be given in all LGAs except those in which LF treatment is approved for

discontinuation by the Federal Government of Nigeria. In those LGAs, praziquantel for schistosomiasis will be provided in a single MDA.

Trachoma: 2010 saw the first mass treatment of blinding trachoma with azithromycin (Zithromax®, donated by Pfizer Inc.) in Plateau and Nasarawa. With what we believe to be the first ever use of Community Directed Distributors (CDDs) for this purpose, The Carter Center worked in collaboration with the Ministry of Health to deliver 769,517 treatments of azithromycin tablets, pediatric oral suspension, or ophthalmic tetracycline ointment (Figure 42) to an estimated 78% of the total population in 7 LGAs targeted for mass treatment due to having a prevalence of active trachoma >10% in mapping exercises. The 2011 UTG is estimated to be at 1.06 million persons. Zithromax® is not yet approved for combined treatment with ivermectin and albendazole, and quadruple treatment (Zithromax®, Mectizan®, albendazole and praziquantel) has not been studied for the safety or feasibility of joint administration. Therefore, Zithromax® will continue to be given as an (expensive) stand-alone treatment.

Integrated Programs in Southeast Nigeria: In 2010, the scope of our schistosomiasis work in the Southeast has expanded from Delta state into Edo state. Thanks to a 2009 Merck KGaA (E-Merck)/WHO donation of praziquantel and financial support from other donors (Izumi and John P. Hussman Foundations), a total of 271,549 treatments were given in 2010, 83.5% of the ATO of 325,000. New funding from the Izumi Foundation is supporting 2010 – 2011 mapping exercises and expansion of treatment into Edo state, one of the 6 states where The Carter Center assists in onchocerciasis MDA that had not yet benefited from praziquantel due to financial constraints. In Delta and Edo states, adults were treated in communities with urinary schistosomiasis prevalence greater than 50%, in accordance to WHO guidelines. In total, nearly 2.2 million praziquantel tablets were used, at an average dose of 1.6 tablets per person, and 2,057,523 praziquantel tablets were in stores at the end of 2010 for use in 2011.

In Delta State, praziquantel treatment is being provided in a rotation practice developed in 2006 for Plateau and Nasarawa States, where praziquantel “holidays” were given for 3 years after 3 to 4 years of annual treatment cycles. These rotations appear to make best use of short supplies of praziquantel. Our observations suggest that treatments can usually be withheld from an area for 3 years before recrudescence occurs (Figure 46). In 2008, praziquantel treatment in Delta State was rotated from 10 initial LGAs to 10 new LGAs as a part of this “praziquantel holiday” plan. In 2011, treatments will berotated back to the first 10 LGAs. In Edo State, the first round of treatments occurred during 2010 in 8 of 12 eligible LGAs. Surveys of the remaining 4 LGAs will be conducted in 2011. The 8 LGAs that already have received one round of stand-alone treatments will begin co-administration with ivermectin in 2011.

In 4 LGAs in Imo and Ebonyi States, LF elimination and malaria control were integrated with support from a 2006 BMGF grant entitled, “Loa loa Paralyzes LF MDA in Central Africa: Integration of LF and Malaria Programs Can Resurrect a Continental Initiative.” In West Africa LF is caused by the parasite *Wuchereria bancrofti* in rural areas, transmitted by *Anopheles* mosquitoes. In Imo and Ebonyi states, potential co-infection

with *Loa loa* parasites prevents use of the mass drug administration (MDA) strategy for LF elimination. The RBP is working with the ministries of health of those states to determine if mosquito vector control for malaria by means of LLIN distribution will impact transmission of LF. In the two study areas (Abakaliki and Ohaji Egbema local governments) where baseline LF antigenemia in sentinel sites was 27%, 139,080 LLINs were distributed to reach all age groups in April-May 2008. Household (HH) cluster surveys showed that the proportion of HH with at least one LLIN increased from 3.4% in 2007 to 91.7% immediately after distribution in 2008, with an average of two nets within HHs owning at least one net.

In 6 sentinel villages (3 in each LGA) mosquitoes have been collected by pyrethrum knockdown every month in one room of each of 30 HH since June 2007. Collected mosquitoes were immediately dissected to determine rates of LF infection (L1-L3 stage larvae). Eighty-two percent of the collections were *Anopheles* species (*An. gambiae* sl 75% and *An. funestus* 7%). Figure 47 compares mosquito collection numbers and infection rates before/around LLIN distribution for the 12-month period June 2007-May 2008 with a 14-month period starting one year after LLIN distribution (June 2008-July 2009). Mosquito captures show a trend suggesting a decrease in mosquito abundance and infection: one infection (L1) was found in the year after LLINs were distributed compared to 38 for the year before (Chi square 7, $p<.01$). No L3 have been detected since LLINs were distributed compared to 11 at baseline (P=NS). The study continues to examine antigenemia impact, but these early results suggest interruption of LF transmission can occur with LLIN alone, without accompanying MDA.

2011 RECOMMENDATIONS FOR CARTER CENTER NIGERIA

All States

The Carter Center Nigeria office should strive to improve data collection, cleaning, backup and reporting mechanisms.

Pursue a high-level advocate (ideally, General Gowon) to help garner more political support for the scaling up and link between interventions against lymphatic filariasis and malaria.

Work towards a target of a minimum 1 CDD to 100 population ratio and 1 community supervisor to 5 CDDs. Measure costs and supervisory demands of conversion to the kinship strategy where this transition is occurring, especially in the southeast where it appears that kinship implementation is reducing reporting due to supervisory complexity.

Advocate for the Federal of Government of Nigeria to provide more financial support to The Carter Center-assisted health programs, and also for the release of counterpart funding from states and LGAs.

The Nigeria program should continue to track government and Carter Center funding figures in 2011, including any additional funds provided through APOC; and monitor trends for increased funding.

Expansion of Carter Center programs into other disease control efforts requires formal Carter Center Board of Trustees approval, adequate funding to participate, and possibly Emory IRB approval. If the government wants to support integration in areas where The Carter Center assists, we will not refuse to participate since these are government-owned programs. However, without Board approval, funding and IRB review, The Carter Center can only be involved in integration/co-implementation activities within designated river blindness Mectizan® distribution areas where TCC is already assisting, and within the time period when such distributions are scheduled.

Coordinate with national programs to ensure that the application for 2012 Mectizan® and albendazole is submitted no later than August of the year before the drug is needed. Albendazole applications require an annual report to be submitted by the national program and approved by the WHO regional office. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year. Changes in denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and MDP should be advised accordingly. Changes in numbers of treatments to be administered (numerators), and frequency of administration (once versus twice per year) require discussion and approval by the MOH/NOTF, MDP and TCC HQ.

Nigeria program staff must complete or renew the Emory IRB certification if they are to be involved with research programs.

Lymphatic Filariasis/Malaria:

Work with national and state malaria authorities to advance the planned future delivery in TCC-supported states of long lasting insecticidal nets (LLIN) related to the national campaign to provide 2 LLINs to all Nigerian households, particularly in Imo and Abia states, which are the TCC priority. Dr. Emmanuel Miri, Country Director, should seek to attend high level national malaria meetings whenever possible.

Seek funds to resurvey the 20 LGAs with continuing LF transmission in 2011, using the new (2011) stop MDA guidelines and the new ICT antigen test.

Publish findings of the Plateau/Nasarawa LF experience to date.

Ensure provision of total LF treatments provided each year to the FMOH for reporting to WHO.

Onchocerciasis:

Conduct The Carter Center monitoring protocol annually in a sample of states to assess and validate coverage, health education, community involvement and ownership. Plateau and Nasarawa (having ended the Gates integration studies) can reenter the monitoring activities in 2011.

Operationalize the new NTD lab. Complete OV16 and PCR lab work on samples collected in 2010 as soon as possible. Analyze and write up results.

Work with the FMOH to determine “stop treatment for onchocerciasis” policy for LGAs where data strongly support interruption of onchocerciasis transmission.

Conduct PCR based black fly entomology surveys in sentinel villages in the southeast states.

Consider conducting additional stop MDA surveys (dependent on evolving APOC/WHO guidelines) in 2012 in Plateau and Nasarawa states.

Schistosomiasis:

Provide praziquantel to all school-age children in all LGAs of Plateau and Nasarawa States. In LGAs where MDA for LF has stopped, PZQ treatment will be stand-alone.

Publish cost study data of savings due to TDA in 2009, compared to 2 separate treatment rounds in 2008.

In Southeast states, combine Mectizan® and praziquantel treatments where possible in areas where at least one year of stand-alone distribution already has occurred.

Stop routine SH monitoring in Plateau and Nasarawa states, but continue in Southeast states, where PZQ holidays continue.

Work to improve PZQ treatment coverage in Plateau and Nasarawa states. Conduct new PZQ coverage surveys to measure improvements in distribution.

As needed, continue to map for urinary schistosomiasis in community-directed treatment with ivermectin (CDTI) areas of Edo state, and launch praziquantel treatment there if supply permits. Expand praziquantel treatments until the 325,000 treatment limit is reached (for both Edo and Delta states), as stipulated in the Izumi Foundation grant.

Per new WHO/MOH guidelines, provide praziquantel treatments in communities in Delta state with ≥10% prevalence and <20% that were not covered during previous rounds. Determine costs for this transition, and include the increased treatments required in the 325,000 total treatment limit (mentioned above).

Trachoma:

Provide second round of Zithromax® to approximately 700,000 persons in the targeted LGAs where TF>10%, as a separate treatment round.

Due to cost constraints, latrine construction should be limited to the availability of funds.

Plateau and Nasarawa States Integrated Program:

Data collection of costs figures for the Gates integrated grant ended in 2010. Complete entry of cost figures and complete cost analysis working in collaboration with Emory's Rollins School of Public Health. Prepare final Gates report and the costs results for publication.

Finalize evaluations of SMTC 'integrated' trainees and write up experience for publication. No new classes should be enrolled unless additional funding is identified.

Imo and Ebonyi States Integrated Program (LF/MAL):

Continue to assess impact of LLINs on LF antigenemia, mf prevalence and malaria. Continue bi-monthly mosquito entomology surveys in sentinel villages in Imo and Ebonyi ('Gates') LGAs. Conduct fifth (and final) household cluster malaria survey in late 2011 and LF night survey in Jan/Feb 2012.

Work in collaboration with MOH and partners to facilitate the delivery of LLINs in 2011 especially in Imo and Ebonyi states (the malaria program also has prioritized LLIN distribution in Abia state).

Complete all outstanding Og4C3 ELISA blood spots specimens. Consider establishing Og4C3 ELISA capacity in the Jos lab for 2011 if it appears to be feasible.

Treatment and Distribution Objectives for Plateau and Nasarawa States 2011:

Mectizan® and albendazole UTG:	**3,400,347 persons**
Praziquantel ATO:	**1,196,224 children**
LLIN:	**45,000 nets**

Training Objective for LF, RB and Schistosomiasis (SH) for Plateau and Nasarawa States 2011:

River Blindness:

CDDs:	**5,890 (1,682 new)**
Community supervisors:	**731 (166 new)**

LF/malaria:

CDDs:	**12,812 (986 new)**
Community supervisors:	**1,828 (264 new)**

Schistosomiasis:

CDDs:	**12,812 (986 new)**
Community supervisors:	**1,828 (264 new)**

Treatment Objectives for Southeast States 2011:

Mectizan® UTG:	**4,797,370 persons**
Praziquantel ATO (Delta and Edo States):	**325,000 persons**
LLIN:	**5,606,451 nets**

Training Objective for RB and SH for Southeast States, 2011:

River Blindness:

CDDs:	**62,175 (8,678 new)**
Community supervisors:	**15,103 (2,858 new)**

Schistosomiasis:

CDDs:	**5,000 (2,850 new)**
Community supervisors:	**3,000 (1,900 new)**

Figure 36

Nigeria: Carter Center-Assisted States

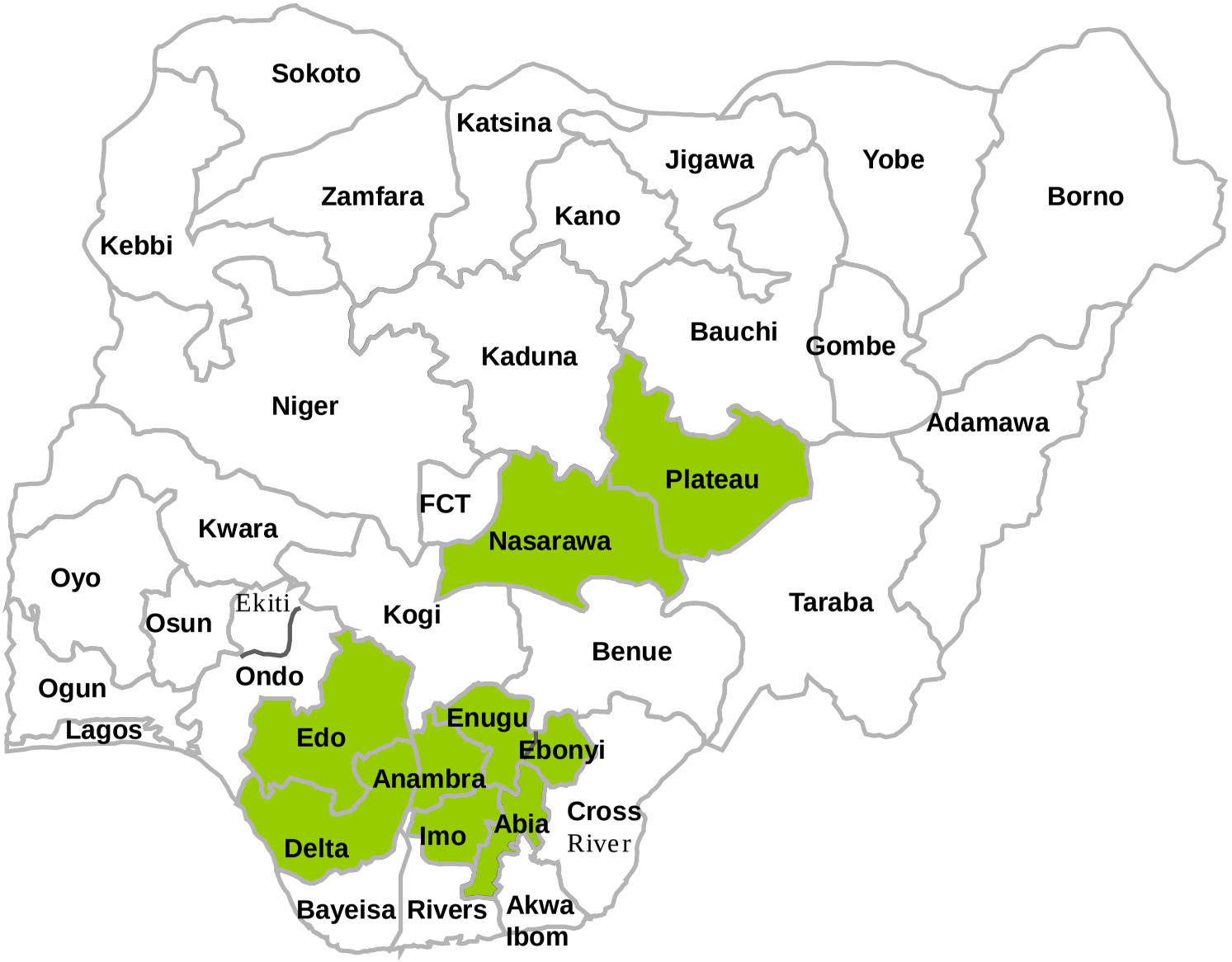
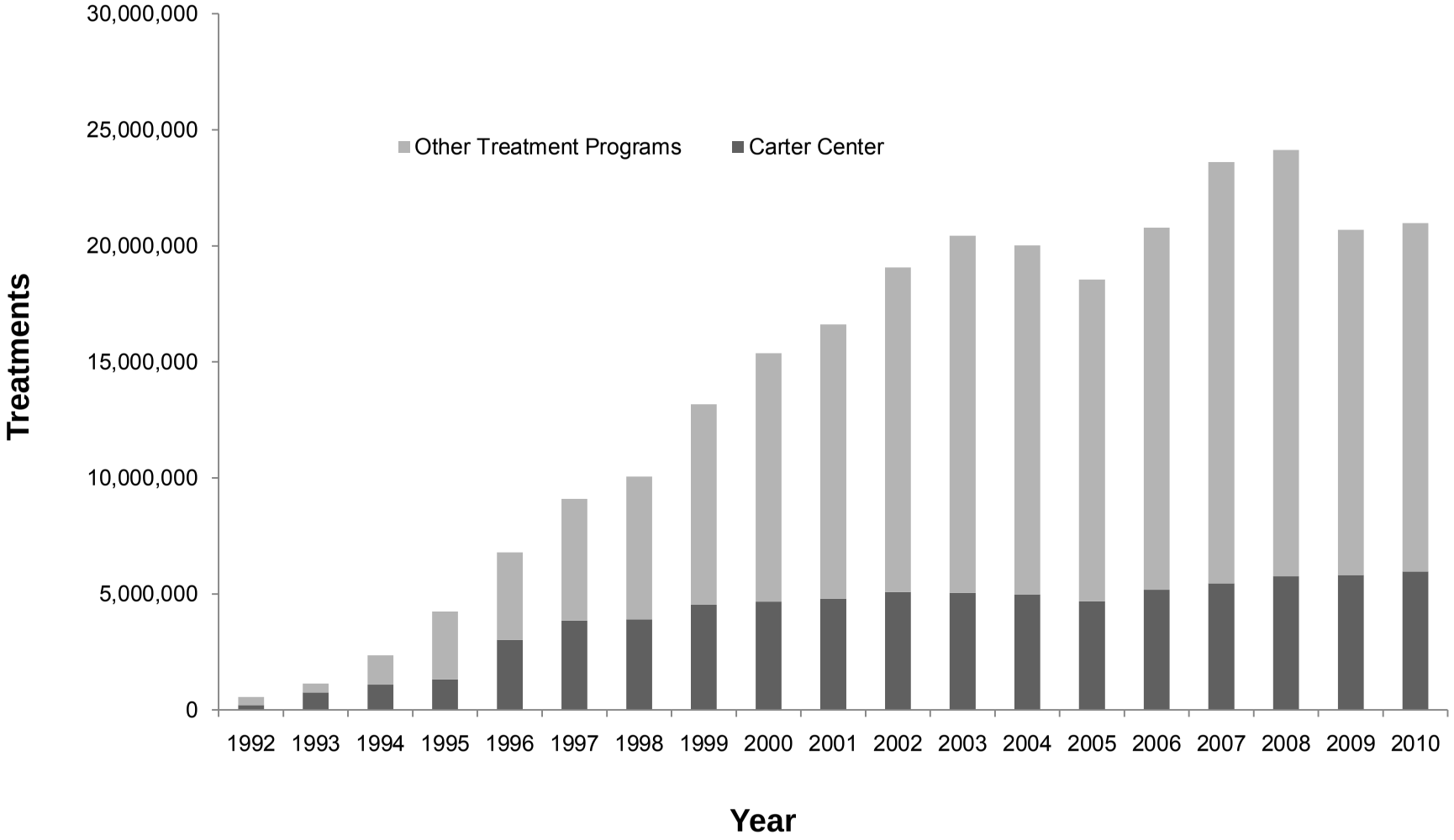


Figure 37

Nigeria: Carter Center-Assisted Treatments and Total Mectizan® Treatments Provided 1989-2010*



* Treatments from 1992-1995 were assisted by RBF. The 2010 national figure is provisional.

Figure 38

Nigeria: Carter Center-Assisted Areas
2010 River Blindness Treatments (Active & Passive)

Active Treatments

Name of State	No. of LGAs	Popn treated cumulative for 2010	Ultimate TX Goal (UTG) For 2010	% UTG treated in 2010	Total Popn for 2010	% of total popn treated in 2010	Active villages cumulative for 2010	Active villages UTG/ATO for 2010	Active villages % for UTG for 2010
ENUGU	16	799,883	820,204	97.52	984,245	81.3	1,338	1,373	97.45
ANAMBRA	16	606,578	609,613	99.50	731,537	82.9	1,051	1,062	98.96
EBONYI	10	507,199	510,961	99.26	613,154	82.7	930	973	95.58
EDO	12	779,300	779,396	99.99	974,391	80.0	530	530	100.00
DELTA	9	487,309	487,885	99.88	617,438	78.9	470	470	100.00
IMO	20	671,125	671,130	100.00	805,356	83.3	1,940	1,940	100.00
ABIA	12	365,868	367,723	99.50	441,267	82.9	680	684	99.42
PLATEAU	5	360,376	365,571	98.6	456,964	78.9	296	296	100.0
NASARAWA	7	866,162	887,725	97.6	1,109,656	78.1	588	589	99.8
TOTAL	107	5,443,800	5,500,208	99.0	7,239,524	82.5	7,823	7,917	98.8

Passive Treatments

Name of State	No. of LGAs	Popn treated cumulative For 2010	*ATO for 2010*	*Popn treated % of ATO*	Passive villages cumulative for 2010	Passive villages ATO for 2010	Passive villages % ATO for 2010
ENUGU	2	9,877	8,957	110.27	43	37	116.22
ANAMBRA	5	35,543	51,177	69.45	128	132	96.97
EBONYI	3	22,578	22,952	98.37	177	193	91.71
EDO	6	147,760	100,000	147.76	162	220	73.64
DELTA	16	95,688	102,000	93.81	280	280	100.00
IMO	9	126,322	126,330	99.99	725	738	98.24
ABIA	9	93,597	94,100	99.47	603	617	97.73
TOTAL	**50**	**531,365**	**505,516**	**105.11**	**2,118**	**2,217**	**95.53**

Figure 39

Nigeria Financial Contributions (in USD) to Carter Center-Assisted Areas, by Donor (2001 – 2010)

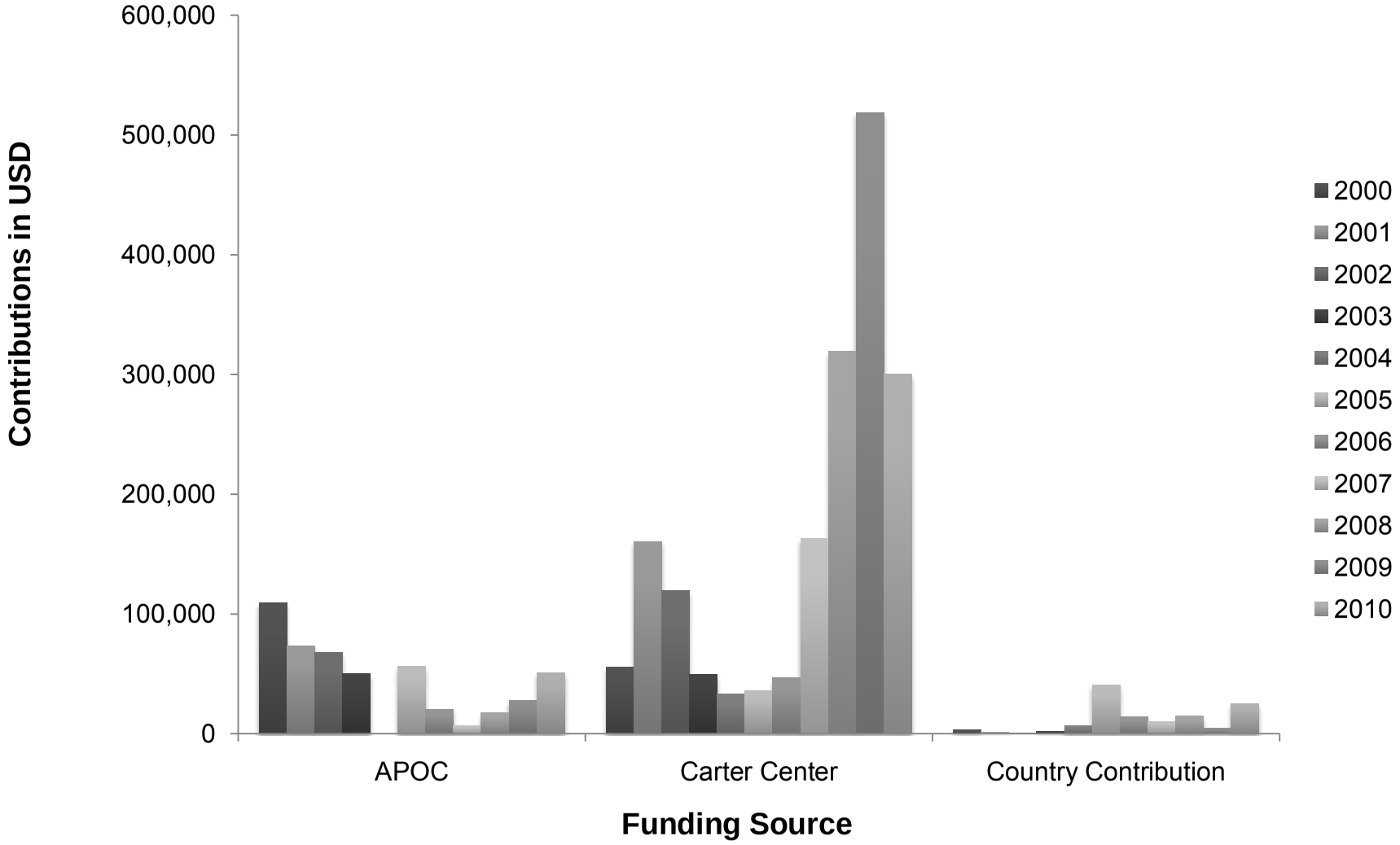


Figure 40

Nigeria: Scale-Up of Lymphatic Filariasis Treatments Integrated with River Blindness Treatments: Plateau and Nasarawa States

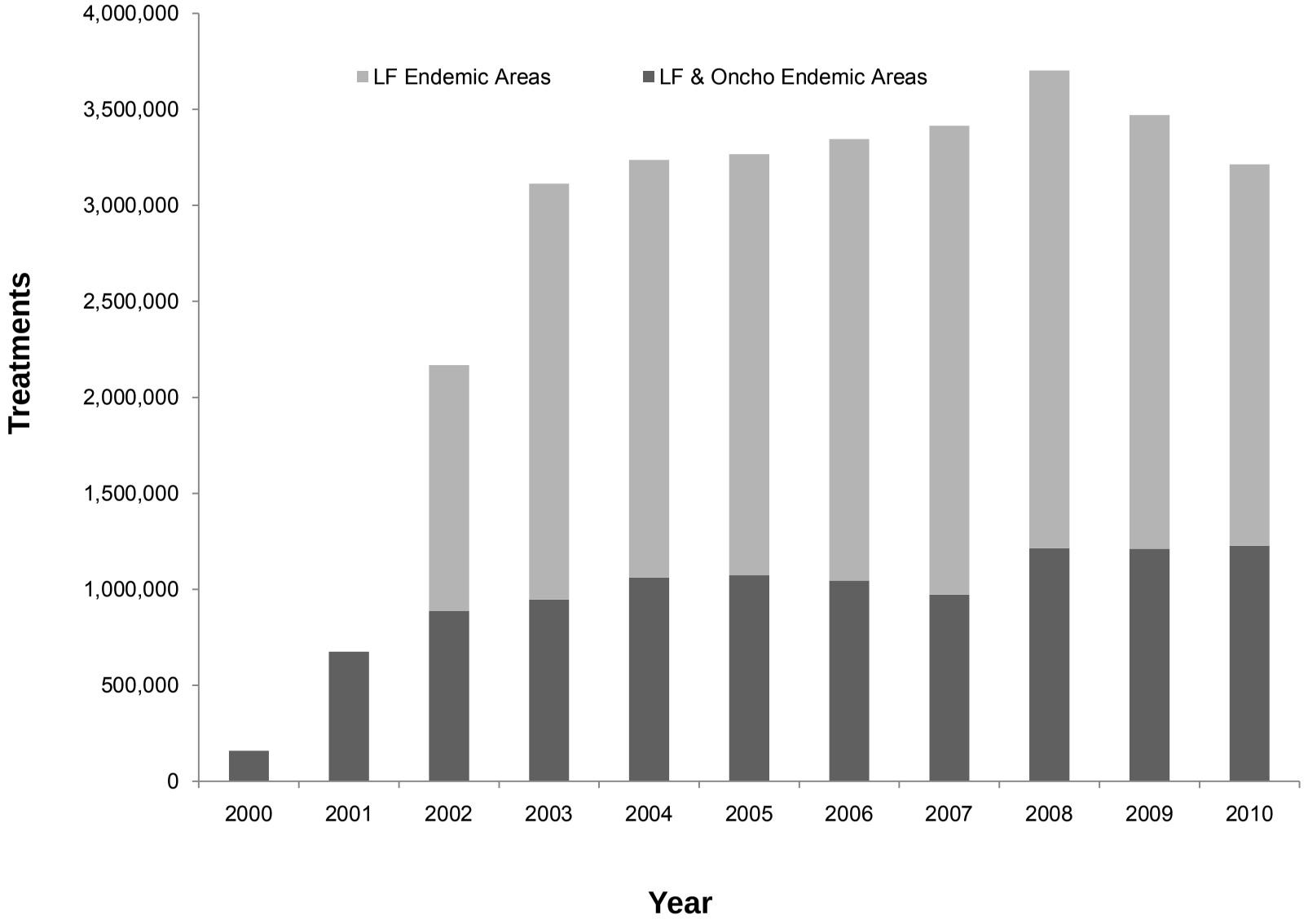


Figure 41

Scale up of Schistosomiasis Treatments in Plateau and Nasarawa, with Transition From Stand-Alone PZQ Treatments to PZQ via Triple Drug Administration (TDA)

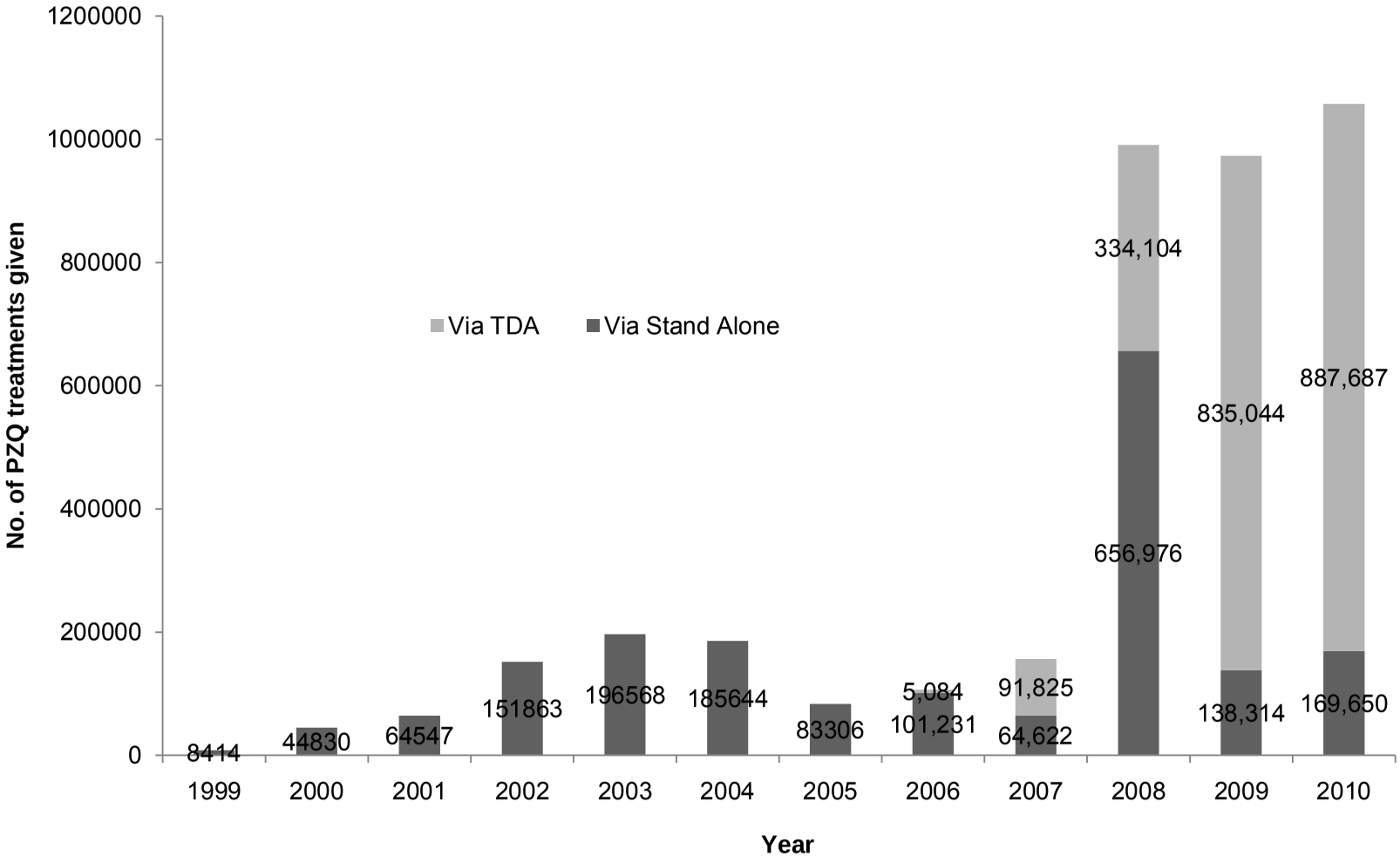


Figure 42

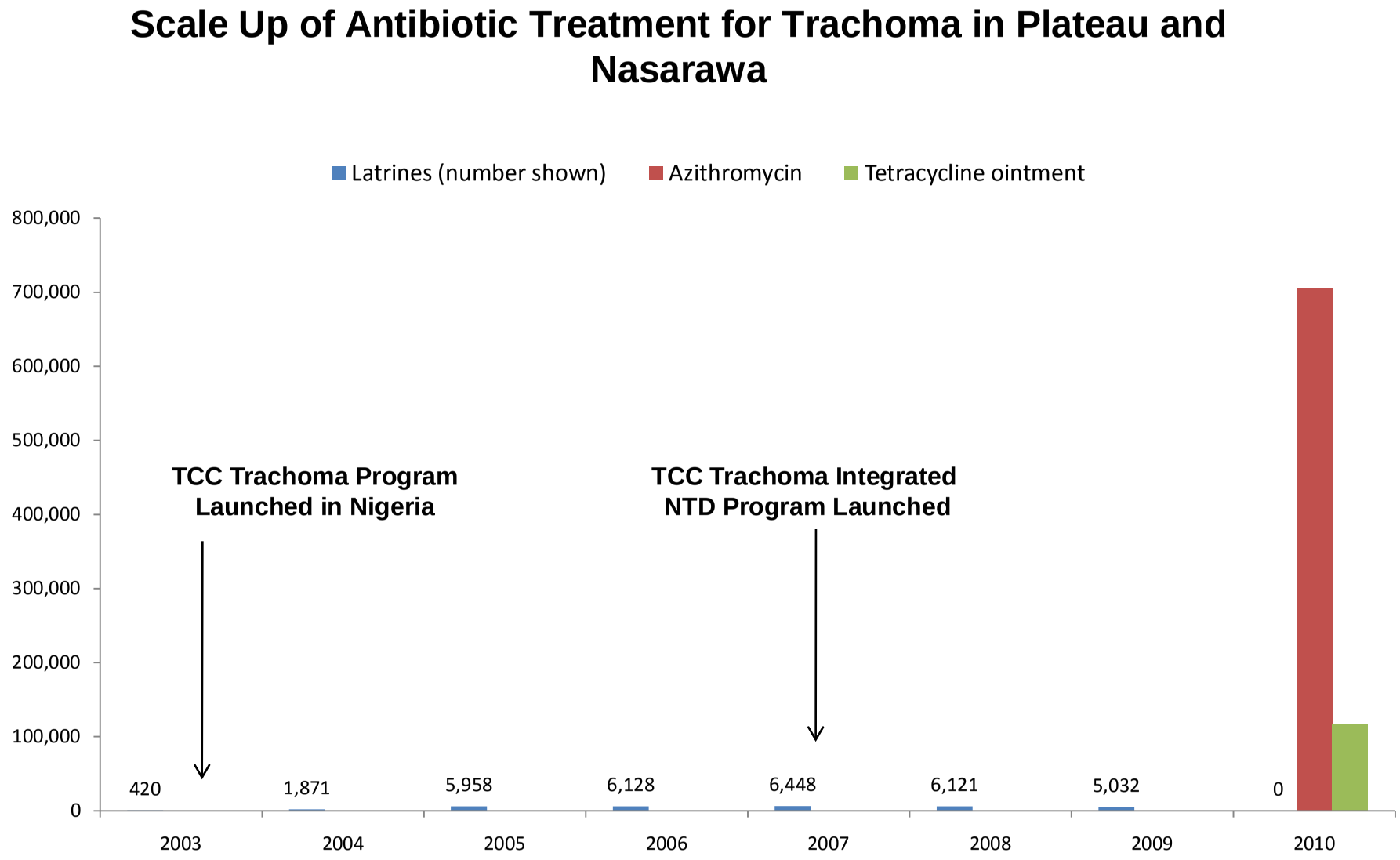

Scale Up of Antibiotic Treatment for Trachoma in Plateau and Nasarawa
Latrines (number shown)
Azithromycin
Tetracycline ointment
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
TCC Trachoma Program Launched in Nigeria
TCC Trachoma Integrated NTD Program Launched
420
1,871
5,958
6,128
6,448
6,121
5,032
0
2003
2004
2005
2006
2007
2008
2009
2010

Figure 43

Nigeria: 2010 Lymphatic Filariasis and Schistosomiasis Treatments

Lymphatic Filariasis Treatments

Name of State	No. of LGAs	Popn treated cumulative for Y2010	Ultimate TX Goal (UTG) for Y2010	% UTG treated in 2010	Total Popn for Y2010	% of total popn treated in Y2010	Active villages cumulative for Y2010	Active villages UTG for Y2010	Active villages % of UTG for 2010
Plateau	14	1,631,571	1,692,258	96.4%	2,115,323	77.10%	2,272	2,328	97.6%
Nasarawa	11	1,581,673	1,657,837	95.4%	2,072,296	76.30%	964	975	98.9%
Total	25	3,213,244	3,350,098	95.9%	4,187,619	76.70%	3,236	3,303	98.0%

Schistosomiasis Treatments

State	No. of LGAs	Cumulative Treatments for 2010	ATO/UTG for 2010	% ATO/UTG Achieved 2010
Edo	10	158,903	155,412	102.2%
Delta	8	112,646	112,628	100.0%
Plateau	17	572,467	670,372	85.4%
Nasarawa	13	484,870	508,173	95.4%
Total	**48**	**1,328,886**	**1,446,585**	**91.9%**

Figure 44

Plateau and Nasarawa States: Oncho microfilaria in Skin (mf) Prevalence in School-Age Children (2009)

LGA	Spot Check Villages	# Tested 2009	# Positive 2009 (%)
Bassa	Rimi	538	0(0.0)
Bokkos	Richa	407	0(0.0)
Jos East	Gada	516	0(0.0)
Karu	Takalafiya	443	0(0.0)
Karu	Sabon Ara	363	0(0.0)
Karu	Zheum Yelwa	192	0(0.0)
Kokona	Ambasi	164	1(0.6)
Kokona	Ninkoro	165	0(0.0)
Total		**2,788**	**1(0.4)**

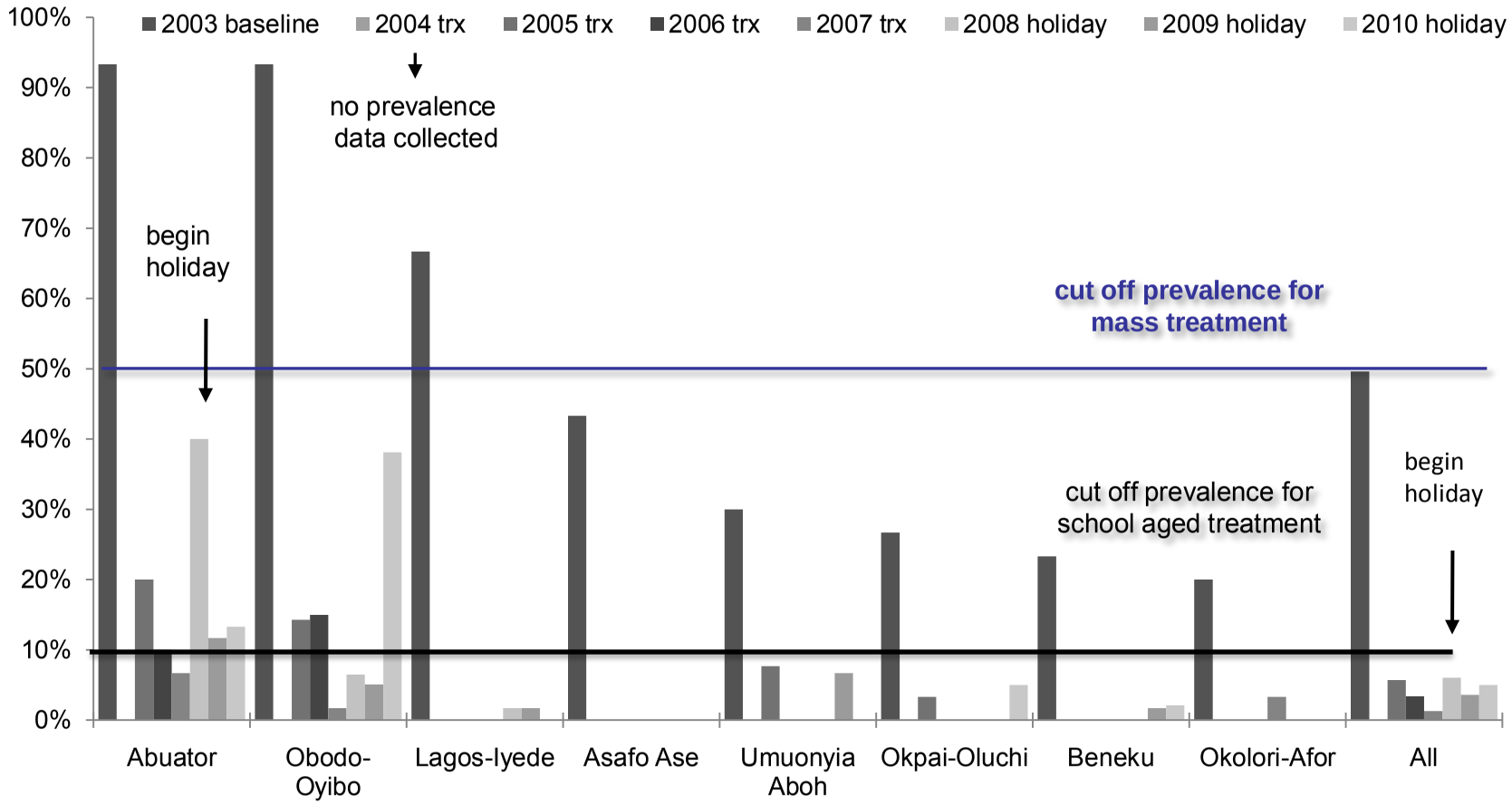
Figure 45

Sentinel and Spot Check Villages in Plateau and Nasarawa States: Comparison of 1991 Onchocerciasis mf Baseline Data with 2009 Survey

LGA	Spot Check Villages	Baseline 1991 (%)	# Tested 2009	# Positive 2009 (%)
Toto	Nyanji	88%	252	0(0.0)
Akwanga	Bayan Dutse	93%	271	1(0.4
Bassa	Bakin Kogi Lemoro	N/A	390	0(0.0)
Akwanga	Angwan Habu	75%	337	0(0.0)
Jos East	Godong	56%	366	1(0.3)
Kokona	Arusu	N/A	348	3(0.9)
Bassa	Mafara	51%	396	0(0.0)
Karu	Gurku	N/A	333	0(0.0)
Toto	Gwargwada	80%	377	0(0.0)
Bokkos	Kamwai	46%	263	6(2.3)
TOTAL			**3,333**	**11(0.3)**

Figure 46

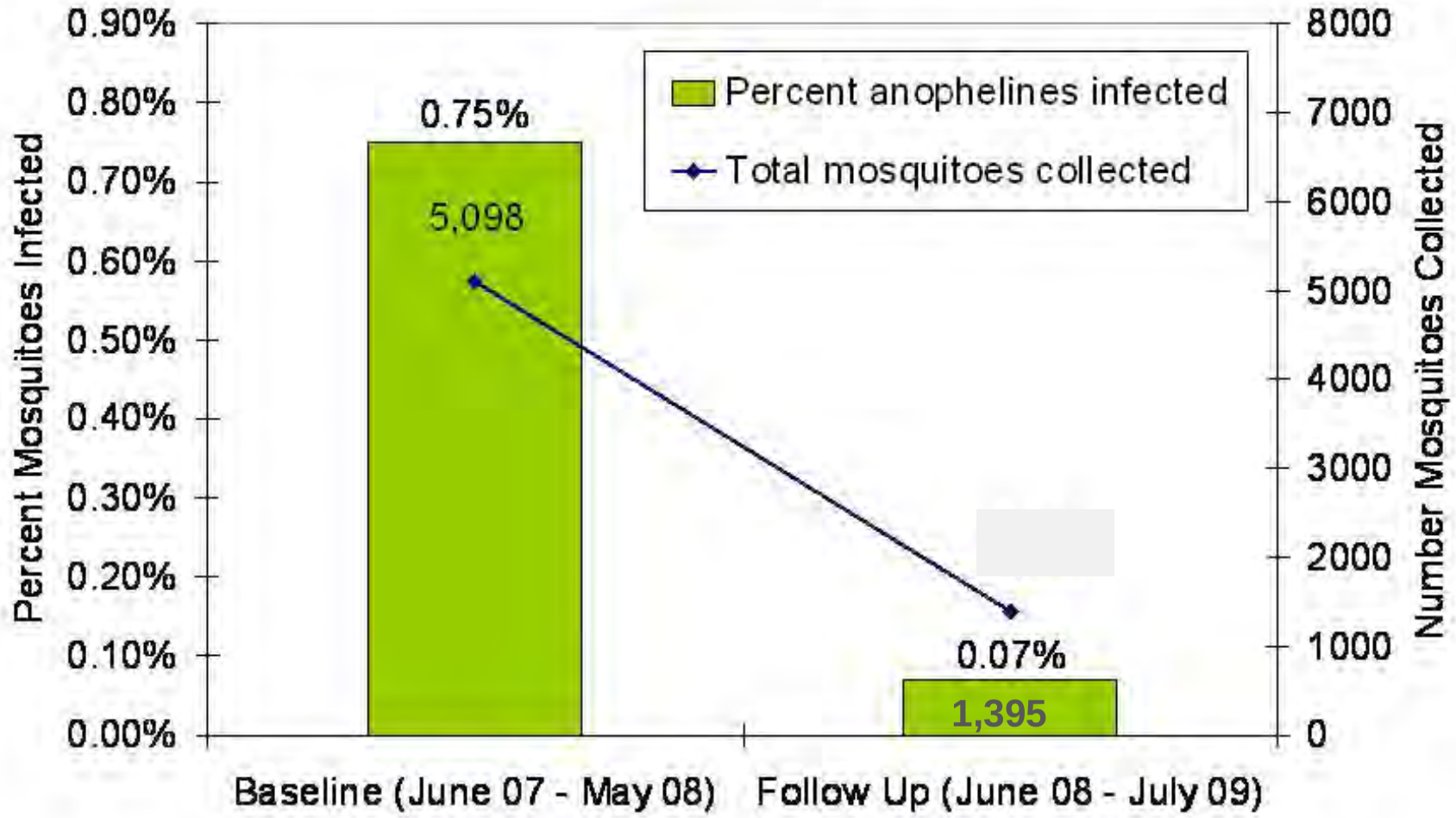
Schistosomiasis Recrudescence Monitoring in 8 Sentinel Villages in Delta State, 2004 – 2010*



* Treatment cutoff point adjusted downward to 10%, in line with current WHO guidelines

Figure 47

Entomological Impact of LLIN on LF Transmission



ETHIOPIA

Background: Ethiopia is the second most populous country in Africa with a population of approximately 83 million. Onchocerciasis was first reported in southwestern regions in 1939, while the northwestern part of the country was recognized to be endemic in the 1970s. The National Onchocerciasis Task Force (NOTF) was established in 2000, and APOC completed Rapid Epidemiological Mapping of Onchocerciasis (REMO) in Ethiopia in 2001. This mapping targeted 10 areas where the prevalence of onchocerciasis was estimated to be more than 40% (≥20% nodule rate) and thus eligible for APOC's community-directed treatment with ivermectin (CDTI) projects. The Carter Center, Lions Clubs International Foundation, and local Lions Clubs partnered with the MOH and APOC in 8 of these 10 projects (Figure 48), beginning with Kaffa and Sheka zones in 2001. Since then, the program has expanded to include Bench-Maji, North Gondar, Illubabor, Jimma, Metekel and Gambella.

Members of Lions District 411A play an important role in both The River Blindness and Trachoma Control Programs in the Lions-Carter Center SightFirst project areas of Ethiopia. Ethiopian Lions participate actively in the Carter Center Ethiopian staff's annual retreat. The Honorable Dr. World Laureate Tebebe Y. Berhan attended the Program Review in Atlanta, representing the Lions Clubs of Ethiopia.

Treatments: During 2010, 3,298,195 people were treated in 13,897 targeted villages in the assisted zones, reaching 95% of the UTG and comprising 69% of all treatments given in Ethiopia (Figure 49 and 50).

Mectizan®: A total of 9,188,500 tablets were received from NOTF in 2010. Together with a balance of 829,167 tablets carried over from 2009, these were made available for distribution to Lions-Carter Center assisted areas. Through the course of the year, 8,984,178 tablets were distributed, while 19,579 (0.2%) were damaged and none expired. The average number of tablets per person treated was 2.7. The balance at year's end was 958,910.

New Onchocerciasis Mapping: In 2010, APOC supported new mapping activities in areas adjacent to Lions-Carter Center-assisted treatment areas. These adjacent areas were previously considered to be hypoendemic (nodule rates <20% and microfilaria rates <40%). River Blindness Program and MOH staff worked with APOC consultants in these activities, which took place in 25 untreated woredas in Illubabor, Jima and North Gondar zones. Preliminary results showed that 18 of these woredas (72%) had nodule and/or mf rates that were above the hypoendemic threshold and were therefore in need of Mectizan® treatment. Although the APOC report is not final at this writing, it is estimated that an additional 1.5 million persons will need to be treated. This figure excludes four zones where there Carter Center does not assist CDTI activities. There are likely to be more areas discovered to be meso- and hyperendemic for onchocerciasis in Ethiopia.

Training and Health Education: Training was provided to 42,887 community-directed distributors (CDDs); of these, 38,013 were returning CDDs (retrained) and 4,874 were newly recruited and trained for the first time (Figure 51). The ratio of CDDs per population remained about the same (1:98 in 2009 and 1:96 in 2010-- Figure 51). The percent of female CDDs is still low (14%), but an increase from 2009 (Figure 52). A total of 3,315 community supervisors were trained, a 12% increase from 2009 (2,925). On average, each community had 4 supervisors, and each supervisor oversaw 13 CDDs. These ratios have been improving annually. In contrast to CDDs, 48% of community supervisors trained in 2010 were female, compared to 0% just 8 years ago (Figure 53). This is due to the effort by the MOH to engage the predominantly female participants in the government's Health Extension Worker program. Ethiopia has been progressively adopting the kinship structure in selecting and training CDDs. Health education was provided in all 14,065 targeted communities, representing 100% geographical coverage.

Financial Contribution: Although CDTI is being implemented through government health care delivery structures, key funding comes from the Lions Clubs International Foundation and other individual donors to The Carter Center. The five-year core funding from APOC ended for Lions-Carter Center assisted RB programs in 2009 (see Annex 8). Government investment in the program improved considerably to $226,924 in 2010, compared to $181,958 reported in 2009. RBP was aware of an APOC contribution of about $47,132 in the CDTI projects in 2010 based on available data, from regional/zonal offices, while The Carter Center's 2010 contribution was $151,285 (Figure 54, Executive Summary).

Integration: The Carter Center's malaria program operated at the grassroots level through CDDs in parts of Jimma and Illubabor zones (Oromia regional state), Bench Maji, Sheka, and Keffa zones (SNNPR regional state), Metekel zone (Beneshangul-Gumuz regional state), North Gondar zone (Amhara regional state) and part of Gambella Region. In North Gondar, the integrated program also delivers Carter Center trachoma control activities. Malaria prevention activities are now included in integrated CDD training courses. CDDs are trained to record the number and condition of long lasting insecticidal nets (LLIN) at the household level when updating household registers in the communities annually. An analysis of the quality of those data, and how they might help with malaria programmatic decision making on LLIN coverage and replacement strategies, is ongoing.

With GSK support, The Carter Center assisted in launching a Ministry of Health LF elimination program in Gambella Region in 2009. The first of its kind in Ethiopia, the program administered 73,435 combined Mectizan®/albendazole treatments for LF elimination in onchocerciasis endemic areas of Gambella Region, reaching 87% of the ultimate treatment goal of 84,611.

2011 RECOMMENDATIONS FOR CARTER CENTER ETHIOPIA

Onchocerciasis

Review new APOC REMO data with the MOH, APOC and other partners and discuss plans and mechanisms required for expansion of ivermectin distribution into untreated meso- and hyperendemic areas.

Coordinate with NOCP to ensure that the application for Mectizan® and albendazole is submitted as early as possible, and no later than August of the year before the drug is needed. Albendazole applications require an annual report to be submitted by the NOCP and approved by the World Health Organization's regional office. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year. Changes in denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and Mectizan Donation Program (MDP) should be advised accordingly. Changes in numbers of treatments to be administered (numerators), and frequency of administration (once versus twice per year) require discussion at Carter Center headquarters and approval by the MOH/NOTF and the MDP.

Conduct the Carter Center's monitoring protocol annually to assess and validate coverage, health education, community involvement, and ownership.

Maintain a target of a minimum 1 CDD to 100 population ratio. Seek to increase training, supervision, involvement of kinship groups and gender balance among CDDs and community supervisors as appropriate. The ratio of community supervisors to CDDs should be at least 1:5.

Seek more Lions involvement to help maintain program visibility and support.

Carter Center Ethiopia program staff must complete or renew the Emory Institutional Review Board certification if they are to be involved with research programs.

LF/Onchocerciasis: Continue ivermectin and albendazole treatments for LF in Gambella. Obtain Carter Center headquarters' approval for expansion of the LF efforts into other Carter Center-assisted onchocerciasis CDTI areas endemic for LF.

Malaria/Onchocerciasis (MALONCHO): Retrain CDDs to record the number of nets per household in the household registers when they deliver ivermectin, and train them to instruct in the proper use of bed nets. Improve recording and analysis of these data.

Treatment Objective for onchocerciasis for 2011: 3,383,608 persons
Training Objective for 2011:

CDDs:	**45,607 CDDs (2,720 new)**
Community supervisors:	**5,256 community supervisors (1,941 new)**

Figure 48

Ethiopia: Lions-Carter Center-Assisted CDTI Projects

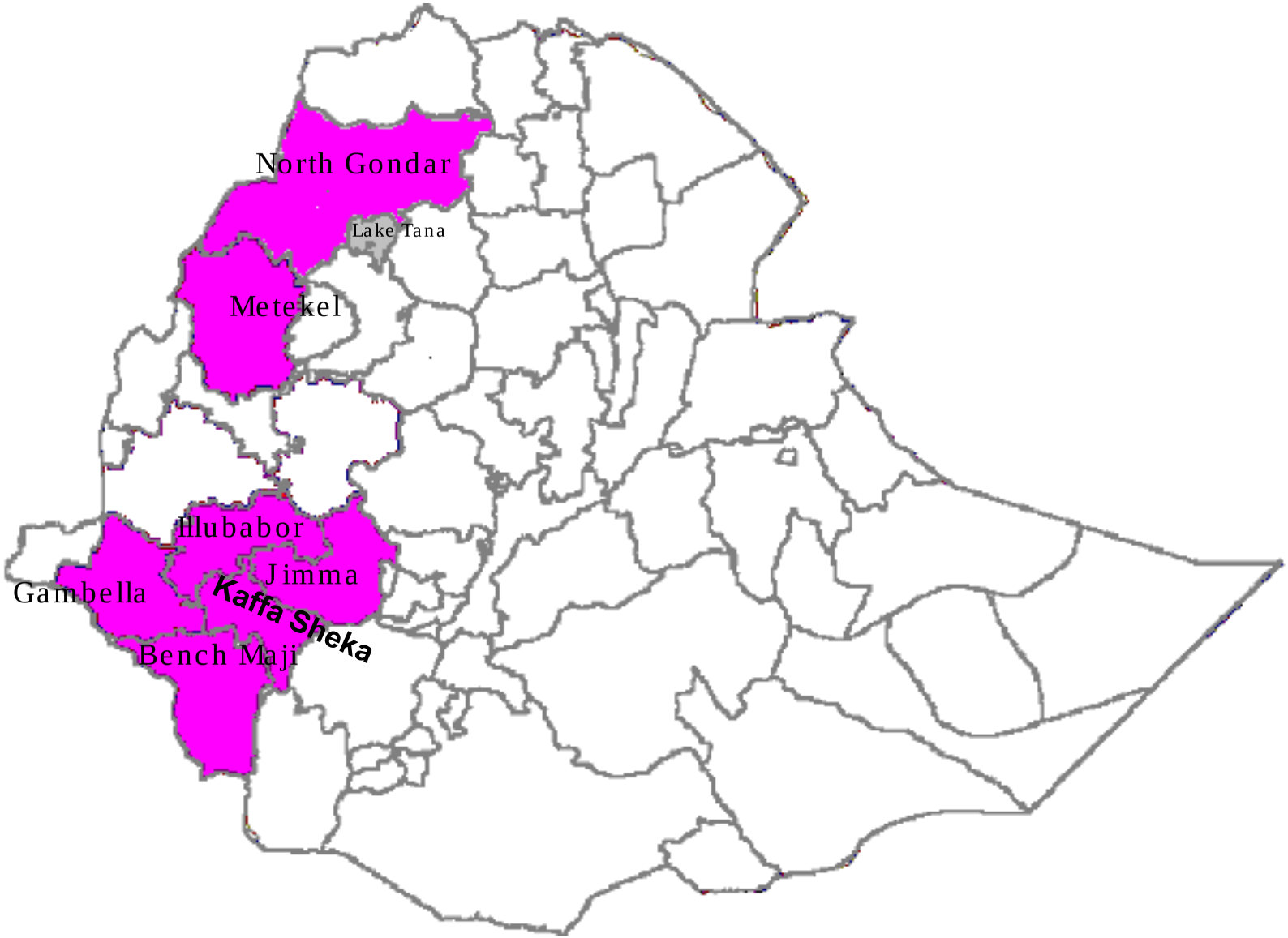


Figure 49

Ethiopia: Lions-Carter Center-Assisted Mectizan® Treatments as Percentage of Total Treatments Provided, 2001-2010

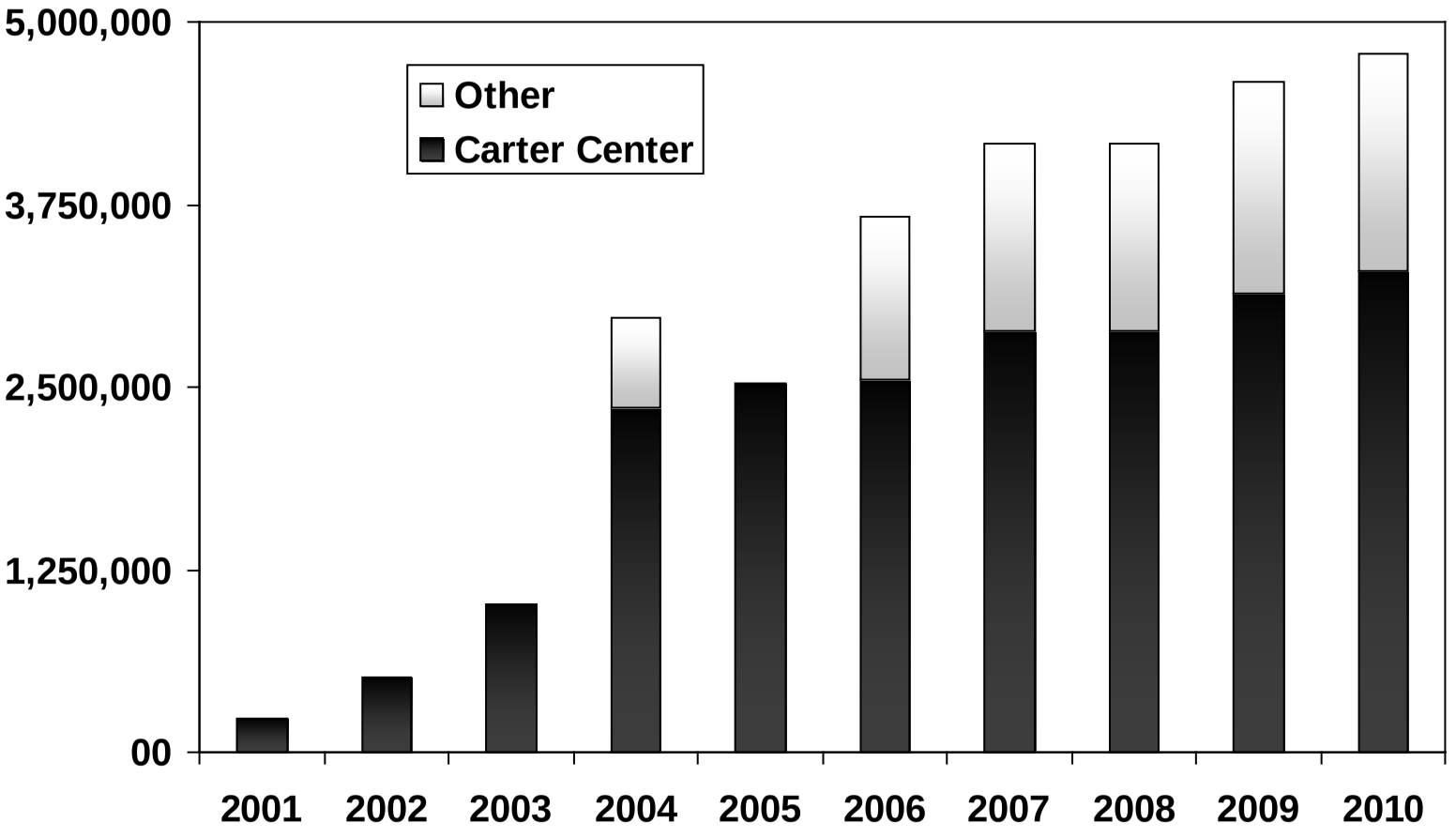


Figure 50

Ethiopia: Lions-Carter Center-Assisted Areas: 2010 River Blindness Treatments

CDTI Zone	Ultimate TX Goal (UTG)	Total Popn 2010	Popn Treated 2010	% UTG Treated	% Total Popn Treated
Kaffa	840,886	1,001,055	784,716	93	78
Sheka	180,053	214,349	177,540	99	83
Bench Maji	579,848	690,295	543,038	94	79
N. Gondar	238,369	283,773	215,632	90	76
Illubabor	648,750	772,321	639,544	99	83
Jimma	765,511	911,323	743,218	97	82
Metekel	127,079	151,284	121,072	95	80
Gambella	84,611	101,013	73,435	87	73
TOTAL	**3,465,107**	**4,125,413**	**3,298,195**	**95**	**80**

Figure 51

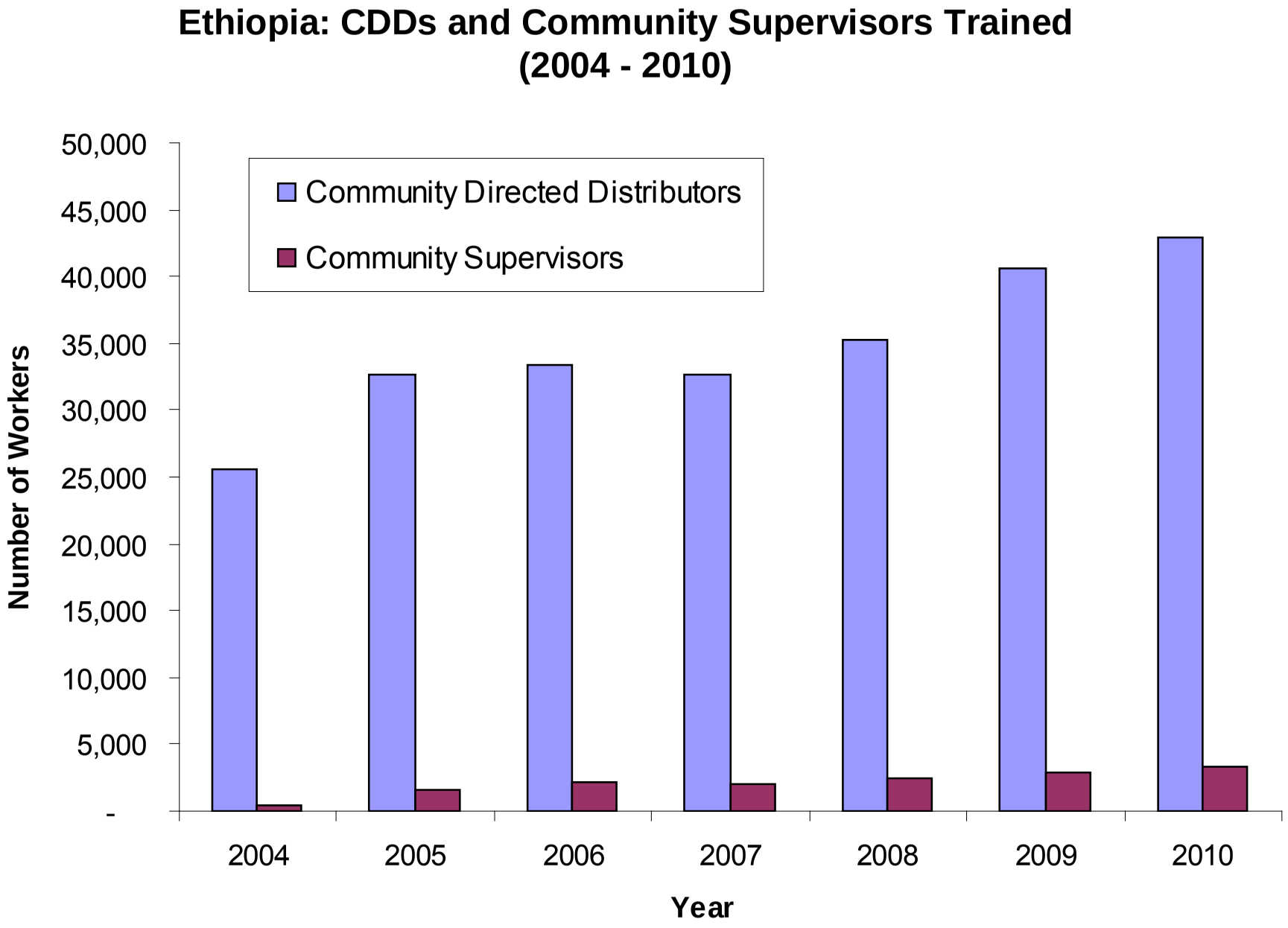

Ethiopia: CDDs and Community Supervisors Trained
(2004 - 2010)
Community Directed Distributors
Community Supervisors
Number of Workers
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
2004
2005
2006
2007
2008
2009
2010
Year

Figure 52

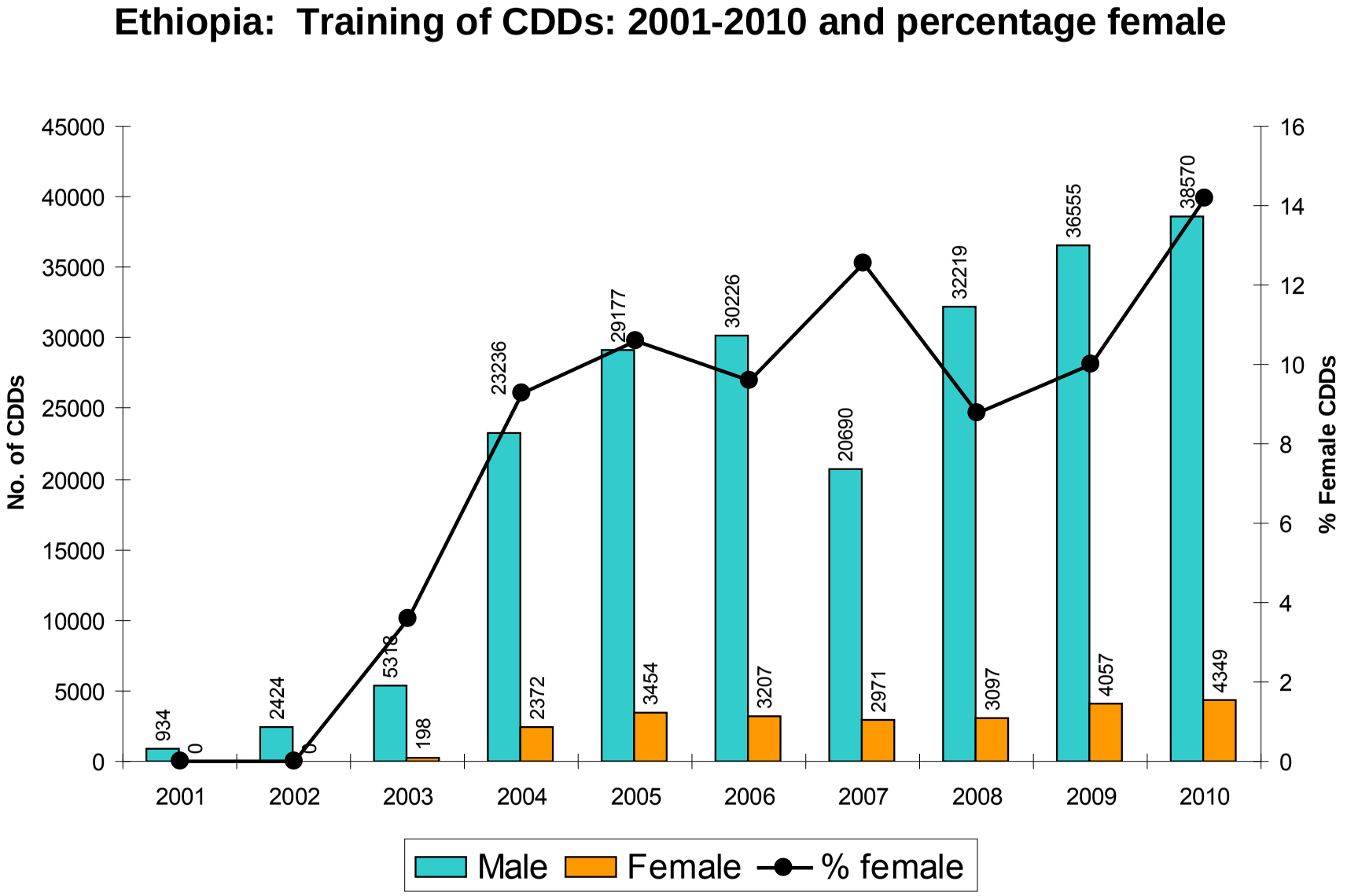

Ethiopia: Training of CDDs: 2001-2010 and percentage female
No. of CDDs
% Female CDDs
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
16
14
12
10
8
6
4
2
0
934
0
2424
0
5318
198
23236
2372
29177
3454
30226
3207
20690
2971
32219
3097
36555
4057
38570
4349
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Male
Female
% female

Figure 53

Ethiopia: Training of Community Supervisors: 2001-2010 and percentage female

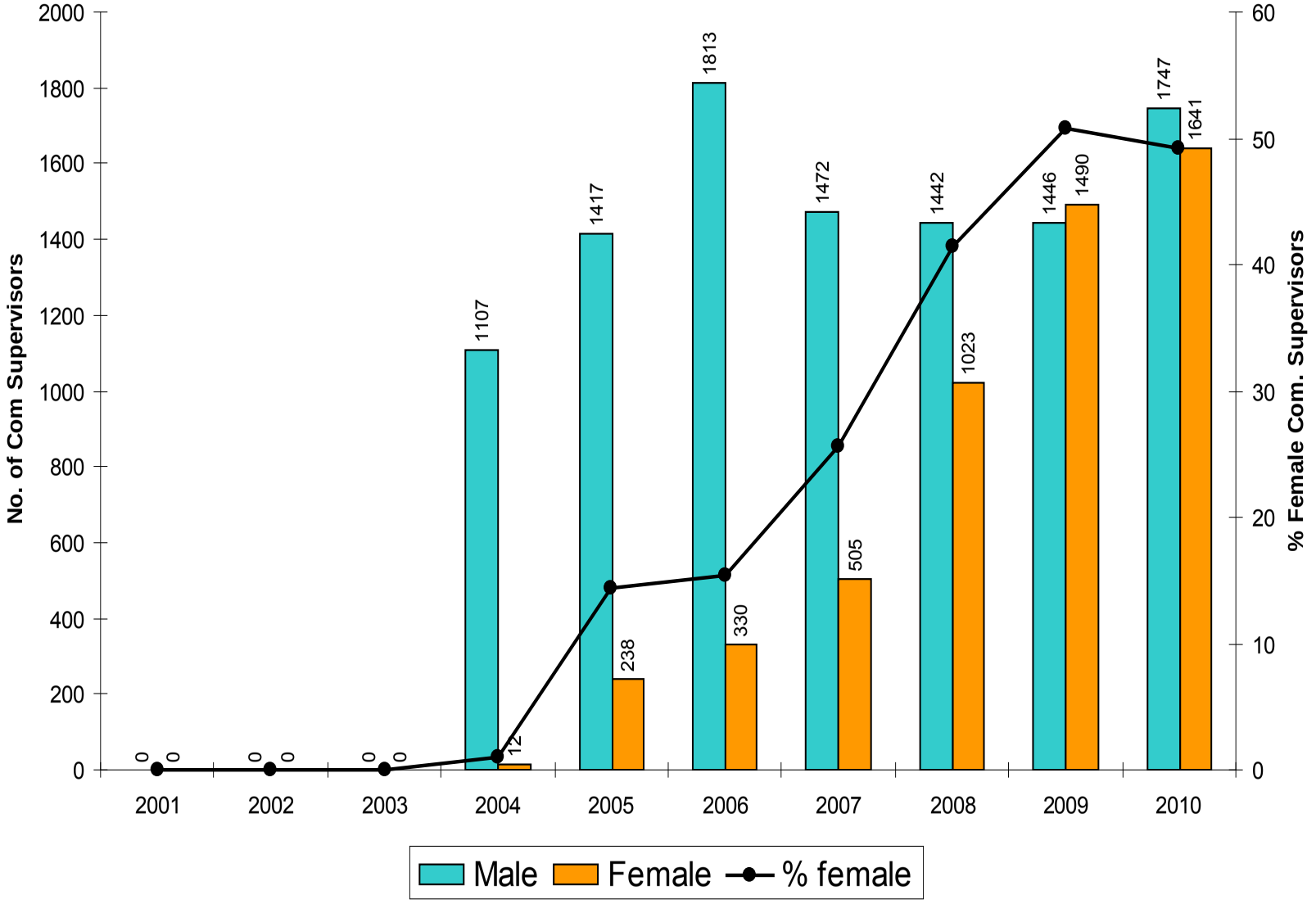
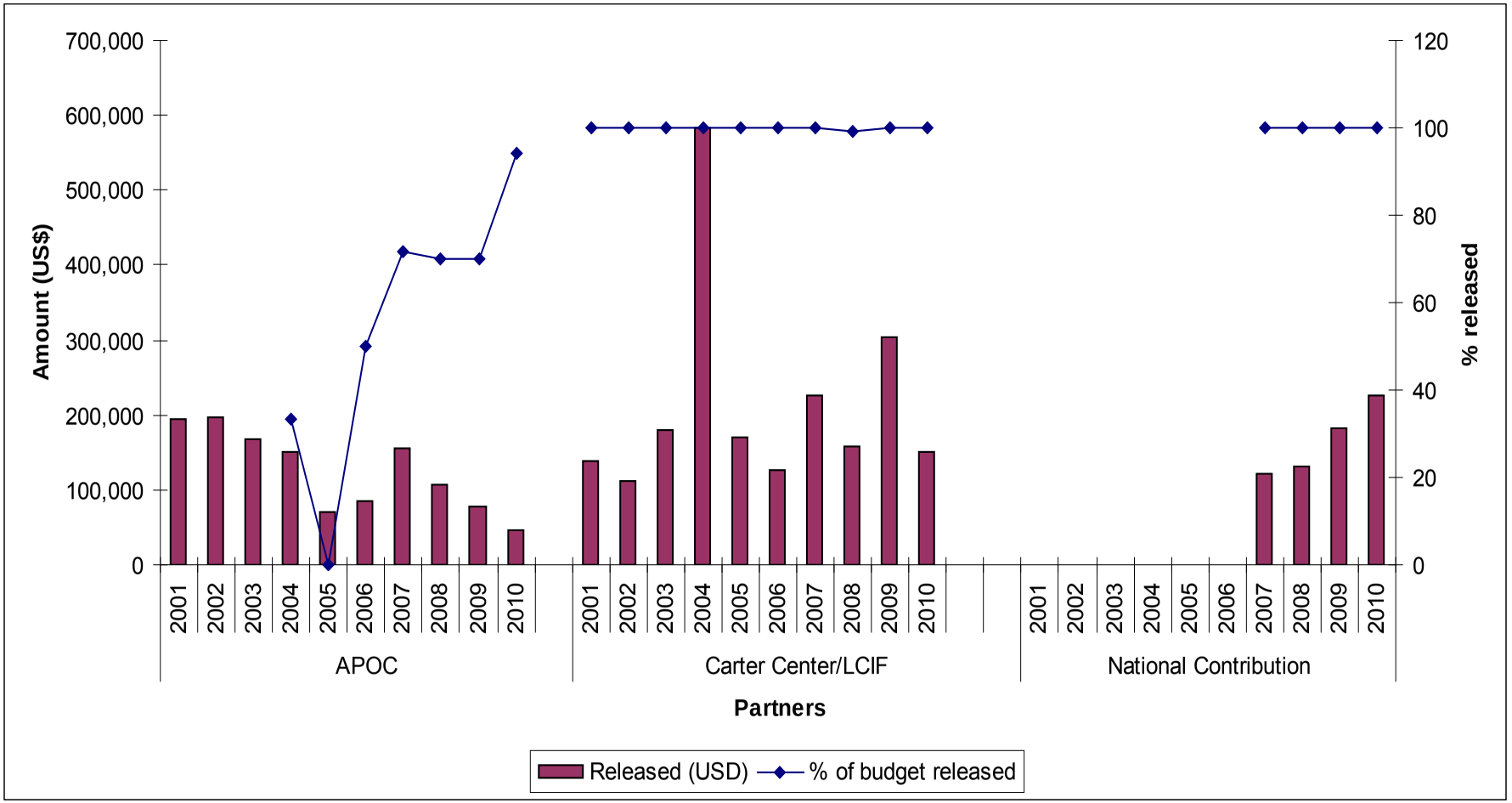


Figure 54

Financial Contribution by different Partners 2001-2010



NOTE: The above contribution does not include staff salaries and benefits for all the partners.

ACRONYMS

APOC	African Program for Onchocerciasis Control
arvs	at-risk villages (villages requiring community-wide active mass therapy
ATO	Annual Treatment Objective
BMFG	Bill & Melinda Gates Foundation
CBM	Christoffel Blindenmission
CDC	Centers for Disease Control and Prevention
CDD	Community Directed Distributors
CDHS	Community-Directed Health Supervisors
CDTI	Community-Directed Treatment with Ivermectin
DEC	diethylcarbamazine
earp	eligible at-risk population
FMOH	Federal Ministry of Health
GOSS	Government of South Sudan
GSK	GlaxoSmithKline
HE	Health Education
HKI	Helen Keller International
HQ	Headquarters
IACO	InterAmerican Conference on Onchocerciasis
IEC	Information, Education, and Communication
IRB	Institutional Review Board
JAF	Joint Action Forum
LCCSFI	Lions-Carter Center SightFirst Initiative
LCIF	Lions-Carter Center SightFirst Initiative
LF	Lymphatic Filariasis
LGA	Local Government Areas
LGA	Local Government Areas
LLIN	Long Lasting Insecticidal (bed) Net
MALONCHO	Malaria/Onchocerciasis
MDA	Mass Drug Administration
MDP	Mectizan® Donation Program
MEC	Mectizan® Expert Committee
Mectizan®	Ivermectin (Merck & Co., Inc., product name)
MOH	Ministry of Health
NGDO	Non-Governmental Development Organization
NOCP	National Onchocerciasis Control Program
NOTF	National Onchocerciasis Task Force
NTDs	Neglected Tropical Diseases

OCP	Onchocerciasis Control Program of West Africa
OEPA	Onchocerciasis Elimination Program for the Americas
PAC	Preschool Age Children
PAHO	Pan American Health Organization
PBD	Department of Prevention of Blindness and Deafness
PCC	Program Coordinating Committee of OEPA
PCR	Polymerised Chain Reaction
PTS	Post Treatment Surveillance
PZQ	Praziquantel
RBF	River Blindness Foundation
RBP	River Blindness Program of The Carter Center
REMO	Rapid Epidemiological Mapping of Onchocerciasis
RTA	Resident Technical Advisor
SAC	School Age Children
SAE	Severe Adverse Events
SH	*Schistosomiasis haematobium* (urinary schistosomiasis)
SMTC	Sustainable Management Training Center
SSI	Sight Savers International
STH	Soil Transmitted Helminths
TCC	Technical Consultative Committee of APOC
TDA	Triple Drug Administration
TDR	Special Programme for Research and Training in Tropical Diseases
UNICEF	United Nations Children's Emergency Fund
UOEEAC	Ugandan Onchocerciasis Elimination Expert Advisory Committee
USAID	U.S. Agency for International Development
UTG	Ultimate Treatment Goal
VAS	Vitamin A Supplementation
WHO	World Health Organization
Zithromax®	Azithromycin (donated by Pfizer Inc.)

ANNEX 1: A history of the river blindness campaign at The Carter Center

Human onchocerciasis, caused by the parasite *Onchocerca volvulus*, is an infection characterized by chronic skin and eye lesions. Onchocerciasis is transmitted by small black flies of the genus *Simulium* that breed in rapidly flowing rivers and streams, and due to the high disease rates near rivers has been called "river blindness." The adult parasites develop in humans, and reside in non-painful 'nodules,' measuring about one to two centimeters in diameter. They have the consistency and dimensions of cooked lima beans and often can be easily felt under the skin. The parasites are thin male and female worms that measure up to 12 inches in length and have a lifespan of five to 15 years. Female worms, which are four to five times longer than males, release embryonic stage offspring called microfilariae that emerge from the nodules. The microfilariae swarm under the skin, where they cause itching and rashes, and can enter the eyes, where they cause inflammation and ocular damage. The transmission cycle is carried on as these microfilariae are picked up, metamorphosize into infectious larvae and are transmitted to another person when the infectious black flies return to once more bite humans. The World Health Organization (WHO) estimates that approximately 32.7 million people are infected and 770,000 are blinded or severely visually impaired in 37 endemic countries, 30 of which are in Africa. Approximately 123 million people live in endemic areas worldwide and are therefore at risk of infection; more than 99 percent of those are African. Annual mass treatment with the oral tablets of a medicine called ivermectin (Mectizan®), which is donated by Merck & Co., Inc., prevents eye and skin disease by killing the microfilariae. Unfortunately ivermectin is not curative, as it does not kill the adult *O. volvulus* (although it does reduce the worms' lifespan). Annual treatment does reduce transmission of the parasite by lowering the amount of microfilariae available to black flies. Twice per year treatment (e.g., every six months) is more certain to completely interrupt transmission of the disease if treatment coverage is high, as this keeps microfilariae levels (and thus fly infection rates) extremely low throughout the year. When transmission falls below a critical threshold, worm populations cannot be sustained. Twice or four times per year treatment also increases the death rate of the adult worms.

Mass drug administration with Mectizan® in community treatment programs is the main global strategy for the control and elimination of onchocerciasis. It has largely replaced vector control, which was the sole strategy for onchocerciasis control before the Merck donation of Mectizan® in 1987. Vector control approaches have always focused on 'larviciding,' meaning putting chemicals into water that kill that the aquatic stages of the black flies, rather than attacking the adult black fly stages that emerge from rivers to bite humans. The large World Bank/World Health Organization partnership known as the Onchocerciasis Control Program of West Africa (OCP) used helicopters and fixed wing aircraft to deliver larvicides for many years; that program closed in 2003. Larviciding on a smaller scale, administered by ground based field teams (hence known as 'ground larviciding'), is done as a supplement to Mectizan® treatment as part of the Uganda elimination program.

The Carter Center and its River Blindness Program: In 1987, Merck & Co., Inc. approached Dr. William Foege, then executive director of The Carter Center, for assistance in organizing the global distribution of Mectizan®. Shortly thereafter, in 1988, the Mectizan® Expert Committee (MEC) and the Mectizan® Donation Program (MDP) were created and housed at the Atlanta-based Task Force for Child Survival and Development (now called the Task Force for Global Health), an independent partner of The Carter Center, with Dr. Foege as Chair. The global initiative has grown to one that now enables approximately 80 million treatments per year, and has cumulatively provided over 800 million treatments valued at more than three quarters of a billion U.S. dollars during the 24 years that it has been in existence. The donation is widely considered a model of public/private partnership that demonstrates how industry, international organizations, donors, national Ministries of Health (MOHs) and affected communities can successfully work together toward solving a major health problem. The MDP has spawned other public-private partnerships based on large drug donations and mass treatment programs to fight what are collectively know as the Neglected Tropical Diseases (NTDs). These include the Global Alliance for the Elimination of Lymphatic Filariasis (GlaxoSmithKline through WHO), the International Trachoma Initiative (Pfizer), the Schistosomiasis Initiative (E-Merck through WHO), and Children without Worms (Johnson & Johnson and most recently GlaxoSmithKline). All these programs are based at, or have a strong linkage to, the Task Force for Global Health.

In 1996, The Carter Center expanded its role in the coalition fighting river blindness by acquiring most of the operations of the River Blindness Foundation (RBF), a Houston based organization founded in 1990 by John and Rebecca Moores. The River Blindness Program (RBP) was established at The Carter Center to assume the field activities of the RBF. The primary aim of the RBP is to help Ministries of Health and residents of affected communities to establish and/or sustain optimal Mectizan® distribution and related health education (HE) activities and to monitor the process toward control of onchocerciasis. RBP also seeks to completely eliminate onchocerciasis where possible, so that Mectizan treatments can be safely stopped. RBP undertakes elimination efforts only when MOHs request our assistance to do so. Currently, RBP assists parts of five countries in Africa: Cameroon, Ethiopia, Nigeria, Sudan and Uganda. The Onchocerciasis Elimination Program for the Americas (OEPA), which coordinates activities to completely eliminate transmission and RB infection in all six onchocerciasis-endemic countries in the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela). OEPA coordinates the elimination effort based on a series of declarations by the Pan American Health Organization (PAHO) to eliminate onchocerciasis transmission from the Americas region.

Shortly after assuming the field activities of the RBF, in 1997, The Carter Center's RBP expanded to (northern and southern) Sudan with support from the Lions Clubs International Foundation (LCIF), as part of the Carter Center's peace initiative and Guinea worm disease eradication efforts in Sudan. In 1999, as part of the expanded Lions-Carter Center Sight First Initiative (LCCSFI), The Carter Center accepted an invitation to assist onchocerciasis control activities in Ethiopia, and Mectizan treatments and HE began in 2001. The Comprehensive Peace Agreement (CPA) in Sudan, signed in January 2005, put an end to the decades-old civil war, and also created the

Government of South Sudan (GOSS). The RBP ceased its support of river blindness control activities in GOSS areas of the country shortly after the CPA was signed, when the African Program for Onchocerciasis Control (APOC) and Christoffel Blindenmission (CBM) signed an agreement to support and establish five Community-Directed Treatment with Ivermectin (CDTI) projects in GOSS areas that overlapped areas historically assisted by RBP.

Northern Sudan and Uganda launched elimination strategies in 2006 and 2007 respectively. Both countries formally invited The Carter Center to participate in their elimination efforts. In Sudan, the elimination strategy targets the Abu Hamad focus on the River Nile. In Uganda, the strategy is to phase in a country-wide policy of elimination which includes not only twice-per-year treatment, but also vector elimination or targeted vector control where feasible through larviciding of breeding sites in fast running rivers and streams.

Integration: Whenever possible, RBP works to integrate (or 'coimplement') MDA activities for onchocerciasis, schistosomiasis, lymphatic filariasis, soil transmitted helminths, and trachoma. Vitamin A supplementation for young children and insecticide treated net distribution are also a part of our integrated efforts, which are undertaken inside of our RB assisted areas at the request of MOHs and to the extent that our funding allows.

Partnerships: The Carter Center works through partnerships, with our primary partners being the Ministries of Health (MOHs) and their national onchocerciasis control or elimination programs. The Carter Center assists programs that are executed within and through the existing primary health care system, with the aim to strengthen those systems. The Carter Center and MOH staff work closely with district and frontline health workers and the afflicted rural communities; RBP does not establish 'parallel systems' to the MOH. RBP provides financial and technical assistance as well as information, education, and communication (IEC), and behavior change communication (BCC). The primary principle is that the people themselves must be empowered to be full partners in the program and in the drug delivery process. As mentioned above, The Carter Center has had a long partnership with Lions Clubs and the Lions' SightFirst Initiative, supported by the Lions Clubs International Foundation, in addition to long standing relationships with Merck & Co., Inc. and the Division of Parasitic Diseases (DPD) at the U.S. Centers for Disease Control & Prevention (CDC). The Carter Center also works closely with the Task Force for Global Health, which houses the Mectizan® Donation Program.

Partners in the African Programs: In Africa, the main Carter Center partners are the MOHs in host countries (Cameroon, Ethiopia, Nigeria, Sudan, and Uganda). The Carter Center also works with other nongovernmental development organizations (NGDOs) through the NGDO Coalition for Mectizan® Distribution that includes, among others, Christoffel Blindenmission, Helen Keller International, Interchurch Medical Assistance, LCIF, Merck & Co., Inc., SightSavers International, and the U.S. Committee for UNICEF.

The African Program for Onchocerciasis Control (APOC), which is executed by WHO and funded through a trust fund housed at The World Bank, is another important partner of The Carter Center. APOC was launched in 1995, and by 2015 aims to establish country-sustained river blindness treatment programs with a "community-directed" approach throughout highly endemic onchocerciasis areas in Africa. Carter Center disease control experts Dr. Donald Hopkins, Dr. Frank Richards, and Dr. Moses Katabarwa have all served on the Technical Consultative Committee of APOC. APOC is actively entertaining a change in strategy from control to elimination, at least in some areas of Africa. The Carter Center applauds this paradigm shift and is prepared to assist in this 'program reorientation' and expanded, intensified interventions against onchocerciasis, as resources allow.

Partners in the Americas Programs: The Carter Center provides the administrative framework for OEPA. Headquartered in Guatemala, OEPA is the technical and coordinating body of a multinational, multi-agency coalition working for the elimination of all onchocerciasis morbidity and transmission from the Americas by the year 2015. Through OEPA, The Carter Center partners with the national programs and MOHs of all six endemic countries of the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela). Regional technical and programmatic goals are developed by a Program Coordinating Committee (PCC), which is convened by OEPA and has representation from key members of the initiative. The Carter Center works with LCIF, PAHO, CDC, and several U.S. and Latin American universities. In 2003, The Carter Center's RBP received its first support from the Bill & Melinda Gates Foundation for OEPA through a matching grant mechanism that drew additional funding from LCIF, Merck & Co., Inc., and more than 70 other donors.

ANNEX 2: The Carter Center RBP reporting processes and research agenda

At-risk Villages (arvs): An epidemiological mapping exercise was a prerequisite to identifying at-risk villages (arvs) for mass Mectizan® treatment programs. The assessment techniques used in the mapping exercise in Africa varied from those used in the Americas. An overview of the two approaches follows.

In much of Africa, a staged village sampling scheme called Rapid Epidemiological Mapping of Onchocerciasis (REMO) was executed with assistance from WHO to define endemic "zones" that should capture most or all villages having onchocercal nodule rates $\geq$ 20 percent in adults (which roughly corresponds to a microfilariae in skin prevalence $\geq$ 40 percent) for mass treatment. The mapping strategy is based on studies that have shown that most ocular and dermal morbidity from onchocerciasis occurs in villages where the nodule prevalence exceeds 20 percent. In the first stage of REMO, survey villages are selected based on a review of large scale maps that are located in areas that appear to be environmentally able to support black fly breeding and therefore transmission of *O. volvulus*. In the second stage, the survey villages are visited by field teams and a convenience sample of 30-50 adults are examined (by palpation) for characteristic onchocercal nodules. The mean nodule prevalence for each village sample is mapped (often using geographic information systems) and the map is used to define endemic zones called 'community directed treatment with ivermectin (CDTI) treatment zones'. These zones typically are defined by sample villages having nodule prevalence of $\geq$ 20 percent. All villages within the CDTI treatment zone are offered mass Mectizan® treatment annually. This approach is modified for areas where the parasite *Loa loa* exists. The approach of REMO excludes areas where there may be onchocerciasis, but given that nodules rates are under 20 percent (the so-called 'hypodendemic areas'), CDTI is not offered. As the policy shifts from control to elimination, the role of hypoendemic areas in *Onchocerca volvulus* transmission is being critically re-examined. The River Blindness Program (RBP) has been engaged in this area of investigation in Cameroon, Uganda, Sudan, and Ethiopia. Based on evidence we have collected, we firmly believe that transmission occurs in some hypoendemic areas and that they must therefore be treated with CDTI, with a shift in policy from control to elimination of onchocerciasis.

In the Americas, the goal is to eliminate both morbidity and transmission from *O. volvulus*, and, as a result, all villages where transmission can occur are considered "at-risk" and are offered mass Mectizan® treatment activities every six months. Thus, a 'broader net' is cast for mass treatment where elimination is the goal and the concept of excluding hypoendemic villages does not exist. For the Americas, where the endemic foci are characteristically smaller and more defined than Africa, every village in known or suspected endemic areas has a rapid epidemiological assessment of 50 adults, who have both nodule examinations and superficial skin biopsies to identify *O. volvulus* microfilaria in skin. Villages in which one or more persons are positive (sample prevalence $\geq$ 2 percent) are considered "at-risk," and recommended for the mass treatment campaign. Thus, the cutoff prevalence for treatment is much lower for the Americas compared to Africa, and approximates thresholds used by the Lymphatic

Filariasis (LF) elimination campaign (> 1 percent) where the goal is also transmission interruption. It is because the lower LF elimination program treatment thresholds are being used in Plateau and Nasarawa states that we believe onchocerciasis transmission may have likewise been interrupted there. This is another area of active RBP research in Nigeria.

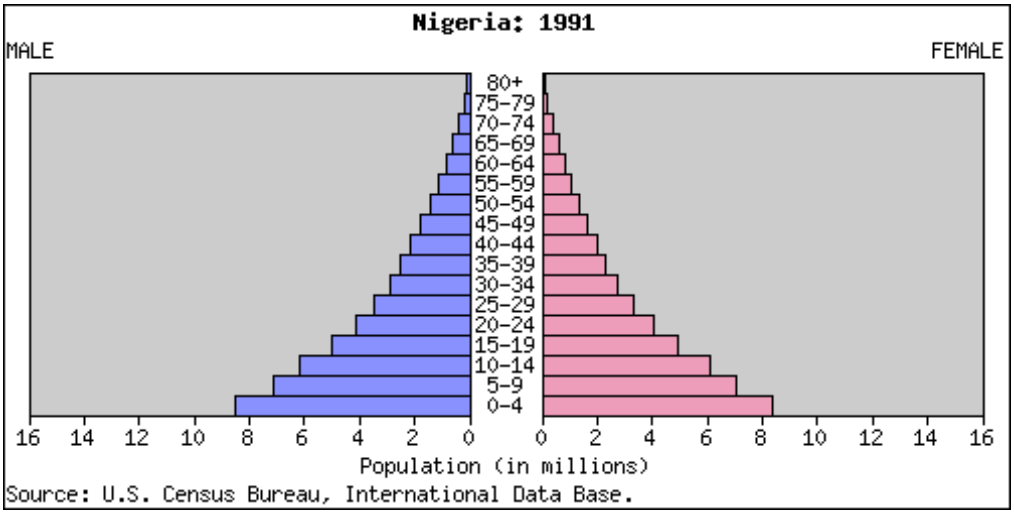
Data Reporting: The Carter Center program offices report monthly to The Carter Center headquarters in Atlanta. These reports include: 1) numbers of villages and persons treated during the previous month (reporting of treatments are updated quarterly for the Americas); 2) the status of the Mectizan® tablet supply; 3) training and health education activities; 4) epidemiological assessment, research, and program monitoring activities; and 5) administrative issues. Standardized tables and graphs are used across programs. The treatment data that are reported originate from village level records prepared during mass treatment activities carried out by village distributors and/or national Ministry of Health (MOH) personnel. The accuracy of these reports is routinely confirmed with random spot checks performed primarily by MOH personnel, supplemented by a standardized monitoring questionnaire administered by The Carter Center staff and/or Lions Clubs members. Summary reports of numbers of villages and persons treated are compiled at the district level and forwarded (whenever possible through MOH surveillance and reporting channels) to both headquarters of the national onchocerciasis programs and the national Carter Center offices in Jos (Nigeria), Kampala (Uganda), Yaoundé (Cameroon), Addis Ababa (Ethiopia) and Khartoum (Sudan). In the Americas, the MOHs in the six countries report treatments quarterly to the OEPA office in Guatemala City, which then provides a combined regional report to The Carter Center and to the Program Coordination Committee (PCC), InterAmerican Conference on Onchocerciasis (IACO) and the Pan American Health Organization (PAHO)/ World Health Organization (WHO) in its regular meetings; OEPA updates are provided in WHO's annual Weekly Epidemiological Record articles. African MOHs report their annual results directly to WHO and APOC.

The data from monthly reports are supplemented with additional information at an annual Carter Center River Blindness Program Review held during the first quarter of the following year. At these reviews, all Carter Center program directors and other partners convene to finalize treatment figures for the previous year and establish new treatment objectives for the coming year. Data on Mectizan® treatments provided by other programs/partners operating in other parts of the countries where The Carter Center assists also are discussed (if these data are available), as well as results from research initiatives. The Carter Center reports its final annual treatment figures to the Mectizan® Donation Program (MDP), Merck & Co., and NGDO Onchocerciasis Coordination office located in the Department of Prevention of Blindness and Deafness (PBD), WHO, Geneva.

RBP Treatment Indices: Treatments are reported as numbers of persons and number of at-risk villages treated for the month, by state or province. Cumulative treatment figures for the year are compared to the Annual Treatment Objectives (ATOs) or Ultimate Treatment Goals (UTGs). The decision whether to use ATOs or UTGs is

based on projections of program capacity. Mature programs that sufficiently reach all targeted communities within their entire program area are said to be at "full geographic coverage," and use the UTG index as their coverage denominator (see below). UTG figures typically increase by about five percent annually to account for normal population growth. All Carter Center-assisted river blindness programs have already reached their UTGs, as has the Plateau/Nasarawa Lymphatic Filariasis (LF) and Schistosomiasis (SH) programs; the SH program in southeast Nigeria is at scale in one of the seven states assisted. The LF Mass Drug Administration (MDA) activities in southeast Nigeria are paralyzed by the *Loa loa* issue.

The eligible populations of at-risk villages (arvs) targeted for active mass distribution receive community-wide Mectizan® treatment. The eligible at-risk population (earp) includes all persons living in arvs who are eligible to receive Mectizan® (i.e., who are either ≥5 years of age, ≥15 kg in weight, or ≥ 90 cm in height, and who are in good health). Although RBP mass treatment activities exclude pregnant women, these women should be treated later during the treatment year (treatment may be given one week or more after parturition) and therefore all adult women are included in the ATO/UTG calculation. In practice, the ATO and UTG are established by arv census from the most recent treatment rounds. The ATO/UTG is expected to be the same figure used in the annual request for tablets submitted to the Mectizan® Donation Program. APOC and LF elimination use total population as their treatment denominator, so RBP routinely reports both coverage of eligible population (ATO/UTG) and coverage of total population ('therapeutic coverage') to satisfy those program's needs. The rationale for RBP's focus on the ATO/UTG denominator has been published (Richards et al., *American Journal of Tropical Medicine and Hygiene* 2001; 65:108-14). In general, total population coverage is 8-10% less than ATO/UTG (eligible) population coverage, in accord with population pyramids in areas being served, where 8 percent of the population is under 5 years of age and thus ineligible for Mectizan® treatment (see example below, Nigeria).



The UTG(2) denominator is used by elimination programs where semiannual treatments are delivered: its value is twice the UTG, and represents treatments delivered, not persons treated. Full coverage in control programs is defined as 90 percent

achievement of the UTG established for active mass treatment. Full coverage for elimination programs is 90 percent of the UTG(2) in African projects, or 85 percent for OEPA. Passive treatments are Mectizan® treatments for onchocerciasis provided through health care units located in hypoendemic communities (where estimated onchocerciasis nodule prevalence is under 20 percent) in the control program strategy. In elimination programs supported by RBP, hypoendemic villages receive mass treatment (not passive).

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ANNEX 5: Program Review Agenda

Fifteenth Annual River Blindness Program Review Agenda
Monday, February 28 – Wednesday, March 2, 2011
The Carter Center, Atlanta, GA

Day 1: Monday February 28, 2011

8:00	***Shuttle pickup at hotel***	
8:30 – 9:00	***Continental breakfast***	
9:00 – 9:15 9:15 – 9:45	Welcome Overview and Introduction to Part 1	Dr. Donald Hopkins Dr. Frank Richards (chair)

Part 1: 2010 Treatment Activity Summary

9:45 – 10:15 10:15 – 10:30	Onchocerciasis *Discussion*	Dr. Emmanuel Emukah
10:30 –11:00 11:00 – 11:15	Nigeria: Lymphatic Filariasis, Schistosomiasis and Malaria *Discussion*	Dr. Abel Eigege
11:15 – 11:30	***Coffee Break***	
11:30 – 11:50 11:50 – 12:00	Nigeria: LF national mapping and treatments *Discussion*	Dr. Ben Nwobi, FMOH Nigeria
12:00 –12:30 12:30 – 12:45	Ethiopia presentation *Discussion*	Dr. Teshome Gebre
12:45 – 2:00	***Lunch***	
2:00 – 2:30 2:30 – 2:45	OEPA presentation *Discussion*	Dr. Mauricio Sauerbrey
2:45 – 3:15 3:15 – 3:30	Uganda presentation *Discussion*	Ms. Peace Habomugisha
3:30 – 3:45	***Coffee Break***	
3:45 – 4:15 4:15 – 4:30	Sudan presentation *Discussion*	Dr. Nabil Aziz
4:30 – 5:00 5:00 – 5:15	Cameroon presentation *Discussion*	Dr. Albert Eyamba
5:15	***Session Adjourned***	

Day 2: Tuesday March 1, 2011

8:00	***Shuttle pickup at hotel***	
8:30 – 9:00	***Continental breakfast***	

Part 2: Sustainability

9:00 – 9:15	Mectizan® and albendazole discussion	MDP
9:15 – 9:35 9:35 – 9:50	Introduction to Part 2 *Discussion*	Dr. Moses Katabarwa
9:50 – 10:20 10:20 – 10:35	Uganda presentation: kinship and integration *Discussion*	Ms. Peace Habomugisha
10:35 – 11:00	***Coffee Break and Group Photo***	
11:00 – 11:45 11:45 – 12:00	Cameroon presentation: kinship and integration *Discussion*	Dr. Albert Eyamba
12:00 – 12:15 12:15 – 12:25 12:25 – 12:30	Sudan presentation: New government support for onchocerciasis *Video: Pioneering Approach Brings River Blindness to Brink of Elimination in Sudanese Community* *Discussion*	Dr. Kamal Hashim Osman MOH, Sudan
12:30 – 1:30	***Lunch***	
1:30 – 2:00 2:00 – 2:15	Ethiopia presentation: kinship and integration *Discussion*	Dr. Zerihun Tadesse
2:15 – 2:40 2:40 – 2:45 2:45 – 3:00	OEPA presentation: Government funding and possibilities for integration *Video: Eliminating River Blindness in the Americas* *Discussion*	Dr. Mauricio Sauerbrey
3:00 – 3:30 3:30 – 3:45	Nigeria presentation: Plateau and Nasarawa Gates integration activities *Discussion*	Dr. Abel Eigege
3:45 – 4:00	***Coffee Break***	
4:00 – 4:30 4:30 – 4:45	Gates Cost Studies *Discussion*	Dr. Deborah McFarland, Emory School PH
4:45 – 5:15 5:15 – 5:30	Nigeria presentation: Southeast Gates Integration Activities and Impact Surveys *Discussion*	Dr. Emmanuel Emukah
5:30	***Session Adjourned***	

Day 3: Wednesday March 2, 2011

8:00	***Shuttle pickup at hotel***	
8:30 – 9:00	***Continental breakfast***	

Part 3: Research and Special Reports

9:00 – 9:05	Introduction to Part 3	Ms. Lindsay Rakers
9:05 – 9:35 9:35 – 9:50	OEPA: Post Treatment Surveillance (PTS) guidelines *Discussion*	Dr. Mauricio Sauerbrey
9:50 – 10:20 10:20 – 10:35	Cameroon: Onchocerciasis assessments and lessons learned *Discussion*	Dr. Albert Eyamba
10:35 – 10:50	***Coffee Break***	
10:50 – 11:20 11:20 – 11:35	Nigeria: Plateau Nasarawa onchocerciasis transmission update (results of entomology and serology) Schistosomiasis evaluation *Discussion*	Dr. Abel Eigege Mr. Darin Evans
11:35 – 11:50 11:50 – 12:00	Nigeria: Southeast onchocerciasis impact data and Edo schisto mapping *Discussion*	Dr. Emmanuel Emukah
12:00 – 12:15 12:15 – 12:30	Field perspectives on a macrofilaricide *Discussion*	Dr. Julie Jacobson BMGF
12:30 – 1:30	***Lunch***	
1:30 – 1:55 1:55 – 2:00 2:00 – 2:15	Uganda: Progress of onchocerciasis elimination policy since it was launched in 2007 *Video: River Blindness Elimination in Uganda* *Discussion (with comments by Dr. Richard Ndyomugyenyi)*	Dr. Thomson Lakwo MOH Uganda
2:15 – 2:45 2:45 – 3:00	Sudan: 2007 Abu Hamad and Galabat assessment results and 2010/2011 reassessment *Discussion*	Dr. Nabil Aziz
3:00 – 3:30	Discussion on APOC Elimination Plans	Dr. Frank Richards
3:30 – 3:45	***Coffee Break***	
3:45 – 4:15 4:15 – 4:30	Ethiopia: Final LF mapping results and sentinel village updates *Discussion*	Dr. Tekola Endeshaw
4:30 – 4:40 4:40 – 4:50	Uganda: Costs of annual vs. semiannual treatment *Discussion*	Dr. Moses Katabarwa
4:50 – 6:00	Summary and Closure of Fifteenth Session	Dr. Donald Hopkins Dr. Frank Richards
6:00	***2010 Carter Center River Blindness Program Review Adjourned***	

ANNEX 6: The Nigeria Lymphatic Filariasis (LF) Elimination Program and Schistosomiasis Control Program, with a note on soil transmitted helminths (STH)

Lymphatic filariasis in Africa is caused by *Wuchereria bancrofti*, a filarial worm that is transmitted in rural and urban areas by *Anopheline* and *Culex sp*. mosquitoes, respectively. The adult worms live in the lymphatic vessels, and cause dysfunction, often leading to poor lymphatic drainage. Clinical consequences include swelling of limbs and genital organs (lymphoedema and "elephantiasis"), and painful recurrent attacks of acute adenolymphangitis. The female worms release *microfilariae*, which are tiny embryonic worms that circulate in blood at night, when the vector mosquitoes bite. *Microfilariae* are picked up by mosquitoes, develop over several days into infectious larvae, and are then able to be transmitted to another person when the mosquitoes bite again. *Microfilariae* are killed by annual single-dose combination therapy, with either Mectizan® (donated by Merck & Co., Inc.) and albendazole (donated by GlaxoSmithKline), or diethylcarbamazine (DEC) and albendazole (in areas where there is no onchocerciasis and/or *Loa loa* infection). Annual mass drug administration (MDA) prevents mosquitoes from being infected, and when given for a period of time (estimated to be five to six years) can interrupt transmission of *W. bancrofti* (which has no animal reservoir).

Schistosomiasis is acquired from contact with fresh water. *Cercariae*, released from infected snails, penetrate the skin and develop into adult worms that reside in venules of the intestines (*Schistosoma mansoni*) or bladder (*S. hematobium*). Female worms lay thousands of eggs that exit the body in feces or urine. If the eggs gain access to fresh water, they hatch and release *miracidae*, which swim in search of certain types of snails that they penetrate and infect. In the snails, the *miracidiae* transform and multiply, releasing *cercariae*, thus continuing the lifecycle. Disease from schistosomiasis comes from the inflammation caused by the eggs deposited into human tissues by the female worms. These eggs cause inflammation, organ damage, bleeding, and anemia. School-aged children (ages five to 14) are the most heavily affected by schistosomiasis and act as the main disseminators of this infection through their urination and defecation in or near fresh water. MDA with the safe and effective oral medicine praziquantel can significantly reduce schistosomiasis morbidity. Praziquantel kills the adult worms and so prevents the eggs from accumulating in tissues. Until 2007, praziquantel was not routinely donated in large amounts to control programs by the pharmaceutical companies (as are Mectizan® and albendazole) and had to be purchased at approximately U.S. $0.20 per child treated. In April 2007, the pharmaceutical company Merck KGaA (E-Merck) announced a 200 million tablet, 10-year donation of praziquantel to the World Health Organization for schistosomiasis control.

Nigerians suffer in disproportionate numbers from LF and schistosomiasis. The country is considered to contain the largest number of persons at risk for LF in Africa, and is ranked third globally behind India and Indonesia in the human suffering from this parasite. It is estimated that more than 25 million Nigerians (22 percent of the population) are infected with LF, and the mass drug administration for LF in Nigeria will

need to reach many times this number to cover the entire at-risk population. For schistosomiasis, an estimated 20 million Nigerians (the greatest of any country) need to be treated with praziquantel every one to three years.

The Carter Center, working with the Federal Ministry of Health (FMOH) of Nigeria and with the state and local government ministries in Plateau and Nasarawa states, has assisted in establishing an LF elimination program in Plateau and Nasarawa states. The effort is based on a strategy of health education (HE) and annual drug combination therapy with albendazole and Mectizan®. The manufacturers of the drugs have global donation programs for LF: GlaxoSmithKline donates albendazole, and Merck & Co., Inc. donates Mectizan®. Through a grant from the Bill & Melinda Gates Foundation, The Center has been conducting field research on using LLINs alone to combat LF in Imo and Ebonyi state, which are areas where LF MDA is not currently possible due to the presence of *Loa loa*. Thanks to the Global Fund Round 8, long-lasting insecticide treated nets (LLINs) are now being mass distributed for malaria prevention, two per household, in many states in Nigeria; this supplements HE and drug combination therapy as one more way to fight LF. The national programs are actively involved in The Carter Center-assisted program, and The Carter Center has assisted in the mass distribution of LLIN in some states where we work.

The Carter Center's schistosomiasis control program operates in Plateau, Nasarawa, Delta and Edo states (See maps in Nigeria section). The strategy is similar to the RBP and LF programs: HE and mass annual treatments with safe and effective oral drugs, in this case a medicine called praziquantel. Until 2007, praziquantel was not routinely donated to the program, although in past years, The Carter Center did received limited gifts of praziquantel from pharmaceutical companies including: Bayer AG, Medochemie, Ltd., and most recently, Shin Poong Pharmaceutical Company, Ltd. The Carter Center has purchased the remainder with funds raised from other donors. WHO, in collaboration with Merck KGaA (E-Merck), has been donating praziquantel tablets to our Plateau and Nasarawa projects since 2008, with the intention to continue this donation annually for up to 10 years, depending on progress and the Center's ability to find funding for drug distribution. The new strategy in those two states is to treat all the estimated one million children. This major development removes the hurdle of the price of praziquantel (approximately U.S. $0.20 per treatment) for those two states, which has restricted the growth of the schistosomiasis program in the past. The schistosomiasis program in Delta and Edo states operates and purchases praziquantel with a generous grant from Izumi Foundation.

Treatment in Plateau and Nasarawa addresses coendemic intestinal *Schistosomiasis mansoni* (SM), in addition to urinary schistosomiasis (*Schistosomiasis haematobium* or SH). The change in approach was decided upon after a Carter Center-supported study, in collaboration with Emory University School of Medicine, concluded that the costs of the village-by-village diagnosis of SH and SM would be greater than those of the presumptive treatment of the school-age children (SAC) in all villages. Until improved and less expensive rapid diagnostic methods for SM become available, the least costly approach to the overall problem of schistosomiasis in this part of Nigeria would

therefore be widespread mass drug distributions, without screening for at-risk populations.

The soil transmitted helminths (STH), primarily *Ascaris lumbricoides*, hookworms (*Necator americanus* and *Ancyclostoma duodenale*), and *Trichuris trichiura*, are highly prevalent in most of sub-Saharan Africa. They are responsible for significant morbidity and mortality worldwide, causing an estimated loss of 39 million Disability Adjusted Life Years (DALYs). This disability burden is greater than that due to malaria (35.7 million DALYs), yet in comparison, STH are amongst the most neglected of the 'neglected tropical diseases.' STH infections disproportionately affect those living in the most resource poor settings, where the infections' effects contribute to the continued cycle of poverty. Although the ultimate goal involves elimination of STH infections through improved hygiene and sanitation, achieving this goal will take time and considerable resources. In the meantime, reductions in morbidity and mortality can be achieved through mass treatment programs, similar to those in place for onchocerciasis and lymphatic filariasis. Treatment of intestinal helminths has been shown to have beneficial effects on growth and nutrition, child mortality, and school performance. Working in collaboration with Emory University School of Medicine (Dr. Julie Gutman), we evaluated in Imo state, Nigeria, the effect of annual Mectizan® distribution for onchocerciasis on the prevalence of STH infections in school age and preschool age children (PAC) by comparing children in villages that had received treatment for 13 years to those from socioeconomically similar villages in untreated (hypoendemic) areas. We enrolled 1031 SAC and 211 PAC for Kato Katz examinations. Treated areas had a statistically significantly lower prevalence of ascaris and trichuris, but not hookworm. The prevalence of ascaris or trichuris in treated areas was below the WHO threshold for mass antihelminthic treatment (MDA), but not for hookworm. We concluded that benzimidazole MDA in Mectizan® treatment areas is indicated to effectively control hookworm. This was the first Carter Center study devoted completely to STHs; it was published in the American Journal of Tropical Medicine and Hygiene in 2010.

ANNEX 7: Report on the progress of cost studies in Plateau and Nasarawa states

As part of the Carter Center's integrated programs in Nigeria, supported by a grant from the Bill & Melinda Gates Foundation, costs are being tracked to assess cost-efficiencies gained through integrated delivery of six interventions for onchocerciasis, lymphatic filariasis, schistosomiasis, trachoma, malaria, and vitamin A deficiency. Costing of the programs was done through the use of work and travel logs, retrospective surveys and financial records for both Ministry of Health (MOH) and partner organizations. Data collected included capital costs, salaries, transportation, supplies, per diems, intervention materials, overheads, and time. Operational data also were collected in terms of specific activities. These include advocacy, data management and reporting, drug delivery and distribution, field supervision, health education and community mobilization, M & E, morbidity control, planning and budgeting, procurement, and training.

Integration is accomplished in this project through the joint or 'bundled' delivery of services approved by the World Health Organization (WHO) and the Nigerian Federal MOH. Integration occurs at both the programmatic and managerial levels; activities such as training, health education and community mobilization, data collection, and distribution are done concurrently for all of the interventions while state and local government personnel work across multiple platforms as integrated 'health teams,' as opposed to individuals in vertical programs. Some activities which are exclusive to specific interventions cannot be integrated, such as latrine construction or entomology surveillance, and external logistics, such as resource acquisition or drug delivery.

Preliminary data using Carter Center expenses have shown as much as a 35% reduction in costs from 2007 to 2009, likely due to the integration of praziquantel delivery with ivermectin and albendazole in certain LGAs, as well as integrated training and mobilization activities. These reductions were most significant in transportation and other recurrent costs, such as office support and supplies.

Two sub-studies also have come out of the analysis. The first is a study on the cost of integrated mapping. In 2007, disease mapping for trachoma and urinary schistosomiasis took place in Plateau and Nasarawa. LGAs that conducted the mapping separately spent an average of 41,900 Naira ($300 USD) per LGA surveyed while LGAs that conducted integrated mapping averaged 36,173 Naira ($258 USD), a difference of 14%. The second study has been on the cost of integrated delivery of the drugs ivermectin, albendazole, and praziquantel (PZQ). In 2008, nine LGAs conducted two separate, stand-alone distributions, one of ivermectin plus albendazole, and the other of PZQ. In 2009, these LGAs integrated delivery of the drugs in what has come to be known as triple drug administration (TDA). While the number of treatments remained relatively stable at about 1.6 million, total costs were reduced by 41.1%. Economies of scale were witnessed in urban areas where centralized health services and easy transportation were available.

ANNEX 8: Monitoring sustainability and costs after withdrawal of core funding by the African Program for Onchocerciasis Control (APOC)

The African Program for Onchocerciasis Control (APOC) administers a large World Bank trust fund for onchocerciasis, which provides major ('core') support for African onchocerciasis projects during their first five years. The Carter Center River Blindness Program (RBP) and its national partners enjoyed APOC Trust Fund support for delivery of Mectizan® for 18 Carter Center-assisted river blindness projects in Africa, until each completed the five year cycle between 2002 and 2008 (Table A). Several RBP projects continue to receive support for special initiatives, but no longer receive regular APOC funding for implementation (field) activities such as community mobilization, health education, supervision, monitoring, data collection and reporting. While these fundamental tasks required for sustaining Mectizan® treatment programs should be the responsibility of government, RBP has, in general, observed insufficient national funding needed to sustain the original APOC projects (see Figure 7) although government support trended upward in 2009.

Table A: APOC funding for The Carter Center assisted CDTI projects

COUNTRY	PROJECT	First year with APOC (JAF, definitive)	5th year APOC core funding ended
Nigeria	Imo/Abia	1998 Sept	2003 Oct
Nigeria	Enugu/Ebonyi/Anambra	1998 Sept	2003 Oct
Nigeria	Edo/Delta	1999 June	2004 Nov
Nigeria	Plateau/Nasarawa	1998 April	2003 May
Cameroon	North Province	1998 Nov	2003 Oct
Cameroon	West Province	2001 Jan	2006 June
Sudan	Northern	1997 May	2003
Uganda	Kasese/Kisoro	1997 May	2002 July
Uganda	Mbale/Kabale	1998 Sept	2003 Oct
Uganda	Kanungu/Nebbi	1998 Dec	2004 June/July
Uganda	Moyo/Gulu/Apac/Adjumani	1999 Aug	2005 Feb
Ethiopia	Illubabor Zone	2004 June	2008 Nov
Ethiopia	Jimma Zone	2004 June	2008 Nov
Ethiopia	Kaffa/Sheka Zones	2000 Aug	2005 Oct
Ethiopia	Bench Maji Zone	2002 Oct	2007 Mar
Ethiopia	North Gondar Zone	2002 Oct	2008 Mar
Ethiopia	Metekel Zone*	2004 Aug	2008 Aug
Ethiopia	Gambella Zone*	2004 Sept	2008 Sept
* APOC began funding in 2004. Carter Center became an NGDO partner in 2005.			

The RBP has made it one of its basic monitoring tasks to collect and refine government and Carter Center funding figures, along with additional funds provided through APOC.

Monitoring trends for increased funding is especially important to determine if countries are filling the 'post-APOC funding gap.' The post-APOC gap is defined as budget shortfalls in key areas arising since withdrawal of core APOC support for distribution activities. The RBP is monitoring Ultimate Treatment Goal (UTG) coverage by post-APOC treatment year as well (Table B), and have not observed a decline in treatments in the 'post-APOC' period. However, when RBP has temporarily withdrawn its support also, we have observed programmatic decline in either treatments (see Rakers et al, Lancet 2009) or in programmatic activities such as training, health education or treatment reporting. The ultimate goal is to see Mectizan® delivery handed over to the full fiscal responsibility of the national, state, and local governments.

Table B: Carter Center/Lions-Assisted project coverage as it relates to year of APOC funding

				Coverage (UTG)										
COUNTRY	PROJECT	Overall APOC Sustainability Score	First year with APOC	5th year funding ends	1 Year before APOC stopped funding	Year when APOC funding stopped	Year after APOC funding stopped	Second year after APOC funding stopped	Third year after APOC funding stopped	Fourth year after APOC funding stopped	Fifth year after APOC funding stopped	Sixth year after APOC funding stopped	Seventh year after APOC funding stopped	Eighth year after APOC funding stopped
Cameroon	North*	2.9	1998	2003	98	110	100	89	91	87	88	89	98	-
	West	2.5	2001	2006	94	96	93	93	90	96	-	-	-	-
Ethiopia	Illubabor	n/a	2004	2008	97	98	97	99	-	-	-	-	-	-
	Jimma	n/a	2004	2008	99	99	98	97	-	-	-	-	-	-
	Kaffa	3.0	2000	2005	91	96	94	93	95	93	-	-	-	-
	Sheka	3.0	2000	2005	95	98	95	95	96	99	-	-	-	-
	Bench Maji	n/a	2002	2007	91	84	91	91	94	-	-	-	-	-
	North Gondar	n/a	2002	2008	83	93	92	90	-	-	-	-	-	-
	Metekel	n/a	2004	2008	85	88	84	95	-	-	-	-	-	-
	Gambella	n/a	2004	2008	97	90	93	87	-	-	-	-	-	-
Nigeria	Enugu	1.9	1998	2003	86	93	99	100	100	98	100	99	98	-
	Anambra	3.2	1998	2003	86	88	100	93	94	96	104	97	100	-
	Ebonyi	2.4	1998	2003	86	88	100	87	94	102	100	96	99	-
	Edo	3.1	1999	2004	92	93	100	100	99	110	102	99	100	-
	Delta	2.5	1999	2004	85	91	99	97	99	100	99	100	100	-
	Imo*	3.6	1998	2003	90	92	76	55	86	96	99	100	100	-
	Abia*	2.6	1998	2003	90	92	76	39	84	98	100	100	100	-
	Plateau	2.4	1998	2003	94	90	97	95	108	100	115	114	99	-
	Nasarawa	2.4	1998	2003	100	96	108	109	99	90	114	112	97	-
South Sudan	Juba	n/a	n/a	2003	63	63	38	not known	not known	not known	not known	not known	not known	not known
Sudan	Khartoum	2.4	1997	2003	78	60	96	37	36	92	86	94	86	-
Uganda	Kasese	2.9	1997	2002	99	100	100	99	97	99	98	95	91	97
	Kisoro*	2.5	1997	2002	93	94	94	89	84	85	96	96	94	93
	Mbale*	3.1	1998	2003	100	100	100	97	100	98	100	98	99	-
	Kabale	2.4	1998	2003	93	92	90	88	85	94	94	96	93	-
	Kanungu	2.6	1998	2004	98	97	97	97	97	97	95	94	-	-
	Nebbi	3.0	1998	2004	100	100	98	97	99	97	98	99	-	-
	Moyo	n/a	1999	2005	99	99	99	97	98	97	98	-	-	-
	Gulu	n/a	1999	2005	93	96	97	94	93	98	96	-	-	-
	Apac	n/a	1999	2005	100	97	99	N//A	N//A	N//A	N//A	-	-	-
	Adjumani	n/a	1999	2005	98	97	95	93	98	98	98	-	-	-
Average performance with respect to APOC year					**92**	**93**	**93**	**89**	**92**	**97**	**99**	**99**	**97**	**95**

* projects which performed the post-APOC, post-NGDO sustainability trial
A "-" indicates information that the program has not yet reached this year

ANNEX 9: Publications Authored or Coauthored by RBP Personnel

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ANNEX 10: Acknowledgements

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