THE
CARTER CENTER

Waging Peace. Fighting Disease. Building Hope.

Summary
2007 Program Review for The Lions-Carter Center SightFirst
River Blindness Programs
Cameroon, Ethiopia, Nigeria, OEPA, Sudan, and Uganda
6 – 8 February 2008
The Carter Center
Atlanta, GA

LIONS CLUBS INTERNATIONAL FOUNDATION

THE CARTER CENTER
RIVER BLINDNESS PROGRAM

August 2008

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And to many others, our sincere gratitude.

Figure A

The Carter Center's River Blindness Program celebrates the delivery of more than 100 million (10^8) Mectizan® treatments in Africa and the Americas since the program began in 1996. President Carter has described a Mectizan tablet as "more precious than a diamond of the same size."

The milestone was achieved in a collaboration with the 11 national programs and our partners. Through a strong international coalition we are preventing blindness one person at a time.

Design created by Mrs. Sherri Richards, artist and graphic designer

Figure B

Carter Center program staff celebrate Dr. Hopkins' receipt of the 2007 Mectizan Award, awarded to him by Merck & Co.

Left to right: Mr. Craig Withers, Dr. Frank Richards, Dr. Donald Hopkins, Ms. Lindsay Rakers, and Dr. Moses Katabarwa..

Figure C **Group Photo: 2007 Program Review for The Carter Center River Blindness Program**

Figure D

Treatments with Mectizan® in the Americas: 1989-2012

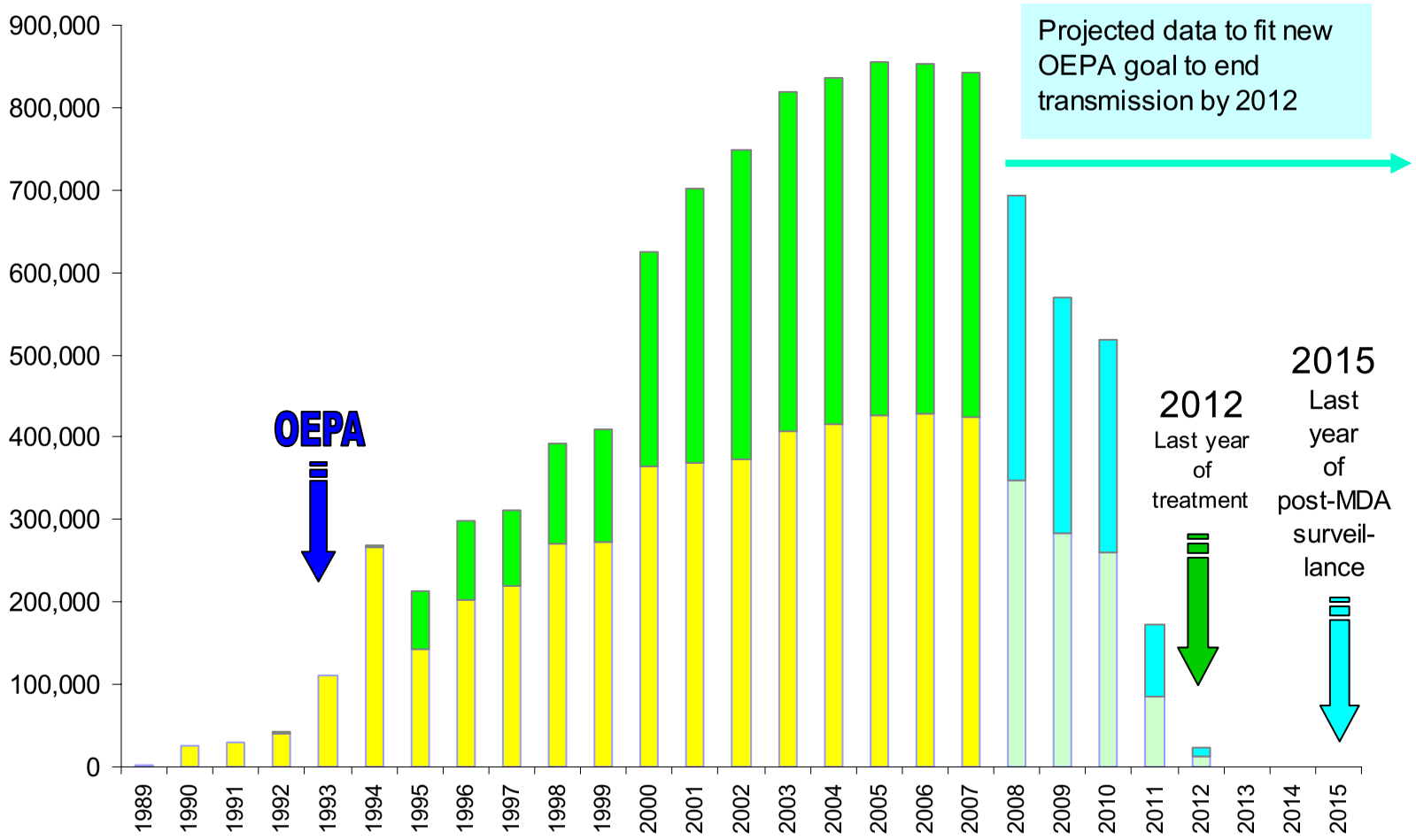


Figure E

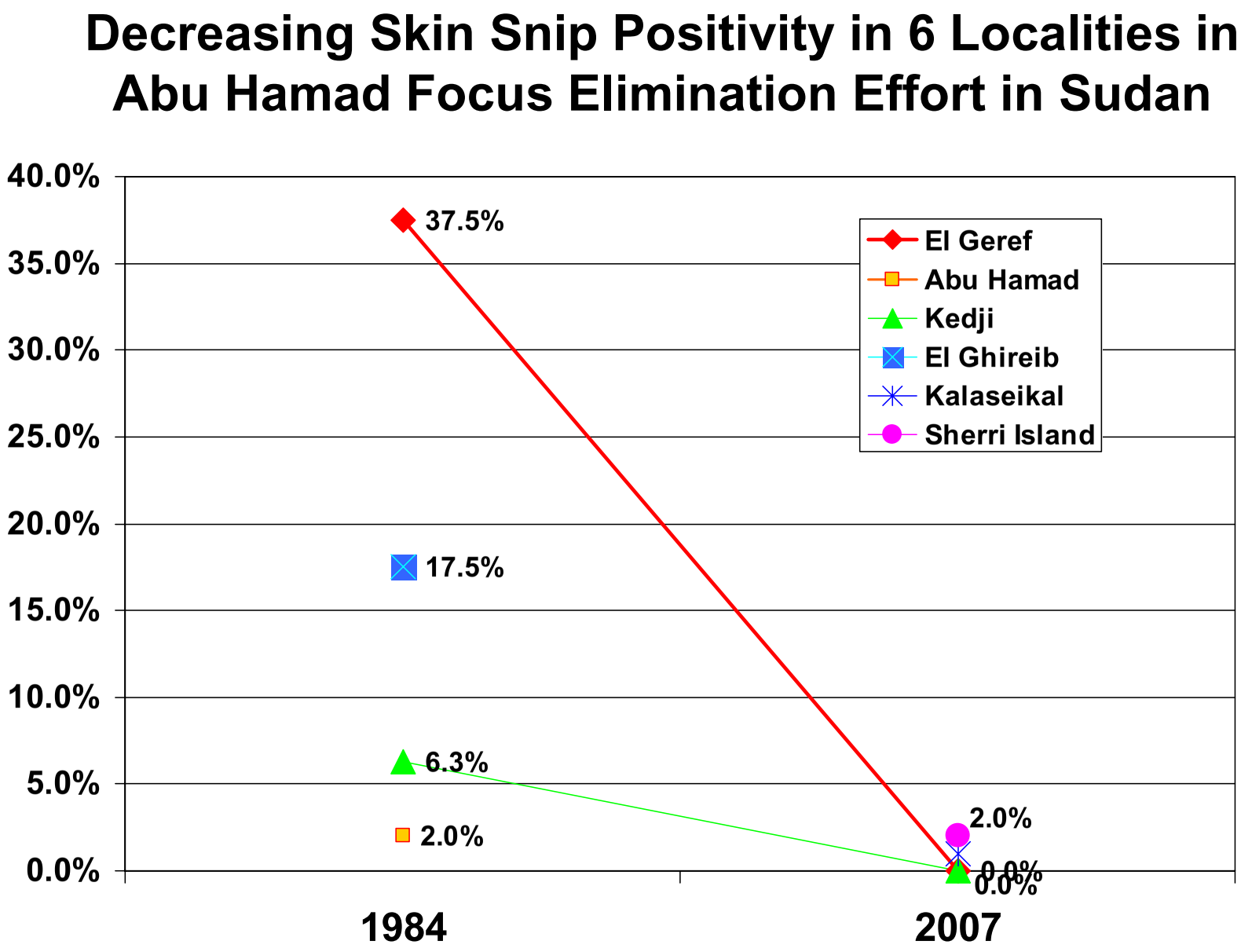
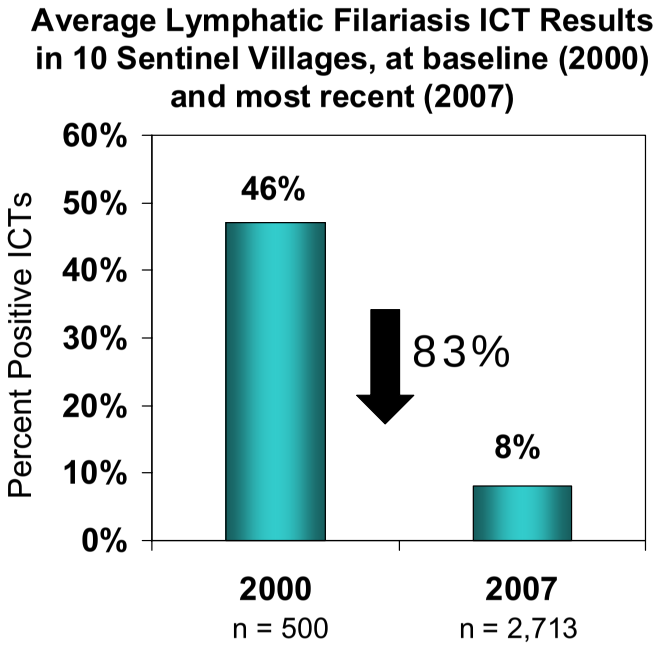
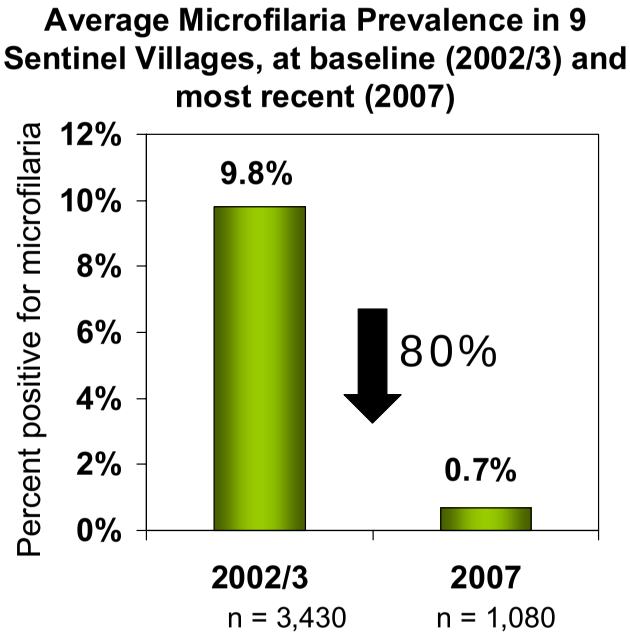
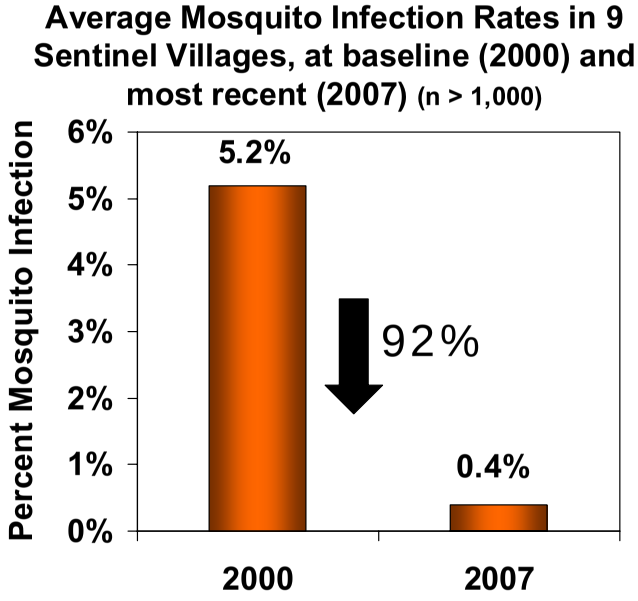

Decreasing Skin Snip Positivity in 6 Localities in Abu Hamad Focus Elimination Effort in Sudan
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
37.5%
17.5%
6.3%
2.0%
2.0%
0.0%
0.0%
1984
2007
El Geref
Abu Hamad
Kedji
El Ghireib
Kalaseikal
Sherri Island

Figure F

Nigeria: Impact on Lymphatic Filariasis*



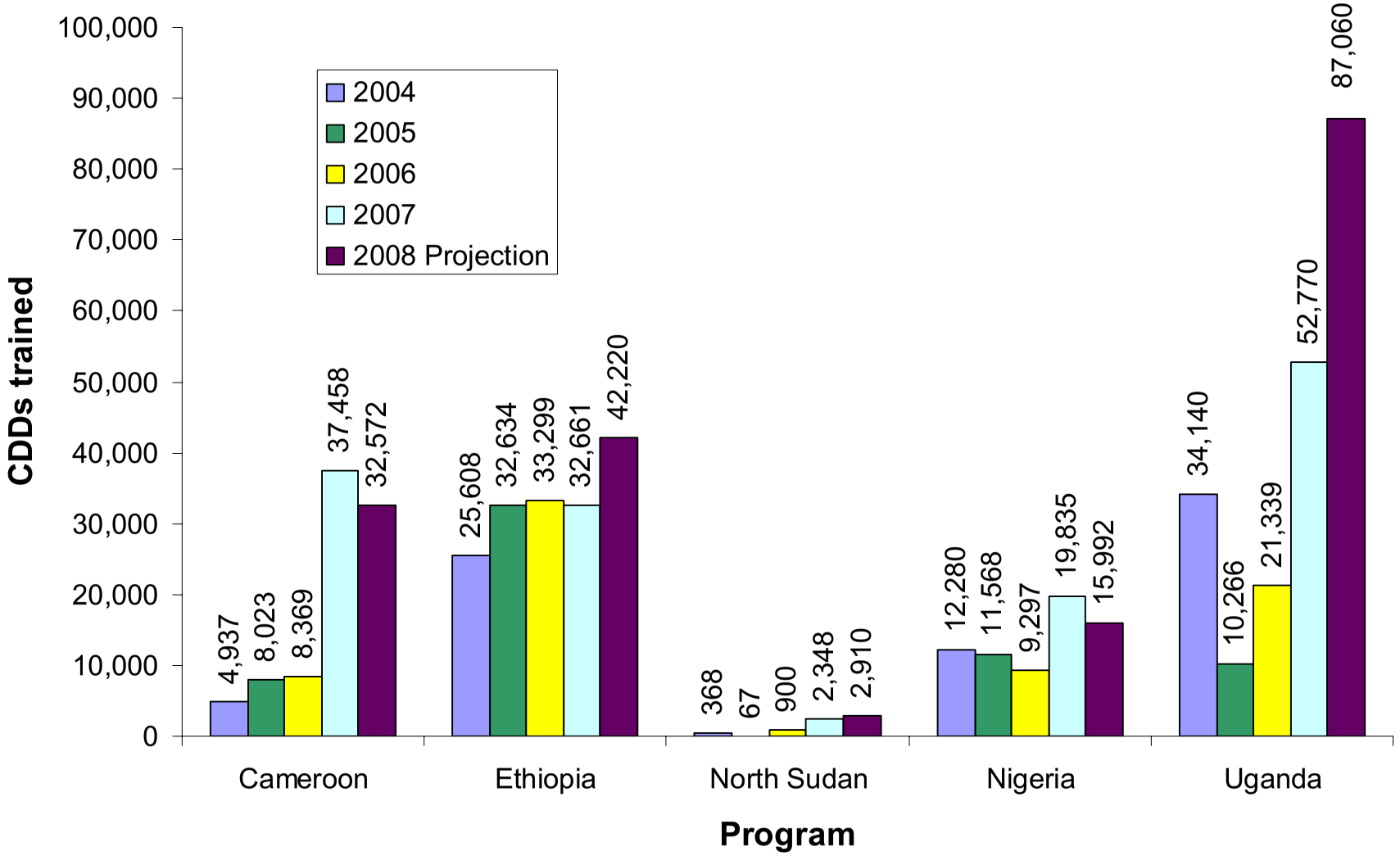




*In Plateau and Nasarawa States

Figure G

Training of Community Directed Distributors (CDDs) for Last Four Years and Projection for 2008



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EXECUTIVE SUMMARY

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. In 2007, the RBP and its partners provided over 12 million Mectizan® treatments (the greatest number since the program launched in 1996), and also reached a fantastic milestone: RBP's 100 millionth (cumulative) Mectizan® treatment! The milestone was celebrated with a commemorative medal, a press release, a website announcement (www.cartercenter.org), and displays at the river blindness statue located at The Carter Center headquarters in Atlanta.

President Carter has described a Mectizan® tablet as "more precious than a diamond of the same size" to those who suffer from river blindness. The commemorative '10^8' (the scientific notation for 100,000,000) medal was awarded to partners and Carter Center staff at the 12th Annual River Blindness Program Review held in Atlanta in February 2008. Included among awardees were the ministries of health (MOHs) of all 11 countries; Merck & Co., Inc; President Carter; John Moores; and President H.E. Girma Wolde Giorgis of Ethiopia. See Frontispiece Figure A for the design of the 100,000,000 treatment medal.

In addition to this achievement, we are pleased to announce that Dr. Donald Hopkins, Vice President of The Carter Center's Health Programs, was nominated by his colleagues and chosen by Merck & Co., Inc., to receive the 2007 Mectizan® Award. Merck & Co., Inc., and the Mectizan® Donation Program (MDP) give the Mectizan® Award to an outstanding contributor in the fight against onchocerciasis and/or lymphatic filariasis. Ms. Brenda Colatrella, Executive Director, HIV Policy & External Affairs, presented the award to Dr. Hopkins on November 14, 2007, at the IACO '07 meeting in Quito, Ecuador. See Frontispiece Figure B for a photograph of Dr. Hopkins and the Atlanta RBP team with the Mectizan® Award.

Human onchocerciasis, caused by the parasite *Onchocerca volvulus,* is an infection by a worm that causes chronic skin and eye lesions. The worms live under the skin in nodules. 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 frequency of treatment per year and the geographic extent of the distribution programs. (See Annex 1 and 6 for further details.)

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

The Carter Center's RBP is dedicated to safe and sustainable distribution of Mectizan® with health education to control or eliminate onchocerciasis. The distinction between control and elimination is important. In the former, Mectizan® distribution will likely need to continue indefinitely because onchocerciasis transmission persists; sustainability of programs is vital and integration with other similar disease control activities is an important element in this scenario. In the latter case (elimination), Mectizan® treatment is used more intensively so that it can eventually be halted when evidence indicates that the parasite population has disappeared. Trying to eliminate onchocerciasis where feasible is an important goal of the RBP, and current RBP elimination efforts include all six countries in the Americas and designated foci in Uganda and Sudan.

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 through their SightFirst Initiative to The Carter Center for the control of RB and trachoma. 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, until 2005, Uganda) and eliminating RB altogether in the six endemic countries of the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela). Under the new SightFirst II Initiative, LCIF continues to partner with The Carter Center for blindness programs in Ethiopia.

In 2003, The Carter Center's RBP received its first support from the Bill & Melinda Gates Foundation 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 provided support to The Carter Center's integrated programs (that include RB) in Nigeria. Other 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).

The RBP hosted its twelfth annual Program Review on February 6 - 8, 2008, at The Carter Center in Atlanta. The meeting focused on providing recommendations for each program after determining progress, impediments and problems in 2007 treatment activities and implementation. The review is modeled after similar reviews developed by The Carter Center and CDC for national Guinea Worm Eradication Programs, beginning with Pakistan in 1988.

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

Program Review participants included the following: Carter Center country representatives Dr. Albert Eyamba (Cameroon), Mr. Teshome Gebre (Ethiopia), Ms. Peace Habomugisha (Uganda), and Dr. Emmanuel Miri (Nigeria). Dr. Mauricio Sauerbrey, director of the OEPA, presented progress made in the six endemic countries in the Americas. Other technical staff members included Dr. Abel Eigege and Dr. Emmanuel Emukah (Nigeria); and Dr. Estifanos Biru and Mr. Getachew Temeche (Ethiopia). MOH representatives included Mr. Thomas Lakwo (Uganda), Dr. Mkpouwoupieko Salifou (Cameroon), Dr. A. Ngozi Njepuome (Nigeria), Dr. Tadesse Zerihun (Ethiopia) and Drs. Kamal Hashim Osman and Tong Chor Malek Duran (Sudan). Special guests included Honorable Dr. World Laureate Tebebe Y. Berhan (Lions – Ethiopia); Mr. Philip Albano (Lions Clubs International Foundation); Dr. Julie Jacobson and Ms. Erin Shutes (Bill & Melinda Gates Foundation); Dr. Adrian Hopkins, Dr. Yao Sodahlon, and Dr. Kisito Ogoussan (Mectizan® Donation Program); Dr. Uche Amazigo (Director of APOC); Ms. Jessica Rockwood (Development Finance International); Mr. Kenneth Gustavsen (Merck & Co., Inc.); Ms. Barbara Saunders (The Arthur M. Blank Family Foundation); Mr. Thomas Soerensen (Vestergaard Frandsen); and Ms. S. Eliza Petrow (Izumi Foundation). Dr. Frank Richards (Director of The Carter Center's Malaria, RB, Lymphatic Filariasis and Schistosomiasis Programs) chaired the meeting. (See Frontispiece Figure C for the photo from this meeting and Annexes 3, 4 and 5 for a complete participant list, contact list, and agenda.)

A major focus of The Carter Center is routine monthly reporting by assisted programs. The reader is referred to Annex 6 for a discussion of The Carter Center reporting process and treatment indices used by the program and in this report. Important terms include the number of treatments provided (TX); the Ultimate Treatment Goal (UTG); UTG(2), as used by elimination programs where semiannual treatments are delivered; Annual Treatment Objectives (ATOs); and full coverage, which is defined as 85% achievement of the UTG established in active treatment villages, or, for elimination programs, 85% of the UTG(2). 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. Hypoendemic villages receive mass treatment (not passive) in elimination programs.

Summary of the Meeting

In 2007, MOHs in Carter Center-assisted areas provided 12,425,818 mass Mectizan® treatments for onchocerciasis in active treatment villages (Figures 1 and 2), and over a half million (559,478) passive treatments in hypoendemic areas. This represented a 10% increase from the total of 11,301,304 treatments in 2006. This large increase is mainly due to expanding twice-per-year treatment efforts in new elimination efforts in Uganda and Sudan. Treatments constituted 96% of the UTG in the assisted areas (Figure 3), and brought the cumulative number of treatments assisted by the program since its inception in 1996 to 101,999,340. About 42% of treatments were provided in Nigeria (Figure 4). About 85% of treatments (all but Uganda) were supported by LCIF.

Americas: The Onchocerciasis Elimination Program for the Americas (OEPA) assists all six endemic countries to eliminate eye disease and interrupt transmission of river blindness. In the thirteen endemic foci for river blindness in the Americas, 843,095 treatments were assisted in 2007, 95% of their goal. This is a slight decrease from 2006, which reflects that the Santa Rosa focus of Guatemala is no longer treating, because that focus has halted transmission. Further reduction in treatment numbers is expected in 2008 as Lopez de Micay (Colombia), Escuintla (Guatemala), Northern Chiapas (Mexico) and the Rio Santiago subfocus (Ecuador) also have declared that transmission has ceased and will halt treatments. See OEPA section of this document for more details.

Cameroon: A total of 1,650,198 persons in North and West Provinces received Lions-Carter Center-assisted mass treatment in 2007, for 92% of the UTG. Vitamin A distribution integrated into the system of community-directed treatment with ivermectin continued, and 270,027 treatments with supplements in 2007 were delivered.

Ethiopia: The Lions-Carter Center partnership, working in eight of the ten endemic zones in Ethiopia, helped treat 2,883,468 persons (93% of the 2007 UTG, and a 13% increase over 2006). The Center purchases and helped to distribute 746,924 LLIN in RBP-assisted areas in 2007 as part of the new Carter Center assistance to Ethiopia's Malaria Control Program.

Nigeria: Over half of the 100 million Mectizan® treatments the Carter Center has assisted since 1996 were in Nigeria. In 2007, 4.9 million mass treatments were assisted in this country, 98% of the UTG. In Plateau and Nasarawa States, the RBP is integrated with the Lymphatic Filariasis (LF) program (with funding from the Bill & Melinda Gates Foundation and GlaxoSmithKline), which assisted in 3,414,800 combined treatments with Mectizan® and albendazole (93% of its UTG). In addition, 202,941 praziquantel treatments for schistosomiasis, 96,270 government-donated insecticide treated nets, and 534,770 Vitamin A supplements to young children were provided. Two of the seven Carter Center-assisted states in the southeast are beginning an integrated malaria/LF program and presented plans for distribution of 200,000 long-lasting insecticidal nets.

The urinary schistosomiasis program in Plateau, Nasarawa, and Delta States, funded in part by the Izumi Foundation, reached its one millionth cumulative treatment in 2007, since beginning in 1999. The WHO will provide over 1.5 million tablets per year for the next several years to the Plateau Nasarawa program beginning in 2008, and we anticipate quadrupling the number of treatments assisted by this program in 2008. The praziquantel is part of a very large donation to WHO by Merck KGaA (E-Merck), Germany.

Sudan: Sudan's Khartoum office reported 199,599 treatments in 2007, a 75% increase over 2006 and UTG coverage of 92%. Like Uganda, Sudan has shifted to a semiannual treatment approach to eliminate river blindness once and for all from the Abu Hamad focus on the River Nile.

Uganda: The RBP in Uganda assisted in 1,945,986 Mectizan® treatments in 2007, 97% of their UTG, and an incredible 87% increase over 2006 treatments due to the shift in government policy to an elimination approach in several isolated foci using twice-per-year treatments and vector control with Abate® larvicide. Vitamin A distribution integrated with RBP Mectizan® distribution resulted in 35,835 supplements in our assisted areas in 2007.

GENERAL 2008 RECOMMENDATIONS FOR THE CARTER CENTER'S RIVER BLINDNESS PROGRAM

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, The Carter Center cannot invest in integration efforts with other diseases unless we first obtain formal Carter Center Board of Trustees approval and adequate funding to participate.

All Carter Center-assisted programs active in Vitamin A supplementation (VAS) have been challenged by the need to deliver VAS every six months, VAS supply chains, and other NGOs or agencies delivering Vitamin A. Above all we seek safety, by providing optimal spacing of VAS, when two annual rounds of VAS are planned. The Carter Center will provide VAS if distribution can be simultaneous with Mectizan® distribution, but it cannot provide financial support for separate rounds of VAS or distribution in areas where we are not already assisting Mectizan® distribution. The Carter Center's priority is Mectizan® distribution, and it cannot hold up Mectizan® distribution if VAS supplies are not readily available or if another VAS round has been given within the six month period.

Carter Center-assisted projects should continue to:

Refine government and Carter Center funding figures in 2008, including any additional funds coming in from APOC. We will monitor trends for increased funding, especially as they relate to how The Carter Center might be asked to fill the 'post APOC funding gap.'

Refine epidemiological indices more precisely where we have launched elimination efforts in Africa (Sudan and Uganda). More work is needed to operationally define and then delimit the precise borders of the isolated foci targeted for elimination.

Encourage the WHO (APOC, PAHO) to assist us in evaluating cross border issues in our assisted elimination programs. Some of these issues need to be addressed in ministerial meetings on cross border health issues.

Continue to develop antigen detection tests for use in OEPA, Uganda, and possibly Nigeria, in collaboration with Scripps Research Institute.

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

Work towards a target of a minimum 1 CDD to 100 population ratio in our assisted African programs. Seek to increase training, supervision, involvement of kinship groups, and improve gender balance among CDDs, as appropriate. CDD training and CDD retraining needs to be expressed in relation to annual training goals.

Publish results of programmatic improvement resulting from conversion to the kinship strategy. Conduct new research to measure costs and supervisory demands of conversion to the kinship strategy where this transition is occurring.

Complete analysis and report of the Imo-Abia Post APOC, Post-NGDO study in Nigeria. Consider writing a report of the Uganda and Cameroon Post APOC, Post-NGDO studies.

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

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

Treatment Objective for 2008 for onchocerciasis: 13,442,586 treatments.

Training Objective for 2008: CDDs (225,839) and community supervisors (38,345).

Figure 1

2007 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	% ALL TX
NIGERIA	***UTG=**	**4,980,653**		**UTG(arv)=**	**7,917**										
Treatments	0	68,155	108,192	175,307	498,688	685,081	911,434	926,127	732,762	404,900	318,885	73,941	**4,903,472**	98%	39%
Villages treated	0	50	157	247	662	1,098	1,522	1,536	1,252	643	479	228	**7,874**	99%	27%
UGANDA	***UTG=**	**833,736**		**UTG(arv)=**	**1,397**										
Treatments		0	0	66,914	227,023	140,534	100,883	105,403	65,135	48,805	38,293	5,000	**797,990**	96%	6%
Villages treated		0	0	221	465	373	320	151	140	68	38	13	**1,789**	128%	6%
UGANDA ELIM.	****UTG(2)=**	**1,197,632**		**UTG(arv)=**	**1,697**										
Treatments		0	0	419,996	150,969	0	0	0	0	158,273	418,758	0	**1,147,996**	96%	9%
Villages treated		0	0	1,363	482	0	0	0	0	393	1,316	0	**1,664**	98%	6%
CAMEROON	***UTG=**	**1,790,427**		**UTG(arv)=**	**3,631**										
Treatments	0	0	0	0	0	0	296,632	998,501	177,741	177,324	0	0	**1,650,198**	92%	13%
Villages treated	0	0	0	0	0	0	762	2,275	239	355	0	0	**3,631**	100%	12%
OEPA	****UTG(2)=**	**891,484**		**UTG(arv)=**	**1,808**										
Treatments	0	0		0	0	423,944	0	0	0	0	0	419,151	**843,095**	95%	7%
Villages treated	0	0		0	0	1,734	0	0	0	0	0	1,721	**1,728**	96%	6%
ETHIOPIA	***UTG=**	**3,110,238**		**UTG(arv)=**	**13,046**										
Treatments		0	0	0	0	153,583	1,703,475	655,087	370,480	843	0	0	**2,883,468**	93%	23%
Villages treated		0	0	0	0	571	8,066	3,046	2,655	6	0	0	**14,344**	110%	49%
SUDAN	***UTG=**	**72,432**		**UTG(arv)=**	**375**										
Treatments	0	0	0	0	0	0	23,647	0	0	21,234	19,273	0	**64,154**	89%	1%
Villages treated	0	0	0	0	0	0	31	31	31	123	143	0	**359**	96%	1%
SUDAN ELIM.	****UTG(2)=**	**145,230**		**UTG(arv)=**	**89**										
Treatments	0	0	0	0	0	0	0	0	0	63,917	0	71,528	**135,445**	93%	1%
Villages treated	0	0	0	0	0	0	0	0	0	89	0	89	**89**	100%	0%
TOTALS	***UTG=**	**13,021,832**		**UTG(arv)=**	**29,960**										
Treatments	**0**	**68,155**	**108,192**	**595,303**	**649,657**	**1,262,608**	**2,911,541**	**2,643,632**	**1,280,983**	**812,868**	**809,171**	**564,620**	**12,425,818**	**95%**	
V illages treated	**0**	**50**	**157**	**1,610**	**1,144**	**1,098**	**2,284**	**3,811**	**1,491**	**1,480**	**1,795**	**2,038**	**29,330**	**98%**	

Cumulative RBP-assisted treatments (1996 - 2007) = 101,999,340

2007 Mass Treatments	12,425,818
2007 Passive Treatments	559,478
2007 TOTAL TREATMENTS	**12,985,296**

***UTG**: Ultimate Treatment Goal

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

Figure 2

Carter Center-Assisted Programs: Annual Mectizan® Treatments, 1996 - 2007

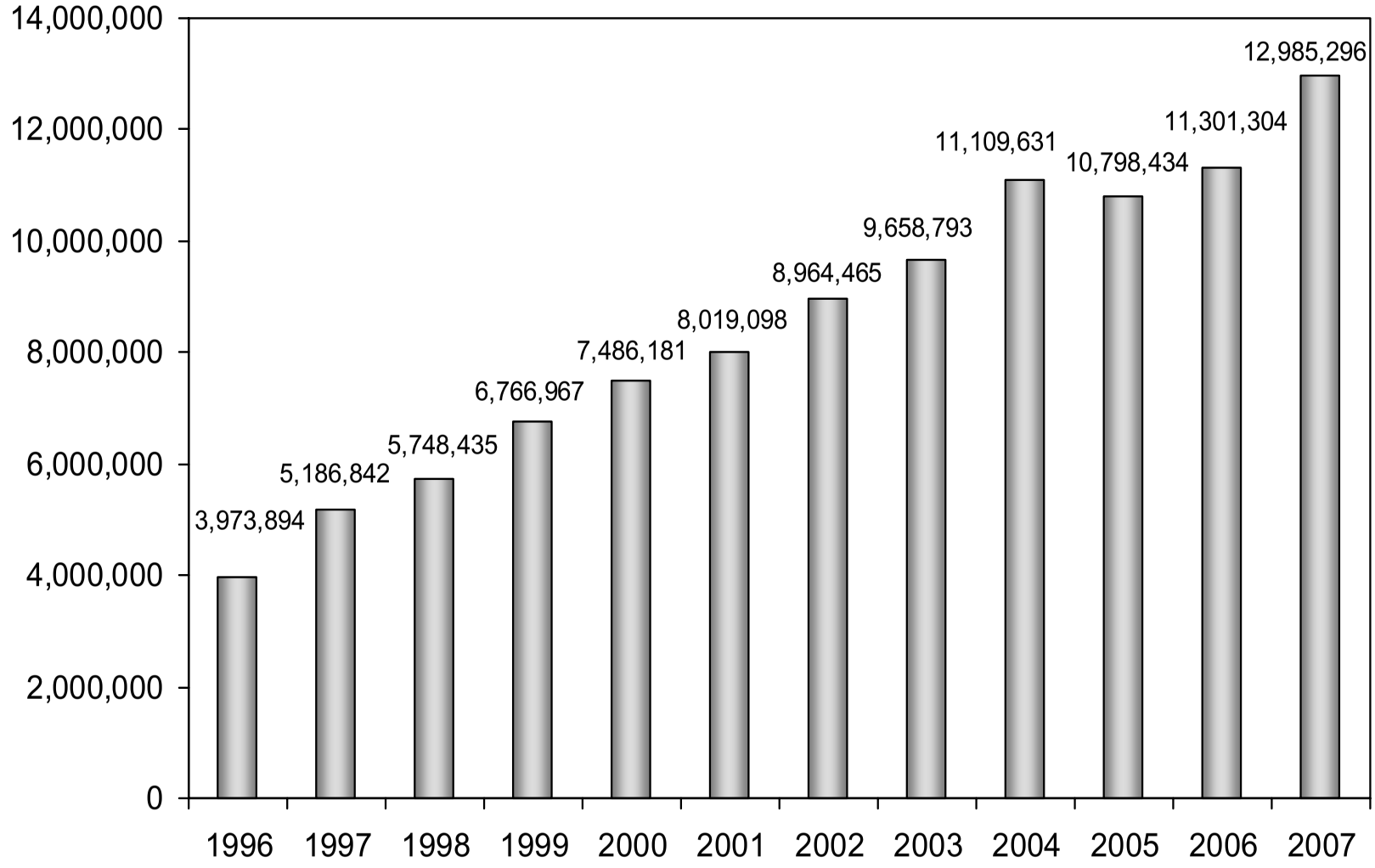


Figure 3

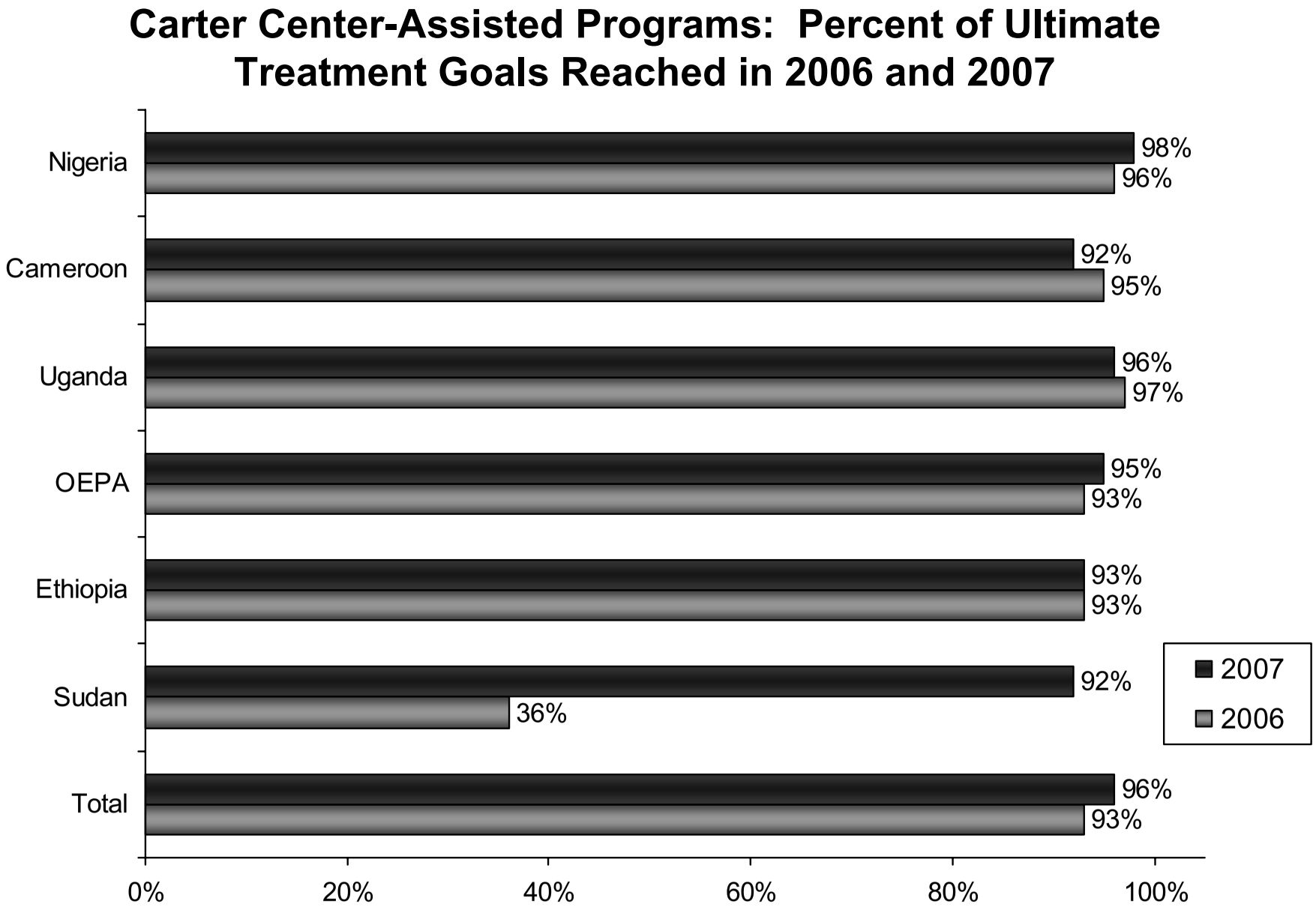
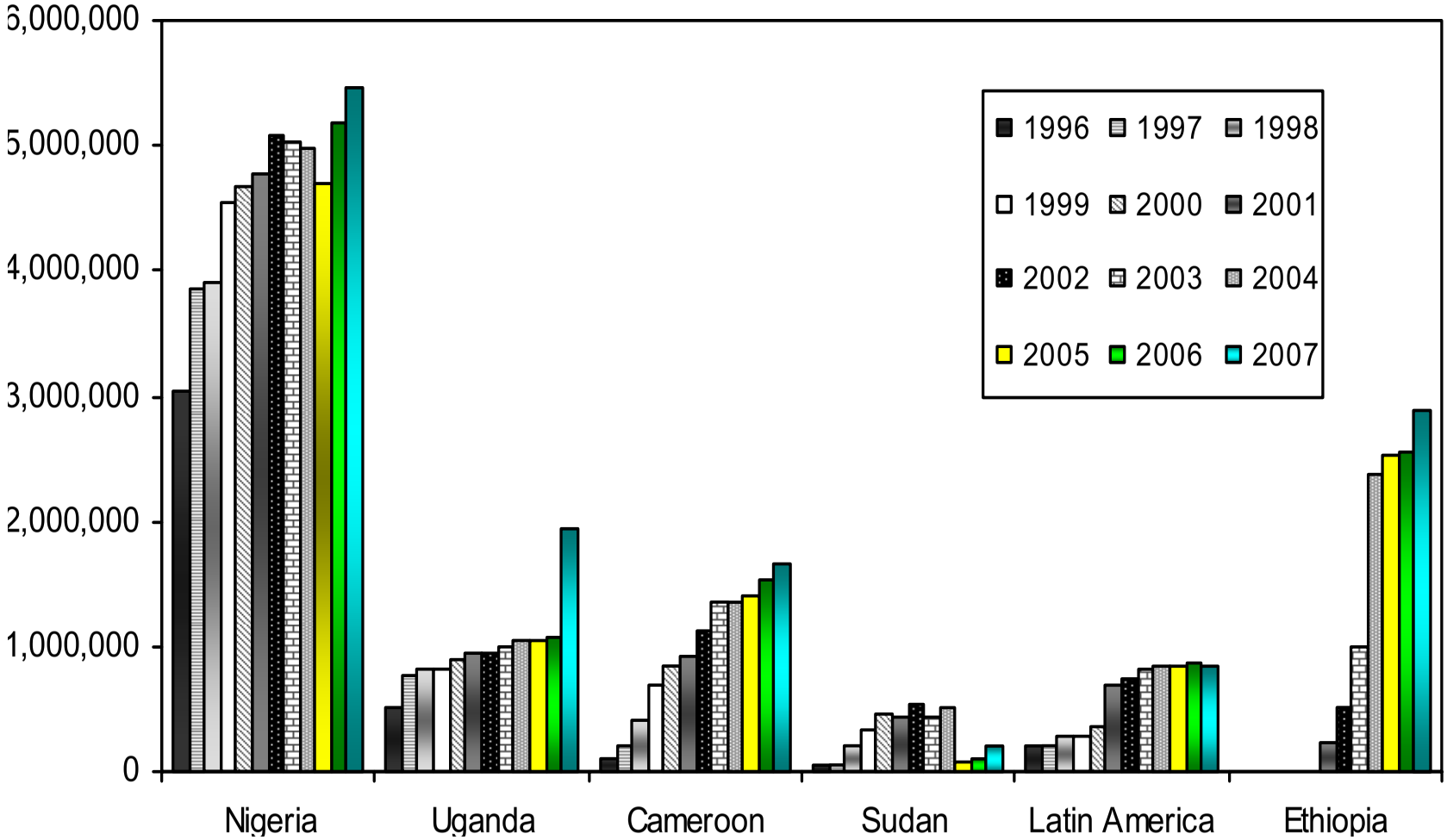

Carter Center-Assisted Programs: Percent of Ultimate Treatment Goals Reached in 2006 and 2007
Nigeria
98%
96%
Cameroon
92%
95%
Uganda
96%
97%
OEPA
95%
93%
Ethiopia
93%
93%
Sudan
92%
36%
Total
96%
93%
2007
2006
0%
20%
40%
60%
80%
100%

Figure 4

Carter Center-Assisted Programs: 1996 - 2007 Mectizan® Treatments by Program



ONCHOCERCIASIS ELIMINATION PROGRAM FOR THE AMERICAS (OEPA)

The Onchocerciasis Elimination Program for the Americas (OEPA) is a regional initiative working to eliminate both morbidity and transmission of onchocerciasis from the Americas through semi-annual (i.e., every six months) distribution of Mectizan® in the endemic areas of the region (Figure 5). The initiative began 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 OEPA coalition includes ministries of health (MOHs) of the six countries with onchocerciasis in the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela), The Carter Center, Lions Clubs and the Lions Clubs International Foundation (LCIF), 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 the OEPA staff, who are based in Guatemala City. The Carter Center coordinates technical and financial assistance to the six countries through the OEPA office.

Treatments

The OEPA strategy is to help the six national onchocerciasis elimination programs provide mass treatment with ivermectin twice per year, while reaching at least 85% treatment coverage. Mass treatment is sustained until onchocerciasis transmission is interrupted. The total number of people in the region (445,742) eligible for ivermectin treatment (the UTG) in 2007 was determined using information from censuses conducted during the second treatment round of 2006 in each endemic community. Since the goal is to provide ivermectin treatment twice a year, treatment coverage was calculated as the total number of treatments delivered during the year divided by twice the UTG (the UTG(2)), or 891,484 treatments. These ivermectin treatments are distributed among the endemic countries according to need in the following order: Guatemala (38%), Mexico (32%), Venezuela (22%), Ecuador (5%), Brazil (2%), and Colombia (1%). See Figures 6 and 7 for more details on treatments.

In 2007, the 12 foci that remain under treatment surpassed the 85% coverage in both treatment rounds, distributing a total of 843,095 (95%) treatments out of the UTG(2) of 891,484. The Santa Rosa focus in Guatemala (the 13th focus in the Americas) stopped treatment activities beginning in 2007 after the MOH of Guatemala concurred with the conclusion of the PCC that onchocerciasis transmission had been interrupted there. That conclusion was based on a 2004-2005 study of entomological, ophthalmologic and serological field studies completed by the MOH, CDC and OEPA. The MOH decided, therefore, to halt ivermectin treatments in that focus in 2007, and maintain a post-treatment surveillance program there for at least three years.

Important milestones accomplished in 2007:

The vision of the OEPA initiative is that one day onchocerciasis will be completely eliminated from the Americas and that ivermectin mass distribution programs can cease

to operate. The first step in realizing this vision came when treatment was halted in the Santa Rosa focus. In a review of data at PCC meetings held in June and November of 2007, further recommendations were made to the ministries of health of Colombia, Guatemala, Mexico and Ecuador to halt Mectizan® treatments in 2008 in Lopez de Micay, Escuintla, North Chiapas and (the subfocus) Rio Santiago in Esmeraldas focus, respectively. The ministries of health subsequently accepted these recommendations. Suspension of treatment in Lopez de Micay means Colombia will be the first country within the region to have achieved country-wide interruption of transmission. Post-treatment surveillance for resurgence of onchocerciasis transmission is needed for at least three years, in accordance with WHO onchocerciasis certification guidelines, before onchocerciasis can be declared eliminated.

Country specific information:

Brazil's endemic population resides in a vast area (the Amazonas–Roraima focus) which is continuous with Venezuela's South focus. The entire binational endemic zone, which is called the 'Yanomami Area,' has a combined UTG(2) of 26,858. Brazil provided 14,862 treatments in 2007, 93% of its UTG(2) of 16,040. Brazil has surpassed the 85% treatment coverage goal for the seventh consecutive year. In contrast, on the Venezuelan side, the poorly accessible South focus in the Yanomami area has only been able to reach its coverage goal for two consecutive years, giving 10,184 treatments, which is 94% of its UTG(2) of 10,818 in 2007. The South focus provided 4,869 (90%) treatments during the first round and 5,315 (98%) during the second. Overall, the Yanomami Area reached 93% of its UTG(2), with 25,046 treatments of 26,858.

Colombia has a single endemic focus (López de Micay, Cauca). Its program provided 2,232 treatments in 2007, which is 93% of its UTG(2) of 2,410. Colombia exceeded the treatment coverage goal for the ninth consecutive year. Based on a conclusion by the PCC that transmission has been interrupted in Colombia, the Ministry of Social Protection resolved to halt ivermectin treatment in 2008, and begin the three year post-treatment epidemiological surveillance period for disease recrudescence required prior to declaration of parasite elimination.

Ecuador has a single endemic focus in Esmeraldas Province (the Esmeraldas–Pichincha focus). The program achieved a treatment coverage of >85% for the seventh consecutive year, providing 42,112 treatments, which is 97% of the UTG(2) of 43,598. The Ecuadorian Onchocerciasis Program, also following a recommendation by OEPA's PCC, resolved to suspend treatment in the Río Santiago sub-focus starting January 2008 (Figure 8).

Guatemala has four endemic foci: the Central endemic zone, Huehuetenango (bordering the Southern Chiapas focus in Mexico), Escuintla/Guatemala and Santa Rosa. Santa Rosa has been under post-treatment epidemiological surveillance since January 2007. In the other foci of the country the program surpassed the coverage goal for the sixth consecutive year by providing 320,112 ivermectin treatments in 2007,

which is 94% of a UTG(2) of 339,976. In 2007, the PCC concluded that onchocerciasis transmission was interrupted in the Escuintla/Guatemala focus and the Guatemalan Ministry of Health decided to halt treatment there in 2008 and begin the three-year post-treatment epidemiological surveillance.

Mexico has three endemic foci (Oaxaca, Northern Chiapas and Southern Chiapas) where >85% coverage was achieved for the seventh consecutive year with 273,897 treatments, which is 95% of the UTG(2) of 289,266. Mexico has also been providing ivermectin quarterly in 50 of its most highly endemic communities in the Southern Chiapas focus since 2003, in a trial aimed at hastening onchocerciasis elimination. In 2007, the PCC concluded that onchocerciasis transmission was interrupted in the Northern Chiapas focus. The Mexican Ministry of Health agreed to stop ivermectin treatment in 2008, beginning the three-year post-treatment epidemiological surveillance.

Venezuela has three endemic foci: North Central, Northeast and South (the latter being part of the Yanomami Area discussed above under Brazil). The North Central and Northeast foci reached their treatment coverage goals for the fifth consecutive year. Overall, Venezuela provided 189,880 treatments, which is 95% of the UTG(2) of 200,194. Since the South focus of Venezuela is contiguous with the Brazilian focus, interruption of transmission in both countries was threatened by the failure to reach good coverage in southern Venezuela. To sustain the success in this very remote area, it has been important to implement and fully fund the Venezuelan Government's "Yanomami Health Plan" which provides for the air transport and critical on-ground infrastructure needed to deliver ivermectin treatments as part of an integrated essential health care package. Ongoing discussions and cooperation between Brazil and Venezuela are also key to the success of the attack on onchocerciasis transmission in the Yanomami Area.

IACO 2007

The seventeenth annual Inter-American Conference on Onchocerciasis (IACO'07) was convened November 15-17 by the Ministry of Health of Ecuador, OEPA, and PAHO, with support from the Bill & Melinda Gates Foundation and Lions Clubs in Quito, Ecuador. The meeting was attended by 76 persons, including 30 Ecuadorian field workers active in the national onchocerciasis elimination program. Also represented at the meeting were the directors of the six national onchocerciasis elimination programs (Brazil, Colombia, Ecuador, Guatemala, Mexico and Venezuela), members of Lions Clubs from all six countries (See Figure 9, and PAHO Washington Headquarters. Dr. Ricardo Cañizares, Sub secretary, Ministry of Health, Ecuador, opened the meeting.

The theme of IACO 2007 was 'The Beginning of a New Era.' The New Era was reflected in decreasing numbers of countries, foci and people under ivermectin treatment in the region. After the success in Colombia, there are now five endemic countries under treatment (Brazil, Ecuador, Guatemala, Mexico and Venezuela). The total number of foci under treatment in the region dropped from 13 in 2006 to 12 in 2007 to 9 in 2008. Similarly, the UTG(2) in the region has decreased from 913,606 in 2006 to

891,484 in 2007; in 2008 the UTG(2) is 693,356. The New Era also involves new responsibilities for rigorous post-treatment monitoring evaluations. Ministries of health will require technical, financial and political assistance from CDC, OEPA, and PAHO to help them assure that there will be no resurgence of onchocerciasis in these areas after treatment has been halted. A three year post-treatment surveillance period has been recommended in the WHO onchocerciasis certification guidelines prior to the declaration that the parasite has been 'eliminated' from a focus.

Status of Ocular Morbidity in the Region

The OEPA initiative was launched in response to a PAHO resolution which called for the elimination of all new ocular morbidity caused by onchocerciasis by the year 2007. In 2007, based on recent ophthalmologic assessments in sentinel and extra-sentinel areas, it was reported that 9 of the 13 foci have achieved the goal of elimination of new ocular morbidity (defined as <1% prevalence of microfilariae in the cornea and/or anterior chamber of the eye). The four foci that have not yet met the ocular morbidity elimination goal are Northeast Venezuela, North Central Venezuela, and the two cross-border foci of the Yanomami Area. See Figure 10 for more detail.

Status of Transmission in the Region

At the present time, active transmission is believed to be ongoing in six foci (Brazil, Ecuador, the Central endemic zone of Guatemala, and all three foci in Venezuela,). In the other three foci, (Oaxaca and the South Chiapas in Mexico and Huehuetenango in Guatemala) transmission has been suppressed (Figure 11). These foci are currently the subject of epidemiological and entomological evaluations, the data from which will be considered by the PCC for possible recommendation for treatment withdrawal by next year. Based on the progress being made, and the projections for transmission interruption in each remaining focus, IACO 2007 declared 2012 as the last expected year for ivermectin treatments in the Americas, with 2015 being the last expected year for post-treatment surveillance. See Frontispiece Figure D for a depiction of the projected diminishing treatments to be required in the Americas through 2012.

The Need for a New Resolution from PAHO

A new PAHO resolution for onchocerciasis is needed as soon as possible since the 1991 PAHO resolution is now outdated. OEPA staff are working with PAHO to submit a progress report on the initiative to PAHO/WHO's Directing Council during its annual meeting in September 2008. It is hoped that the Directing Council will announce a new formal resolution calling for complete interruption of new onchocerciasis related eye disease and transmission by the Year 2012. Such a resolution is key to maintaining the political support that sustains the OEPA initiative. The new goal for halting eye disease and transmission by 2012 also will be part of the PAHO 2008-2012 Regional Eye Health Plan.

2008 RECOMMENDATIONS for OEPA

Provide a report of progress to PAHO's Directing Council, and work for inclusion of OEPA goals in the 2008-2012 Regional Plan for Eye Health. Obtain a new resolution to complete interruption of transmission and morbidity elimination by the end of 2012.

Encourage strengthening of the health infrastructure in Yanomami focus (shared between Venezuela and Brazil).

Address cross border issues, with PAHO assistance in joint ministerial meetings. The Yanomami focus is the most important in this regard.

Work to update the 13-foci table, particularly adding Annual Transmission Potential (ATP) and mathematical transmission modeling results.

Collect needed data to allow the PCC to make recommendations on whether to stop treatments in Oaxaca (Mexico) and Huehuetenango (Guatemala).

Set up and implement recrudescence monitoring plans for foci where treatments have been stopped: Santa Rosa and Escuintla (in Guatemala), N. Chiapas (Mexico), Rio Santiago (Ecuador), and Colombia.

Publish results of certification exercises from Escuintla (Guatemala), N. Chiapas (Mexico), Rio Santiago (Ecuador), and Colombia.

Assist in the analysis of the four times-per-year treatment study conducted in Chiapas (now in the laboratory, data entry, and analysis phase).

Work with CDC and others to develop the use of doxycycline as an anti-*Wolbachia* treatment in Guatemala or elsewhere.

Continue to develop antigen detection tests in collaboration with Scripps Research Institute.

Work with the Ministry of Health and CDC (using recently updated census data) to suppress transmission as soon as possible in the central endemic zone of Guatemala.

Maintain CDC, University del Valle/Guatemala, and University of Southern Florida (Tom Unnasch) lab involvement, particularly in serology, nodule histology, molecular entomology, modeling and drug studies.

Promote cross fertilization between OEPA and the Uganda onchocerciasis elimination program.

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

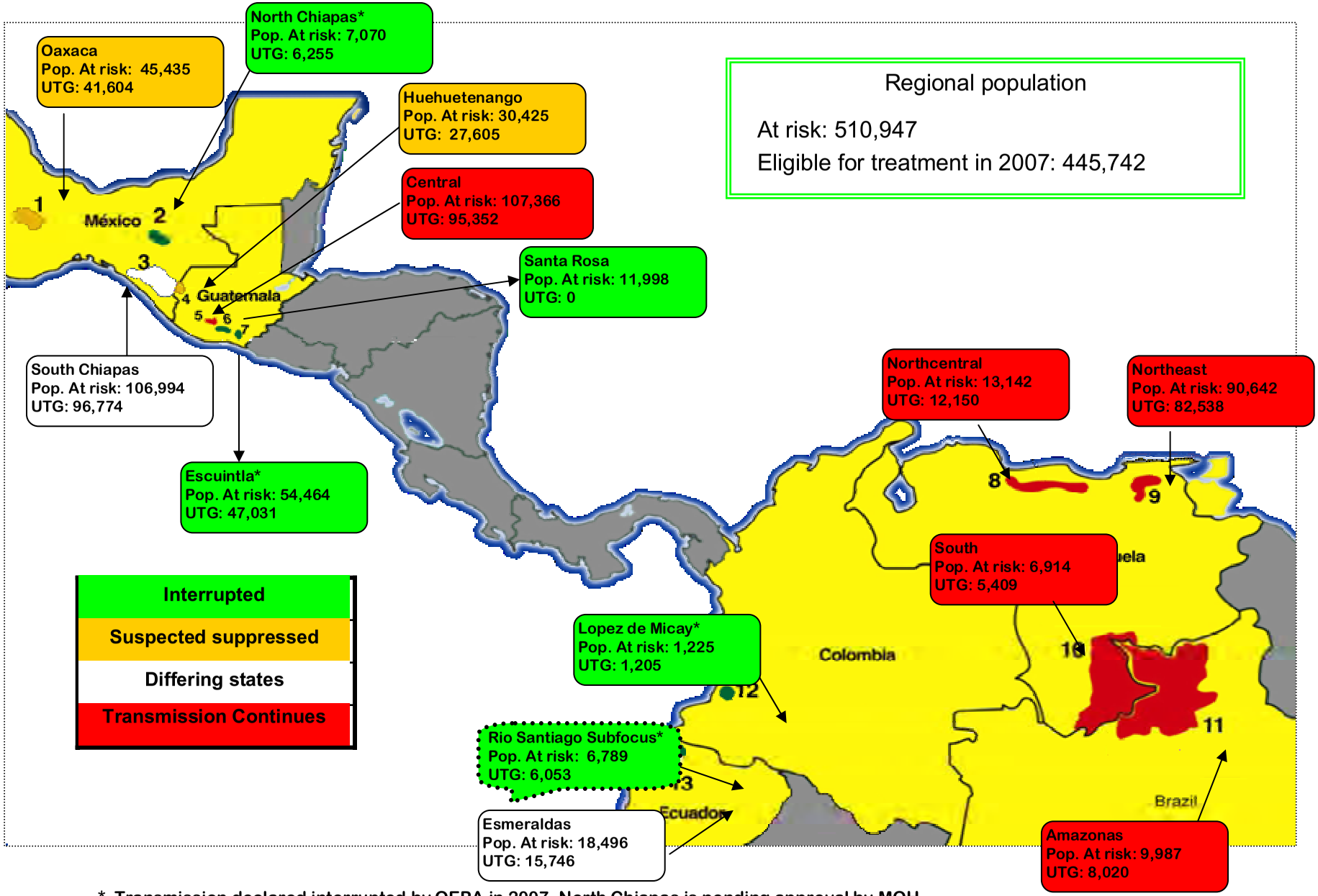
Promote routine community surveys for validating the level of community involvement, health education, training and coverage.

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

Treatment Objective for 2008 (UTG(2)): 693,356 treatments.

Figure 5

OEPA: 13 Onchocerciasis Foci



* Transmission declared interrupted by OEPA in 2007. North Chiapas is pending approval by MOH.
UTG: Ultimate Treatment Goal, or eligible persons for twice-per-year treatment in endemic areas.

Figure 6

OEPA: Treatments with Mectizan® in the Americas 1989-2007

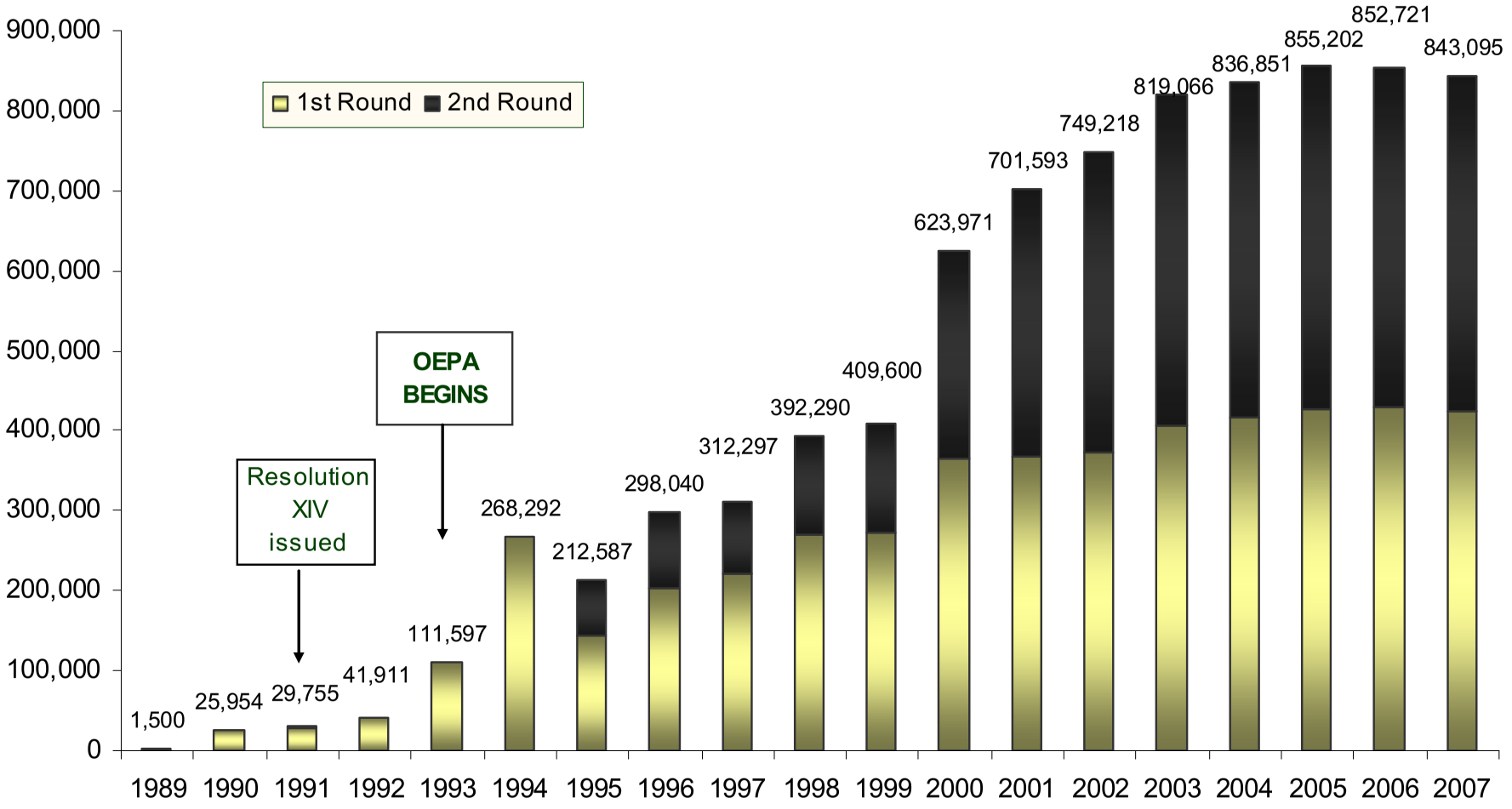


Figure 7

OEPA: Carter Center-Assisted Treatments in the Americas by focus, 2007

Focus	Communities	Pop. at risk	Eligible Pop. (UTG)	Pop. treated 1st Rd	Treatment coverage %	Pop. treated 2nd Rd	Treatment coverage %	UTG(2)	Treated UTG(2)	Coverage UTG(2)
Amazonas-BRA	17	9,987	8,020	7,313	91%	7,549	94%	16,040	14,862	93%
Lopez de Micay-COL	1	1,225	1,205	1,081	90%	1,151	96%	2,410	2,232	93%
Esmeraldas-ECU	119	25,285	21,799	20,884	96%	21,228	97%	43,598	42,112	97%
Escuintla-GUA	117	54,464	47,031	45,043	96%	45,617	97%	94,062	90,660	96%
Central -GUA	321	107,366	95,352	88,669	93%	88,206	93%	190,704	176,875	93%
Huehuetenango-GUA	43	30,425	27,605	26,405	96%	26,172	95%	55,210	52,577	95%
Santa Rosa-GUA**	37	11,998								
North Chiapas-MEX	13	7,070	6,255	6,865	100%	5,399	86%	12,510	12,264	98%
South Chiapas-MEX	559	106,994	96,774	92,131	95%	91,120	99%	193,548	183,251	95%
Oaxaca-MEX	98	45,435	41,604	39,207	94%	39,175	100%	83,208	78,382	94%
Northcentral-VEN	45	13,142	12,150	12,040	99%	11,204	93%	24,300	23,244	96%
Northeast-VEN	465	90,642	82,538	79,437	96%	77,015	97%	165,076	156,452	95%
South-VEN*	10	6,914	5,409	4,869	90%	5,315	109%	10,818	10,184	94%
TOTAL	**1,845**	**510,947**	**445,742**	**423,944**	**95%**	**419,151**	**94%**	**891,484**	**843,095**	**95%**

* Communities of the Santa Rosa focus will be part of the inventory of communities until the 3-year period of Epidemiological Surveillance is over and elimination of the disease, verified.

** Treatments halted in 2007 due to interruption of transmission

Figure 8

OEPA: IACO 2007 in Quito, Ecuador

Viceminister of Health of Ecuador, declaring suspension of treatment in the Subfocus of Rio Santiago in 2008.

Figure 9

OEPA: Lions Involvement

Dr. Ramiro Peña Constante; Sra. Margarita Peña, Ecuador; Dr. Ronald Guderian, former director of Ecuador Program; Ms. Kristen Eckert, USA; Dr. Florencio Cabrera Coello, Mexico; Dr. Libardo Bastidas Passos, Colombia; Dr. Ricardo Gurgel, Brazil

Figure 10

OEPA: New Ocular Morbidity from onchocerciasis in the 13 foci of the Americas (baseline and most recent evaluation in both sentinel and extra sentinel areas)

Country	Focus	Baseline Evaluation		Most Recent Evaluation			
		Year	Prevalence MfAC	Year	Prevalence MfAC	Prevalence MfC	Prevalence MfAC & MfC
Brazil	Amazonas	1995	31.20%	2007	2.20%	4.30%	6.50%
Colombia	Lopez de Micay	1996	2.20%	2006	0.00%	0.00%	0.00%
Ecuador	Esmeraldas	1991	24.70%	2006	0.00%	0.00%	0.00%
	Central Focus	1981	20.70%	2007	0.00%	0.40%	0.40%
	Escuintla-Guatemala	1979	6.20%	2006	0.00%	0.00%	0.00%
	Huehuetenango	1981	7.20%	2006	0.00%	0.00%	0.00%
Guatemala	Santa Rosa	--	N/A	2005	0.00%	0.00%	0.00%
	South Chiapas	1995	1.50%	2007	0.07%	0.00%	0.07%
	North Chiapas	1995	60.00%	2006	0.00%	0.00%	0.00%
México	Oaxaca	1995	0%	2004	0.00%	0.00%	0.00%
	North Central	1999	31.00%	2005	0.00%	1.70%	1.70%
	North East	1999	21.70%	2006	3.30%	0.70%	4.00%
Venezuela	South	1998	10.50%	2001**	5.8%**	18.6%**	24.4%**

MfAC-microfilariae in the anterior chamber of the eye; MfC-microfilaria in the cornea

*Based on finding microfilariae in either the anterior chamber or the cornea of the eye

**Pending re-evaluation in 2008

N/A - not available

Figure 11

OEPA: Status of Onchocerciasis transmission (river blindness) in the Americas

Focus	Blindness Stopped?	Transmission Stopped?
Santa Rosa, GU	Yes	Yes (2006)
Lopez de Micay, CO	Yes	Yes (2007)
Escuintla, GU	Yes	Yes (2007)
Huehuetenango, GU	Yes	Suspected Suppressed
Oaxaca, MX	Yes	Suspected Suppressed
North Chiapas, MX	Yes	Yes (2007)
South Chiapas, MX	Yes	Different states of transmission
Central focus, GU	Yes	No
Esmeralda, EC	Yes	Different states of transmission (interrupted in Rio Santiago 2007)
North Central, VZ	Yes	No
North Eastern, VZ	Yes	No
Amazonas, BR	Yes	No
South, VZ	Yes	No

UGANDA

Background: Onchocerciasis affects 29 of the 80 districts in Uganda. The Carter Center assists community-directed treatment with ivermectin (CDTI) in 17 (59%) of those endemic districts: Kabale, Kanungu, Kasese, Kisoro Bushenyi, Kamwenge and Ibanda, in Southwest Uganda; Adjumani, Moyo, and Nebbi, in the West Nile region bordering Sudan and DRC; Amuru, Gulu, and Oyam Districts in the Middle North areas; and Bududa, Manafua, Mbale, and Sironko, in the Mount Elgon focus in the east, bordering Kenya (Figure 12). In 2007, the Carter Center's UTG in Uganda accounted for 66% of the national UTG, compared to 59% in 2006.

Although LCIF funding to Uganda ended in 2005, the Local Lions Clubs have remained active participants in the Carter Center-assisted river blindness control activities. Local Lions engaged and mobilized members of parliament and other government officials. They provided onchocerciasis education and advocated for regular and sustained government support of CDTI activities. The Carter Center's Country Representative in Uganda, Ms. Peace Habomugisha, is a Lions Club member.

Onchocerciasis control commenced in Uganda in 1992 with large scale, annual, mass treatment with Mectizan®. The River Blindness Foundation (RBF) and Sight Savers International (SSI) provided the initial financial support to the government. In 1997, The Carter Center and the African Programme for Onchocerciasis Control (APOC) helped support those established projects. APOC also supported apparently successful transmission elimination efforts in two foci (Itwara and Mpamba-Nkusi) using focal larvicide application and annual Mectizan® distribution. Armed with this success (and the memory of a 1970s elimination victory in the Victoria focus, which liberated three million people from the threat of onchocerciasis), the government of Uganda and its partners launched a bold new elimination policy in 2006 targeting six new endemic areas in Uganda, with an ultimate goal of eliminating onchocerciasis from all foci of Uganda (Figure 13). The strategy involves increasing from annual to twice-per-year Mectizan® treatments (every six months) and providing targeted ground larviciding for vector control or vector elimination where technically feasible. New epidemiological and entomological surveys in support of this elimination effort are being conducted. The Carter Center, with support from Merck and Co., Inc., through the NGDO group, helped launch semiannual treatments in the Wadelai focus in Nebbi District in 2006 (see details below). The Center also partnered with the Ministry of Health by providing financial and technical assistance to the government of Uganda, made possible by a generous donation from Mr. John Moores, Chairman of The Carter Center Board of Trustees. The Merck and Co., Inc., Mectizan® Donation Program committed to provide sufficient Mectizan® for twice-per-year treatments. SSI also agreed to assist in intensified efforts planned for 2007 in districts in which it has traditionally worked that now are aiming for elimination.

The "Oncho Flag": The elimination strategy is illustrated in color in what is called the "oncho flag" (see Figure 13): green shows foci where transmission has already been interrupted (although the criteria for such interruption needs to be better defined), and yellow shows the foci where new elimination activities are ongoing. The six new elimination areas (shown in yellow) where semi-annual treatment with Mectizan® and ground larvicide application were conducted are: Wadelai (Nebbi District); Wambabya-Rwamarongo (Hoima District); Mt. Elgon (Bududa, Manafua, Mbale and Sironko districts), Budongo (Bulisa and Masindi districts); Kashoya-Kitomi (Bushenyi, Kamwenge and Ibanda districts); and Bwindi (Kabale, Kanungu and Kisoro districts). In Wambabya-Rwamarogo and Budongo foci, Sight Savers International provides direct support while technical support is provided by The Carter Center (Figure 14).

The flag also shows blue areas, which are priority for further assessments to determine if elimination is feasible, and red areas, which are unlikely candidates for elimination at this time (primarily because a part of the transmission foci cross international borders into South Sudan or the Democratic Republic of the Congo (DRC) and would thus require international collaboration). During 2007, the focus for onchocerciasis elimination was to work in the 'yellow areas' and demonstrate progress internally and to the international health community. The ultimate goal is to eventually move all onchocerciasis endemic communities from the yellow, blue, and red zones into the green zone, thus marking interruption of transmission, and subsequently, onchocerciasis elimination.

Treatments: The UTG for 2007 in Carter Center-assisted areas in blue and red foci (e.g., a control strategy with annual ivermectin treatment) was 833,736 (Figure 15). In the yellow areas targeted for elimination the UTG was 598,816; since the strategy in these areas is semiannual treatment, the UTG(2) index was used (twice the UTG) to calculate the coverage goal (1,197,632) (Figure 16). The Carter Center Uganda assisted in 1,945,986 treatments in 2007, a marked increase from 1,042,397 in 2006, which is attributed to the expansion of twice-per-year treatments. All of the 3,062 high-risk villages were treated during the year (100% geographic coverage). Excluding passive and visitor treatments (totaling 8,192), Uganda reached 95.8% of its treatment goals. In elimination areas, UTG coverage was 95.3% and 96.4% for the first and second rounds of treatment, respectively. This was the 11th straight year of more than 85% coverage of the UTG in Carter Center-assisted areas, and the tenth successive year of coverage exceeding 90% of the UTG.

In 2007, Carter Center-assisted areas provided 66% of the country's total of 1,954,178 treatments (see Figure 17). A total of 2,114,041 treatments is the Carter Center's treatment goal for 2008.

Training and Health Education: Uganda trained or retrained 57,770 Community-Directed Distributors (CDDs) and 8,062 Community-Directed Health Supervisors (CDHSs) in 2007 (Frontispiece Figure G, and Figures 18 and 19). Of these, 42.9% of the CDDs and 43.6% of the Community Supervisors were female. The current ratio of CDDs to population served is about 1 to 30, with 11 CDDs per community, which is the

best ratio of all Carter Center river blindness programs. The Uganda program was awarded a three-year grant from the Lavelle Fund to further improve numbers of CDDs trained under the kinship system. The aim is to train as many CDDs as practical in each onchocerciasis-endemic community to further improve prospects of sustained health education and higher treatment coverage. The five primary objectives of the grant from Lavelle Fund are to: 1) maximize involvement of the traditional kinship system in CDTI activities in all 2,385 communities of the 12 Carter Center-assisted districts; 2) ensure that there are at least six trained community-directed health workers (CDHW) in every kinship zone and three trainers of trainees (TOT) per community; 3) maximize involvement of women as CDHWs in every kinship group and have at least one female TOT in every community; 4) attain and sustain a coverage of at least 90 percent of the total eligible persons or ultimate treatment goal (UTG) living in all onchocerciasis-endemic communities of the 12 Carter Center-assisted districts; and 5) encourage the national health delivery care system to integrate other health care and development activities within the community-directed interventions approach using the traditional kinship system. The results this year so far show that these objectives have been attained. Even where twice a year distribution for onchocerciasis elimination was launched, the coverage in the second round was above 90% of UTG and was accomplished within a month for all the concerned districts.

Financial Contribution: In 2007, some districts, health sub-districts, and sub-counties contributed funds for CDTI activities, but the amounts were insufficient to sustain CDTI training, Information, Education and Communication (IEC) material production and distribution, and vehicle maintenance. Most financial support to The Carter Center assisted areas was provided by The Carter Center. The NGDO Coordination Group for Onchocerciasis Control (with funds from Merck and Co., Inc.,) supported work in the Wadelai elimination focus. All districts completed their fifth year of APOC funding between 2002 and 2005. See Figure 20 for APOC, Carter Center, and state, local, and national financial contributions from 2001 to 2007. The APOC increase was due to capital equipment purchases. The Carter Center increase reflects the new elimination program. The increase in government contribution results from payment of taxes on capital imports by The Carter Center.

Sustainability and Integration: The community-directed intervention approach was adopted as national health policy in Uganda in 2001. Hence, political support for onchocerciasis control activities within the primary healthcare system is strong, although government financial support has not been regular or up to expected amounts. Cash contributions to CDTI activities from districts, sub-districts, and sub-counties continue to decline, from approximately U.S. $9,000 in 2004 to $6,552 in 2005, $6,394 in 2006, to zero in 2007. However, the central government, through the Ministry of Health, contributed about $20,929 ($3,375 as well as $17,554 in tax exemptions) in 2007. In contrast, involvement and active participation of members of the affected communities have increased over the years. Program strategies include: 1) training as many inhabitants of endemic villages as possible to serve as distributors; 2) encouraging the involvement of women; 3) grouping community health workers and those they serve within their own kinship clans to reduce the demand for “incentives”; and 4) letting community members choose their own health workers and the location of treatment

centers. The CDDs and community supervisors demonstrate high levels of involvement in other types of interventions, most commonly water provision and sanitation, malaria control, and immunization. One hundred percent of communities in Carter Center-assisted areas of Uganda use the kinship system.

Monitoring, Evaluation and Research: Annual monitoring of CDTI activities was carried out in five randomly selected districts: Kanungu, Kamwenge, Mbale, where twice-a-year treatment is going on, and Kasese and Moyo districts where annual distribution is going on. Overall, there was general improvement in 2007 compared to 2006 in the percentage of persons who received health education, the community decision on treatment location, and treatment coverage levels (Figure 21 and Figure 22). For the last three years, health education, selection of CDDs by community members, shorter distances from individuals' homesteads to treatment locations, decision on the location of the treatment center and the reduction or elimination of monetary incentives have been predictors of achievement of the treatment coverage goal of 90% and above. These accomplishments also increase the likelihood that individuals will return the following year for treatment.

Entomology Data from Three Onchocerciasis Foci Targeted for Elimination*: *Wadelai, Bwindi, and Mount Elgon:

As part of the elimination effort, the Center is assisting in enhanced entomology monitoring and evaluation. Data from three foci reveal the following:

Wadelai focus: Since 2005, no black flies have been seen or caught. This implies that transmission in this focus is interrupted.

Kashoya-Kitomi focus: In April 2007, the baseline data on fly infection and crab infestation were collected (river crabs are a requirement for the black fly breeding process in some parts of Uganda). A total of four catching and 63 dosing sites were established in April 2007 and river treatment began the following month. *Simulium neavei spp* was reduced from an average of 66.3% positive in May, 2005 to 1.6% in December, 2007. It is projected that the last river treatment will take place in November, 2008

Mt. Elgon Focus: *Simulium neavei spp* catches in the Mt. Elgon focus started in April, 2007, and larviciding trials began in November during the same year. Preliminary results show 80% to 97% larval mortality in eight of the nine dosing points. The ninth dosing point had larval mortality of about 40%, but this was because human activity interfered with Abate® (Temophos) being carried through the water. Immediately after this discovery 27 dosing points were established and the projection is that one year of river treatment (January-December 2008) will be sufficient to eliminate *Simulium neavei spp*. Interruption of onchocerciasis transmission also will be achieved in this period.

Establishment of the laboratory in Uganda: In addition to field entomological surveys, The Carter Center helped establish a laboratory at the Ministry of Health's

Vector Control Division (VCD) in Kampala, including the provision of equipment, reagents, and training consultants. The Carter Center also sponsored a microbiologist, Mr. David Ogutu, from VCD to train under Dr. Tom Unnasch at the University of Alabama, Birmingham, for one month. Mr. Ogutu is now in charge of the Uganda laboratory. Dr. Tom Unnasch also traveled to Uganda to assist in establishing the laboratory, along with Ms. Nancy Cruz-Ortiz, who leads an OEPA supporting laboratory in Guatemala.

2008 RECOMMENDATIONS FOR CARTER CENTER UGANDA

GENERAL

The Uganda program should continue to refine government and Carter Center funding figures in 2008, including any additional funds coming in from APOC. Monitor trends for increased funding, especially as related to how The Carter Center might be asked to fill the 'post APOC funding gap.'

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

Work towards a target of minimum 1 CDD to 100 population. Seek to increase training, supervision, involvement of kinship groups, and improve gender balance among CDDs, as appropriate. CDD training and CDD retraining needs to be expressed in relation to annual training goals.

If the government wants to support integration in areas where The Carter Center assists, we will not refuse to participate as these are government owned programs. However, The Carter Center cannot invest in integration efforts with other diseases unless we are already assisting Mectizan® distribution in that area, have obtained formal Carter Center Board of Trustees approval, and have adequate funding to participate.

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

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

SPECIFIC

Integrate semiannual treatment with Vitamin A supplement distribution into CDTI in areas where semiannual ivermectin treatment is being provided as part of the elimination effort. In areas where ivermectin is provided once per year, at least one round of Vitamin A supplementation (VAS) could be linked to CDTI, but The Carter Center cannot provide financial support for a second round of VAS, or for distribution in areas where we are not already assisting Mectizan® distribution.

Albendazole treatments for LF have been integrated with onchocerciasis treatments in Moyo and Adjumani districts. The Carter Center, however, cannot provide financial support for the LF efforts, nor any type of support for albendazole distribution in areas where we are not already assisting Mectizan® distribution.

Seek to train as many CDDs as is practical, using the kinship structure in all Carter Center-supported districts (in keeping with the purpose of the Lavelle Fund grant).

Establish the Ugandan Elimination Committee (UEC) to include internationally known onchocerciasis experts to assist the Ugandan elimination effort.

Make the PCR (Polymerase Chain Reaction) and OV16 lab in Uganda operational in 2008, with the help of OEPA experts.

Assist in the purchase of Abate® for onchocerciasis elimination efforts.

Carry out semi-annual treatment with ivermectin in onchocerciasis endemic districts targeted for elimination. Begin tracking the number of cumulative rounds >85%, as OEPA is doing.

Create and maintain detailed tables of epidemiological indicators for areas where transmission has been stopped and those targeted for elimination, as is done with the OEPA foci. Clearly define the criteria for an 'isolated focus' in the first UEC meeting.

Monitor government financial contribution to the elimination efforts.

Treatment Objective for 2008: 2,114,041 persons.

Annual = 883,945 persons.

Semiannual (UTG(2)) = 1,230,096 treatments.

Training Objective for 2008: 45,880 new CDDs (Total=87,060 old and new), 2,832 new Community Supervisors (Total =5,664 old and new).

Figure 12

Uganda: Carter Center Assisted Districts

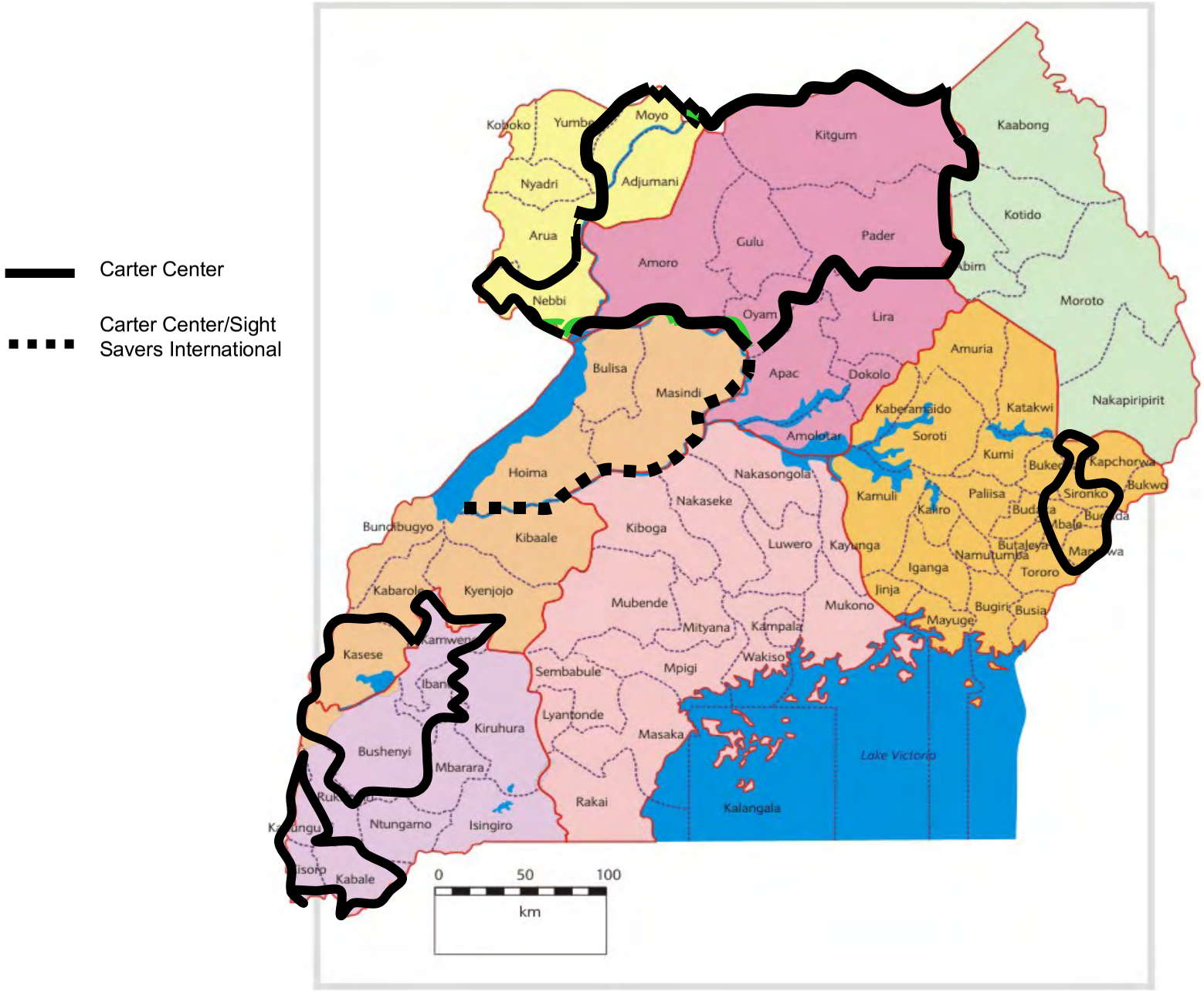


Figure 13

Uganda: plan for onchocerciasis elimination

No.	Focus	Vector	District	2006	of MDAs up to 2006		UTG1	UTG2	Transmission	elimination	treatment, 2007	Vector treatment
1	Victoria	*S. damnosum*	Jinja	GOV	N/A	198,160			Eliminated	1973	No need	*Elimination*
			Mukono	GOV	N/A	387,707			Eliminated	1973	No need	*Elimination*
			Kamuli	GOV	N/A	268,046			Eliminated	1973	No need	*Elimination*
			Mayuge	GOV	N/A	156,714			Eliminated	1973	No need	*Elimination*
			Kayunga	GOV	N/A	142,565			Eliminated	1973	No need	*Elimination*
2	Itwara	*S. neavei*	Kabarole	GTZ/APOC	16	23,881	23,881		Eliminated	2003	Annual	*Elimination*
			Kyenjojo	GTZ/APOC	16	58,382	50,788		Eliminated	2003	Annual	*Elimination*
3	Mpamba-Nkusi	*S. neavei*	Kibale	APOC	13	128,456	124,655		Eliminated	2006	Annual	*Elimination*
4	Wadelai	*S.neavei*	Nebbi	TCC	13	12,220	10,368	20,736	ongoing		Semi-Annual	*Vector Elimination*
5	Wambabya-Rwamarongo	*S. neavei*	Hoima	SSI	14	40,577	37,780	75,560	ongoing		Semi-Annual	*Vector Elimination*
6	Mt. Elgon	*S.neavei*	Manafwa	TCC	13	21,823	20,146	40,292	ongoing		Semi-Annual	*Vector control*
			Mbale	TCC	13	46,899	39,171	78,342	ongoing		Semi-Annual	*Vector control*
			Sironko	TCC	13	62,816	53,743	107,486	ongoing		Semi-Annual	*Vector control*
			Bududa	TCC	13	101,043	92,259	184,518	ongoing		Semi-Annual	*Vector control*
7	Budongo	*S.neavei*	Masindi	SSI	14	59,822	58,435	116,870	ongoing		Semi-Annual	*Vector control*
			Buliisa	SSI	14	21,497	20,973	41,946	ongoing		Semi-Annual	*Vector control*
			Hoima	SSI	14	60,697	55,426	110,852	ongoing		Semi-Annual	*Vector control*
8	Kashoya-Kitomi	*S.neavei*	Bushenyi	GOV	14	88,892	70,936	141,872	ongoing		Semi-Annual	*Vecor control*
			Ibanda	GOV	14	23,150	19315	38,630	ongoing		Semi-Annual	*Vector Control*
			Kamwenge	GTZ	16	29,480	28,479	56,958	ongoing		Semi-Annual	*Vector control*
9	Kigezi-Bwindi	*S.neavei/ S. damnosum*	Kabale	TCC	13	17,912	16,006	32,012	ongoing		Semi-Annual	*Vector Control*
			Kanungu	TCC	13	48,799	41,862	83,724	ongoing		Semi-Annual	*Vector control*
			Kisoro	TCC	13	22,394	19,235	38,470	ongoing		Semi-Annual	*Vector control*
10	Imaramagambo	*S.neavei?*	Bushenyi	GOV	14	84,119	65,408		ongoing		Annual	
11	Maracha-Terego	*S.neavei/S.damnosum*	Maracha-Terego	GOV	14	170,377	136,302		ongoing		Annual	
12	Okoro/Nyagak	*S.neavei*	Nebbi	TCC	13	218,891	175,145		ongoing		Annual	
13	Bondo /Arua	*S.neavei/S.damnosum*	Arua	GOV	14	314,948	307,266		ongoing		Annual	
14	Obongi / Moyo	*S.neavei*	Moyo	TCC	13	17,349	13,778		ongoing		Annual	
15	Lubilila	*S.damnosum*	Kasese	TCC	13	105,253	94,303		ongoing			
16	Nyamugasani	*S.damnosum*	Kasese	TCC	13	9,221	8,436		ongoing			
17	Madi	*S.damnosum*	Moyo	TCC	13	172,882	134,188		ongoing		Annual	
			Adjumani	TCC	13	179,791	153,983		ongoing		Annual	
18	West Nile	*S.neavei/ S. damnosum*	Yumbe	GOV	14	286,615	229,292		ongoing		Annual	
			Koboko	GOV	14	167,076	133,661		ongoing		Annual	
			Arua	TCC	14	138,063	134,696		ongoing		Annual	
			Nebbi (Padyere)	TCC	13	89,574	71,660		ongoing		Annual	
19	Mid-North	*S.damnosum*	Oyam	TCC	13	16,466	13,467		ongoing		Annual	
			Gulu	TCC	13	99,898	82,678		ongoing		Annual	
			Amuru	TCC	13	102,236	84,163		ongoing		Annual	
			Pader	TCC	?	??????	??????		ongoing		Annual	
			Kitgum	TCC	?	??????	??????		ongoing		Annual	
Total						3,041,499	2,621,884	1,168,268				

Green = **Transmission eliminated**

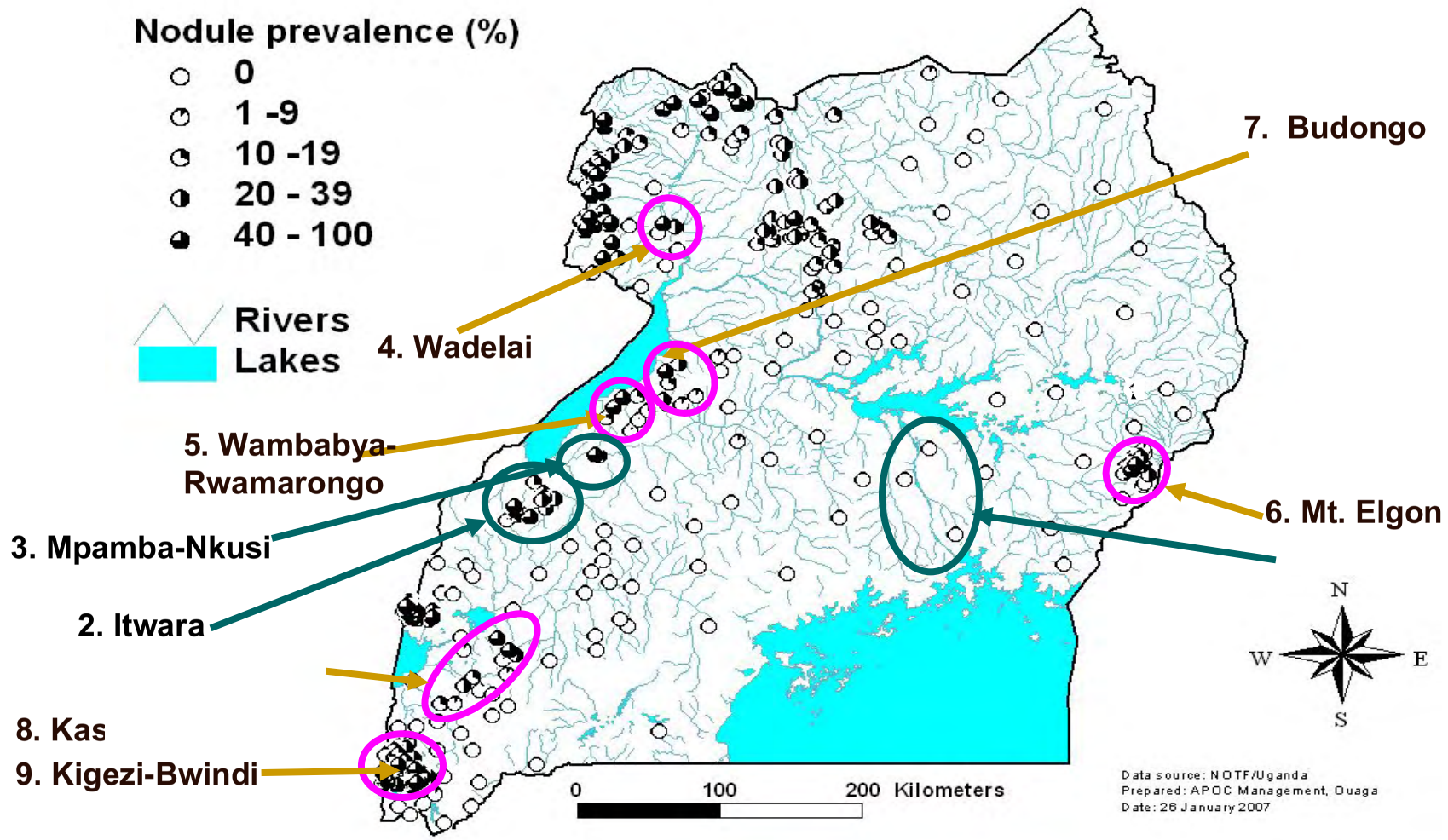
Yellow = **Implement elimination policy**

Blue = **Priority for epi studies for delineation of each focus before semi-annual tx decision**

Red = **Not much is known (Need for epi studies)**

Figure 14

Uganda: foci where onchocerciasis elimination policy is being implemented*



* Foci 1 – 3 have already eliminated onchocerciasis

Figure 15

Uganda: Treatment Coverage, 2007: Annual Treatment areas

Name of of district	Total Popn for 2007	Ultimate Tx Goal (UTG)for 2007	Popn Treated Cumu-lative for 2007	Total Popn TX % For 2007	Popn TX % of UTG 2007	Active Villages UTG for 2007	Active Villages Cumu-lative for 2007	Active Villages % for UTG for 2007
Adjumani	184,286	157,833	146,316	79.4	92.7	204	204	100
Amuru	100,339	84,505	74,889	74.6	88.6	98	98	100
Gulu	99,647	79,479	74,640	74.9	93.9	90	90	100
Kasese	115,472	101,738	99,275	86.0	97.6	131	131	100
Moyo	191,459	147,966	143,038	74.7	96.7	189	189	100
Nebbi.	308,465	246,805	244,454	79.2	99.1	651	651	100
Oyam	18,529	15,410	15,378	83.0	99.8	35	35	100
TOTAL	**1,018,197**	**833,736**	**797,990**	**78.4**	**95.7**	**1,398**	**1,398**	**100**

Figure 16

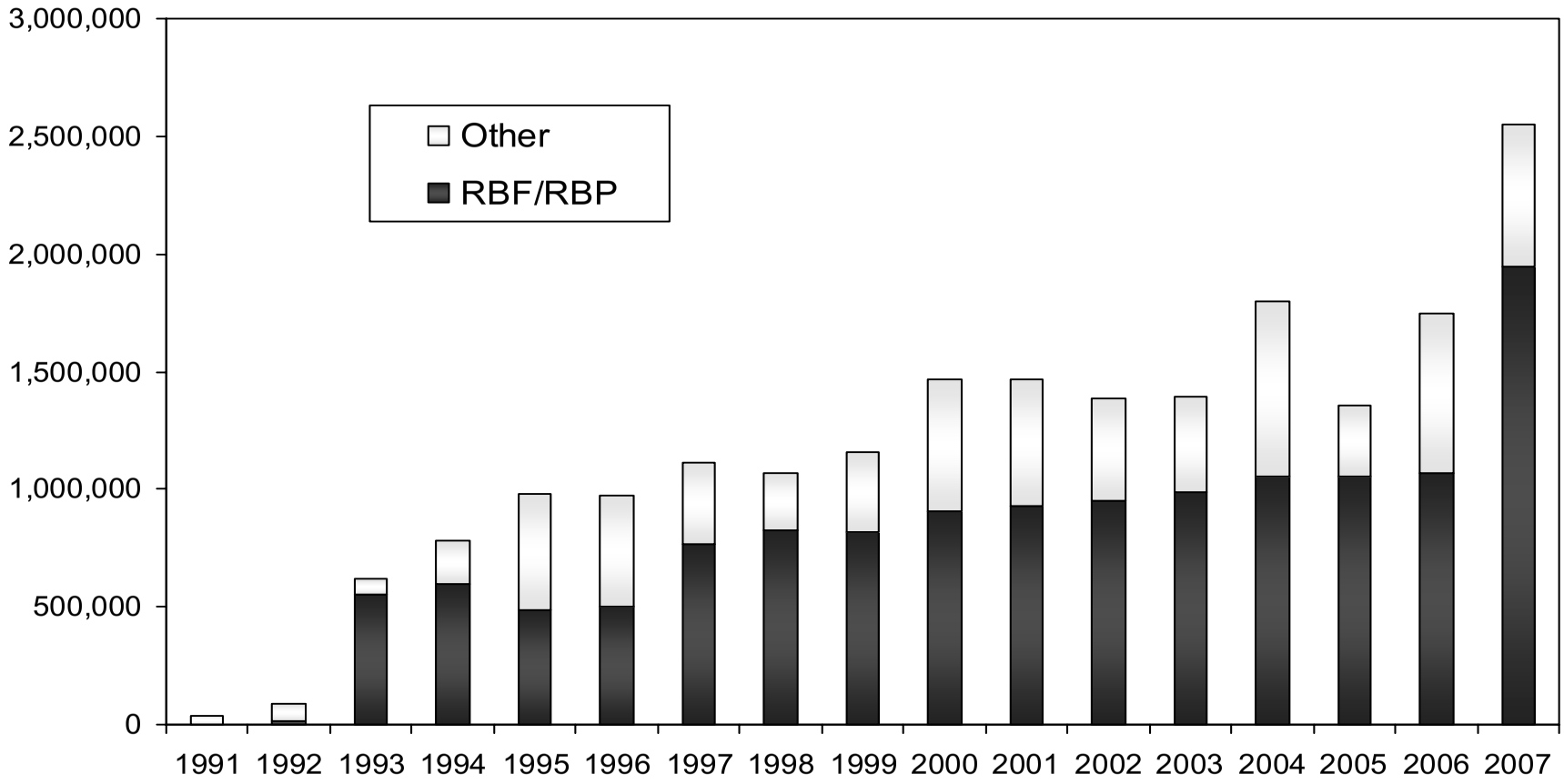
Uganda: Treatment Coverage, 2007: Semiannual Treatment areas

Focus	District	No. of Com	Pop at risk	UTG	Treated in Rd 1	Treated in Rd 2	UTG Cov. Rd 1	UTG Cov. Rd 2	Total Treated	UTG(2)	Cov. UTG 2
Mt Elgon	Bududa	491	126,825	106,585	104,772	104,940	98.3	98.5	209,712	213,170	98.4
	Manafwa	98	32,918	28,352	28,092	27,521	99.1	97.1	55,613	56,704	98.1
	Mbale	124	41,834	33,207	32,402	33,001	97.6	99.3	65,403	66,414	98.5
	Sironko	191	66,548	56,400	54,009	54,669	95.7	96.9	108,678	112,800	96.3
Wadelai	Nebbi	34	12,980	10,626	10,313	10,498	97	98.8	20,811	21,252	97.9
Kashoya-	Bushenyi	207	108,984	92,592	86,147	87,963	93	95	174,110	185,184	94
Kitomi	Ibanda	57	20,700	17,421	16,689	16,577	95.8	95.2	33,266	34,842	95.5
	Kamwenge	53	35,856	30,227	28,334	28,272	93.7	93.5	56,606	60,454	93.6
Bwindi	Kabale	29	21,043	16,939	15,375	16,365	90.8	96.6	31,740	33,878	93.7
	Kanungu	105	48,221	38,899	37,727	37,421	95.6	98.1	75,148	77,798	96.6
	Kasoro	45	31,001	23,227	21,764	22,722	93.7	97.8	44,486	46,454	95.8
Total		**1,434**	**546,910**	**454,475**	**435,624**	**439,949**	**95.9**	**96.8**	**875,573**	**908,950**	**96.3**
Rwambarya											
Rwamurongo	Hoima	70	49,061	43,611	40,556	41,474	93	95.1	82,030	87,222	94.1
Budongo	Hoima	70	57,058	49,099	46,429	47,623	94.6	97	94,052	98,198	95.8
	Bullisa	30	20,794	17,575	16,580	17,193	94.3	97.8	33,773	35,150	96.1
	Masindi	60	40,450	34,056	31,776	30,792	93.3	90.4	62,568	68,112	91.9
Total		**230**	**167,363**	**144,341**	**135,341**	**137,082**	**93.8**	**95**	**272,423**	**288,682**	**94.4**
Grand Total		**1,664**	**714,273**	**598,816**	**570,965**	**577,031**	**95.3**	**96.4**	**1,147,996**	**1,197,632**	**95.9**

NB: Treatments in Budongo and Rwamarongo are supported by Sight Savers International

Figure 17

Uganda: Carter Center-Assisted treatments and total Mectizan® treatments provided, 1991-2007*



* Treatments in 1992-1995 assisted by River Blindness Foundation.
Source of provisional 2006 national figure: Uganda NOCP. Some 2006 data not available.

Figure 18

Uganda: Number of CDTI workers available at the community level (2004-2007)

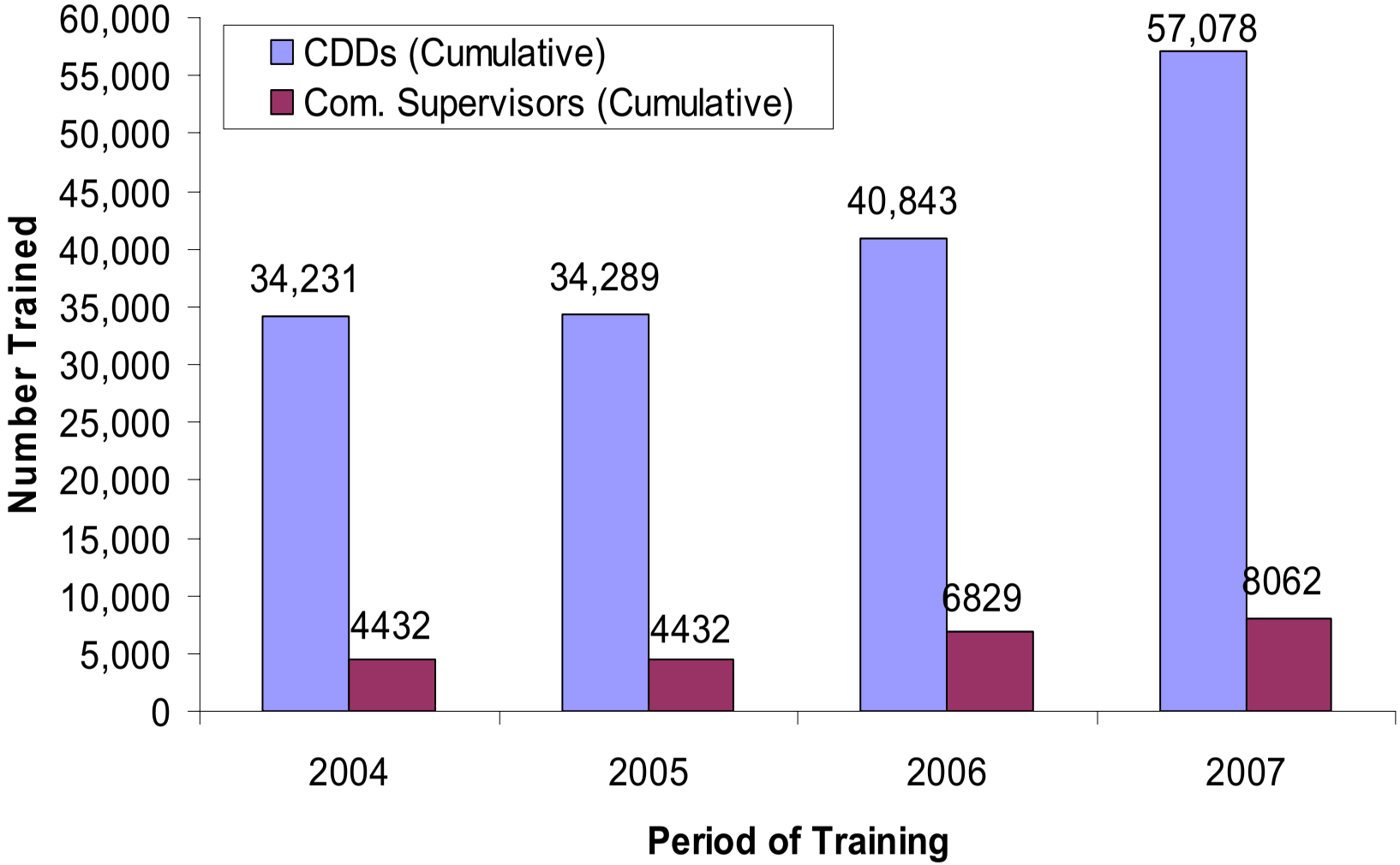


Figure 19

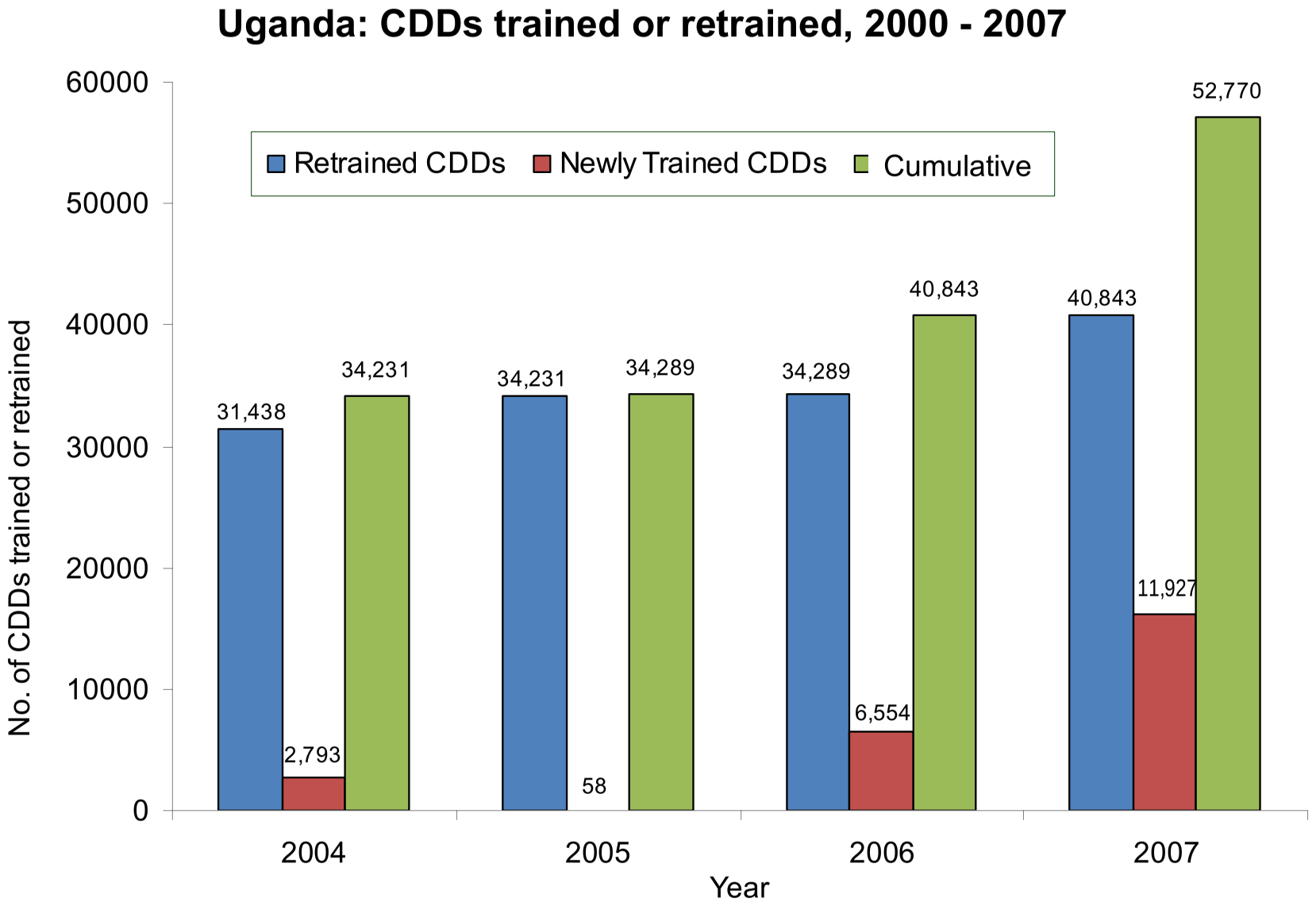

Uganda: CDDs trained or retrained, 2000 - 2007
60000
50000
40000
30000
20000
10000
0
No. of CDDs trained or retrained
Retrained CDDs
Newly Trained CDDs
Cumulative
31,438
2,793
34,231
34,231
58
34,289
34,289
6,554
40,843
40,843
11,927
52,770
2004
2005
2006
2007
Year

Figure 20

Uganda Financial Contributions in US dollars (2001 – 2007)

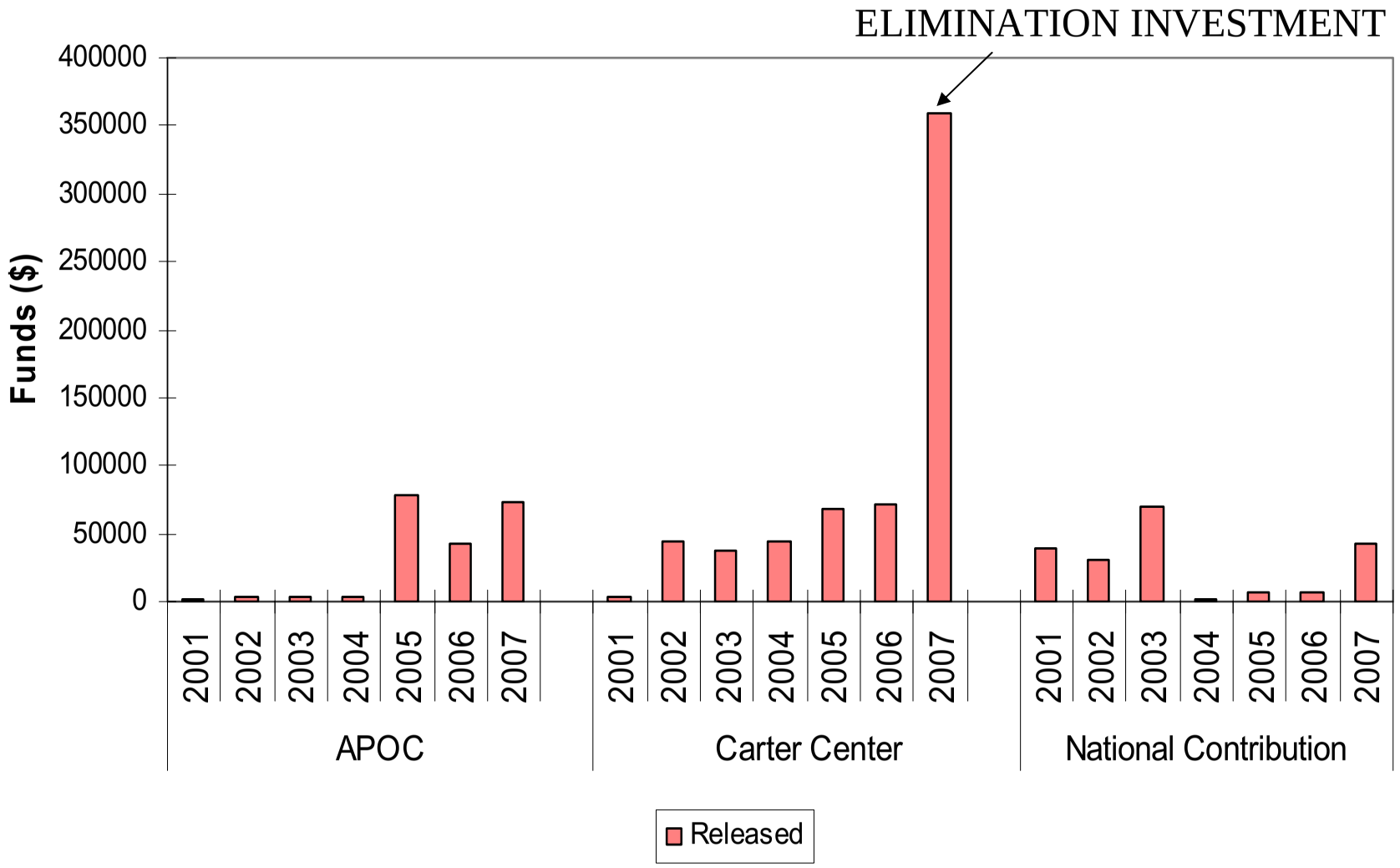


Figure 21

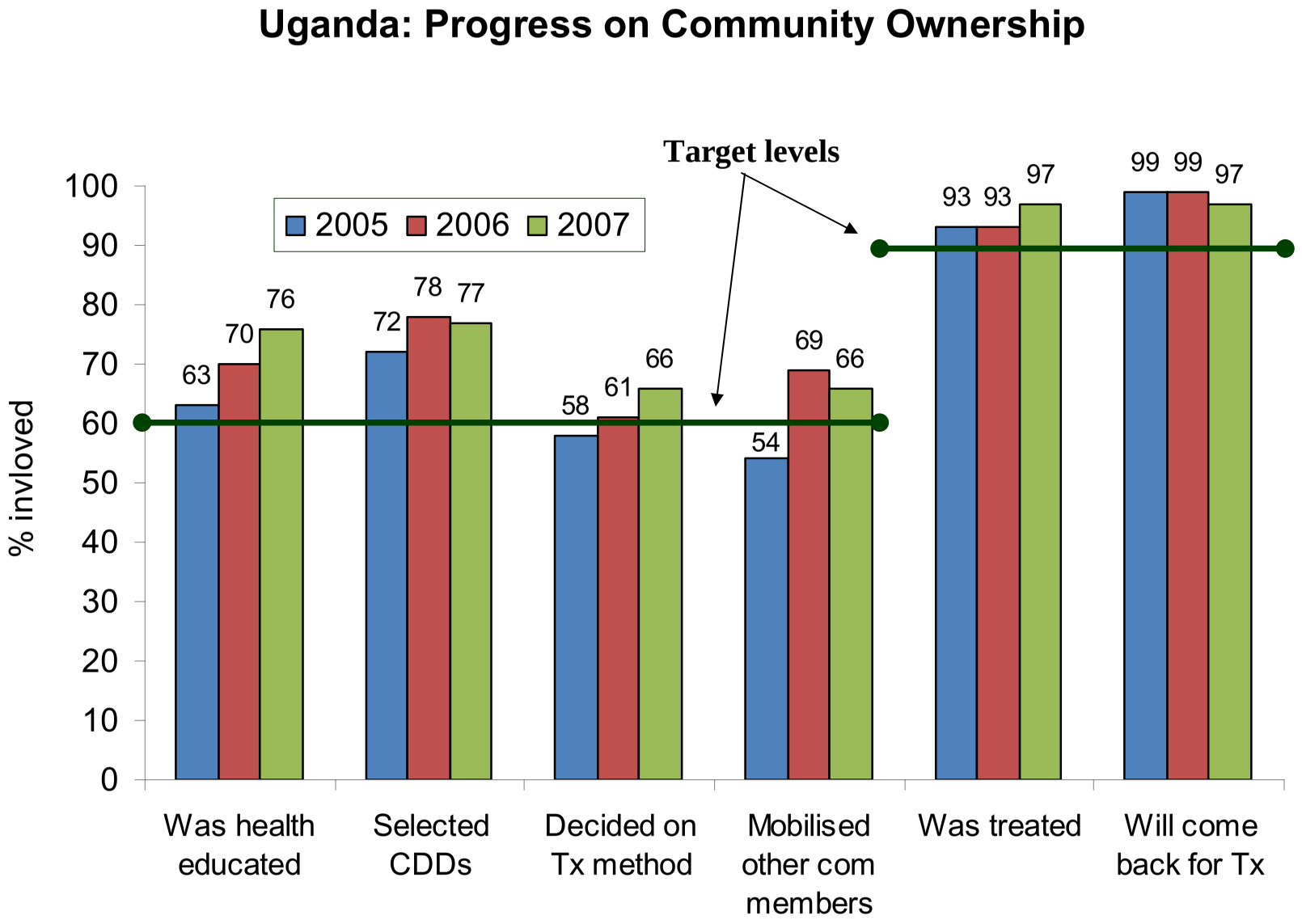
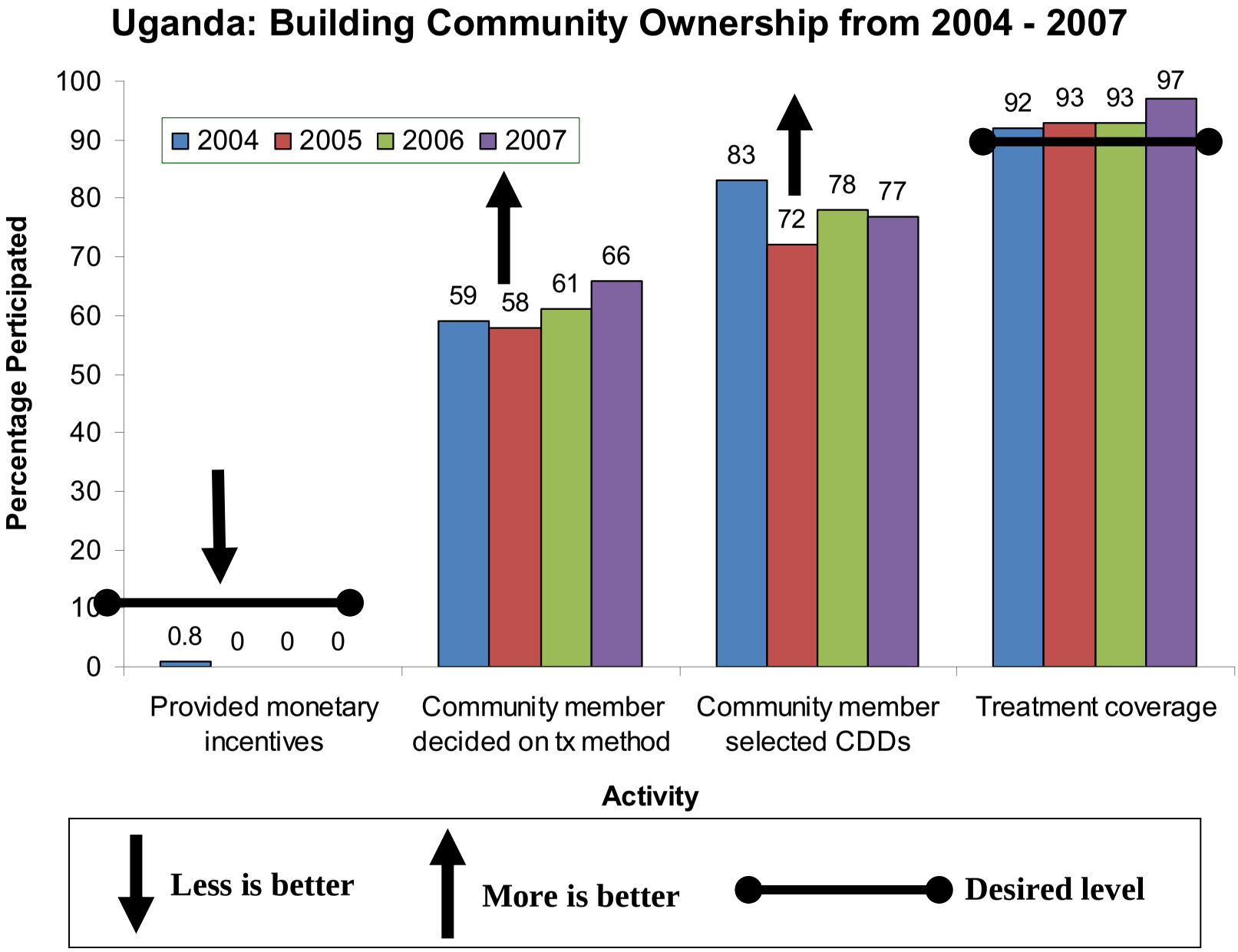

Uganda: Progress on Community Ownership
Target levels
2005
2006
2007
% invloved
100
90
80
70
60
50
40
30
20
10
0
63
70
76
72
78
77
58
61
66
54
69
66
93
93
97
99
99
97
Was health educated
Selected CDDs
Decided on Tx method
Mobilised other com members
Was treated
Will come back for Tx

Figure 22


Uganda: Building Community Ownership from 2004 - 2007
Percentage Perticipated
100
90
80
70
60
50
40
30
20
10
0
2004
2005
2006
2007
0.8
0
0
0
59
58
61
66
83
72
78
77
92
93
93
97
Provided monetary incentives
Community member decided on tx method
Community member selected CDDs
Treatment coverage
Activity
Less is better
More is better
Desired level

NORTH SUDAN

Background: There are approximately five million persons at risk of onchocerciasis in the whole of Sudan, with an estimated ultimate treatment goal (UTG) of 3.4 million. There are several endemic areas in the country in both the north and south and originally The Carter Center supported ivermectin distribution country-wide. The Comprehensive Peace Agreement (CPA), signed in January 2005, put an end to the decades-old civil war, and also created the Government of South Sudan (GOSS). The Carter Center's River Blindness Program 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 Blinden mission (CBM) signed an agreement to support and establish five Community-Directed Treatment with Ivermectin (CDTI) projects in GOSS areas. APOC no longer supports onchocerciasis control in the northern part of Sudan.

In 2006, the Federal Government of Sudan (FGOS) launched a new onchocerciasis elimination policy directed toward the isolated desert focus of Abu Hamad in River Nile State (Figure 23). In Abu Hamad, the strategy changed to providing Mectizan® tablets twice per year (every six months) rather than annually, and treating more broadly in hopes of stopping transmission of the disease as well as halting blindness and skin disease. An expanded Lions-Carter Center assistance to the new elimination effort was likewise approved in 2006. Figure 24 shows the new Resident Technical Advisor, Dr. Nabil Aziz, with Lion Dr. Khair, Chairman of the new Khartoum Lions Club.

Another potential elimination focus, Galabat (of Gedarif state, formerly called the Sundus focus) was evaluated but shown to likely extend across the Sudan Ethiopia border. In 2007, annual treatment for onchocerciasis control was launched there. The Carter Center also assists in ivermectin delivery in Korybus and Radom in South Darfur.

The effort in Abu Hamad to achieve elimination of onchocerciasis from a major focus of the northern part of Sudan, together with the launching of a treatment program in Galabat focus and maintaining treatments in a difficult to reach focus of Radom in Darfur, are signs that the Sudan program did very well in 2007. Data from four sentinel communities show that Abu Hamad focus is possibly approaching *Onchocerca volvulus*-free status (Frontispiece Figure E). Korybus is another suspected onchocerciasis focus that has not been fully evaluated.

Treatments: A total of 135,445 treatments were delivered, for 93% coverage of the UTG (2) of 145,230 in the Abu Hamad focus. Twice per year treatments were delivered in Abu Hamad in 2007: 64,154 persons (or 89% of the UTG) were treated in round one, and 71,528 persons or 99% were treated in round two. Coverage for the second round was far better than the first round partly because registration of household members had been completed. An annual dose of Mectizan® was delivered in Radom in South Darfur with 19,273 treatments, and in Galabat (formerly Sundus) in Gedarif State, with 44,881 treatments. Thus, 199,599 total treatments were delivered in the northern Sudan program in 2007.

See Figure 25 for Carter Center-supported treatments from 1997 to 2007 in the northern sector of Sudan, and see Figure 26 for a summary of treatments in Sudan in 2007. The dramatic decrease of treatments in 2005 was as a result of persons in displaced camps situated in Khartoum leaving for South Sudan, their original home.

Training and Health Education: The program trained 1,403 Community-Directed Distributors (CDDs) and retrained 657 during 2007 in Abu Hamad, Galabat and Radom focus (Frontispiece Figure G). In the northern sector of Sudan, the number of persons for one CDD in Abu Hamad, Galabat and Radom were 130, 100, and 500, respectively. That averages to a CDD per population ration of 1:92. About 18% of the CDDs were female. Health education covered all 152 communities in the Abu Hamad, Galabat, and Radom foci.

Mectizan®: During 2007, 593,482 tablets were distributed in the Abu Hamad, Galabat, and Radom foci with an average of 3.1 tablets per person. No severe adverse effects were reported. Sudan received sufficient Mectizan® to treat Galabat (Sundus) focus twice per year before it was determined that only annual treatment was needed. Therefore, the program carried a balance of 1,082,000 tablets forward for 2008 treatments and no order from the Mectizan® Donation Program (MDP) was required.

Sustainability and Integration: The northern sector of Sudan has had a problematically low number of CDDs per population. This issue may have created and maintained high demand for monetary incentives as a condition for distributing Mectizan® and threatened the sustainability of CDTI activities. In late 2007, the program embarked on involving kinship/family groups in all the foci in mobilization and health education, selection and training of CDDs, and distribution of ivermectin, the impact of which is expected in 2008.

2008 RECOMMENDATIONS FOR THE CARTER CENTER SUDAN

GENERAL

The Sudan program should continue to refine government and Carter Center funding figures in 2008, including any additional funds coming in from APOC. Monitor trends for increased funding, especially as related to how The Carter Center might be asked to fill the 'post APOC funding gap.'

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

Work towards a target of minimum 1 CDD to 100 population. Seek to increase training, supervision, involvement of kinship groups, and improve gender balance among CDDs, as appropriate. CDD training and CDD retraining needs to be expressed in relation to annual training goals.

If the government wants to support integration in areas where The Carter Center assists, we will not refuse to participate since these are indeed government owned programs. However, The Carter Center cannot invest in integration efforts with other diseases unless we are already assisting Mectizan® distribution in that area, have obtained formal Carter Center Board of Trustees approval, and have adequate funding to participate.

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

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

SPECIFIC

Abu Hamad (targeted for onchocerciasis elimination):

- Continue to implement twice per year treatment in Abu Hamad focus.
- Validate 2007 treatment figures. Begin tracking the number of cumulative rounds >85%, as OEPA is doing.
- Monitor the situation related to the Merowe dam and population displacement and treatment issues.
- Create tables and maps of epidemiological indicators for Abu Hamad to help define the southern (western) limit of the focus.
- The Government of Sudan has promoted the use of the Khartoum lab for testing Sudanese specimens for OV-16 serology and Polymerase Chain Reaction (PCR)

black fly analysis. The Carter Center will try to support that request, but is unable to purchase capital equipment for the lab.

- Seek to publish a paper on the Abu Hamad story in 2008.

Given that the Sundus focus is contiguous with the border of Ethiopia, in 2008 the strategy will switch from elimination (semiannual treatment) to control (annual treatment) for that focus.

Treatment Objective for 2008: 321,062 persons.

Annual = 151,196 persons.

Semiannual (UTG(2))= 169,866 treatments.

Training Objective for 2008: 2,910 CDDs (new), 285 Community supervisors (new).

Figure 23

Sudan Khartoum office: Program Areas

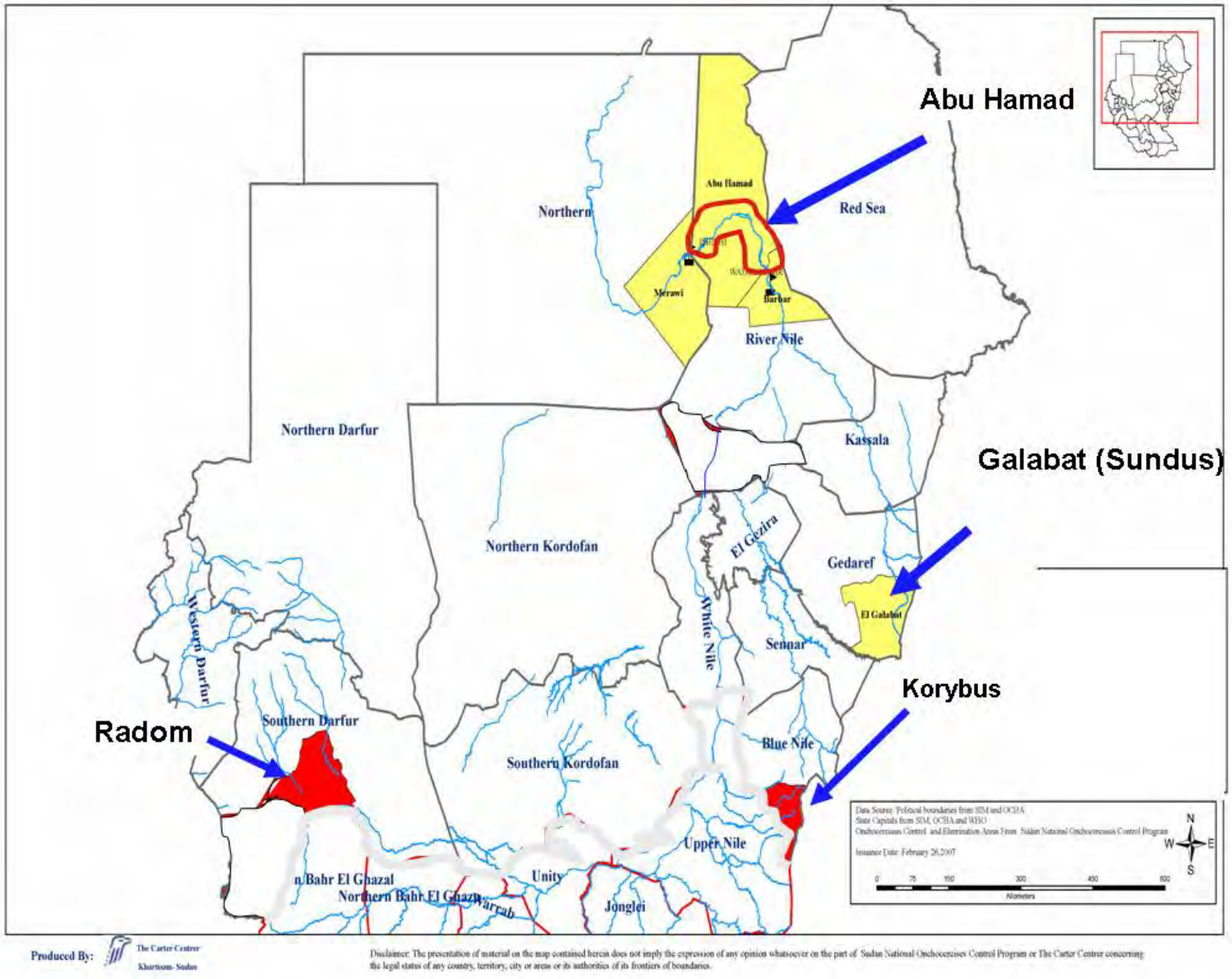
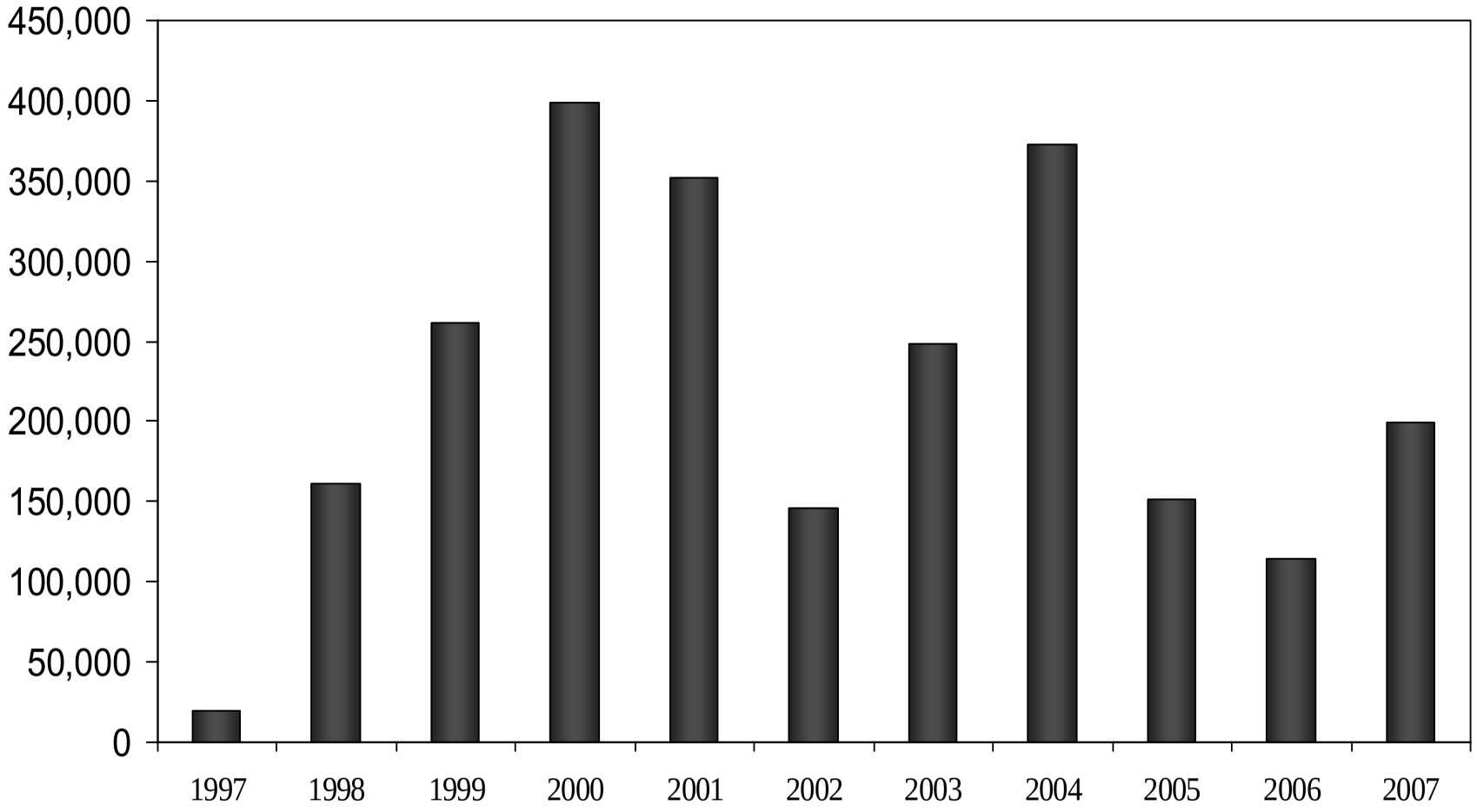


Figure 24

Dr. Nabil, newly appointed Resident Technical Advisor for The Carter Center in Khartoum, with Dr. Al Khair Khalef Allah, Chairman of Khartoum Lions Club.

Figure 25

Sudan Khartoum Office:
Carter Center-Assisted Mectizan® Treatments, 1997-2007*



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

Figure 26

Sudan: Carter Center-Assisted Areas: 2007 River Blindness Treatments

Control Projects

State	# Adm. unit	Total Popn for 2007	Popn treated cumulative for 2007	Ultimate TX Goal (UTG)/ ATO for 2007	% UTG treated in 2007	% of total popn treated in 2007	Active village UTG/ ATO for 2007	Active villages cumulative for 2007	Active village % for UTG/ ATO for 2007
South Darfour	1	23,203	19,273	19,922	97%	83%	20	20	100%
Gadaef	2	66,148	44,881	52,510	85%	68%	34	31	91%
Total	**3**	**89,351**	**64,154**	**72,432**	**89%**	**72%**	**54**	**51**	**94%**

Elimination Focus

State	Focus	Pop at Risk	UTG	Treated in Round 1	Treated in Round 2	UTG Coverage Round 1	UTG Coverage Round 2	Total Treated	UTG(2)	Coverage UTG(2)
River Nile	Abu hamed	100,000	72,615	63,917	71,528	88%	98.50%	135,445	145230	93%
TOTAL		**100,000**	**72,615**	**63,917**	**71,528**	**88%**	**98.50%**	**135445**	**145,230**	**93%**

Village UTG 2007: 89
Villages treated 2007: 81
Village Coverage 2007: 91 %

CAMEROON

Background: Onchocerciasis is widespread in Cameroon, with an estimated 62% of its population at risk of infection. The Carter Center's predecessor, the River Blindness Foundation (RBF), began assisting the Ministry of Health (MOH) in North Province in 1992, followed by West Province (with the assistance of Lions) in early 1996 (Figure 27). North Province has historically had a high rate of blinding onchocerciasis, although ocular morbidity there has not been recently assessed. The Carter Center began assisting both Provinces in 1996 when it took over RBF programs. The Lions-Carter Center SightFirst Initiative project is supervised by Lions District 403B and in partnership with the MOH and three other nongovernmental development organizations (NGDOs)—International Eye Foundation (Adamaoua and South Province), Helen Keller International (HKI) (Centre, Extreme North Province, and East), and Perspective (Littoral I and II). Centre and East provinces were assisted by Sight Savers International (SSI) until 2004 when SSI assistance stopped and HKI took over with Lions Clubs SightFirst Initiative funding. The original SightFirst Cameroon project ended in early 2001, when an extension was granted to supplement new African Program for Onchocerciasis Control (APOC) projects in LCIF-assisted zones. The Lions extension is slated to end in 2010. Support from the African Program for Onchocerciasis Control (APOC) was phased out in North Province in 2003, and will end in West Province in 2008. In 2007, the Carter Center's Ultimate Treatment Goal (UTG) in Cameroon accounted for 38%, down from 42% in 2006 as the rest of the country has increased treatment activities (Figure 28).

The Lions-Carter Center Sight First Initiative, which is coordinated by Lions District 403B, in partnership with the Cameroonian MOH, and local Lions in the cities of Yaoundé and Bafoussam, are strong advocates for support of onchocerciasis control (Figure 29).

Treatments: Carter Center-assisted areas in Cameroon provided 1,650,198 treatments in 2007 (Figure 30), or 92% of the ultimate treatment goal (UTG) of 1,790,427. This included 1,263,400 treatments in West Province and 386,798 treatments in North Province. Four out of six health districts in the North Province achieved UTG coverage of over 85%, while in the West Province, 18 out of 19 health districts achieved over 85% UTG coverage.

Mectizan®: The Carter Center/Cameroon assisted program received a total of 4,797,500 Mectizan® tablets from the Mectizan® Donation Program (MDP) for 2007 treatments, and assisted in distributing 4,627,720 tablets; about 73,391 (2.5%) tablets were lost or expired during the period of distribution in both provinces. The balance of 861,666 tablets was returned through the health system to the Drug Procurement and Delivery Agency (DPDA). No severe adverse events (SAEs) were reported. The average number of tablets per treatment was 2.8.

Training and Health Education: In 2006, the Program trained a total of 16,286 community-directed distributors (CDDs) in West and North Provinces (103% of the training 2007 objective); of these 8,564 were newly trained (52.5%). This compares to 11,158 trained in 2006, a 46% increase (Frontispiece Figure G, and Figure 31). The Carter Center/Lions Clubs assisted programs in Cameroon have been consistent in progress from a ratio of 1 CDD:575 persons in 2001 to 1:56 in 2007. About 33% of the CDDs trained were female.

Loa loa: No cases of serious adverse events potentially related to *Loa loa* were reported in Carter Center-assisted areas of Cameroon in 2007, making this the fifth year free of serious reactions.

Assessments for Lymphatic Filariasis in North Province: Nocturnal blood slide collection assessments done by MOH technical personnel showed that the province had in some communities 2% prevalence of lymphatic filariasis. This implied that the whole province was eligible for mass chemotherapy with ivermectin and albendazole, and an application to the Mectizan® Expert Committee for albendazole was submitted by the MOH and approved. The Carter Center is not currently assisting the LF program in North Province. If the government wants to support co-implementation of LF and onchocerciasis treatments in areas where The Carter Center assists, we will not refuse to participate, since these are government owned programs. However, The Carter Center cannot invest in the LF effort formally until we have obtained formal Carter Center Board of Trustees approval, and have adequate funding to participate.

Financial Contribution: The Lions-Carter Center SightFirst Initiative provided important support to the program in 2006. Major APOC funding stopped for North Province (in 2003) and West Province (in 2005). The Carter Center did not provide support in the North in 2004 and 2005 as part of the post-APOC, post-NGDO sustainability trial (see below), although North Province maintained high coverage in those years. However, support resumed during 2006 with emphasis on continued government support, especially at the provincial level.

There was evidence of a decrease in government investment in the community-directed treatment with ivermectin (CDTI) program in both the West Province (from US $69,958 in 2006 to $30,376 in 2007) and (to a lesser extent) North Province (from $27,267 to $22,073). See Figure 32 for APOC, Carter Center, and national (including state and local) financial contributions from 2001 to 2007.

Sustainability and Integration: In 2004, the Cameroon program began to implement the kinship strategy in Carter Center-assisted areas to reduce the expectation that CDDs would demand payment. Health workers were trained in the kinship strategy and sensitized to the need for community supervisors selected by the community and trained by the health, who in turn are expected to train and supervise CDDs. About 80% of communities are now using the kinship strategy. The number of trained CDDs increased from 5,037 in 2004 to 16,286 in 2007. Also, trained community supervisors (trainers of trainees) increased from 2,277 in 2005 to 5,946 in 2007. Selection and

training of community supervisors should increase the numbers of CDDs substantially, maximize the level of community involvement, and improve the potential for sustainability. The program had planned to double the number of CDDs from 11,158 in 2006 to 22,310 in 2007. Only 73% of the training objective for 2007 was achieved, providing an average of four CDDs per community in 2007, up from three in 2006. Although promotion of the kinship has been successful in maintaining good treatment coverage of eligible population, the performance of 2007 was generally below that of 2006. This may be attributed to lack of close supervision of mass mobilization and health education, which declined from 64% in 2006 to 45% in 2007. Treatment coverage declined from about 94% in 2006 down to 88% in 2007. However, demand for monetary incentives by CDDs as a condition for treatment remained insignificant, and the perceived need for treatment with Mectizan® remained very high, at 99% (Figure 33).

CDDs and community supervisors have been involved with other community health activities, such as 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.

Integration of Mectizan® Distribution with Vitamin A Distribution: In the past, Vitamin A Supplementation (VAS) was provided through National Immunization Days (NIDs) for children between 12-59 months and through the Expanded Program for Immunisation (EPI) for children between 6-12 months. Because NIDs are coming to an end—with the successful elimination of polio resulting in decreased NID funding—new supplementation mechanisms must be identified. It is widely believed that VAS can help strengthen the sustainability of CDTI programs in the post APOC funding era, if an adequate supply of Vitamin A capsules can be obtained in a timely manner for distribution with ivermectin.

All the 25 health districts in West and North Province, where CDTI is being implemented successfully, integrated VAS with Mectizan® Distribution in 2006, and continued this activity in 2007. Timely supply of adequate capsules remained an issue, as did the challenge of providing an additional VAS round of treatment, since VAS is recommended twice per year (every six months). The Carter Center has been unable to financially support a second independent round of community-directed VAS, and so the second round has been left to the MOH to fund. Training for the co-implemented VAS round took place at district, health area and community levels, working with the Provincial Nutrition Coordinator (PNC). Vitamin A orders for children 6-59 months of age were calculated from the community CDTI household registers. The community registers were also adjusted to capture VAS data. As a result of these efforts, 203,390 young children received VAS in West Province, 80% of the UTG of 255,237 (children of 12-59 months) in the first round. The PNC reported that 157,989 (62%) VAS were provided in the second round of the year. North Province provided VAS to 59,562 (71% of the UTG of 83,877) while only 22,607 (27%) VAS could be managed in the second round (Figure 34).

2008 RECOMMENDATIONS FOR THE CARTER CENTER CAMEROON

GENERAL

The Cameroon program should continue to refine government and Carter Center funding figures in 2008, including any additional funds coming in from APOC. Monitor trends for increased funding, especially as related to how The Carter Center might be asked to fill the 'post APOC funding gap.'

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

Work towards a target minimum of one CDD to 100 population. Seek to increase training, supervision, involvement of kinship groups, and improve gender balance among CDDs, as appropriate. CDD training and CDD retraining needs to be expressed in relation to annual training goals.

If the government wants to support integration in areas where The Carter Center assists, we will not refuse to participate since these are indeed government owned programs. However, The Carter Center cannot invest in integration efforts with other diseases unless we are already assisting Mectizan® distribution in that area, have obtained formal Carter Center Board of Trustees approval, and have adequate funding to participate.

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

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

SPECIFIC

Albendazole treatments for LF will be integrated with ivermectin treatments in North Province in 2008 in CDTI areas. The government and WHO LF authorities have asked that the LF program expand into non-CDTI areas (expanding treatments by a factor of three). The Carter Center cannot provide additional financial support for the LF efforts required for expansion to non-CDTI areas. The Carter Center is also not able to provide technical assistance in assessing the impact of LF treatments.

Indicate in monthly reports activities related to lymphatic filariasis elimination developments taking place at national level, as well as in North and West Provinces.

The Carter Center also cannot provide financial support for a second round of VAS, or for distribution in areas where we are not already assisting Mectizan® distribution. If two rounds of VAS are planned, spacing of the second (non-CDTI) VAS dose should be as close to six months later as possible. That is, where the ivermectin implementation plan is for the first semester, the extra VAS round should be provided in the second semester, and vice versa.

Seek to demonstrate impact of ivermectin treatment on ocular disease. Review available data from past sentinel areas that may have baseline data pertaining to visual impairment or ocular disease due to RB. In those areas having baseline data, surveys for anterior segment disease should be conducted, particularly in North Province, using the new slit lamp provided in 2007.

Treatment Objective for 2008: 1,692,249 persons.

Training Objective for 2008: 32,572 CDDs (16,286 new). 11,892 Community Supervisors (5,946 new).

Figure 27

Cameroon
Carter Center - Assisted Provinces

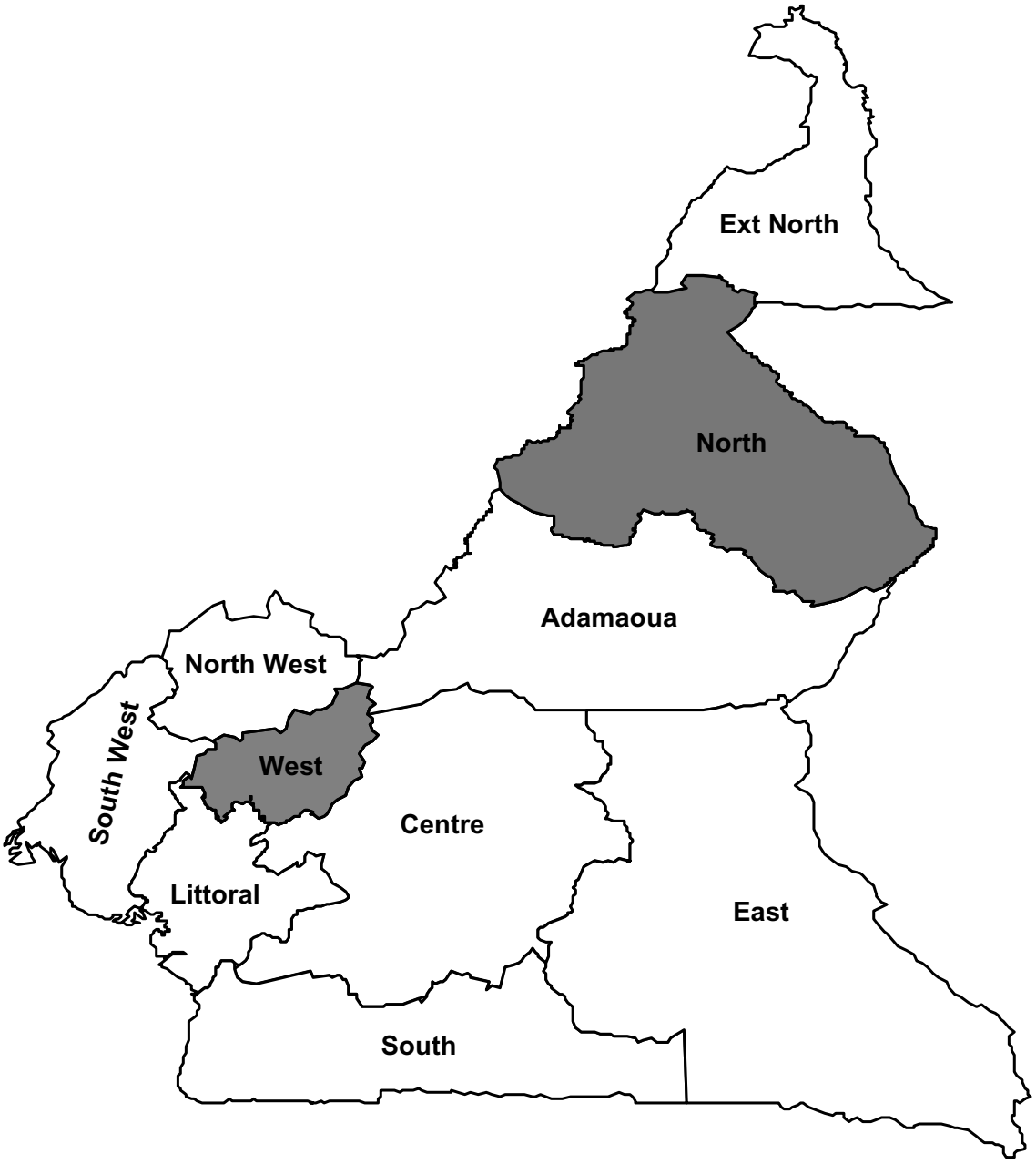
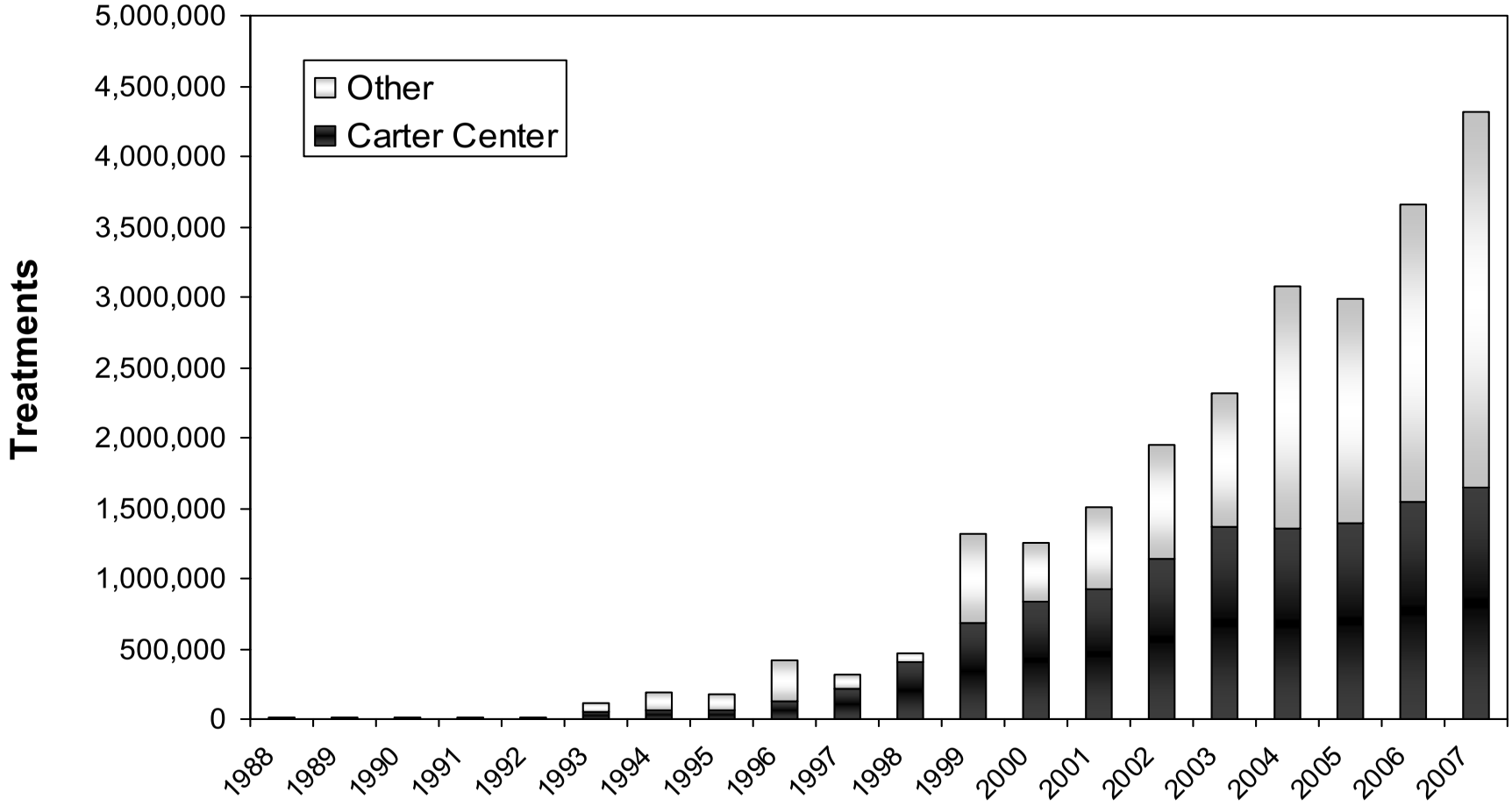


Figure 28

Cameroon: Carter Center-Assisted Mectizan® Treatments as Part of Total Treatments Provided, 1988-2007*



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

Figure 29

Cameroon: Local Lions Involvement

Lion Mme. Coste and Dr. Albert Eyamba, Carter Center Cameroon Country Director

Figure 30

Cameroon: Carter Center-Assisted Areas: 2007 Mass and Passive River Blindness Treatments

Provinces	Total Population	UTG for 2007	Population Treated Cumulative for 2007	% Total Pop. Treated	% UTG Treated	Active Comm. Treated in 2007	Active Comm. Cumulative for 2007	Active Comm. UTG for 2007	% Comm. UTG Treated
West	1,590,742	1,352,133	1,263,400	79%	93.4%	2,474	2,474	2,474	100%
North	515,640	438,294	386,798	74%	87.3%	1,157	1,157	1,157	100%
Total	2,106,382	1,790,427	1,650,198	78%	91.9%	3,631	3,631	3,631	100%

Figure 31

Cameroon: Training 2005-2007, with 2008 Targets: CDDs and Community Supervisors

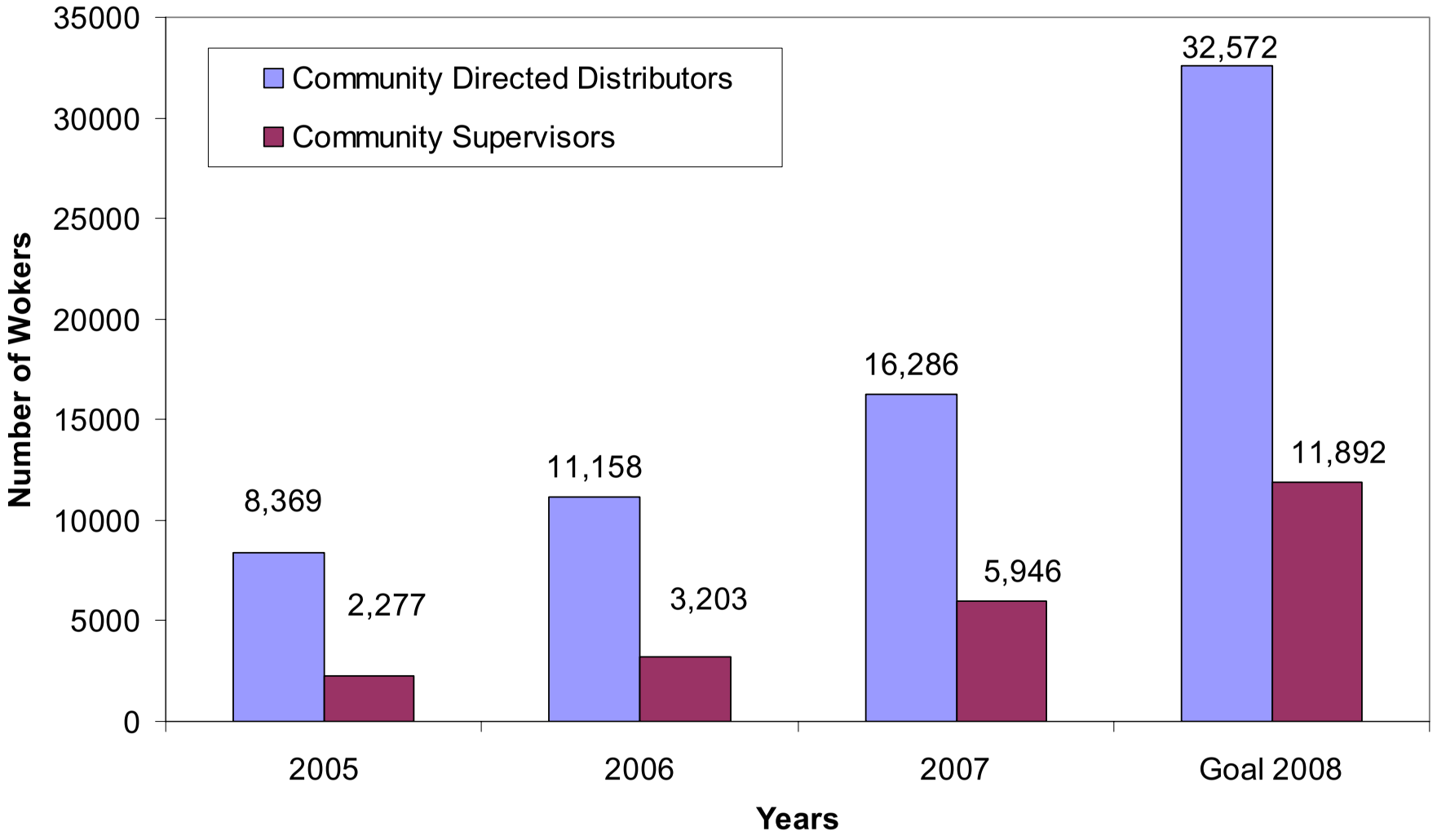
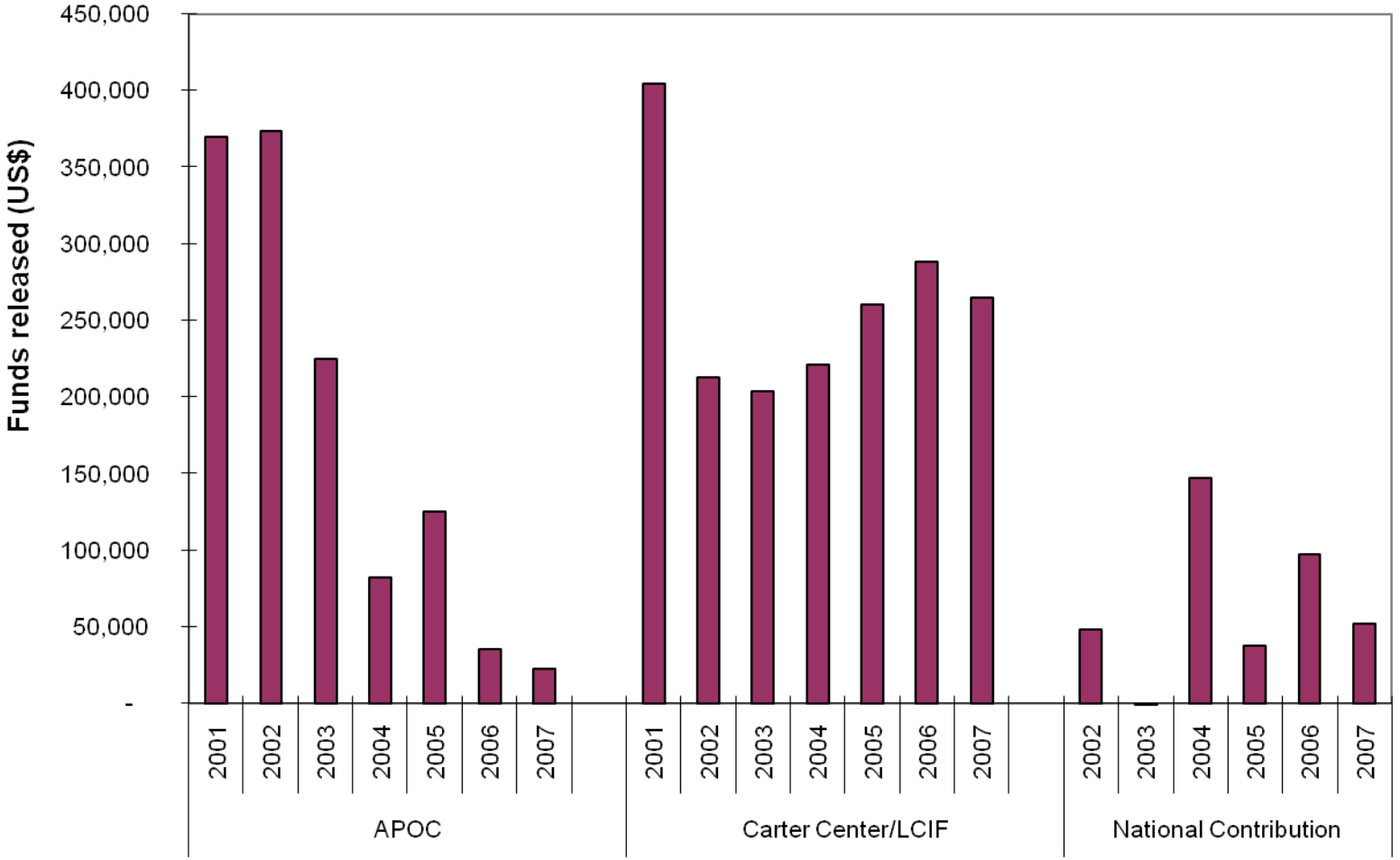


Figure 32

Cameroon: Financial Contributions (in USD), 2001 – 2007



APOC trend is down, Carter Center/LCIF trend is stable, and national contribution is erratic

Figure 33

Cameroon: Comparison of Annual Performance on Community Policy Factors in Carter Center-Assisted Areas (2004-2007)

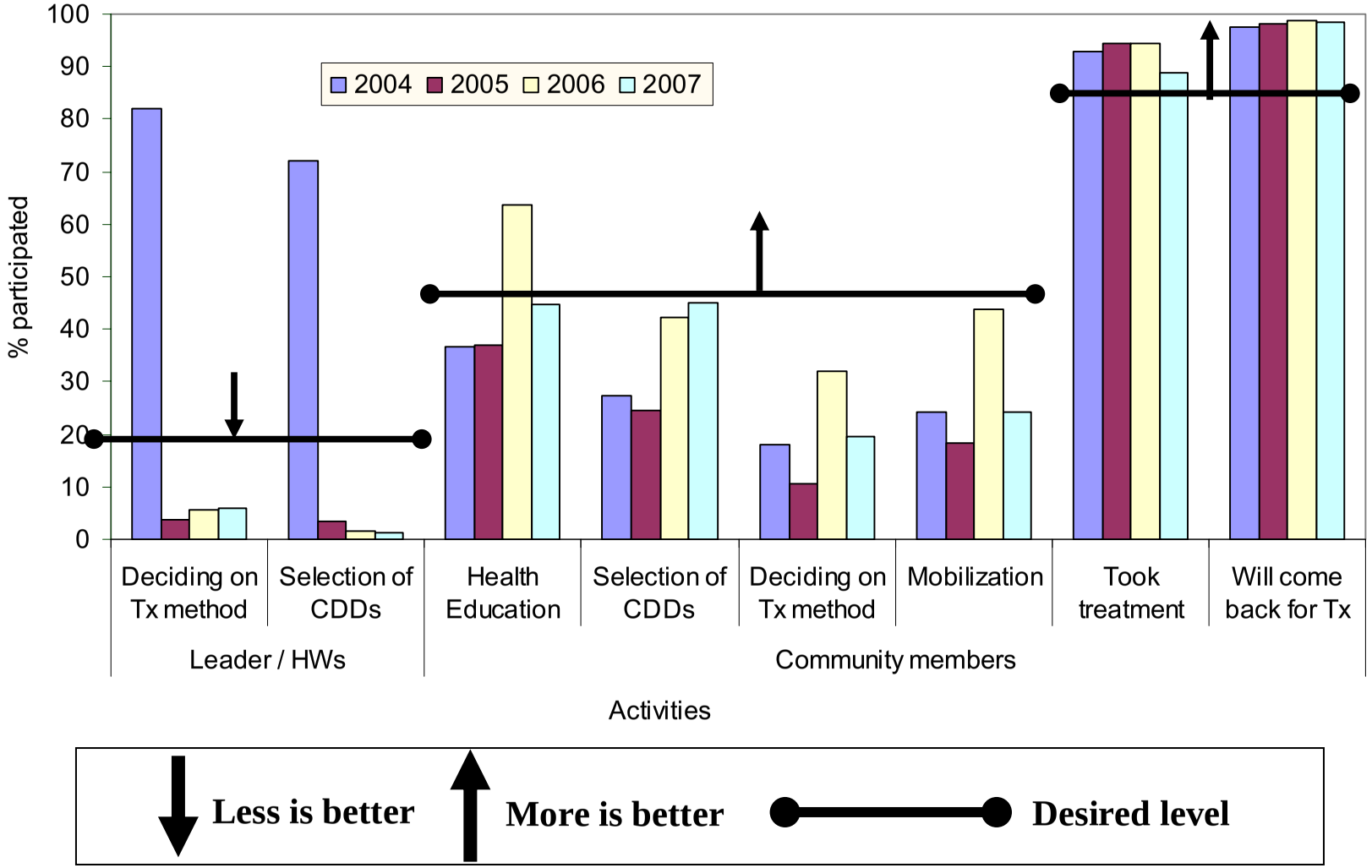


Figure 34

Cameroon: Vitamin A Supplementation 2007 (North and West)

Province	Round	UTG - Total Children (6- 59 months)	Children Treated	% UTG treated	UTG for Communities	Comm. Treated	% comm. treated
West	1st	255,237	203,390	80	2,474	2,474	100
	2nd	255,237	157,989	62	2,474	2,474	100
North	1st	83,877	59,562	71	1,157	1,157	100
	2nd	83,877	22,607	27	1,157	1,157	100

NIGERIA

Nigeria is the most endemic country in the world for river blindness (RB), having as much as 40% of the global disease burden. It is estimated that up to 27 million Nigerians living in 32 endemic states need curative or preventative treatment with Mectizan® for RB (the UTG is estimated by the Nigerian Federal Ministry of Health [FMOH] to be between 22-27 million). The National Onchocerciasis Control Program (NOCP) is the largest Mectizan® distribution program in the world and provided throughout Nigeria approximately 14 million treatments in 2007 (estimate is subject to revision by the FMOH, see Figure 35). In 2007, The Carter Center's UTG in Nigeria accounted for 20% of the national UTG.

Background: 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 nine RB endemic states: Abia, Anambra, Delta, Ebonyi, Edo, Enugu, Imo, Nasarawa, and Plateau States (see Figure 36). As in all other African programs except Ethiopia, The Carter Center-Nigeria RB projects no longer enjoy substantial APOC support.

The Lions Clubs International Foundation SightFirst Initiative has been a major Carter Center partner in Nigeria. In addition to the funding provided by LCIF, members of Lions Clubs in District 404 have been active participants in the Carter Center-assisted RB control activities in Nigeria since 1996. They mobilize communities in advance of mass drug administration, conduct health education and advocacy campaigns, and monitor coverage.

Treatments: In 2007, the Lions-Carter Center-assisted program in Nigeria provided health education and Mectizan® treatments to 5,454,758 persons (Figure 37), 90% of whom were in community-directed mass treatment in at-risk villages, with the remainder given as passive treatments. Overall treatments reflected a 5% increase over 2006. Treatments were conducted in 10,081 villages. The treatments assisted by The Carter Center represented approximately 39% of the total treatments estimated to have been reported so far by the FMOH to have occurred in 2007 in Nigeria.

The Carter Center Nigeria Program received approximately 13.5 million Mectizan® tablets for 2007, and the average number of Mectizan® tablets per person treated was three. Approximately 600,000 Mectizan® tablets remained at the end of 2007.

No Severe Adverse Events (SAEs) were reported as a result of Mectizan® treatments in Nigeria in 2007. Particularly close monitoring for adverse reactions is given in the southeastern states because of the presence of *Loa loa* in that part of the country. *Loa loa* is a parasite similar to *O. volvulus*, but it can give rise to SAEs when Mectizan® is administered.

Training and Health Education: The nine states assisted by The Carter Center conducted training or retraining for 19,111 health workers involved in Mectizan® distribution in 2007 (see Frontispiece Figure G). These numbers are exciting because it shows a reversal in the two-year decline observed in 2005-2006. More than 5,000 more health workers were trained in 2007 than in 2006. This year's total included 14,963 Community-Directed Distributors (CDDs), 1,832 Community Supervisors, and 2,316 Frontline Health-Level Workers. The average number of CDDs per village was approximately 2.1, up from 1.2 in 2006. The ratio of persons treated per one CDD was 365; too high (the goal is 1:100), but greatly improved over 1:532 in 2006. In the Southeast states, 38% of CDDs were female; data are not available for Plateau and Nasarawa. In spite of high ratios, progress in adopting the kinship system in selection, training of CDDs and carrying out treatment in Southeast Nigeria was impressive. Over 80% of communities are now using the kinship system.

Financial Contribution: Overall, the funding for Carter Center-assisted programs in Nigeria during the period 2001-2007 (Figure 38) was characterized by a decrease over time in APOC funding and insufficient government contributions. Carter Center funding to RB activities appears to have decreased, but that is an artifact of shared costs with integrated efforts which are not included in the figures given. In 2007, contributions from all levels of the government amounted to approximately 19% of total funds. APOC contributed 19% (for non-core purposes), and The Lions-Carter Center SightFirst Initiative contributed the remaining 62%.

At the community level, 1,836 villages, or 23% of all at-risk villages receiving mass treatment, supported their CDDs with cash. The amount contributed per CDD averaged U.S. $1.37 (at 125 Naira to the dollar). Total village-level contributions equaled approximately 2.5 million Naira (U.S. $20,425), nearly $4,000 higher than 2006. However, because there were more CDDs in 2007 than 2006, the amount villages contributed *per* CDD fell by over a dollar. LGA-level contributions in eight of the nine states (Plateau LGAs did not contribute) totaled approximately 3.8 million Naira (U.S. $30,714), a 60% decrease from 2006. State-level contributions in seven of the nine states (Plateau and Nasarawa did not contribute) totaled approximately 3.3 million Naira (U.S. $26,294), a slight increase from 2006, but a steep decline (over 50%) from 2005.

The Integrated Program in Plateau and Nasarawa: The Carter Center program in Nigeria has pioneered the concept of integrated mass treatment, in which the logistics of a mass drug administration (MDA) program are shared across several programs. Integration results in greater impact against diseases that can be addressed with similar strategies, lower costs and higher efficiency.

The initiative's central platform is an infrastructure and logistical system to deliver annual combination Mectizan®/albendazole community-based mass treatment with health education for lymphatic filariasis (LF) to the entire population throughout the two-state area. The initiative partners include Nigeria's FMOH, state governments, and the ministries of health of Plateau and Nasarawa. The program began in 1999 by integrated RB interventions with urinary schistosomiasis, expanding into LF in 2000.

Interventions now also include trachoma, malaria, and Vitamin A deficiency. The LF treatment combination is also effective against several soil transmitted helminthes (STH), which are intestinal worms. Another important goal is to establish LF's potential for eradication in sub-Saharan Africa, in *Anopheles* transmission zones. Background information on LF and urinary schistosomiasis (*Schistosomiasis haematobium* or SH) is given in Annex 7.

In 2006, the Bill & Melinda Gates Foundation awarded The Carter Center funding for Plateau and Nasarawa States (the grant is entitled, "Proof of Concept for Integrated Health Intervention in Nigeria"). The funding enabled further expansion of the scope of the program to include assessing cost-effectiveness and sustainability of integrated interventions and advocacy for national replication of the integrated approach. Replication depends on whether support can be secured from of the government of Nigeria. The Center has partnered with the CDC and Emory University in the execution of the cost and sustainability (managerial) dimensions of integration. President Carter is a strong and vocal advocate for expansion with the Nigerian government.

Lymphatic Filariasis: 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. A total of 3,414,800 persons in the two states received health education and mass treatment for LF in 2006, which was 93.5% of the UTG of 3,652,859 treatments (see Figures 39 and 40). RB is simultaneously treated with LF combination therapy of Mectizan® and albendazole. However, ivermectin treatment for hyper/mesoendemic RB is more limited than that of LF. Of the total treatments given, approximately 30% (972,534) were in RB target areas, and the remaining 2,442,266 were in LF-only areas (some of which are also hypo-endemic for RB). 2007 marked the fifth year in which all 30 LGAs in the two states were reached. The WHO elimination strategy calls for between four and six years of treatment to eliminate LF. Approximately 47,000 albendazole tablets remained at the end of 2007.

In 2007, The Carter Center conducted assessments in the two-state area to determine if LF had been eliminated by the MDA program. The infection rates in 2007 were compared with baseline values gathered in 1999-2003 in nine sentinel villages. *Wuchereria bancrofti* microfilariae in nocturnal thick smears decreased by 85% (Figure 41), from 9.8% in 2002-2003 to 0.7% in 2007 (the WHO threshold for elimination is for microfilaremia to be below 1%). The Filariasis Immunochromatographic Card Test (ICT) for LF antigenemia decreased by 83%, from 46% in 2000 to 8% in 2007. LF infection rate (L1-3) in anopheline mosquitoes decreased by 92%, from 5.2% in 2000 to 0.4% in 2007 (See Frontispiece Figure F). These decreases were all statistically significant. A small cohort study of 174 permanent residents of the sentinel villages who were tested with ICT in 2004 were retested in 2007. The study found 97 persons who were ICT negative in 2004 remained negative in 2007, indicating 0% incidence over a three year period (or 291 person-years). Among persons who were ICT positive in 2003 (n= 77), 19.5% became seronegative over that same period. While these findings are encouraging, disaggregated results show that there remain 'hot spots' of LF infection

and that treatment should not be discontinued before further evaluations take place in 2008.

Malaria: In Africa, the same anopheline mosquitoes that transmit LF also transmit malaria. Insecticide treated bed nets (ITNs) 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. With this in mind, The Carter Center partnered with the Nigerian Ministry of Health and linked ITN distribution with mass drug administration programs for LF on a pilot basis. Sharing resources will result in cost reductions, and protection from the mosquito vectors will reduce transmission of both diseases simultaneously. Having ITNs, particularly long lasting insecticidal nets (LLINs), distributed free of charge and at scale (e.g. full population coverage) in Plateau and Nasarawa States is the best way to protect from resurgence of LF after MDA is halted. Up until now however, the ITNs that have been provided by the FMOH are given only to children under five years of age and pregnant women ('malaria vulnerable groups'). Logistical systems have been developed to enable distribution of ITNs during the MDA for LF/ RB.

Since 2004, 217,884 ITNs have been distributed during MDA in eight LGAs in Plateau and Nasarawa (see Figure 42). For the first 3 years, these donated nets were conventionally impregnated (insecticidal action lasting less than one year), not LLIN (insecticidal action lasting up to five years, or the lifespan of the net itself). We adopted a policy to retreat those nets (using retreatment sachets) during MDA, but this slows the MDA process, and funding to purchase the retreatment kits is limited. As a result, annual retreatment levels were running at only approximately 30%. In 2007, for the first time, the MOH provided the program with 100,000 LLINs. Henceforth, the program intends to distribute only LLINs.

Schistosomiasis (program includes also Delta State):

In 2007, The Carter Center reached the milestone of one million cumulative assisted praziquantel (PZQ) treatments since the schistosomiasis treatment program was launched in 1999. Also in 2007, the program achieved its second highest total ever with 202,941 persons in Plateau, Nasarawa and Delta States (in southeast Nigeria) receiving health education and mass PZQ treatment for schistosomiasis in 2007 (Figure 43), exceeding the Annual Treatment Objective (ATO) of 192,361. Approximately 390,000 PZQ tablets were used, at an average dose of 2 tablets per person, and 47,000 PZQ tablets were remaining at the end of 2007.

Two integrated surveys were carried out in 2007 to complete mapping of trachoma and urinary schistosomiasis in eight LGAs of Plateau and Nasarawa States of Nigeria and determine whether the integrated results provide sufficient evidence to guide program interventions. Mr. Jonathan King, Program Epidemiologist for The Carter Center's Trachoma Control Program, was part of the study team, and gave a presentation on these surveys at the Program Review. A summary can be found in Annex 9 *Integration Applied: Mapping of urinary schistosomiasis and trachoma in Plateau and Nasarawa States*.

In 2008, the program plans to increase treatments by nearly five times due to a WHO/E-Merck donation to The Carter Center of 1.5 million PZQ tablets; enough to treat all the estimated 1,000,000 school-age children in Plateau and Nasarawa. This major development removes the hurdle of the price of PZQ (approximately U.S. $0.20 per treatment) which has restricted the growth of the schistosomiasis program in the past. Up until now, PZQ was purchased through a generous grant from the Izumi Foundation and with support from individual donors. In 2008, the schistosomiasis program in Delta State will continue to receive funding through that grant, in addition to possible program expansion in the other Carter Center–assisted states in the southeast. Further discussion of the reasons for expanding PZQ treatment in Plateau and Nasarawa states (to begin to treat intestinal schistosomiasis as well as urinary) are given in Annex 7.

Co-Administration (Triple Drug Administration): PZQ has been shown to be safe for combined treatment with Mectizan® and albendazole. This benefits our integrated programs, where savings are based on the ability to provide multiple treatments in a single village encounter. The Carter Center launched extended Triple Drug Administration (TDA) treatment throughout the Plateau and Nasarawa integrated program areas in 2007, after monitoring a successful TDA trial in five communities in Mikang LGA, Plateau State in 2006 (see Annex 8, Eigege et al., Annals Tropical Medicine and Hygiene, March 2008, for the details of this experience). In 2008, the integrated program will conduct TDA in all LGAs where separate rounds of treatment with PZQ have already been given at least once, per WHO guidelines.

The Integrated Program in Southeast Nigeria:

The integrated schistosomiasis program in Delta State is described briefly above. Delta State will likely begin to rotate PZQ treatment ('PZQ holidays') in 2008 so that treatments can be extended to new areas and more people will benefit. The rotation practice was developed in 2006 for Plateau and Nasarawa States, where holidays were given for two to three years after a three -year treatment cycle. In most areas, treatment reduces the rate of hematuria from schistosomiasis to below the 20% mass treatment threshold, and PZQ is moved to other LGAs that have yet to be treated. However, once PZQ treatment is halted, hematuria prevalence among children slowly begins to increase again, indicating a return of the infection. Our observations in Plateau and Nasarawa suggest that treatments can be withheld from an area for three years before recrudescence brings the rate to 20% or more again. Plateau and Nasarawa will no longer be using a rotation scheme thanks to the drug donation by WHO. It is also hoped that soon Mectizan® treatments can be combined with PZQ treatments in Delta state so that separate distribution rounds are not necessary.

In 2006, the Bill & Melinda Gates Foundation awarded The Carter Center funding for two states in southeast Nigeria (Ebonyi and Imo States) in a grant titled, "*Loa loa* Paralyzes LF MDA in Central Africa: Integration of LF and Malaria Programs Can Resurrect a Continental Initiative." The goal of the project is integration of malaria and LF programs in a field demonstration that will test whether LLINs alone, without

adjunctive MDA, can interrupt LF transmission while improving the control of malaria. LF cannot be treated with MDA in areas coendemic for *Loa loa*, like southeast Nigeria, due to the risk of severe adverse reactions that can occur when persons with *Loa loa* receive the medicines used for treatment of LF. Therefore, it is desirable to find alternative methods to MDA for controlling LF. Baseline information was collected in 2007 in preparation for the distribution of 200,000 LLIN in four LGAs in the two states in 2008.

2008 RECOMMENDATIONS FOR CARTER CENTER NIGERIA

All States

GENERAL

The Nigeria program should continue to refine government and Carter Center funding figures in 2008, including any additional funds provided through APOC; monitor trends for increased funding, especially as related to how The Carter Center might be asked to fill the 'post APOC funding gap'

Apply The Carter Center monitoring protocol annually to assess coverage, health education, and community involvement, in non Gates supported states; given the work demands in Gates supported states, the monitoring protocol should be suspended

Work towards a target of minimum 1 CDD to 100 population; seek to increase training, supervision, involvement of kinship groups, and improve gender balance among CDDs, as appropriate; and CDD training and CDD retraining needs to be expressed in relation to annual training goals

Encourage the Lions Clubs District 404 to be more involved in advocacy at the state levels; seek more Lions involvement to help maintain program visibility and support

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

SPECIFIC

Advocate for the Nigeria government to provide more financial support to the treatment program; pursue a high-level advocate like General Gowon to help garner more political support for the integrated programs in particular

Advocate strongly for the release of counterpart funding from states and LGAs

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

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

Plateau and Nasarawa States' Integrated Program:

Launch Emory (Dr. McFarland) economic studies and CDC integration management work

Work with Carter Center headquarters to get drugs, bednets and lab materials where they are needed in a timely fashion

Lymphatic Filariasis:

Increase LLIN distribution to more LGAs; consider replacing all conventional ITNs with LLINs to prevent having to organize repeated reimpregnations if supplies become available (Plateau State, being supported by the Global Fund, has less difficulty accessing LLIN than Nasarawa State, which is not so supported)

Replace conventional ITNs in ITN sentinel villages with LLINs in Plateau State in 2008; monitor mosquito numbers, parity and infection rates in all sentinels per protocol

Complete LF/Trachoma integrated assessments and analyze/report data; draft a manuscript reporting the results; consider extra-sentinel, community-wide surveys in communities we have previously surveyed in 2000-2001; continue ivermectin/albendazole combined MDA for LF statewide for now in 2008

Draft a manuscript reporting the Plateau/Nasarawa LF experience (treatments, coverage, entomology, sentinel mf rates and ICT results)

Submit for publication the hydrocele surgery manuscript by Dr. Gail Thomas; consider further integration of LF surgery days with trichiasis surgery days, if cost savings would result; focus on pre-op screening, sterility during surgery, timely removal of stitches, and postoperative follow-up

Schistosomiasis:

Obtain the 1.5 million tablet donation of PZQ from Merck KGaA, through WHO.
Launch PZQ treatments throughout the two state area aimed at school-aged children, using triple drug administration (TDA: Mectizan®, albendazole and PZQ) whenever possible.
In LGAs where PZQ is being offered for the very first time, the PZQ dosage should be given as a separate round from the albendazole/ivermectin (separation by at least a week); this would not include LGAs that had rotated off PZQ treatment in a PZQ holiday, where TDA would be offered

Analyze baseline and recrudescence hematuria data from the PZQ holiday rotation and draft a manuscript

Design an evaluation for the added impact of trachoma latrines (in addition to PZQ) on the prevalence of schistosomiasis (urinary and intestinal)

Trachoma

Complete mapping of the two state area, in an integrated fashion with LF assessments

Obtain the donation of azithromycin from Pfizer and launch treatments in LGAs where TDA is ongoing; azithromycin treatments will be given as a separate round from TDA

Onchocerciasis:

Seek the funding needed to allow a thorough evaluation of the impact of combined albendazole and Mectizan® on onchocerciasis transmission.

Vitamin A supplementation:

Vitamin A supplementation (VAS) has been a challenge given the need to deliver VAS every six months, the erratic VAS supply chains, and by other NGOs or agencies delivering Vitamin A in the same target villages. Nevertheless, the Plateau/Nasarawa project needs to do its best to provide VAS simultaneously with Mectizan® distribution, as this is an objective of the Gates integrated grant. However, we are not in a position to provide for a second, separate round of VAS, or to distribute in areas where we are not already assisting Mectizan® distribution.

Treatment Objectives for Plateau and Nasarawa States, 2008:

Ivermectin/Albendazole: 2,646,723 persons.

Ivermectin: 1,060,929 persons.

PZQ: 926,913 persons

ITN: 206,667 persons.

VAS: 900,000 treatments.

Training Objective for 2008: 10,589 CDDs and 3,638 community supervisors.

Southeastern States:

The priority activities of the Southeast Owerri Office, and the director of Southeast programs, is the Bill & Melinda Gates Foundation-supported Malaria/LF Integration Project in Imo and Ebonyi States. See separate section below)

If there is opportunity, seek to demonstrate impact of ivermectin treatment on ocular disease in one or two other assisted states. Review available data from past sentinel areas that may have baseline data pertaining to visual impairment or ocular disease due to RB. In those areas having baseline data, surveys for anterior segment disease should be conducted using the new slit lamp provided in 2007.

Apply The Carter Center monitoring protocol annually to assess coverage, health education, and community involvement in states not involved in Gates' projects.

Complete the data collection phase, complete analysis, and draft a manuscript of the Imo and Abia Post-APOC Post NGDO scenario study.

Gates Malaria/LF Integration Project in Imo and Ebonyi States:

Complete upgrade of Owerri office and improve internet access.

Complete community-wide LF surveys in sentinel villages by April 2008.

Continue longitudinal entomology monitoring with monthly baseline data in all villages during the rainy season.

Deliver 200,000 LLINs to the four target LGAs (two LGAs targeting vulnerable groups, two full coverage) using a campaign strategy and fixed distribution points, starting in Imo in April 2008 and continuing to Ebonyi by mid-May. Integrate with Vitamin A delivery if possible, but this is dependent upon prompt and adequate supply.

Establish a system for resupply of nets to future pregnant women in the 'vulnerable populations" (group A) LGAs.

Closely monitor the number of nets delivered using a tracking and reporting system.

Complete and publish the analysis of the household malaria/net survey completed in Nov/Dec 2007.

Execute a study to evaluate the impact of ivermectin on soil-transmitted helminthes in Imo State by a stool survey of children inside (RB LGAs) and outside (LF Gates LGAs) the ivermectin treatment zones.

Treatment Objectives for Southeast States, 2008:

Ivermectin: 4,536,811 persons

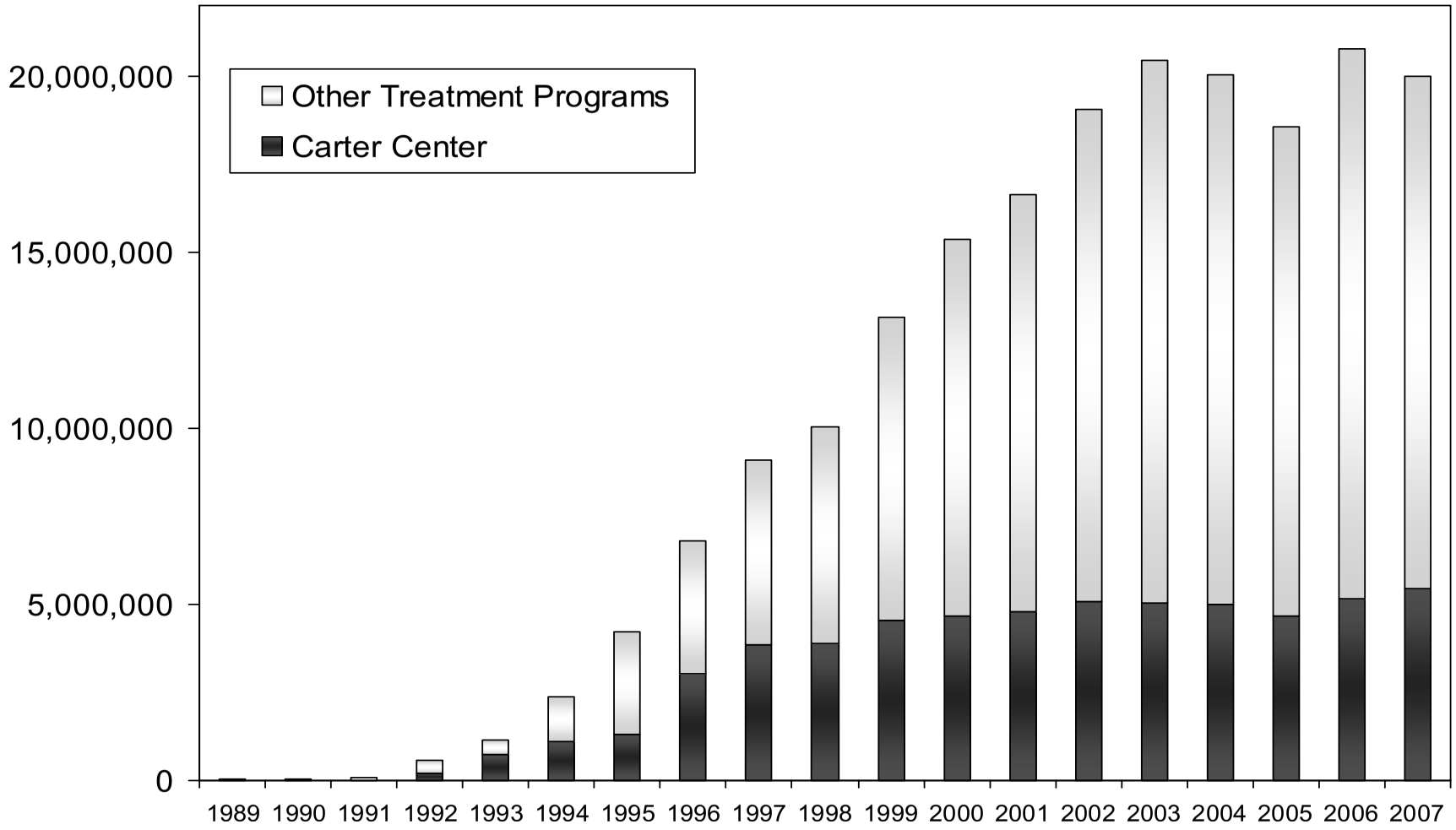
LLIN distribution: 200,000 persons

PZQ: 95,412 persons

Training Objective for 2008: 51,488 CDDs and 14,668 community supervisors.

Figure 35

Nigeria: Carter Center-Assisted Treatments and Total Mectizan® Treatments Provided in 1989-2007*



* Treatments from 1992-1995 by RBF. National figure provisional.

Figure 36

Nigeria: Lions/Carter Center-Assisted States

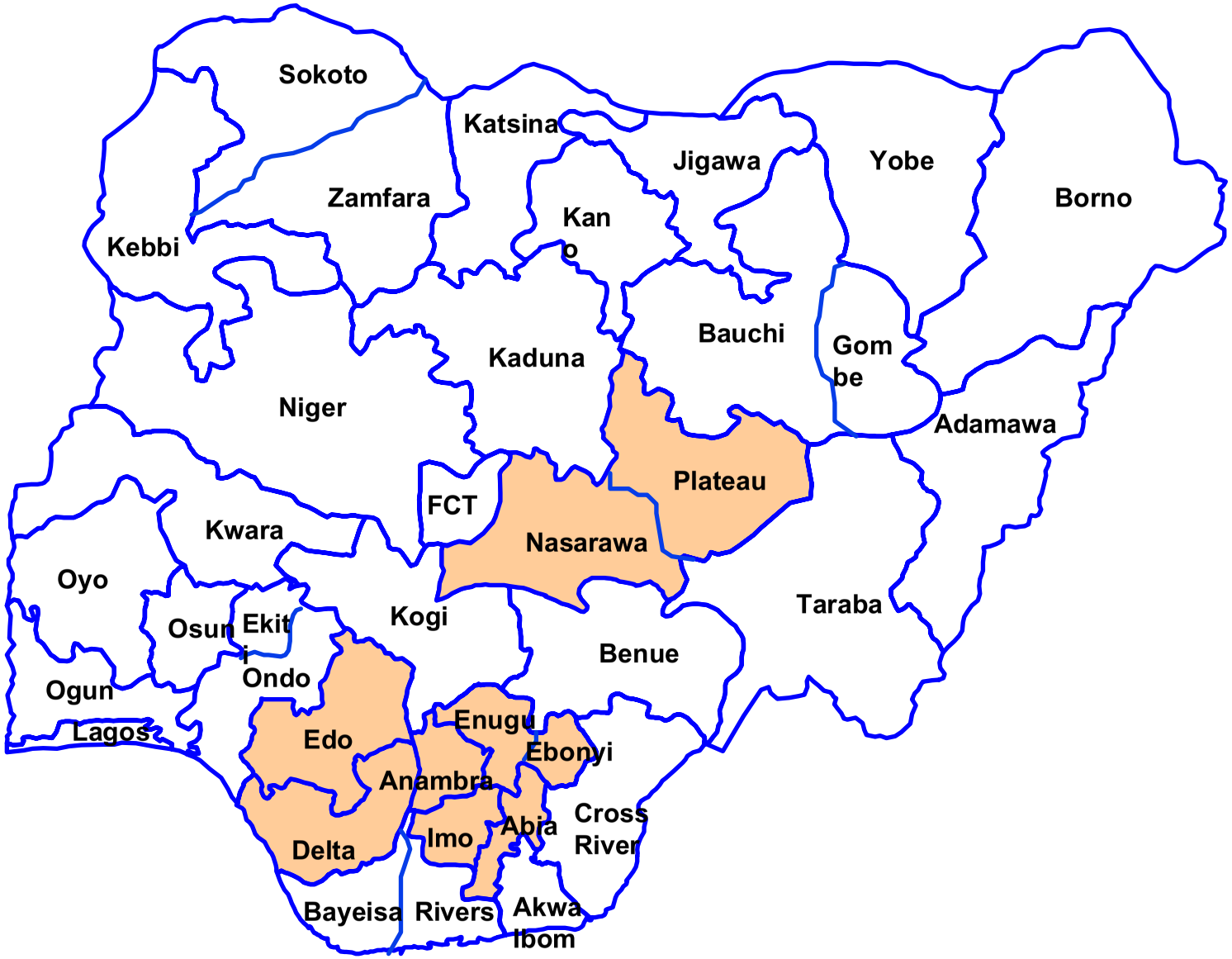
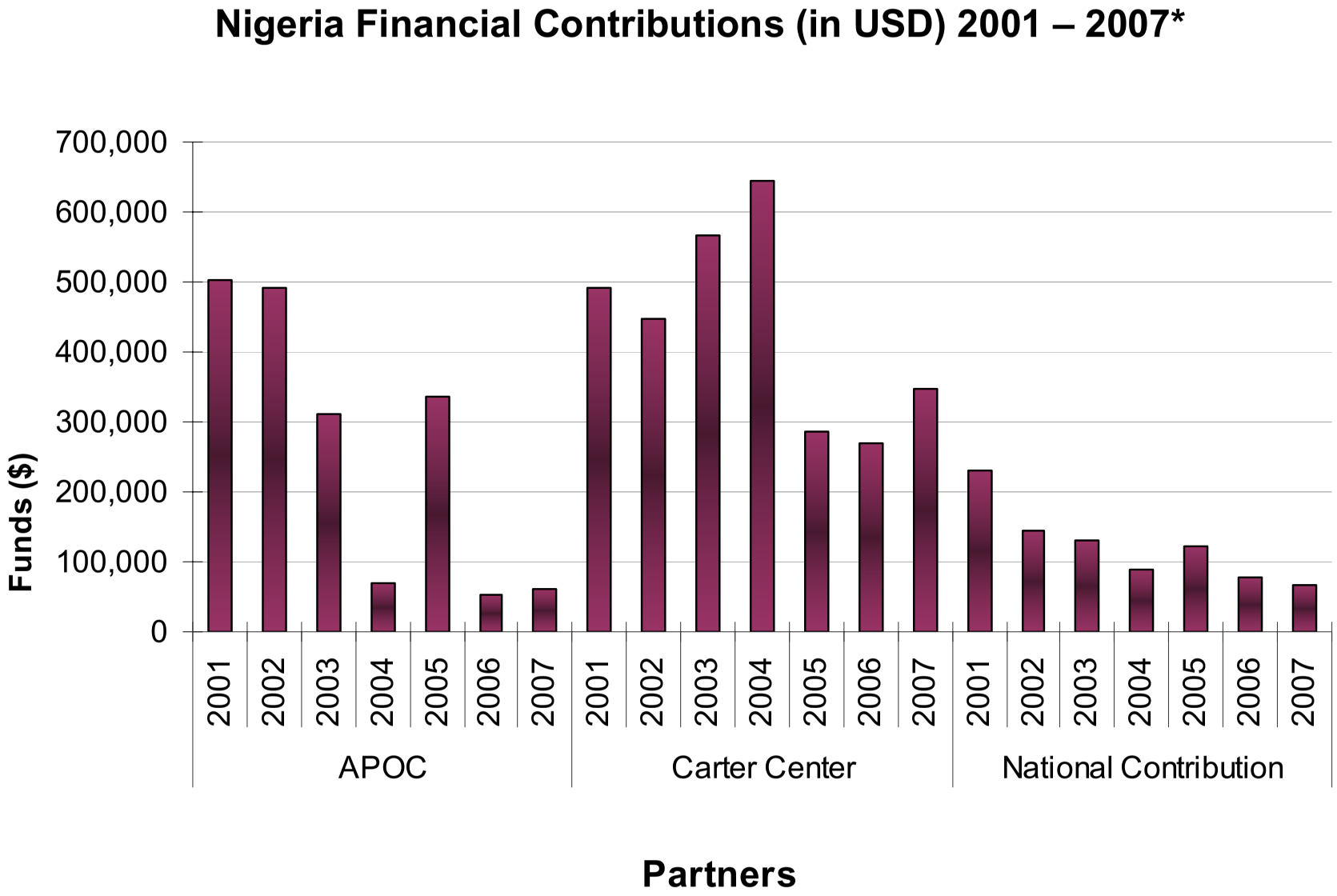


Figure 37

Nigeria: Lions-Carter Center-Assisted Areas: 2007 Mass River Blindness Treatments

Name of State	District	Total Popn for 2007	Ultimate TX Goal (UTG) for 2007	Popn treated cumulative for 2007	% UTG treated in 2007	% of total popn treated in 2007	Active villages cumulative for 2007	Active villages UTG/ATO for 2007	Active villages % for UTG for 2007
ENUGU	16	975,141	795,996	779,583	97.94	79.95	1,329	1,373	96.80
ANAMBRA	16	777,352	592,333	566,233	95.59	72.84	1,062	1,062	100.00
EBONYI	10	610,810	495,711	507,521	102.38	83.09	972	973	99.10
EDO	12	731,900	584,026	643,178	110.13	87.88	530	530	100.00
DELTA	9	568,064	461,277	460,700	99.87	81.10	470	470	100.00
IMO	20	805,208	650,165	625,223	96.16	77.65	1,917	1,940	98.81
ABIA	12	422,920	355,895	348,500	97.92	82.40	709	684	103.65
PLATEAU	5	378,878	303,102	303,528	100.1	80.1	296	296	100.00
NASARAWA	7	927,685	742,148	669,006	90.1	72.1	589	589	100.00
TOTAL	107	6,197,958	4,980,653	4,903,472	98.45	79.11	7,874	7,917	99.46

Figure 38



* Lions Clubs International Foundation provided major financial support in 1999 – 2005, and partial support in 2006 - 2008

Figure 39

Nigeria: 2007 Lymphatic Filariasis and Schistosomiasis Treatments

Lymphatic Filariasis Treatments

Name of State	No. of LGAs	Popn treated cumulative for Y2007	Ultimate TX Goal (UTG) for Y2007	% UTG treated in 2007	Total Popn for Y2007	% of total popn treated in Y2007	Active villages cumulative for Y2007	Active villages UTG for Y2007	Active villages % of UTG for 2007
Plateau	17	1,986,499	2,132,287	93.2%	2,665,359	74.5%	2,571	2,577	99.8%
Nasarawa	13	1,428,301	1,520,572	93.9%	1,900,715	75.1%	1,061	1,061	100.0%
TOTAL	**30**	**3,414,800**	**3,652,859**	**93.5%**	**4,566,074**	**74.8%**	**3,632**	**3,638**	**99.8%**

Schistosomiasis Treatments

Name of State	No. of LGAs	Popn treated cumulative for Y2007	ATO for Y2007	% ATO for 2007
Plateau	5	39,714	69,697	57.0%
Nasarawa	4	116,733	76,142	153.3%
Delta	8	46,494	46,500	100.0%
TOTAL	**17**	**202,941**	**192,339**	**107.3%**

Figure 40

Nigeria: Lymphatic Filariasis Treatments: Plateau and Nasarawa States

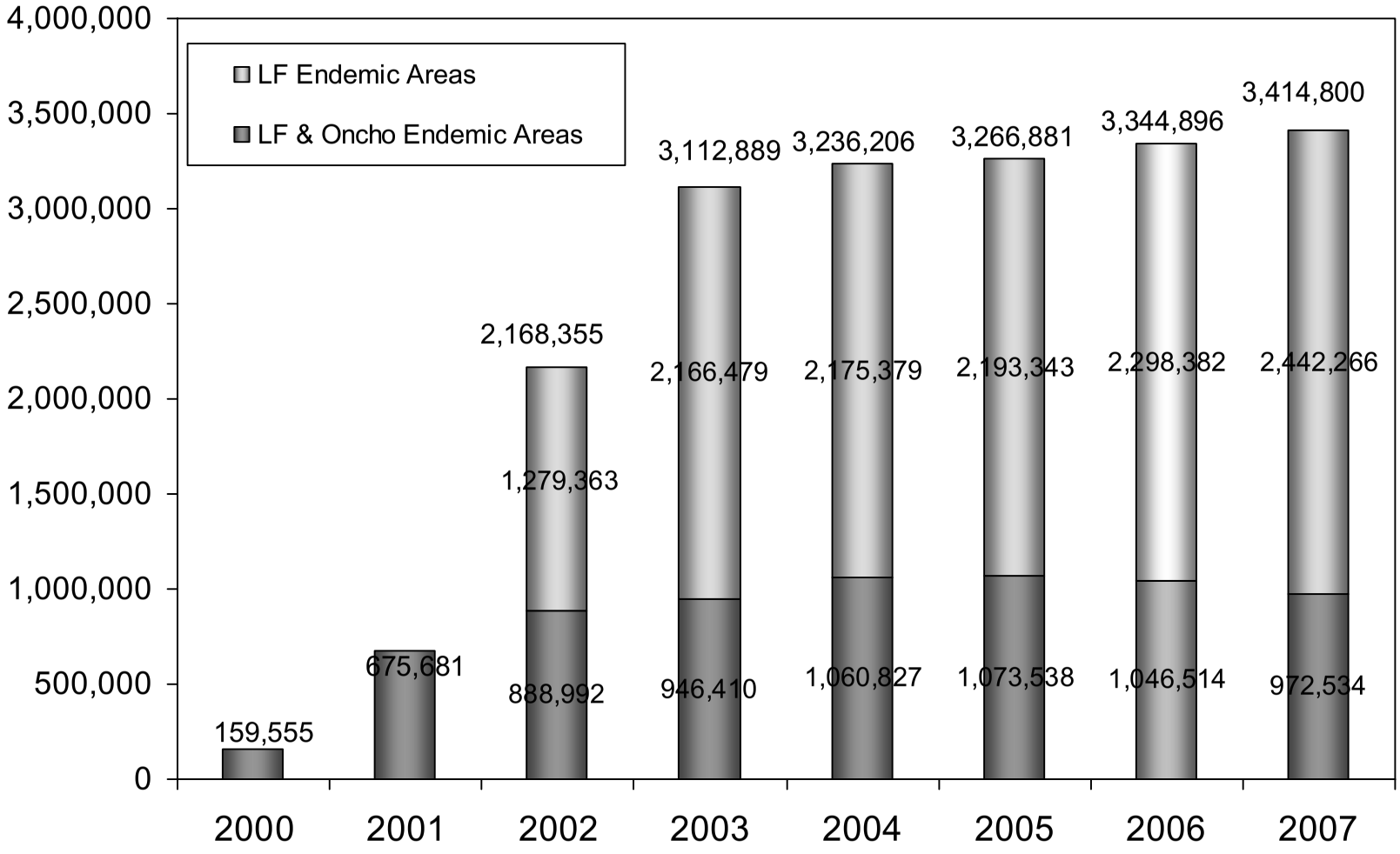


Figure 41

Nigeria Thick Smear Results (LF) Comparing Baseline Data with 2007 Data in Ten Sentinel Sites of Plateau and Nasarawa States

VILLAGE	Baseline Data: 2002/2003			2007 Data		
	Number postive	Sample size	Percent positive	Number postive	Sample size	Percent positive
Akwete	2	424	0.5%	0	81	0.0%
Azara	1	402	0.2%	0	20	0.0%
Babale	12	261	4.6%	0	96	0.0%
Dokan Tofa	21	419	5.0%	2	151	1.3%
Gbuwhen*	19	508	3.7%	0	196	0.0%
Gwamlar**	33	494	6.7%	2	128	1.6%
Lankan	9	274	3.3%	2	117	1.7%
Maiganga	23	486	4.7%	1	158	0.6%
Seri*	56	527	10.6%	1	133	0.8%
TOTAL	176	3,795	4.6%	8	1,080	0.7%

* Began receiving insecticide-treated bed nets in 2004

** Gwamlar baseline data from 2005

Figure 42

Nigeria: Collaboration between LF and Malaria Programs

Bed Net Distribution in 2007

Name of State	No. of LGAs	Popn recvd ITN cumulative for Y2007	ITN Distribution objective (ADO) for Y2007	Total Popn for Y2007 of LGA	ATO (Villages)	Cum no. villages covered	% ADO coverage	% village coverage
Plateau (Bassa, Jos East, Jos South, Kanke, Mangu, Riyom, L/North & Q/Pan LGAs)	8	63,129	40,544	213,720	767	1,187	155.7%	154.8%
Nasarawa (Keana, Nasarawa & Akwanga LGAs)	3	33,141	32,398	452,632	348	223	102.3%	64.1%
TOTAL	**11**	**96,270**	**72,942**	**666,352**	**1,115**	**1,410**	**132.0%**	**126.5%**

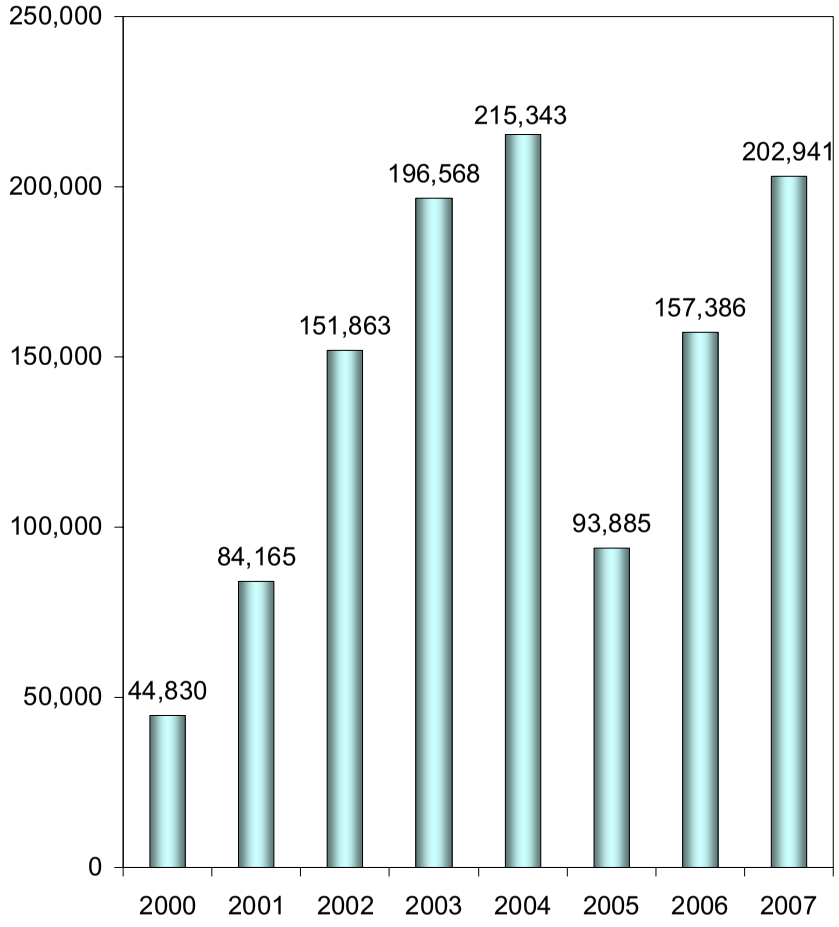
Cumulative Bed Net Distribution and Retreatment

	Bed Nets Distributed	Bed Nets Retreated
2004	38,620	-
2005	18,447	15,545
2006	64,547	21,806
2007	96,270	44,577
TOTAL	**217,884**	**81,928**

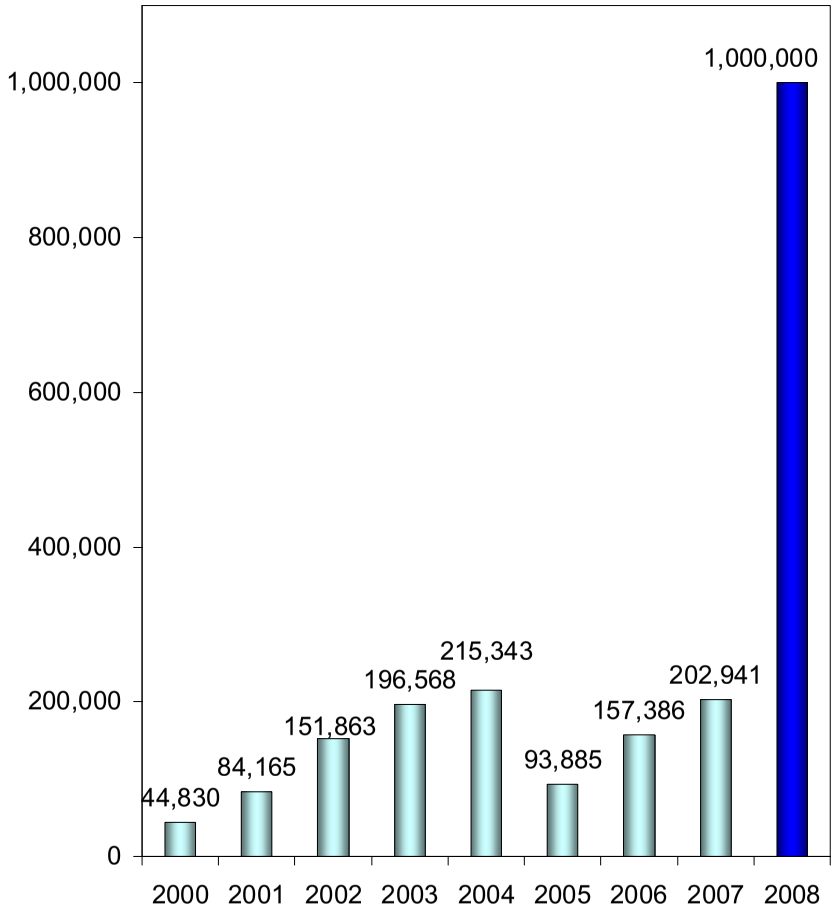
Figure 43

Nigeria: Schistosomiasis Treatments: Plateau, Nasarawa and Delta States

1999-2007



1999-2007, with 2008 projection



ETHIOPIA

Background: Ethiopia is the largest, most populous country in the Horn of Africa (with a population of approximately 75 million). Onchocerciasis was first reported in southwestern regions in 1939, while the northwestern part of the country was recognized to be endemic in the 1970's. The National Onchocerciasis Task Force (NOTF) was established in 2000 and functions through the Ministry of Health's (MOH) Malaria and Other Vector Borne Disease Control Unit (MOVDCU). APOC completed Rapid Epidemiological Mapping of Onchocerciasis (REMO) in Ethiopia in 2001 and targeted ten areas where the prevalence of onchocerciasis was estimated to be over 40% and, thus, eligible for APOC's community-directed treatment with ivermectin (CDTI) projects (Figure 44). The Carter Center and Lions Clubs partnered with APOC and the MOVDCU in eight of these ten projects (Map 15), beginning with Kaffa and Sheka zones in 2001. Since then Lions-Carter Center assistance has expanded to include Bench-Maji, North Gondar, Illubabor, Jimma, Metekel and Gambella. The 2007 total population in the assisted areas was 3,694,310 people, with a UTG of 3,110,238 people. Mectizan® treatment is very popular in Ethiopia, in part because of its additional and highly popular benefits from purging intestinal helminthes. In 2007, the Carter Center's treatments in Ethiopia accounted for 69% of that country's Mectizan® treatments.

Members of Lions District 411A play an important role in both The Carter Center's RB and trachoma control programs in the Lions-Carter Center-assisted areas of Ethiopia. The Carter Center country representative, Mr. Teshome Gebre, himself a Lion, is co-chair of the NOTF and chair of the NGDO coalition. He represents the Lions both on the NOTF and the National Committee for the Prevention of Blindness (NCPB) and is the incoming SightFirst Committee Vice Chairman for Ethiopia. Ethiopian Lions participate actively in the annual Carter Center Ethiopian staff retreat. The Honorable Dr. World Laureate Tebebe Y. Berhan attended the Program Review in Atlanta.

Treatments: During 2007, 2,883,468 people were treated in 14,344 targeted villages (93% of the UTG) in assisted zones of Kaffa, Sheka, Bench-Maji, North Gondar, Illubabor and Jimma (Figure 45 and 46). This is a 12.9% increase over that 2,554,576 treatments assisted in 2006. There were no Severe Adverse Events (SAEs) associated with treatments given in 2007. In 2008, the program aims to treat 3,024,138 persons.

Mectizan®: In 2007, a total of 7,979,000 tablets were received from NOTF and together with a balance of 563,444 tablets from 2006, were made available for distribution to Lions-Carter Center assisted areas. Through the course of the year, 7,863,746 tablets were distributed, while 42,121 (0.5%) were damaged and 15,473 (0.2%) expired. The average number of tablets per person treated was 2.7. The balance available for 2008 treatments was 621,104.

Training and Health Education: Training was provided to 32,661 community-directed distributors (CDDs); of these, 28,179 were returning CDDs (retrained) and 4,482 were newly recruited and trained for the first time (Frontispiece Figure G, and Figures 47 and 48). This is a 2% decrease from CDDs trained in 2006 (33,299). The ratio of CDDs per population was 1:113, a decline from 2006 ratio of 1:103. Of the CDDs trained, 9% were female. A total of 1,977 community supervisors were trained, a 5% decrease from 2006 (2,072). Health education was provided in all 14,344 targeted communities, representing 100% geographical coverage. In 2008 the program plans to increase training to 41,220 CDDs (with 8,297 new CDDs) and 2,198 community supervisors. Ethiopia has been progressively adopting kinship structures in selecting and training CDDs. An estimated 90% of communities are now using the kinship structure. Figures 49 and 50 show the progress Ethiopia has made in community ownership and a lower population served per CDD. (Figure 51 shows the training plan for 2008.)

Financial Contribution: Although CDTI is being implemented through government health care delivery structures, key funding comes from the Lions Clubs International Foundation. The five year funding from the African Programme for Onchocerciasis Control (APOC) will end for Lions-Carter Center assisted RB programs in 2008 (see Annex 2). As in all African programs, there is need for the government to begin allocating and releasing more funds in support of the onchocerciasis program. In 2007, the first report was received of Ethiopian government investment in the program of almost $122,000 (Figure 52), although in an increasingly integrated funding environment, these funds may not have been dedicated totally to onchocerciasis. Also, APOC funding is integrated fully in the government finance system from the national to woreda level.

The MALONC Integration Initiative: In February 2006, the Ethiopian Minister of Health requested that The Carter Center assist in malaria control. Four months later, The Carter Center's Board of Trustees approved the proposal to launch a malaria control effort integrated into ongoing onchocerciasis and trachoma work in Ethiopia, with an initial goal of providing an average of two long lasting insecticide-treated nets (LLINs) per household. The rationale for an integrated approach is based on the idea that impact of LLIN on the mortality and morbidity associated with malaria can be enhanced by using the grass roots community intervention systems of the neglected tropical diseases.

A man transports LLINs in his community with the help of a mule.

Within seven months of the MOH's request, The Carter Center had released financial resources needed to purchase three million LLINs. After the first of these LLINs arrived in Ethiopia in December 2006, it took our country-based staff and our partners only eight months to achieve a 99% delivery rate to the household level in areas where we have programs. The timeline displayed the speed at

which the Center accepted and acted upon our invitation from the Ethiopian Minister of Health to join their national challenge to control malaria.

In RB areas, CDDs selected from their own communities have become engaged in behavioral change communication training regarding malaria and its prevention. The malaria plus onchocerciasis program (known as MALONCHO) includes parts of Jimma and Illubabor zones (Oromia Regional State), Bench Maji, Sheka, and Keffa zones (SNNP Regional State), Metekel (Beneshangul-Gumuz Regional State), North Gondar (Amhara Regional State) and Gambella Region. The effort is coordinated through the collaborative efforts of The Carter Center, Regional Health Bureaus, Zonal Health Departments and Woreda Health Offices.

Our malaria program staff also began working immediately on how to identify efficient ways to integrate malaria into the onchocerciasis program with new training and health education materials based upon an integrative approach. There was also work to consider how to assess the impact of having CDDs assist in monitoring the use and replacement needs of LLINs at a grassroots level.

The following were recommended as indices to monitor integration:

1) Percent of base coverage of trained CDDs *(# of trained CDDs/Base number of CDDs needed)*
2) Percent of eligible population treated with ivermectin *(Total persons treated/total eligible population)*
3) Percent of communities trained in MALONCHO *(Number of communities trained/Number of communities)*
4) Percent of average Knowledge Score of health education key messages (*Average score of those tested/Total possible*)
5) Percent of national Goal of 2 LLIN per HH in malarious areas (*Average number of LLINs per HH)*

The Lymphatic Filariasis Mapping Initiative: The occurrence of lymphatic filariasis (LF) in Ethiopia was first documented in 1971 in Gambella region. Unfortunately, there has been no effort to comprehensively map LF in Ethiopia. In 2007 The Carter Center began supporting an expert team (led by Dr. Hailu and Dr. Kassahun from the Faculty of Medicine at the University of Addis Ababa) to conduct district level mapping of LF in the west and southwest of the country over the next year, using the rapid antigen detection blood tests (also known as immunochromatographic tests, or ICTs) recommended by WHO for mapping LF. The team will begin work in 2008 and follow the WHO recommended approach to LF mapping (Figure 53 shows potentially endemic areas). The initial surveys will be launched in Gambella, Oromia, and the south-western localities of SNNPR. These areas include the Lions-Carter Center focus areas for onchocerciasis.

2008 RECOMMENDATIONS FOR CARTER CENTER ETHIOPIA

GENERAL

- The Ethiopian program should continue to refine government and Carter Center funding figures in 2008, including any additional funds coming in from APOC. Monitor trends for increased funding, especially as related to how The Carter Center might be asked to fill the 'post APOC funding gap.'

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

- Work towards a target of minimum one CDD to 100 population. Seek to increase training, supervision, involvement of kinship groups, and improve gender balance among CDDs, as appropriate. CDD training and CDD retraining needs to be expressed in relation to annual training goals.

- If the government wants to support new integration activities in areas where The Carter Center assists, we will not refuse to participate since these are indeed government owned programs. However, The Carter Center cannot invest in integration efforts with other diseases unless we are already assisting Mectizan® distribution in that area, have obtained formal Carter Center Board of Trustees approval, and have adequate funding to participate.

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

- Ethiopia program staff must complete or renew the Emory Institutional Review Board (IRB) certification if they are to be involved with research programs.

SPECIFIC

- Consider establishing RB sentinel villages for FY 2009. Prepare plan and budget request for HQ review. IRB request prepared. The headquarters staff is mindful that the Ethiopia program is extremely busy and may not be able to undertake these assessments in 2008.

- Complete LF mapping in western Ethiopia in collaboration with the MOH and Addis Ababa University. The survey will include Carter Center RB assisted areas.

<u>Integration with the Malaria program (MALONCHO)</u>

- Ensure that the CDDs have malaria messages and knowledge to deliver when they distribute ivermectin (integrated health education for malaria and onchocerciasis).

- Train CDDs to record the number of nets per household in the household registers when they deliver ivermectin.

- Focus on SNNPR as the area with greatest shortfall of CDDs and so the greatest training need.

Treatment Objective for 2008: 3,024,138 persons

Training Objective for 2008: 41,220 (with 8,297 new CDDs) and 2,198 community supervisors

Figure 44

Ethiopia: Lions-Carter Center-Assisted CDTI Projects

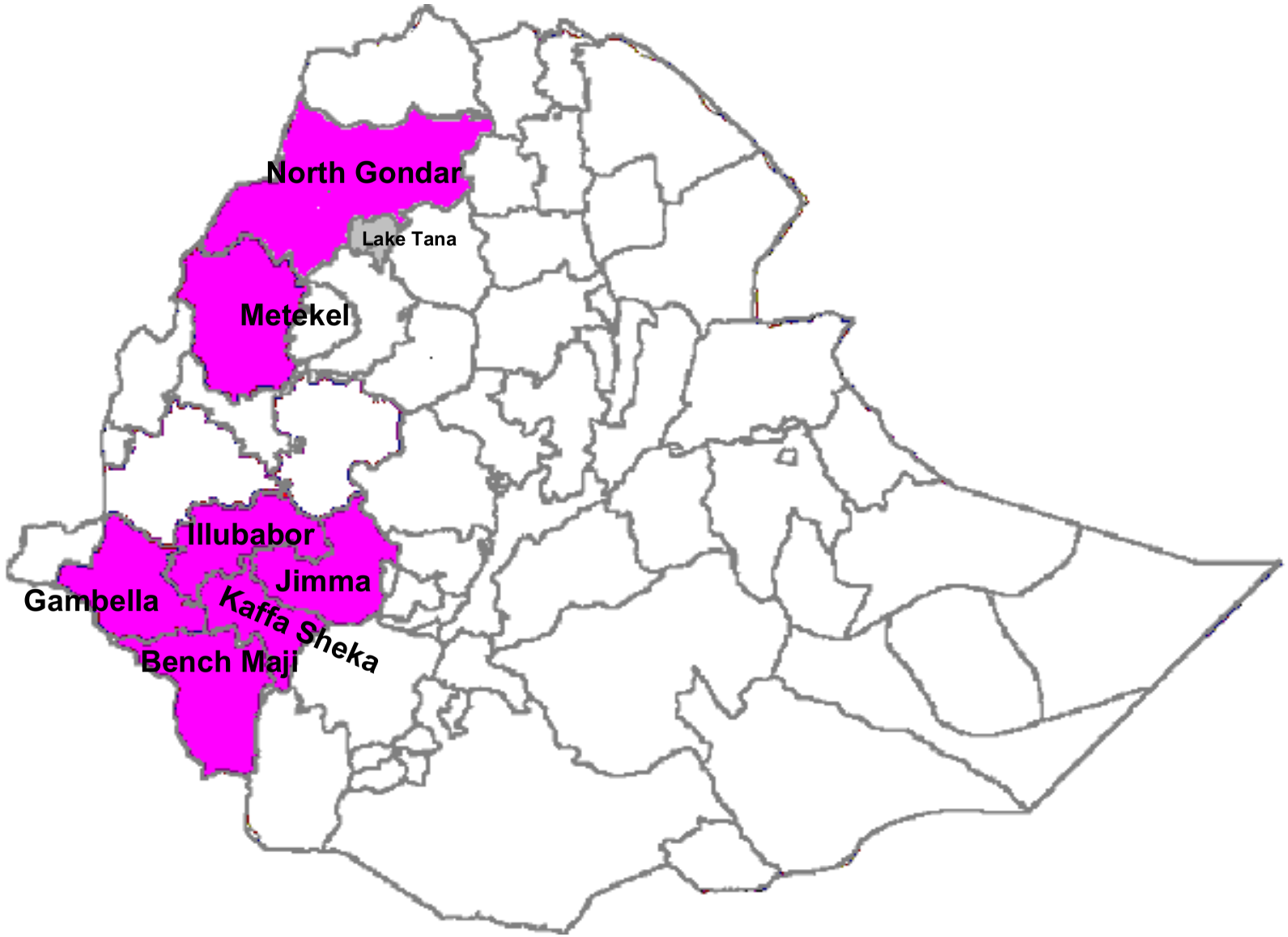


Figure 45

Ethiopia: Lions-Carter Center-Assisted Areas: 2007 River Blindness Treatments

CDTI Zone	Popn treated cumulative 2007	Ultimate TX Goal (UTG)	% UTG treated	Total Popn 2007	% total popn treated	Active villages UTG	Active villages treated as % UTG
Kaffa	689,566	737,092	94%	877,490	79%	3,155	100%
Sheka	153,807	162,233	95%	193,135	80%	571	100%
Bench Maji	417,714	498,205	84%	593,101	70%	1,195	100%
N. Gondar	211,953	254,187	83%	302,604	70%	904	100%
Illubabor	528,754	547,175	97%	651,399	81%	3,704	100%
Jimma	704,113	712,890	99%	848,678	83%	4,123	100%
Metekel	99,660	117,753	85%	140,182	71%	289	100%
Gambella	77,901	80,703	97%	87,721	89%	403	100%
TOTAL	2,883,468	3,110,238	93%	3,694,310	78%	14,344	100%

Figure 46

Ethiopia: 2001-2007 Mectizan® Treatments and 2008 UTG*

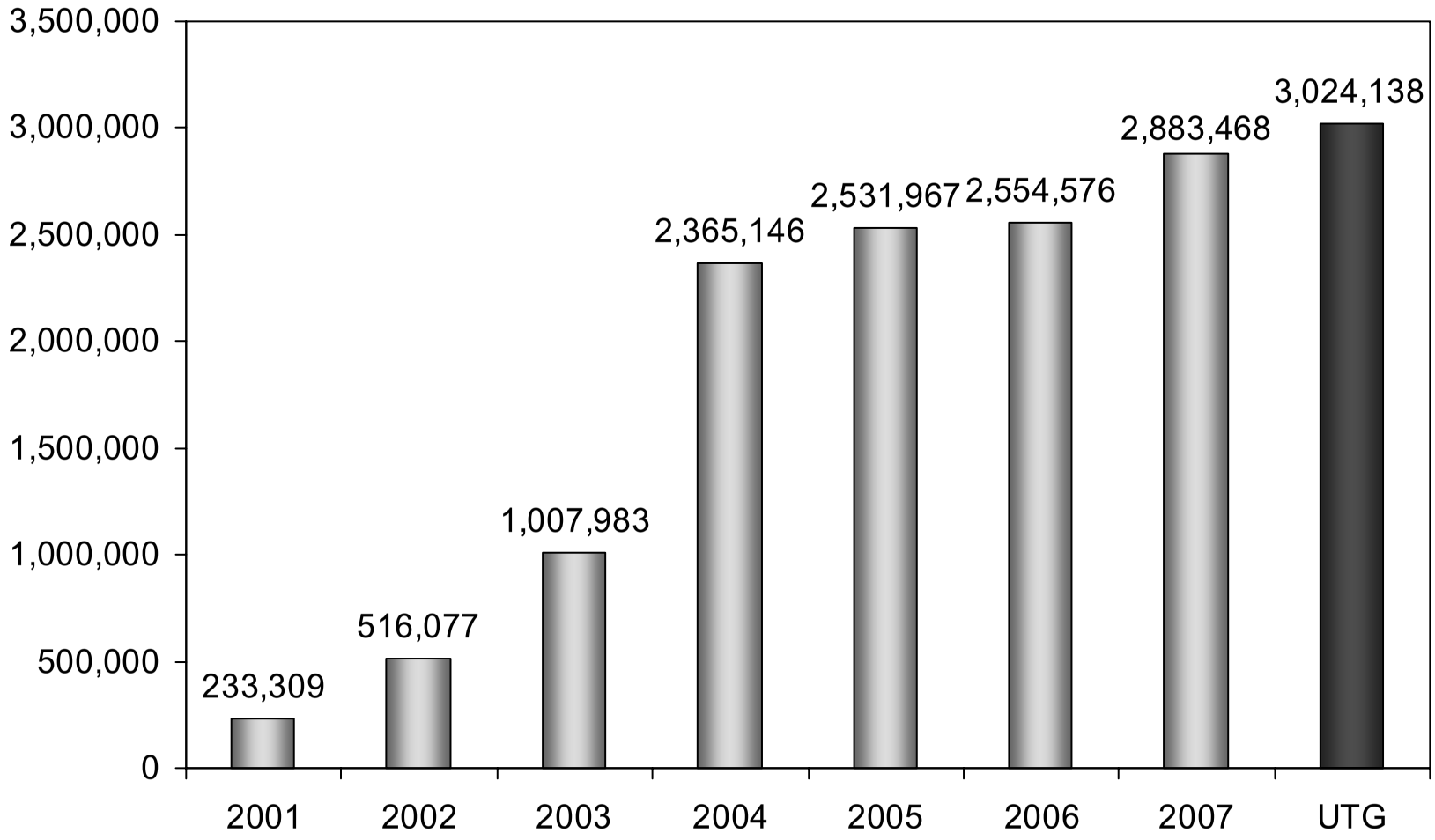


Figure 47

Ethiopia: Training of CDDs 2001-2007

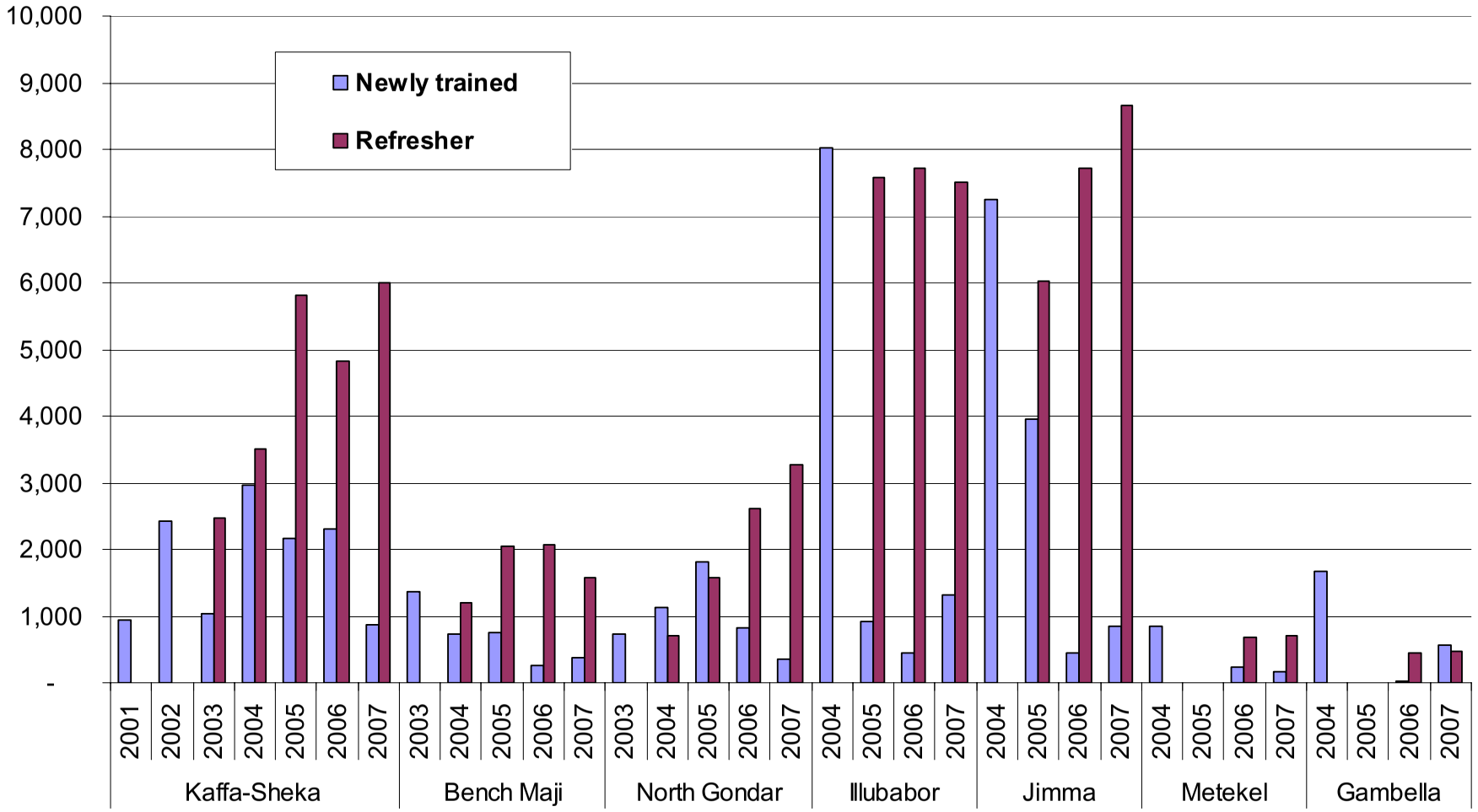


Figure 48

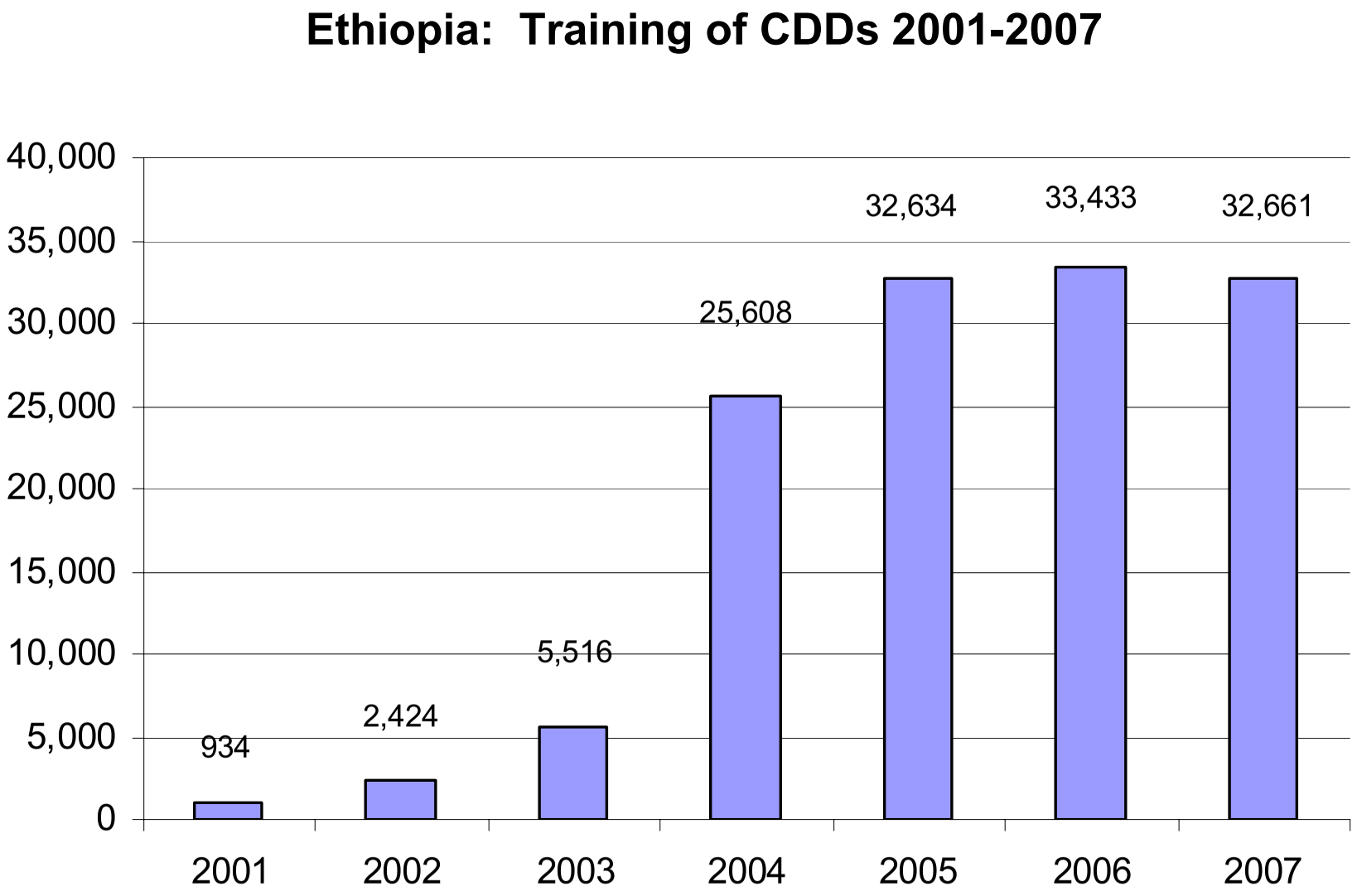

Ethiopia: Training of CDDs 2001-2007
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
934
2,424
5,516
25,608
32,634
33,433
32,661
2001
2002
2003
2004
2005
2006
2007

Figure 49

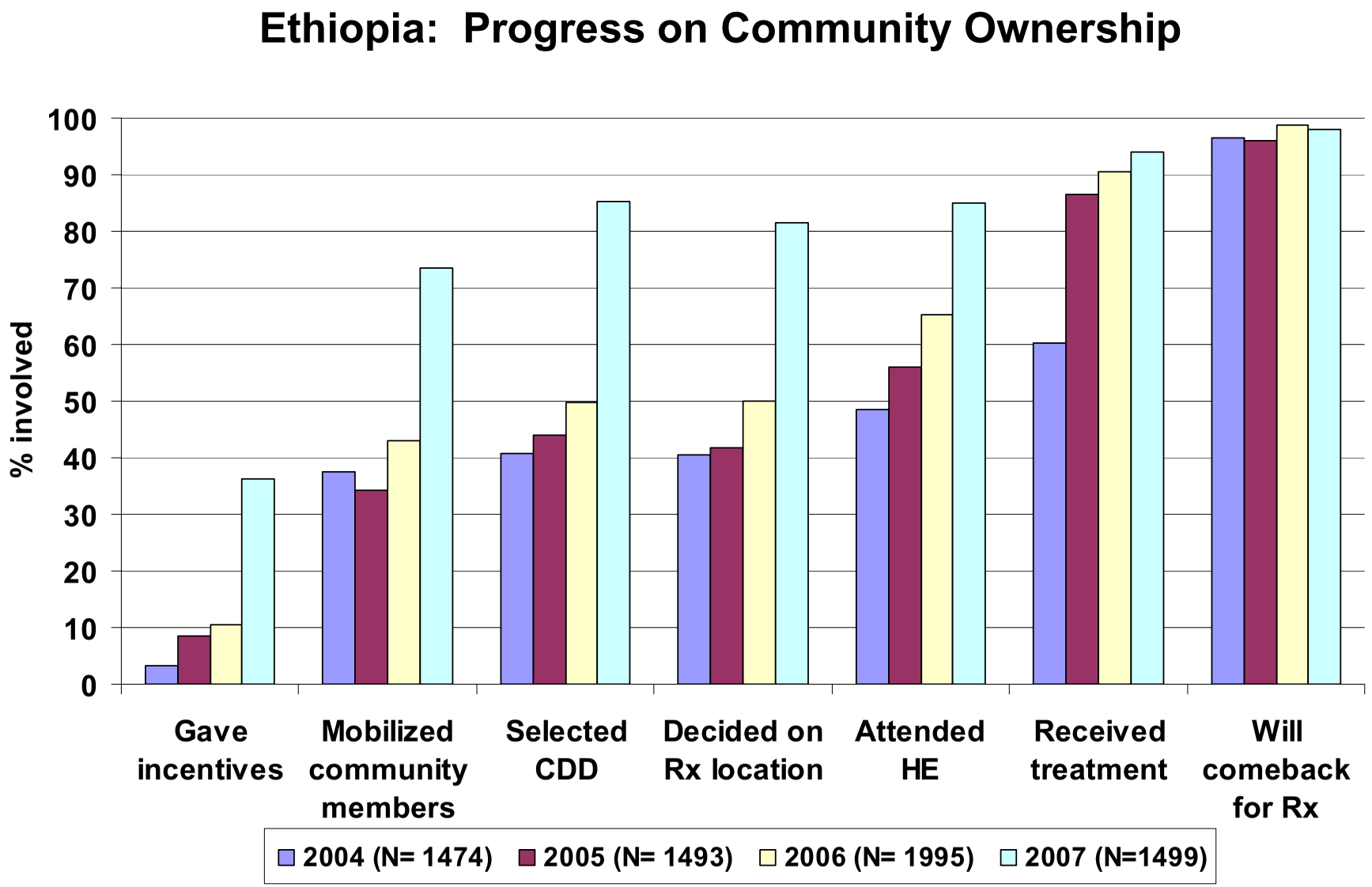

Ethiopia: Progress on Community Ownership
% involved
100
90
80
70
60
50
40
30
20
10
0
Gave incentives
Mobilized community members
Selected CDD
Decided on Rx location
Attended HE
Received treatment
Will comeback for Rx
2004 (N= 1474)
2005 (N= 1493)
2006 (N= 1995)
2007 (N=1499)

Figure 50

Ethiopia: Ratio of CDDs and Community Health Supervisors to Population and Community

Name of zone	Total population for 2007	No of Villages/communities	Number of CDDs	Number of Community Supervisors	Ratio of CDDs to Community	Ratio of CDDs to Population	Ratio of Community Supervisors to community
Kaffa	877,490	3,155	5,720	282	2:1	1: 153	1:11
Sheka	193,135	571	1,139	64	2:1	1: 170	1:9
B. Maji	593,101	1,195	1,947	268	2:1	1:305	1:4
N. Gondar	302,604	904	3,624	654	4:1	1:84	1:1
Illubabor	651,399	3,704	8,827	342	2:1	1:74	1:11
Jimma	848,678	4,123	9,490	192	2:1	1:89	1:21
Metekel	140,182	289	864	106	3:1	1:162	1:3
Gambella	87,721	403	1,050	69	3:1	1:84	1:6
TOTAL	3,694,310	14,344	32,661	1,977	2:1	1:113	1:7

Figure 51

Ethiopia: Training Plan 2008

	CDDs			Community Supervisors			Health Workers		
	New	Refresher	Total	New	Refresher	Total	New	Refresher	Total
Kaffa	572	5,148	5,720	28	254	282	42	375	417
Sheka	904	1,139	2,043	45	71	116	20	90	110
B. Maji	9,562	1,947	11,509	169	271	440	48	211	259
N. Gondar	904	3150	4,054	10	654	664	62	185	247
Illubabor	400	8,827	9,227	126	100	226	36	190	226
Jimma	4,123	9,590	13,713	11	181	192	128	204	332
Metekel	100	864	964	50	106	156	10	84	94
Gambella	332	1,358	1690	53	69	122	39	65	104
TOTAL	**8,297**	**32,023**	**41,220**	**492**	**1,706**	**2,198**	**385**	**1,404**	**1,789**

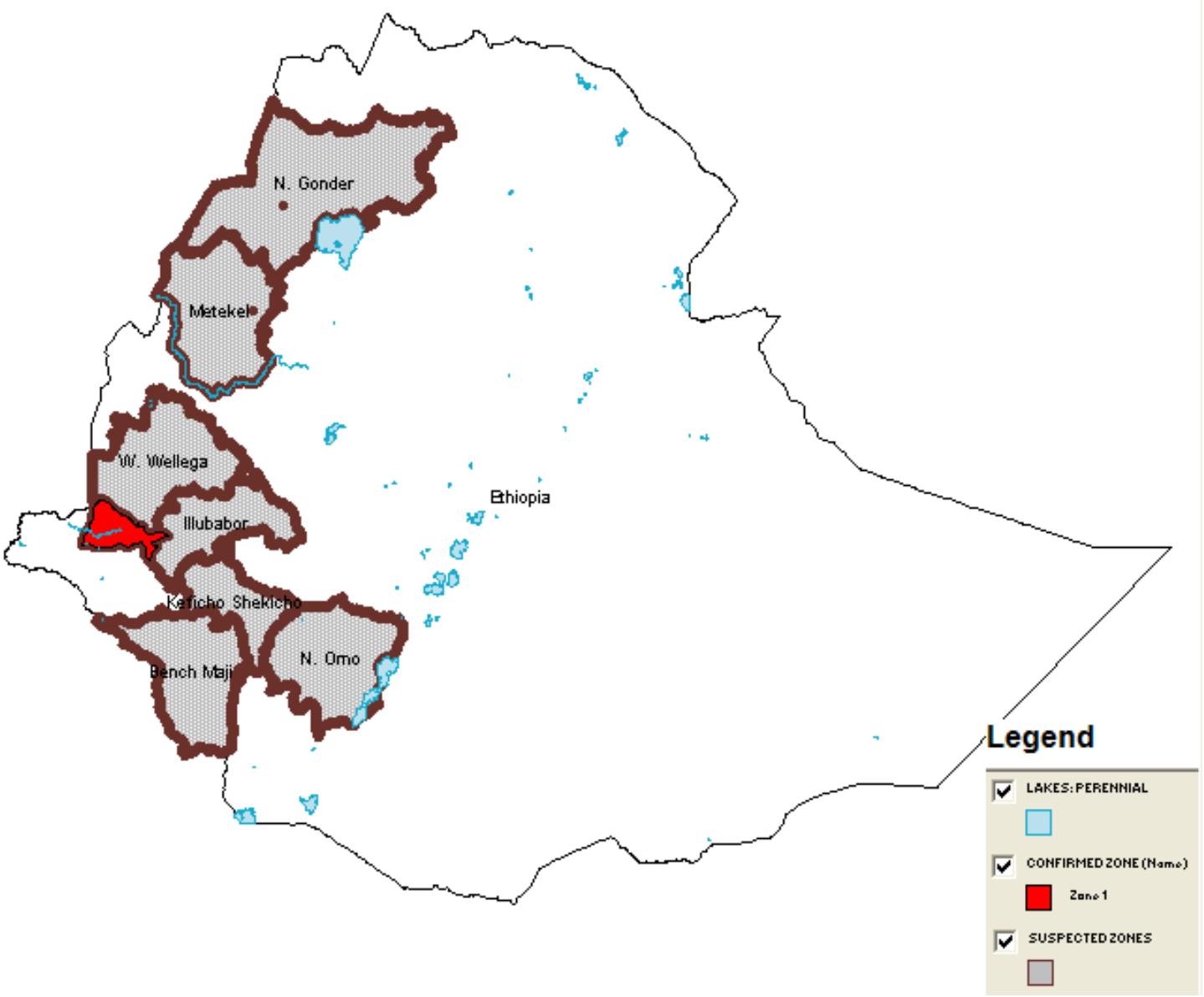
Figure 52

Ethiopia: Government Financial Contribution at Zonal Level

Zone	No. of persons treated	Total amount released from Government (USD)	District Level	
			No of woredas	% released to the woredas
Kaffa	689,566	20,960	11	75
Sheka	153,807	6,295	5	75
Bench Maji	417,714	5928	10	75
North Gondar	211,953	4,685	3	75
Illubabor	528,754	25,860	12	75
Jimma	704,113	20,762	4	75
Metekel	99,660	18,263	4	75
Gambella	77,901	19,211	4	75
TOTAL	2,883,468	121,964	53	75

Figure 53

Ethiopia: Potential Lymphatic Filariasis-Endemic Areas



Acronyms

APOC ..... African Program for Onchocerciasis Control
arvs ..... at-risk villages (villages requiring community-wide active mass therapy)
ATO ..... Annual Treatment Objective
ATP ..... Annual Transmission Potential
CBM ..... Christoffel Blindenmission
CDC ..... Centers for Disease Control and Prevention
CDD ..... Community-Directed Distributors
CDHS ..... Community-Directed Health Supervisors
CDHW ..... Community-Directed Health Workers
CDTI ..... Community-Directed Treatment with Ivermectin
CHS ..... Community Health Supervisor
CPA ..... Comprehensive Peace Agreement
CSA ..... Committee of Sponsoring Agencies
earp ..... eligible at-risk population
DEC ..... diethylcarbamazine
DPD ..... Division of Parasitic Diseases, CDC
DPDA ..... Drug Procurement and Delivery Agency
DRC ..... Democratic Republic of the Congo
EPI ..... Expanded Program for Immunization
FGOS ..... Federal Government of Sudan
FLHF ..... Front Line Healthcare Facility
FMOH ..... Federal Ministry of Health
GOS ..... Government of Sudan
GOSS ..... Government of South Sudan
GSK ..... GlaxoSmithKline
HE ..... Health Education
HQ ..... Headquarters
HW ..... Health Worker
IACO ..... InterAmerican Conference on Onchocerciasis
ICT ..... Immunochromatographic Card Test (for Lymphatic Filariasis diagnosis)
IEC ..... Information, Education, and Communication
IRB ..... Institutional Review Board
ITN ..... Insecticide-treated bednets
JAF ..... Joint Action Forum
LCIF ..... Lions Clubs International Foundation
LCCSFI ..... Lions-Carter Center SightFirst Initiative
LF ..... Lymphatic Filariasis
LLIN ..... Long Lasting Insecticidal (bed) Net
LGA ..... Local Government Area (Nigeria)
MDA ..... Mass Drug Administration
MDP ..... Mectizan® Donation Program
MEC ..... Mectizan® Expert Committee
Mectizan® ..... Ivermectin (Merck & Co., Inc. product name)
MOH ..... Ministry of Health

NID ..... National Immunization Day
NTDs ..... Neglected Tropical Diseases
NGDO ..... Nongovernmental Development Organization
NOCP ..... National Onchocerciasis Control Program
NOTF ..... National Onchocerciasis Task Force
OCP ..... Onchocerciasis Control Program of West Africa
OEPA ..... Onchocerciasis Elimination Program for the Americas
OV ..... *Onchocerca volvulus*
PAHO ..... Pan American Health Organization
PAPN ..... Post-APOC, Post-NGDO
PCC ..... Program Coordination Committee of OEPA
PCR ..... Polymerase Chain Reaction (test for DNA)
PHC ..... Primary Health Care
PNC ..... Provincial Nutrition Coordinator
PZQ ..... Praziquantel
RBF ..... River Blindness Foundation
RBP ..... River Blindness Program of The Carter Center
REA ..... Rapid Epidemiological Assessment
REMO ..... Rapid Epidemiological Mapping of Onchocerciasis
RTA ..... Resident Technical Advisor
SAE ..... Severe Adverse Event
SH ..... *Schistosomiasis haematobium* (urinary schistosomiasis)
SSI ..... Sight Savers International
TCC ..... Technical Consultative Committee of APOC
TCC ..... The Carter Center
TDA ..... Triple Drug Administration
TDR ..... Special Programme for Research and Training in Tropical Diseases
TOT ..... Trainer of Trainees
TX ..... treatments
UEC ..... Ugandan Elimination Committee
UNICEF ..... United Nations Children's Emergency Fund
UTG ..... Ultimate Treatment Goal
VAS ..... Vitamin A Supplementation
VCD ..... Vector Control Division
WHO ..... World Health Organization

ANNEX 1
River Blindness and 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 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 one to two cm. diameter, non-painful 'nodules' that can be often easily felt under the skin. The parasites are very thin male and female worms that measure up to twelve inches in length and are long-lived (between five and 15 years). Female worms release embryonic stage offspring called microfilariae that emerge from the nodules. The microfilariae swarm under the skin and can enter the eyes, where they cause inflammation and ocular damage. The transmission cycle is carried on as these microfilariae are picked up, metamorphasize into infectious larvae and re-transmitted by infectious black flies when they 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% of those are African. Annual mass treatment with the oral tablets of a medicine called ivermectin (Mectizan®), which is being donated by Merck & Co., Inc, prevents eye and skin disease by killing the microfilariae. Unfortunately ivermectin does not kill the adult *O. volvulus* and effect a cure. Annual treatment reduces transmission of the parasite by lowering the amount of microfilariae available to black flies, which are infected when they bite an infected person. 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. When transmission falls below a critical threshold, worm populations cannot be sustained.

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, 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 620 million treatments valued a over three quarters of a billion US dollars over the 20 years that it has been in existence. The donation has stimulated what is widely considered a model of public/private partnership and how industry, international organizations, donors, national Ministries of Health (MOHs) and affected communities can successfully work together toward solving a major health problem.

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 Global 2000 River Blindness Program (RBP) was established at The Carter Center to assume the field activities of the RBF in Cameroon, Nigeria, Uganda and the Americans (OEPA). Activities in Southern and Northern Sudan were added in 1997, and in Ethiopia in 1999. The Carter Center's primary aim is to help residents of affected communities and local health workers establish and/or sustain optimal Mectizan® distribution and related health education (HE) activities, and to monitor that process. Currently we assist parts of five countries in Africa: Cameroon, Ethiopia, Nigeria, Sudan and Uganda. The Carter Center RBP also includes the Onchocerciasis Elimination Program for the Americas (OEPA), which coordinates activities to eliminate the infection in all six onchocerciasis-endemic countries in the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela). In 1997, The Carter Center's RBP expanded to (northern and southern) Sudan with support from the Lions-Carter Center SightFirst Initiative (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 treatments and HE began in 2001. In 2005 the RBP terminated its activities in Southern Sudan after the comprehensive Peace agreement.

In 2007, The Carter Center and its partners celebrated its 100 millionth (cumulative) assisted Mectizan® treatment, and the fourth year in which the program helped to treat more than 10 million people.

Partnerships: The Carter Center works through partnerships, with our primary partners being the Ministries of Health (MOHs) and their national onchocerciasis control programs. The Carter Center assists programs that are executed within and through the indigenous primary health care system. The Carter Center and MOH staff work closely with most workers and the afflicted rural communities, and the Center provides technical assistance and assists in information, education, and communication (IEC). A 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, Merck & Co., Inc., and the Division of Parasitic Diseases (DPD) at the U.S. Centers for Disease Control & Prevention (CDC), where Carter Center technical staff members of the RBP are housed. The Carter Center also works closely with the MDP at the Task Force for Child Survival and Development, and is represented on the Mectizan® Expert Committee (MEC).

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 Worldwide, 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 aims to establish by the year 2015, "community-directed" river blindness treatment programs 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 since the inception of the program. APOC, however, provides funds and technical/managerial support for a limited time frame. Of the Carter Center's 18 originally APOC-assisted Carter Center RBP projects, fourteen no longer receive core APOC funding. Four Ethiopian RBP projects will continue to receive APOC core support until late 2008 (Annex Figure 1). APOC Trust Funds are provided as core support for only five years, after which the project may continue to receive limited "non programmatic support" for replacement of capital items or for advocacy and training or special initiatives proposed either by the programs or by APOC HQ in Ouagadougou. Carter Center projects no longer depend upon support from APOC for implementation (field) activities such as community mobilization, health education, supervision, monitoring, data collection and reporting. Although this should be the responsibility of government, a common theme in our experience has been insufficient national funding of APOC projects.

Annex Figure 1: APOC funding for The Carter Center assisted CDTI projects

COUNTRY	PROJECT	First year with APOC (JAF, definitive)	5th year APOC core funding ends
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**

* First year with APOC was 2004, but Carter Center became NGDO partner in 2005

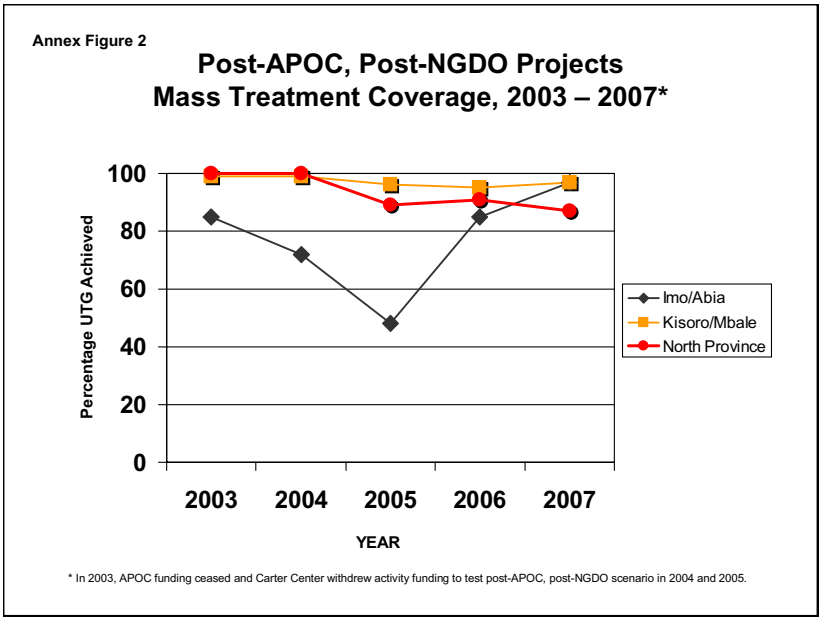
Partners in the Americas Programs: The Carter Center provides the administrative framework for the Onchocerciasis Control Program for the Americas (OEPA). Headquartered in Guatemala, OEPA is the technical and coordinating body of a multinational, multi-agency coalition working for the elimination of 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 the Lions Clubs International Foundation (LCIF), Pan American Health Organization (PAHO), CDC, and several U.S. and Latin American universities. Since 2003, the Bill & Melinda Gates Foundation has been an important partner in the regional initiative to the national programs. Merck and Company provide Mectizan and financial support to OEPA.

ANNEX 2: Experiences of the Post-APOC, Post-NGDO sustainability trial

The African Program for Onchocerciasis Control (APOC), which administers a large World Bank trust fund for onchocerciasis, has markedly reduced World Bank support in recent years to Carter Center-assisted African onchocerciasis projects, with the exception of Ethiopia. Fourteen of the eighteen Carter Center-assisted river blindness projects have completed their five year cycle of APOC core support and are no longer receiving direct APOC Trust Fund support for delivery of Mectizan® (these projects may receive some funds for capital equipment replacement and funds for advocacy). As a result of the APOC pull out, a 'Post APOC funding gap' was established, with added funding demands being placed on The Carter Center RBP and government. Rather than increasing our funding as a result of APOC's funding reduction, we tested the overall sustainability strategy of APOC by deciding in 2004 to select five post APOC project areas and likewise halt Carter Center funding as well. This test is what is called the 'Post-APOC, Post-NGDO' (PAPN) trial. The selected project areas [North Province (Cameroon), Imo and Abia States (Nigeria), and Kisoro and Mbale Districts (Uganda)] were among the highest scoring Carter Center-assisted CDTI projects on their end-of-project APOC sustainability evaluation in their respective countries. The Carter Center withdrew funding for activities in mid 2003, and maintained the PAPN trial through the end of 2005. The purpose was to determine if activities necessary to sustain Mectizan® delivery would continue when handed over to the full fiscal responsibility of the national, state, and local governments.

In all three areas where we undertook PAPN trials we saw evidence of programmatic decline during the PAPN period. The greatest decline occurred in the Imo and Abia States of Nigeria, where treatments decreased by 31% during the PAPN period. Although the Uganda and Cameroon tests did not show dramatic treatment decrease, we observed diminishing training and health education numbers in all areas where Carter Center funding was withdrawn. In 2006, Carter Center funding was restored with a strong emphasis that our funds be matched by the respective governments. A strong recovery in treatments was observed in Nigeria when the PAPN trial ended. Annex Figure 2 shows the treatment performance during and after this period (2003-2007). Annex Figure 3 shows the coverage in each of the Carter Center projects with respect to years of APOC funding.

Annex Figure 2



Research was conducted to try

to determine the financial factors that resulted in the return to high treatment levels in Nigeria in 2006 - 2007. This study is being prepared for publication.

Annex Figure 3: Carter Center/Lions-Assisted project coverage related to year of APOC funding (circles indicate years of the PAPN trial, for those projects which participated.)

					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
Cameroon	North*	2.9	1998	2003	98	110	100	89	91	87	-
	West	2.5	2001	2006	94	96	93	-	-	-	-
Ethiopia	Illubabor	n/a	2004	2008	97	-	-	-	-	-	-
	Jimma	n/a	2004	2008	99	-	-	-	-	-	-
	Kaffa	3.0	2000	2005	91	96	94	-	-	-	-
	Sheka	3.0	2000	2005	95	98	95	-	-	-	-
	Bench Maji	n/a	2002	2007	91	84	-	-	-	-	-
	North Gondar	n/a	2002	2008	83	-	-	-	-	-	-
	Metekel	n/a	2004	2008	85	-	-	-	-	-	-
	Gambella	n/a	2004	2008	97	-	-	-	-	-	-
Nigeria	Enugu	1.9	1998	2003	86	93	99	100	100	98	-
	Anambra	3.2	1998	2003	86	88	100	93	94	96	-
	Ebonyi	2.4	1998	2003	86	88	100	87	94	102	-
	Edo	3.1	1999	2004	92	93	100	100	99	110	-
	Delta	2.5	1999	2004	85	91	99	97	99	100	-
	Imo*	3.6	1998	2003	90	92	76	55	86	96	-
	Abia*	2.6	1998	2003	90	92	76	39	84	98	-
	Plateau	2.4	1998	2003	94	90	97	95	108	100	-
	Nasarawa	2.4	1998	2003	100	96	108	109	99	90	-
South Sudan	Juba	n/a	n/a	2003	63	63	38	not known	not known	not known	-
Sudan	Khartoum	2.4	1997	2003	78	60	96	37	36	92	-
Uganda	Kasese	2.9	1997	2002	99	100	100	99	97	99	98
	Kisoro*	2.5	1997	2002	93	94	94	89	84	85	96
	Mbale*	3.1	1998	2003	100	100	100	97	100	98	-
	Kabale	2.4	1998	2003	93	92	90	88	85	94	-
	Kanungu	2.6	1998	2004	98	97	97	97	97	-	-
	Nebbi	3.0	1998	2004	100	100	98	97	99	-	-
	Moyo	n/a	1999	2005	99	99	99	97	-	-	-
	Gulu	n/a	1999	2005	93	96	97	94	-	-	-
	Apac	n/a	1999	2005	100	97	99	N//A	-	-	-
	Adjumani	n/a	1999	2005	98	97	95	93	-	-	-
Average performance with respect to APOC year					**92**	**92**	**94**	**88**	**91**	**96**	**97**

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

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ANNEX 5

Twelfth Annual River Blindness Program Review Agenda
Wednesday February 6 – Friday February 8, 2008
The Carter Center, Atlanta, GA

Day 1: Wednesday February 6, 2008

8:00	***Shuttle pickup at hotel***	
8:30 – 9:00	***Continental breakfast***	
9:00 – 9:25	Welcome, introduction and remarks	Dr. Frank Richards (chair)

Part 1: 2007 Treatment Activity Summary

9:25 – 9:30	Introduction to Day 1	Ms. Lindsay Rakers
9:30 – 10:00 10:00 – 10:15	OEPA presentation *Discussion*	Dr. Mauricio Sauerbrey
10:15 – 10:45 10:45 – 11:00	Nigeria: Onchocerciasis *Discussion (Comments by Dr. Emmanuel Miri)*	Dr. Emmanuel Emukah
11:00 – 11:15	***Coffee Break***	
11:15 – 11:45 11:45 – 12:00	Nigeria: Lymphatic Filariasis, Schistosomiasis and Malaria *Discussion (Comments by Dr. Miri)*	Dr. Abel Eigege
12:00 – 12:30 12:30 – 12:45	Cameroon presentation *Discussion*	Dr. Albert Eyamba
12:45 – 1:45	***Lunch***	
1:45 – 2:15 2:15 – 2:30	Uganda presentation *Discussion (Comments by Dr. Thomas Lakwo)*	Ms. Peace Habomugisha
2:30 – 3:00 3:00 – 3:15	Ethiopia presentation *Discussion*	Mr. Teshome Gebre
3:15 – 3:30	***Coffee Break***	
3:30 – 4:00 4:00 – 4:15	Sudan presentation *Discussion*	Dr. Tong Chor Malek
4:15 – 4:30 4:30 – 4:45	Cameroon and Uganda: Annual treatment impact on RB *Discussion (comments by Dr. Richards)*	Dr. Moses Katabarwa
4:45 – 5:15	Mectizan® Issues	MDP/Carter Center Staff
5:15 – 5:30	Day 1 Conclusions	Dr. Frank Richards
5:30	***Session Adjourned*** ***Shuttle departs for hotel***	

Day 2: Thursday February 7, 2008

8:00	***Shuttle pickup at hotel***	
8:30 – 9:00	***Continental breakfast***	
Part 2: Sustainability through Integration and Kinship Systems in Africa, Monitoring of the 13 foci in the Americas		
9:00 – 9:05	Introduction to Day 2	Dr. Moses Katabarwa
9:05 – 9:35 9:35 – 9:50	Cameroon presentation *Discussion*	Dr. Albert Eyamba
9:50 – 10:20 10:25 – 10:35	OEPA presentation *Discussion*	Dr. Mauricio Sauerbrey
10:35 – 10:50	***Coffee Break***	
10:50 – 11:20 11:20 – 11:35	Nigeria presentation (Plateau and Nasarawa Gates integration activities) *Discussion*	Dr. Abel Eigege
11:35 – 12:05 12:05 – 12:20	Nigeria presentation (Southeast Gates integration activities) *Discussion*	Dr. Emmanuel Emukah
12:20 – 1:15	***Lunch***	
1:15 – 1:30 1:30 – 1:45	Schistosomiasis recrudescense and rotation plans *Discussion*	Dr. Frank Richards
1:45 – 2:15 2:15 – 2:30	Ethiopia presentation *Discussion*	Mr. Teshome Gebre
2:30 – 3:00 3:00 – 3:15	Uganda presentation *Discussion*	Ms. Peace Habomugisha
3:15 – 3:45	***Coffee Break and Group Photo***	
3:45 – 4:15 4:15 – 4:30	Sudan presentation *Discussion*	Dr. Tong Chor Malek
4:30 – 4:45 4:45 – 5:00	Mectizan Resistance *Discussion*	Dr. Ed Cupp
5:00 – 5:15	Day 2 Conclusions	Dr. Frank Richards
5:15 7:15	***Session Adjourned*** ***Shuttle departs for hotel***	

Day 3: Friday February 8, 2008

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

Part 3: Research and reports on specialized program activities

9:00 – 9:05	Introduction to Day 3	Dr. Frank Richards
9:05 – 9:35 9:35 – 9:50	OEPA: Post-MDA Monitoring Plans *Discussion (Comments by Dr. Richards)*	Dr. Mauricio Sauerbrey
9:50 – 10:20 10:20 – 10:35	Uganda: Epidemiology for elimination foci *Discussion (Comments by Dr. Katabarwa)*	Mr. Tom Lakwo
10:35 – 10:50	***Coffee Break***	
10:50 – 11:05 11:05 – 11:15	Uganda: Comparing the effectiveness of classical CDTI versus the traditional kinship system enhanced CDTI *Discussion*	Dr. Moses Katabarwa
11:15 – 11:30 11:30 – 11:45	East Africa: Lymphatic Filariasis *Discussion*	Dr. Charles Mackenzie
11:45 – 12:15 12:15 – 12:30	Ethiopia: LF Plan and MALONCHO LLIN distribution *Discussion (Comments by Dr. Graves)*	Dr. Estifanos Biru
12:30 – 1:30	***Lunch***	
1:30 – 1:45 1:45 – 2:00	Ethiopia: Linking CDDs and Malaria *Discussion (Comments by Dr. Katabarwa)*	Mr. Aryc Mosher
2:00 – 2:15 2:15 – 2:30 2:30 – 2:45	Nigeria: ICT longevity study Malaria and bed net surveys in Southeast Nigeria *Discussion (Comments by Dr. Richards)*	Dr. Emmanuel Emukah Dr. Patricia Graves
2:45 – 2:55 2:55 – 3:00	Assessing efficiency in integrated programs *Discussion*	Dr. Deborah McFarland
3:00 – 3:15	***Coffee Break***	
3:15 – 3:30 3:30 – 3:45 3:45 – 4:00	Nigeria: LF transmission eliminated in Plateau/Nasarawa Integrated schistosomiasis/trachoma surveys *Discussion (Comments by Dr. Richards)*	Dr. Abel Eigege Mr. Jonathan King
4:00 – 4:15 4:15 – 4:30	Cameroon: Vitamin A experience and LF control plans *Discussion (Comments by Dr. Katabarwa)*	Dr. Albert Eyamba
4:30 – 5:00	Summary and Closure of Eleventh Session	Dr. Frank Richards
5:00	***2007 Carter Center River Blindness Program Review Adjourned*** ***Shuttle departs for hotel***	

ANNEX 6: THE CARTER CENTER RBP REPORTING PROCESSES

At-Risk Villages (arvs): An epidemiological mapping exercise is a prerequisite to identifying at-risk villages (arvs) for mass Mectizan® treatment programs. The assessment techniques used in the mapping exercise in Africa vary 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) is recommended by the WHO to define endemic "zones" that should capture most or all villages having onchocercal nodule rates $\geq$ 20% (and microfilariae in skin prev $\geq$ 40%) for mass treatment. The mapping strategy is based on studies that have shown that most morbidity from onchocerciasis occurs in villages where the nodule prevalence exceeds 20%. In the first stage of REMO, survey villages are selected from areas that are 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 'CDTI treatment zones'). These zones typically are defined by sample villages having nodule prevalence of $\geq$ 20%. 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.

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. For the Americas, where the endemic foci are characteristically smaller and more defined than Africa, every village in known or suspected endemic areas have 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%) 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.

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 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 PCC in its regular meetings. Ministries of Health report their results annually to WHO and (in Africa) to 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.

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 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 5% annually to account for normal population growth.

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 over 90 cm. in height and in good health). Although RBP mass treatment activities exclude pregnant women, these women may 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.

ANNEX 7
The Nigeria Lymphatic Filariasis (LF) Elimination and Urinary Schistosomiasis Control Initiatives

Lymphatic filariasis (LF) 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 in those insects to infectious larvae, and are then able to be transmitted to another 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. 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 which they penetrate and infect. In the snails the *miracidiae* transform and multiply, releasing *cercariae*, so 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 to14) 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 US $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% 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 main goal of the 1997-2001 Nigeria National Plan of Action on Schistosomiasis Control was to reduce the prevalence of the disease by 50% within five years using praziquantel, but few treatments were given because of the expense of the medicine.

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 and schistosomiasis control programs in Plateau, Nasarawa and Delta States (See Maps in Nigeria section). The national programs are actively involved in The Carter Center-assisted program. For LF, the effort is based on a strategy of health education (HE) and annual drug combination therapy with albendazole and Mectizan®. In eight Local Government Areas (LGAs), HE and drug combination therapy is supplemented with the distribution of impregnated bednets (donated through the FMOH). The manufacturers of the drugs have global donation programs for LF: GlaxoSmithKline donates albendazole, and Merck & Co., Inc. donates Mectizan®.

For schistosomiasis, the strategy is similar: HE and mass annual treatments with the oral drug 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. In late 2007, WHO in collaboration with Merck KGaA (E-Merck), announced that they would donate 1.5 million praziquantel tablets (approximately 500,000 treatments) to our Plateau and Nasarawa projects in 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 This major development removes the hurdle of the price of PZQ (approximately U.S. $0.20 per treatment) which has restricted the growth of the schistosomiasis program in the past. Up until now, PZQ was purchased through a generous grant from the Izumi Foundation and support from individual donors. In 2008, the schistosomiasis program in Delta State will continue to receive funding from the Izumi Foundation grant, in addition to possible program expansion to other Carter Center–assisted states in the southeast.

This change in approach to treatment addresses coendemic intestinal *Schistosomiasis mansoni* (SM), in addition to urinary schistosomiasis (*Schistosomiasis haematobium,* or SH), resulting from a recent Carter Center-supported study which determined 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-aged children in all villages. Until improved and cheaper rapid diagnostic methods for SM become available, the cheapest 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 (See Gutman et. al. in Appendix 8).

ANNEX 8
Publications Pertaining to the Program

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ANNEX 9: SUMMARIES OF SPECIAL PRESENTATIONS AT PROGRAM REVIEW

SPEAKER SUMMARIES

(***our gratitude to the individual speakers for providing these***)

1. Cameroon and Uganda: Annual treatment impact on RB	Dr. Moses Katabarwa
2. The Schistosomiasis Control Program in Plateau and Nasarawa States: 'Moving ahead in 2008.'	Dr. Frank Richards
3. Possible Mectizan® resistance	Dr. Ed Cupp
4. Uganda: classical CDTI versus kinship enhanced CDTI	Dr. Moses Katabarwa
5. East Africa: Lymphatic Filariasis	Dr. Charles Mackenzie
6. Ethiopia: Linking CDDs and Malaria	Mr. Aryc Mosher
7. Integrated LF/malaria bednet surveys	Dr. Patricia Graves
8. Integrated schistosomiasis/trachoma surveys	Mr. Jonathan King
9. Assessing efficiency in integrated programs	Dr. Deborah McFarland

1. Cameroon and Uganda: Annual treatment impact on RB
Presented by Dr. Moses Katabarwa

Methods: Baseline nodule and microfilaria prevalence data were available for 10 sentinel communities in Cameroon (from 1996) and 20 in Uganda (from 1993). The sentinel communities in Cameroon achieved ivermectin treatment coverage (of the eligible population) range of 37%- 100%. In Uganda, sentinel communities achieved coverage range of 74%-100%. During the baseline survey of 1996 in Cameroon, 719 people of 10 years of age and above were examined while in the follow up survey of 2005, 838 people were examined. In Uganda, 1590 people of 10 years of age and above were examined during the baseline survey in 1993, and 2122 people in the follow up survey of 2005. We also examined children of less than 10 years old in Cameroon (1996, n=185; 2005, n=448 and Uganda (1993, n=177; 2005, n=130). In Uganda, baseline information from 28 excised nodules collected in 1992 was compared with that of 80 excised nodules collected in 2005.

Results: Microfilaria carriers among older children and adults (10 years and above) in Cameroon sentinel communities reduced from 70.1 % to 6.68% ($P<0.0001$). Nodule carriers reduced from 58% to 9.55% ($p<0.0001$). Similarly, for Uganda, microfilaria carriers reduced from 71.9% to 7.49% ($p<0.0001$), and nodule carriers in the same period reduced from 53.21 % to 9.66% ($p<0.0001$). Microfilaria carriers among children under 10 years of age in Cameroon reduced from 29.73% in 1996 to 3.8% ($p<0.0001$) in 2005, and in Uganda from 33.89% in 1993 to 3.1% ($p<0.0001$) in 2005. The results from excised Uganda nodules still showed that majorities of female (64%) were alive, 24% of live female worms were inseminated and 81.4% male worms were alive.

Conclusion: A decade or more (10 years in Cameroon, and 13 years in Uganda) of annual single dose ivermectin treatment has reduced onchocerciasis to below the threshold of being a public health problem (defined as a nodule rate of **≤** 20% and a community microfilaria prevalence of ≤ 40%). However, at least 3% of young children still had microfilaria, and excised nodules showed live and inseminated female worms, implying that onchocerciasis transmission persists. We recommend that with the available annual dose of ivermectin, treatment should be continued indefinitely in these areas.

2. The Schistosomiasis Control Program in Plateau and Nasarawa States: 'Moving ahead in 2008.'
Presented by Dr. Frank Richards

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 (so called 'intestinal schistosomiasis' which is caused by a number of schistosomes, but in Nigeria is caused by *Schistosoma mansoni*) or bladder ('urinary schistosomiais' caused exclusively by *S. hematobium*). 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 5-14) 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. Mass drug distribution of the safe and effective oral medicine praziquantel significantly reduces schistosomiasis morbidity, especially in children, where the disease is almost totally reversible. Praziquantel kills the adult worms and so prevents the eggs from accumulating in and damaging tissues. Unfortunately, praziquantel has not been routinely donated in large amounts to control programs by the pharmaceutical companies, (as are Mectizan® and albendazole) and costs approximately US $0.20 per child treated.

Nigerians suffer in disproportionate numbers from schistosomiasis, with at least 20 million Nigerians (the greatest of any country) in need of praziquantel treatment every one to three years (the true number is not known). Unfortunately, few treatments are given because of the expense of the medicine. 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 launched a urinary schistosomiasis program based on health education and praziquantel distribution in 1999. In past years The Carter Center has received limited gifts of praziquantel from several pharmaceutical companies that manufacture the drug, including Bayer AG, Medochemie, Ltd., and Shin Poong Pharmaceutical Company, Ltd. The Carter Center has purchased the remainder through funds raised from other donors. Treatments have averaged between 100-200,000 per year, and in 2007 the program celebrated its 1 millionth cumulative praziquantel treatment. While seemingly impressive, this was only 1/20 of the number of treatments given for lymphatic filariasis (LF) in the same time interval.

In an article we published in 2006 (F. Richards et al. Integration of Mass Drug Administration Programs in Nigeria: The Challenge of Schistosomiasis. *Bull WHO* 2006; 8: 1-4.) we noted three reasons for the failure to expand the schistosomiasis program in these two states, compared to our LF work: 1) the cost of praziquantel, 2) the fact that, because praziquantel could not be combined with LF treatments, schistosomiasis treatment required an extra treatment exercise in endemic villages, and 3) the costs of mapping individual villages for urinary schistosomiasis, and the operational costs of stratifying those villages into 'no treat', 'treat school-aged children' and 'treat everyone.'

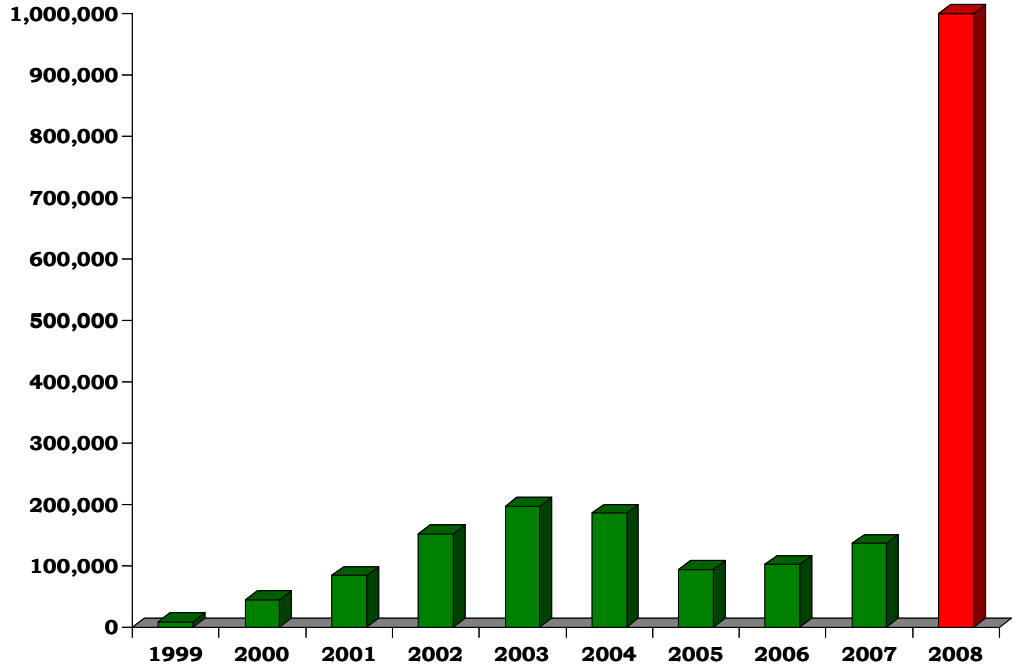
Several developments have taken place related to all three of these challenges that result in an opportunity to make considerable progress in rapid expansion of the schistosomiasis program in 2008.

1) **The cost of praziquantel:** In April, 2007, Merck KGaA (E-Merck) announced a 200 million tablet, 10 year PZQ donation (20 million tablets/year) would be provided through WHO. WHO representatives later announced at The Carter Center's Nigeria program review meeting in November 2007 meeting that WHO would provide Plateau and

Nasarawa States with 1.5 million praziquantel tablets per year starting in 2008. The tablets were to be used to treat school aged children. As a result of this generosity by E-Merck, praziquantel supply will no longer be a major problem for the foreseeable future in these states.

2) **The costs of extra treatment rounds**: Until 2007, praziquantel could not be combined with the ivermectin and albendazole treatment for LF. A 2005 study in uninfected volunteers found no clinically relevant pharmacokinetic interactions or adverse reactions when ivermectin, albendazole and praziquantel were given concurrently, compared to when these drugs were given individually (Na-Bangchang et al., *Transactions of the Royal Society of Tropical Medicine and Hygiene* 2006; 100: 335-345). That study paved the way to implementation of "triple drug administration" (TDA) in which the three drugs would be given together, obviating the requirement for multiple village treatment rounds. In 2007 over 5,000 persons were safely treated with a monitored roll-out of TDA in Plateau State. Village distributors showed only very rare dosing errors (0.06% of doses), and only 56 persons (1.1%) complained of mild adverse events after treatment, none of which interfered with their daily activities (Eigege et al, *Annals Trop Med Parasitology* 2008;102: 177-9). As a result, TDA will be expanded in Plateau and Nasarawa States in 2008 using the WHO/E-Merck donation, targeting local government areas that have had had at least one separate round of mass treatment for schistosomiasis (with praziquantel) separated by at least one week from the mass treatment for LF (with ivermectin/albendazole combination). This will be standard practice given the concern that the risk of adverse events is greatest on the first round exposure to MDA, when community worm burdens are highest.
3) **The costs of mapping:** Mapping is key to the decision of where and how to provide mass treatment for schistosomiasis. Decisions on schistosomiasis treatment are based on assessments of a sample of school aged children at the individual village level. WHO guidelines require the stratification of villages into three groups: 1) those who do not qualify for praziquantel mass treatment (under 20% blood prevalence); 2) mass treatment of school-aged children (20–49%); and 3) community-wide treatment (>50%). Up to now we have focused only on urinary schistosomiasis mapping since it is easily done using rapid diagnostic dipsticks for blood in urine (hematuria) caused by the parasite. We reconsidered our complex operational treatment program after our 2006 study of the extent of intestinal schistosomiasis (which is more difficult to diagnosis and requires a stool examination) in the urinary schistosomiasis treatment program. We found that 57% of surveyed villages excluded from the urinary schistosomiasis treatment program had sufficient intestinal schistosomiasis to warrant mass treatment. Overall, 81% of villages need treatment, compared with 50% if only urinary schistosomiasis was considered. A cost analysis showed that presumptive treatment of all school children was less costly than the ‘map and treat’ approach. As a result of this, we recommended to the ministry of health that the new E-Merck donation for Plateau and Nasarawa States be used to presumptively treat all school aged children in all rural villages in 2008.

SCHISTO TREATMENTS, 1999 – SEPTEMBER 2007 IN PLATEAU, NASARAWA AND DELTA STATES, WITH 2008 PROJECTION FOR PLATEAU AND NASARWA



Conclusion: The 2008 plan for Plateau Nasarawa States' schistosomiasis program, as a result of the above developments, will be extremely ambitious. It would include: 1) universal mass drug administration with praziquantel for all school-aged children, without village by village mapping; 2) a cessation of 'community-wide treatments;' 3) the use of TDA whenever possible. We expect to provide praziquantel treatment to 1 million Nigerian children in 2008, five times our usual treatment program plan. If we achieve 1 million treatments in 2008, this will match our cumulative total of 1 million provided up to now over a 9 year period!

3. Possible Mectizan® resistance

Presented by Dr. Ed Cupp

Resistance to ivermectin (IVR) has been reported for many parasites of veterinary importance, i.e. nematodes and arthropods. Until recently, there have been no reports of resistance in filarid nematodes, i.e. parasites that use a blood-feeding arthropod as an intermediate host.

Three possible IVR-resistant mechanisms might develop in O. volvulus based on its action: (1). IVR kills microfilariae (mf) in the skin (microfilaricidal); (2). IVR prevents release of mf by adult female worms; (3). IVR kills adult worms when used twp or four times per year over multiple years. To date, only one of these scenarios has been reported. A small group of individuals in Ghana were classified in 2004 as "suboptimal responders", because they harbored adult female worms that released mf into the skin more quickly after treatment than predicted. However, mf remained sensitive to IVR. More recently, Osei-Atwenboana et al. (2007) reported that resistance had become more wide-spread in Ghana and that despite annual treatment, the prevalence rate doubled between 2000 and 2005 in two of 19 communities. Further, while at 30 days assessment, mf were cleared from the skin (100% in >99% of people), at day 90 post-treatment, four of 10 communities had significant microfilarial repopulation, from 7% to 21% and rising to 54% by day 180. This suggested that resistant adult parasite populations are emerging. If true, this is the first report of IVR resistance in a filariid species. If the maximum total of annual IVR treatments in Ghana was 18, and that the average length of the O. volvulus pre-patent period is 1.5 years, then resistance occurred in about 12 generations. By comparison, the first report of IVR resistance in H. contortus (21 day life cycle) occurred within 33 months of its introduction, which means that this species, which is notorious for quickly becoming drug resistant, required 48 generations before resistance appeared. Thus, there is a four-fold difference in filial generations between emergence of resistant O. volvulus and resistant H. contortus.

The issue of poor drug coverage in Ghana has cast some doubt on the veracity of the assumption that rapid skin re-population by mf is due to IVR resistance. For example, during the period of 1996-2002, geographic treatment coverage ranged from a low of ≈ 22% (1996) to a high of 70% (1999). However, coverage in 2002 was below 50%, which was two years before suboptimal responders were reported. In the study by Osei et al., of a possible 18 annual treatments, 30% of the villages received nine treatments or less. Because there was such poor coverage, it is reasonable to assume that substantial "background" transmission took place, leading to undetected developing infections (L_4, juvenile stages) in many of these communities. Because IVR is not prophylactic, it is likely that there were on-going "new" infections in each community in the Ghana study that were over-looked. Studies done in Asubende, Ghana have shown that "young" female worms are more fecund than "older" worms when recovering from IVR treatment. Thus, these more fecund worms were able to re-populate the skin with microfilariae more quickly than anticipated; perhaps leading to the assumption that resistance was emerging.

The worst case scenario, should the resistance phenomenon be real, would be the spread of this gene. However, IVR remains microfilaricidal in the "resistant" strain, so skin and ocular disease can be controlled. Operational changes from 1x/yr treatment to a 2x/yr treatment schedule could be instituted in areas where this "resistant" strain is suspected. Suboptimal responders also could be treated with antibiotics (microfilaricidal at 4-6 weeks) that target Wolbachia spp. to eliminate adult worms. Two meetings have been held recently to address this issue and plan for future detection and surveillance of IVR resistance. The first was a World Health Organization - World Bank sponsored meeting in Washington, D.C. (Oct. 31 -Nov. 2, 2007), and the second was held in Ouagadougou, Burkina Faso last week.

4. Uganda: classical CDTI versus kinship enhanced CDTI
Presented by Dr. Moses Katabarwa

Background: *Community-directed treatment with ivermectin (CDTI):* is an approach where the community is given adequate information to get involved in decision-making, organization and mobilization of resources to distribute ivermectin for onchocerciasis control.

The traditional kinship system refers to: the central social structure that defines human relationships on how they interact; the things they do and say in their dealings with one another; the ideas about their relationship; their conceptions of one another; and the understandings, strategies and expectations that guide their behavior. Kinship refers intuitively to "blood relationships". It is the successive links between parents and their children that are essential strands of kinship (Keesing and Strathern, 1998).

It was not clear whether utilizing the traditional kinship system would or would not improve the effectiveness of CDTI.

Objectives of the study:
1. Assess and compare treatment coverage attained using the classical CDTI and the traditional kinship system enhanced CDTI;

2. Assess and compare performance on community decision-making and ownership factors in the classical CDTI and the traditional kinship system enhanced CDTI; and

3. Assess and compare performance of Community-directed distributors (CDD) in the classical and CDTI and the traditional kinship system enhanced CDTI.

Methods:
- Study sites: Hoima District (Classical CDTI and Moyo District kinship enhanced CDTI).
- 4 out of 11 in Hoima District and 3 out of 7 sub counties in Moyo District were randomly selected.
- From this sample, 40 communities (15 from Moyo and 25 from Hoima) were randomly selected from a list of endemic communities in each district.
- Household lists for each of the randomly selected communities were made from the community household registers; and using a table of random numbers the 1st household in each community was randomly selected. After, every 5th household was selected.
- In each random selected community, 15 households were randomly selected. Two people per household (one adult male and female) were interviewed per household, bringing to total 1200 (Moyo, N= 450 and Hoima, N=750) people interviewed.
- All CDDs in selected communities were interviewed too.

Analysis: Data obtained after field work was coded, scored and entered into the computer and analyzed using Epi Info™ statistical program.

Results: Overall, the results at the district level showed that the kinship enhanced CDTI in Moyo District had better treatment coverage in 2005 (96.5%) and 2006 (93.7%) compared with classical CDTI, 2005 (76.4%) and 2006 (62.1%). Community members were satisfied with the kinship enhanced CDTI (92.5%) compared to classical CDTI (78%).

At the sub county level, there was no significant difference among the communities in the kinship enhanced CDTI in Moyo District treatment coverage and satisfaction with the CDTI activities. In the classical CDTI of Hoima District, there were differences on these factors.

Also at the districts level, a significant number of community members in the kinship enhanced CDTI decided upon where their respective treatment centres were to be located (62.8%) and also selected their CDDs (76.5%) compared to 14.7% and 17.2% in the classical CDTI respectively. More community members were educated in the kinship enhanced CDTI (79.6% in 2005 and 71.5% in 2006) compared with classical (27.9% in 2005 and 19.4% in 2006). In the classical CDTI, community leaders significantly decided on the treatment centres without consulting community members (50.8%) compared to kinship enhanced (6.8%).

Community members from sub counties implementing the kinship enhanced CDTI performed better than those in the classical CDTI on: decision on location of treatment centres; mobilizing other community members; and being educated selection of CDDs. While in the classical CDTI, community leaders largely decided on the treatment centres.

Conclusion and Recommendations:

- Treatment coverage, satisfaction with the program in kinship enhanced CDTI was significantly higher than in classic CDTI project;
- Participation of community members in deciding on community policies was higher in kinship enhanced CDTI than in the classic CDTI project;
- Utilization of the traditional kinship system resulted into:
  - Increased community involvement;
  - Reduced: work overload, distance to walk in the community, and period of Ivermectin distribution to within a week for most CDDs;
  - CDDs working among people who were related.

- The results are consistent with what has been observed in Cameroon and Nigeria (unpublished);
- Classic CDTI should utilize the traditional kinship or neighborhood structures within the community in order to improve its efficiency and effectiveness.

5. Lymphatic Filariasis in Eastern Africa

Presented by Charles D. Mackenzie

Africa has been known for many years to have substantial levels of lymphatic filariasis, and recently there have been increased interest in defining the disease in many countries in the continent as a result of the global lymphatic filariasis (LF) elimination program (GAELF – Global Alliance to Eliminate Lympnatic Filariasis). Although Africa is not, in all likelihood, the major global epidemiological focus of the infection, it nevertheless has substantial levels and degrees of disease and infection; the true prevalence of disease and infection, however, remain to be defined. East Africa has been a major center of research and control activity in this infection for the past half century, with most efforts being focused in research centers such as those in Tanga and Zanzibar in Tanzania.

The knowledge of the extent and severity of the clinical disease in a country, and in sub-regions within a country, is a very important data for management, planning and advocacy of control programs; this is currently important as each new endemic country joins in the global LF control efforts. It must be stated that data on the true distribution of the various forms of LF are very varied in its validity; and in many countries such data is simply not available. In general, in Eastern and Southern Africa it is thought that lymphoedema and elephantiasis is more common in coastal regions of East Africa, and that hydrocele is more uniformly distributed throughout all the endemic areas; this may only be partially true and better data on disease prevalence is needed.

The prevalence of all these conditions appears to be correlated with the level of endemicity. Perhaps the most detailed information on the distribution of disease presently available is from Tanzania, where LF has been studied in detail for many years and where a Mass Drug Administration program has been in place for over seven years (now covering almost half of this large country). Kenya, Malawi and Uganda also have focused on this disease to some extent, and a number of prevalence studies have been documented; however, for most of the other countries in Eastern and Southern Africa there is little data presently available.

A major site in Tanzania for studies on the clinical aspects of LF has been the northern coastal area of Tanzania, where there have been numerous research and control activities for many years (Fleming-Hubertz et al., 1997; Bernhard et al., 2001; Friis et al., 2002; Nielsen et al., 2002a; Simonsen et al., 2002; Taylor et al., 2005). The National LF Elimination Programme has been active along the coastal belt and has gained knowledge as to the prevalence of the disease and the effects of the MDA program on the clinical disease. LF endemicity in the northern coastal areas of Tanzania was in the order of 15-45% overall microfilaremia in the examined communities (Wegesa et al., 1979; Abaru et al., 1980;McMahon et al., 1981; Meyrowitsch et al., 1995; Simonsen et al., 1995, 2002; Bernhard et al., 2000; Massaga et al., 2000). Here the reported prevalences of lymphoedema among adults were 1.0-6.9%. Hydrocele, on the other hand, was some 4-16 times more common, with 27-47% reported in adult males. The increase in prevalence with age for both of these disease manifestations was demonstrated by the presence of hydrocele at 38% and 56% in the male population aged 40-59 and 60+ years, respectively, and of lymphoedema in the adult population at 3.6% and 6.3% in those aged 40-59 and 60+ years, respectively (Meyrowitsch et al., 1995).

Active LF disease in the islands off the coast of Tanzania has also been well studied. Zanzibar now has an active program against the infection and has seen success (Mohammed et al., 2006). Semi-urban communities on the island of Pemba, with overall microfilaremia prevalence between three and 13%, had hydrocele prevalence of 12-36% among adult males and

lymphoedema prevalences of 0-2% among adults of both sexes (Pedersen et al., 1999). Acute episodes were reported in coastal Tanzania to occur at an annual rate of some 33/1000 people (Gasarasi et al., 2000). Simonsen et al. (2002) reported acute attacks in up to 12.2% of their study population, a group that had some 2.2% with lymphoedema and 13% hydrocele in males.

Kenya is setting out on the road to establishment of a strong MDA program (Wamae et al., 2001), and it is clear that there is a significant prevalence of LF disease in the country that needs attention. A number of studies, beginning with those of Wijers (1977a, 1977b) identified the prevalence of disease in different endemic areas of Kenya. Estambale et al. (1994) found 16.5 percent of the males over 14 years of age had hydrocele and 2.4 percent of the adults of this age group had lymphoedema. They also, as others have done, showed an increase in hydrocele prevalence with age (23.8 percent in those older than 49 years). Hydrocelectomy records in local hospitals in Kenya were seen as a good proxy for the community prevalence of hydrocele (Mwobobia et al., 2000); in one case in the endemic area 27.6 percent of the hospitals' surgeries were hydrocelectomies and this closely reflected the local situation with regards to this condition. A study by Mukoko et al. (2004) showed, in another Kenyan endemic site, a prevalence of 20% for hydrocele and 2.9% for lymphoedema in adults in an endemic area where the community microfilaremia prevalence ranged from 8.1-27.4 percent, figures proportionally consistent with other endemic areas in other countries. Recently, Njenga et al., (2007) observed an even higher prevalence of hydrocele (34.4%) in adult males – with around 55.3 percent in those over 50 years of age. The prevalence of lymphoedema in this latter area was 12.6 percent in adult males and 5.7 percent in adult females.

Malawi is a country where the prevalence of LF disease – at least from published information – is lower than that seen in Tanzania and Kenya. Studies in adults by Ngwira et al. (2002) revealed a prevalence of some 11.7 percent of hydrocele and 1.0-3.7 percent of lymphoedema in areas of 28-58 percent antigen positivity. Nielsen et al. (2002b), studying populations with an overall endemicity of around 20 percent microfilaremia (63% antigenaemia), found that there was 1.3-3.7 percent lymphoedema and 13-18 percent hydrocele present among the adults.

The work of Onapa and colleagues (2001b) indicates that Uganda does have areas with significant levels of lymphoedema (greater than 4.5%) and up to 28 percent hydrocele – interestingly in areas with only comparatively moderate antigenemia prevalence (18-30%). This situation deserves further attention to determine the factors at play in this focus. There is little recent data available on LF morbidity from Madagascar (Champetier de Ribes et al., 1996, 2000) where a major LF program is now in place, or from the Comoros where parasitological surveys have documented high infection prevalences (Charafoudine and Pesson, 1986; Blanchy and Benthein, 1989). Nor is there much confirmed data from Ethiopia, Burundi, Rwanda, Zambia, Zimbabwe or Mozambique. Mass drug treatment has been activated in many countries (Table 1) or is planned for the near future.

COUNTRY	LF MAPPING ACTIVITIES	"ENDEMICITY" OF COUNTRY	CURRENT ACTIVITY
TANZANIA	COMPLETE	100%	ALB/IV - 2000
UGANDA	COMPLETE	50%	ALB/IV -2002
MALAWI	COMPLETE	98%	ALB/IV-2008?
KENYA	COMPLETE	10%	ALB-DEC-2002
MOZAMBIQUE	COMPLETE	?	ALB-IV-2008?
MADAGASCAR	COMPLETE	80%	ALB/DEC-2005
COMOROS	COMPLETE	100%	ALB/DEC-2001
RUWANDA	BEGUN	?	ALB/DEC-?
ZIMBABWE	COMPLETE	20%	ALB/DEC-?
SUDAN	PARTIAL	> 30%	ALB/IV-?
ETHIOPIA	BEGUN	?	ALB/IV-?

Tanzania began its elimination program in 2000 and has had considerable success in reducing both infection levels (MF and immunochromatographic card test) and in reducing the morbidity of the disease in endemic areas, where approximately 12 million people live; and have plans to extend their national program considerably in the near future. It is hoped that other countries will soon enjoy the benefits of active elimination programs.

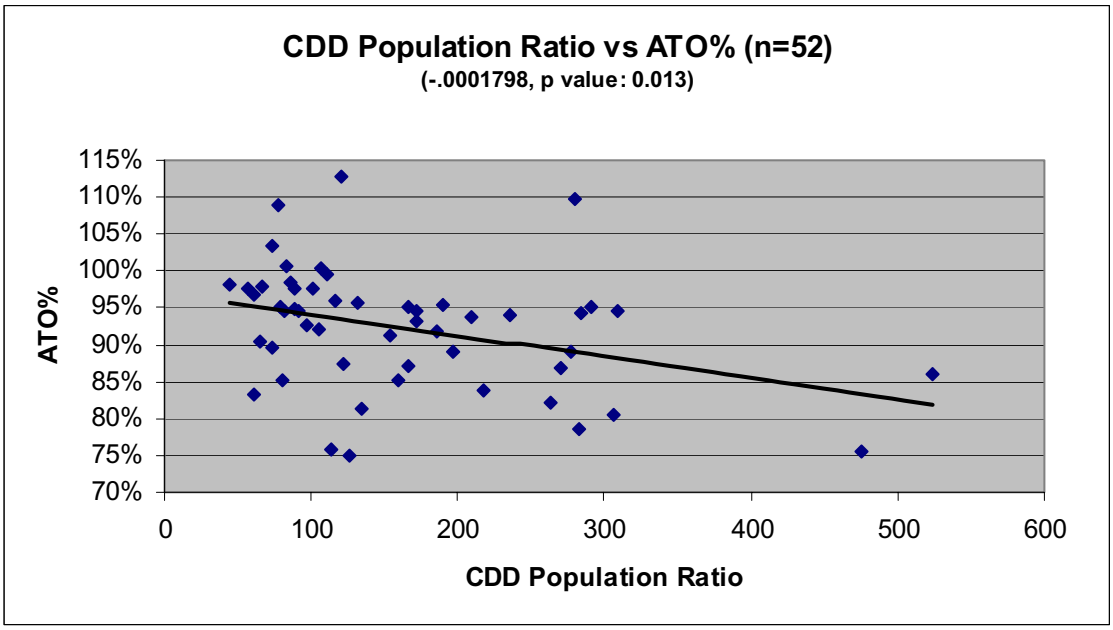
6. Ethiopia: Linking CDDs and Malaria
Presented by Mr. Aryc W. Mosher

This presentation focused on highlighting recommended steps to create strong supportive links between the established Community-directed treatment with ivermectin (CDTI) approach of the onchocerciasis control program and preventative health messages and activities for reducing risk to malaria in Ethiopia.

The existing CDTI program format uses community identified leaders as the key player in assisting the importation and acceptance of health messages and activities to communities. An integrated approach to malaria and onchocerciasis can profit from the two opportunities for community interaction: 1) Household registration and 2) Drug (Ivermectin) distribution.

In order to capitalize on these two opportunities, a MALONCHO Integration program should accept the following steps:

Step One: ***Achieving 100% "coverage" of messages and activities in program areas*****.**
If the program is to succeed, all essential messages and clear instructions regarding necessary activities need to be placed before the targeted population. Within the MALONCHO project, messages and activities are brought to the targeted communities via the Community-directed distributors (CDD). A sufficient number of CDDs need to be present to ensure that each community member can receive the information in a manner that is understandable. Therefore, a CDD to population ratio needs to be determined that will enable information to be transferred effectively. The presentation discussed the usefulness of accepting the African Program for Onchocerciasis Control recommendation of one CDD to 100 persons. In terms of number of CDDs and ultimate treatment goals (UTG), evidence suggests that as the number of persons per CDD decreases, UTG percentage increases. Current numbers suggest that the program is in need of an additional 9,241 CDDs. The program is in need of improving population estimates to provide more precise instructions to zonal and woreda levels regarding the number of CDDs need to the desired ratio. As of the close of the 2007 program year, Bench Maji zone has the highest ratio at one CDD to 305 persons.



Step Two: ***Training of MALONCHO messages to message givers and recipients.***
The training of MALONCHO suggests development and training of very specific messages to both the message givers (CDDs) and recipients (community members). The Ethiopian program assessed past malaria Knowledge, Attitude and Practices studies in Ethiopia. Eight concepts were identified as being critically misunderstood and if unaddressed would pose obstacles to a successful campaign. The Ministry of Health and other key partners chose four of these misconceptions to address in our first year. They were: 1) Temporal Risk to malaria, 2) Appropriate care and use of nets, 3) Knowledge of national prioritization plan, and 4) Early treatment for potential exposure to malaria. For these malaria concepts, as well as additional ones for onchocerciasis, the program developed lists of critical pieces of knowledge (one for the message givers and one for the receivers) and an accompanying action step, referred to as "Doable Messages." The doable messages are considered extremely important to the program as they instruct the recipient as to how to engage the information that they have received. The following are the four Doable Messages tailor-made for the malaria misconceptions identified above:

1) Sleep under a long lasting insecticidal bed net (LLIN) every night;
2) Priority for LLINs is given to pregnant women and children under five;
3) Properly hang and care (wash and mend) for your LLIN;
4) Seek medical attention for all febrile illness.

Step Three: ***Ensuring all "tools" are in place to enable messages to be enacted.***
The messages and suggested activities call for the population to "do" certain actions. Alongside having enough persons to disseminate clearly defined information, the program needs to ensure that tools and resources are on the ground to enable communities to carry out the messages instructions. Three resources/capacities must be effectively available in the targeted communities:

1) Ivermectin must be timely ordered and delivered in quantities that meet community need;
2) Local health facilities need resources and tools to manage diagnosis of febrile cases;
3) Number of LLINs needs to match community need.

Step Four: ***Monitor integration process.***
Prior to assessing the impact of this integrative approach on malaria prevention, the program needs to ascertain whether integration has indeed occurred. The following were recommended as indices:

6) Percentage of base coverage of trained CDDs *(# of trained CDDs/Base Number of CDD needed);*
7) Percentage of eligible population treated *(Total Population treated/Total Eligible Population);*
8) Percentage of communities trained in MALONCHO (Number of communities trained/Number of communities);
9) Percentage of average Knowledge Score of MALONCHO CHAIN Average Score of those tested/Total possible;
10) Percentage of national Goal of LLIN Coverage per HH (Average number of LLINs per HH/2 -- National Program Goal).

Step Five: ***Measuring impact***

To assess the impact of integrating malaria prevention messages with CDD CDTI activities, we would need to compare difference between woredas inside and outside the CDTI areas. Possible points of comparison:

1) Monthly malaria case numbers (confirmed, unconfirmed, in/out patient) from routine data sources;
2) Householder's knowledge of malaria prevention and key messages by interview survey in selected clusters in both CDTI/non-CDTI (baseline given by MIS questions);
3) Prevalence survey and net use in follow-up MIS after 2 years.

7. Summary of presentation on Malaria and Mosquito Net Survey in South East Nigeria
Presented by Dr. Patricia Graves

***Background*:** In parts of SE Nigeria which are endemic for lymphatic filariasis (LF), mass drug administration (ivermectin/albendazole) cannot be used because of likelihood of infection with Loa loa, and the possibility of adverse effects. A Bill and Melinda Gates Foundation funded project is currently under way to test the effect of long lasting insecticidal nets (LLIN) on LF transmission in four Local Government Areas (LGAs). The study has two arms – two of the LGAs will provide nets only to vulnerable groups (under fives and pregnant women), while two other LGAs will provide full net coverage. Since malaria is transmitted by the same mosquitoes as LF, it was decided to assess effect of these two strategies on malaria also. The definitive studies of effectiveness of impregnated nets were done with full coverage, although policy in most countries, including Nigeria, has been to give nets only to vulnerable groups. Whether LLIN have a significant effect on malaria transmission in the latter case is unknown.

***Objectives*:** the survey described here had 3 objectives: 1) to obtain baseline data on malaria, anemia and net coverage in each LGA; 2) to assist in matching LGAs for the two study arms; 3) to assist planning in net distribution policy by assessing numbers of sleeping spaces.

Methods: 15 clusters (census enumeration areas or EAs) were selected per LGA. One was selected in each sentinel site (3 per LGA) and 12 others were selected systematically from the list of EAs. All households in an EA were surveyed unless it was large (>30 households), in which case a random segment of the EA was chosen. Blood tests for malaria and anemia were done in every third household.

Results: In the 60 sampled clusters there were 968 households (average 16.2 per cluster) and 4227 people. Blood tests were administered to 1,384 people, including 589 children under five. The mean number of persons per household was 4.4 and the median was 3. The average number of sleeping spaces per house was 3.1 and the number of vulnerable sleeping spaces (occupied by a pregnant woman and/or a child under five) was 1.1.

Net coverage was extremely low, with only 5 percent of households having one or more net (most were LLIN) (Figure X). One LGA (Ohaji Egbema) had no nets in the sampled households. Overall 31 percent of people were positive for malaria by blood slide, and the prevalence was not much greater in under fives than in >10 year olds (Figure Y). There was more malaria and anemia in Ebonyi than in Imo state, but within each state malaria and anemia prevalence was comparable.

Next steps: During the meeting, randomization of the LGAs within each arm was done by Dr. Ngozi Njepuome (head of Public Health) who picked the LGA names in each state out of a cup. Ohaukwu and Owerri West will receive nets to vulnerable groups while Abakaliki and Ohaji/Egbema LGAs were selected for full coverage.

Average numbers of sleeping spaces observed were used to develop a scheme for net distribution that will result in the desired average number of nets per household. For vulnerable groups this involves giving one net to each child under five and one to each pregnant woman. For full coverage it is proposed to give one net for the first person in household, then another net for each additional one or two people, up to a maximum of 10 nets per household.

Figure X: Household net coverage

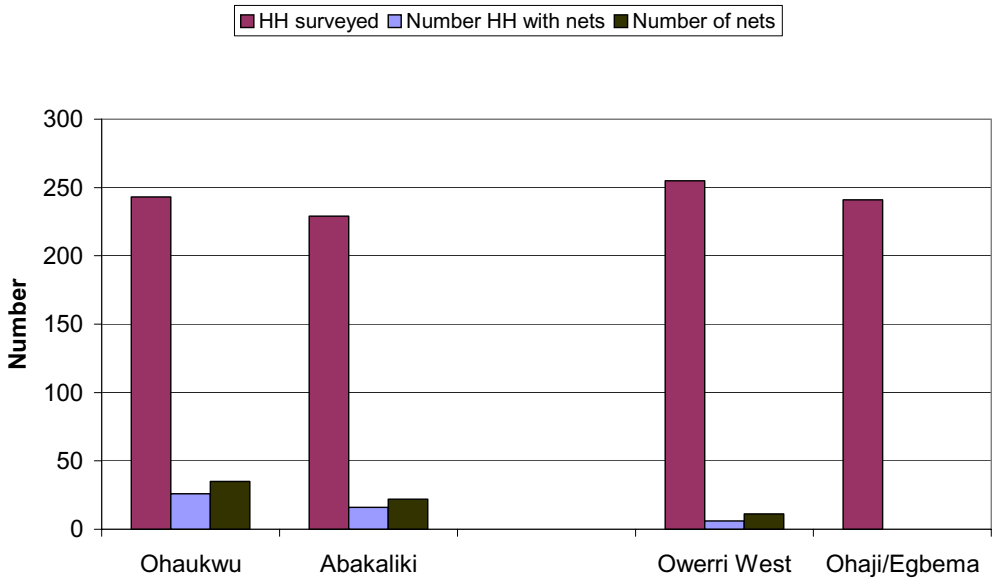
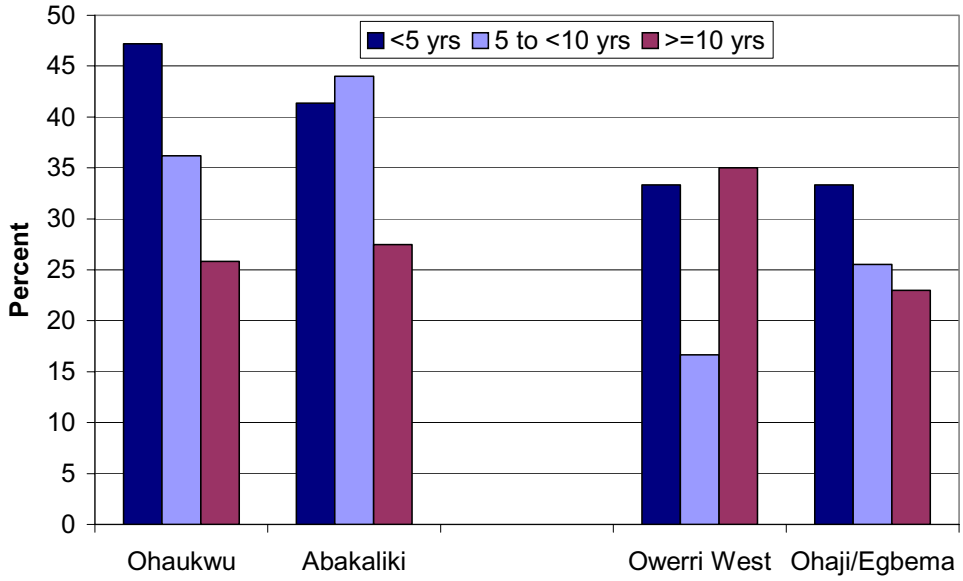


Figure Y: Percent slide positive for malaria by LGA and age-group



8. Integration Applied: Mapping of urinary schistosomiasis and trachoma in Plateau and Nasarawa States

Presented by Mr. Jonathan King

District level estimates of prevalence are recommended for mapping trachoma prior to intervention. Where the prevalence of active trachoma (trachomatous inflammation – follicular TF) is 5-9% in children 1-9 years of age, a community-by-community approach to assessment and intervention is suggested. Yet there is no recommended methodology for assessing trachoma at the community level. One option for mapping *Schistosoma hematobium* is the rapid assessment of hematuria in school children to provide a community estimate of the burden of disease. Drug interventions to control schistosomiasis are made at the community level.

We conducted two separate integrated surveys to complete mapping of trachoma and urinary schistosomiasis in eight Local Government Areas (LGAs) of Plateau and Nasarawa States of Nigeria and to determine whether the integrated results provide sufficient evidence to guide program interventions. In the first survey we added trachoma assessment to the World Health Organization-recommended methodology for urinary schistosomiasis mapping. We surveyed all rural government primary schools in the eight LGAs taking a systematic sample of 32 to 47 children for each disease. All children of less than 10 years of age were eligible for trachoma exam. All children of 10-14 years of age were eligible for hematuria assessment with a dipstick test.

The second survey added indicators for urinary schistosomiasis, lymphatic filariasis, and household characteristics like mosquito net ownership to the recommended trachoma survey methodology. A systematic sample of 20 enumeration areas (EA) per LGA served as the primary sampling units. Households in each EA were randomly selected with equal probability. All ages were examined for trachoma and children ages 10-14 years were selected for hematuria assessment.

According to WHO guidelines, the prevalence estimate from either method was lower than the 10 percent threshold for mass intervention. Prevalence estimates of active trachoma fall either below 5 percent, where no intervention is indicated, or between 5-9 percent. The prevalence of trichiasis in adults was less than 1 percent in all LGAs. LGA level estimates of active trachoma derived from the integrated school surveys were similar to the findings from the standard trachoma survey methodology across all LGAs. Greater than 5 percent of the examined children had signs of active trachoma in 129 out of the total 352 schools assessed. Following the WHO guidelines for mapping and intervention would have identified only 56 of the 129 communities where trachoma interventions are warranted.

Communities surrounding a total of 65 schools qualified for praziquantil treatment to control urinary schistosomiasis. Mass praziquantil treatment of all ages was warranted in 8 of the 65. LGA level estimates of hematuria from integrated cluster surveys exceeded 10% in one out of the eight LGAs surveyed. The decision to treat based on integrated cluster survey estimates would have qualified only one LGA for praziquantil in school children and missed 50 communities that met the threshold for school-aged treatment. In addition, the eight communities that exceeded the threshold for community-wide treatment would have been missed.

Integrating trachoma examinations with urinary schistosomiasis assessments in schools was quick, easy and useful. Schools surveys may provide a method of identifying hot spots of trachoma in hypo-endemic areas where school enrollment is high. LGA estimates of urinary schistosomiasis from integrated cluster surveys may not be useful for planning treatment interventions. The value of disease surveys may be increased by including more than one disease indicator.

9. Assessing the efficiency of integrated NTD programs
Presented by Dr. Deborah McFarland

The prevailing wisdom is that integration of Neglected Tropical Diseases programs, services and/or interventions is, *ceteris paribus*, more efficient than programs, services and/or interventions delivered via single focus programs. While this may seem intuitively obvious, evidence of efficiency is limited. The Bill and Melinda Gates Foundation funded integration project in Plateau and Nasarawa States in Nigeria gives the chance to measure whether cost efficiencies are realized in the integration of NTD packages (bundles) at Local Government Level. We have developed a common set of cost data collection instruments for use in all the BMGF funded integration projects in Africa, as well as a common protocol for data collection and analysis. These instruments have been field tested in P/N and are now being used by Carter Center, State and LGA staff. The first activity in the integration project for which we have cost data is mapping. Mapping of trachoma and schistosomiasis was conducted in those LGAs in P/N where mapping was not complete. Three different mapping regimens were employed: 1) trachoma only mapping using a cluster survey sampling method; 2) schistosomiasis only mapping using school based survey methods; and 3) an integrated mapping strategy for both trachoma and schistosomiasis using a combination of cluster and school based methods. In LGAs where integrated mapping was conducted, assessment for LF was also done. Cost results suggest that integrated mapping is far less costly and thus more cost efficient in LGAs where mapping was required for both trachoma and schistosomiasis than single focus mapping would have been.

Cost per LGA of 3 Mapping Regimens, Plateau/Nasarawa, 2007

Trachoma Only Mapping (Cluster survey)	$1,760.90
Schistosomiasis Only Mapping (School based survey)	$3,629.50
Integrated Mapping: Trachoma, Schisto, LF assessment (Cluster and school based surveys)	$2,196.00

These results give us preliminary evidence on efficiency for a critical activity in integrated program implementation. Assessing efficiency for all NTD activities requires the following:

- Consistent cost data over time from all levels of the program and from all financing sources;
- Clear measures of program outputs (activities);
- Focus and assessment of the major cost drivers – personnel, vehicles and transport, supplies;
- Development of measures to assess management efficiencies, in addition to economic efficiency, that enhance performance at all levels of the health system.

ANNEX 10: ACKNOWLEDGEMENTS

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"More precious than a diamond."

Former U.S. President Jimmy Carter, speaking about Mectizan® tablets that prevent river blindness (Annual Report, 2001-2002).