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CARTER CENTER

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Summary
2006 Program Review for The Lions-Carter Center SightFirst River Blindness Programs
Cameroon, Ethiopia, Nigeria, OEPA, Sudan, and Uganda
19 – 21 April 2007
The Carter Center
Atlanta, GA

LIONS CLUBS INTERNATIONAL FOUNDATION

THE CARTER CENTER
RIVER BLINDNESS PROGRAM

September 2007

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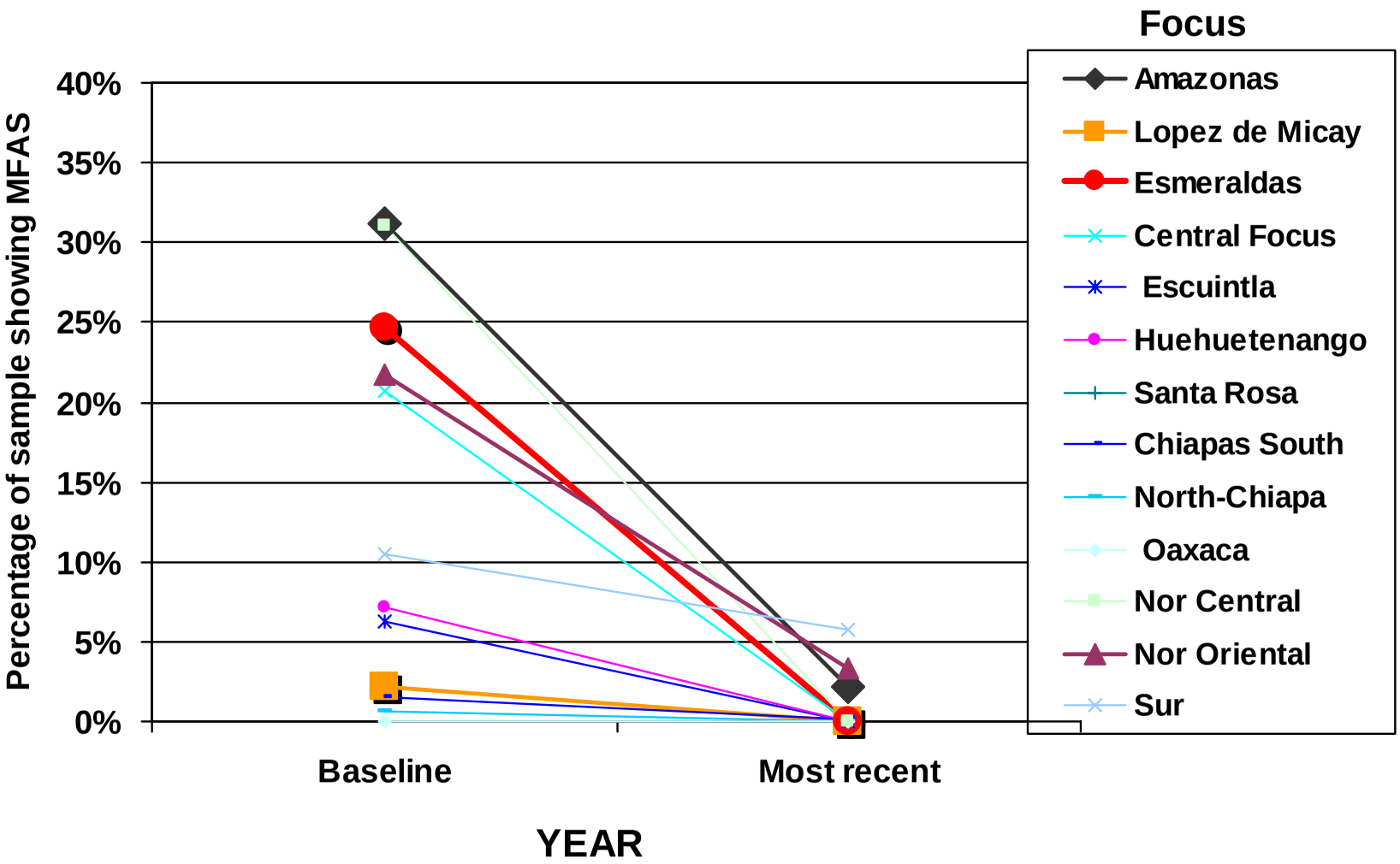
And to many others, our sincere gratitude

Figure A

Progress on reduction of microfilaria in the anterior segment of the eye in the Americas, by focus



Based on ophthalmological assessments in sentinel and non sentinel areas

Figure B

Treating 3 diseases at once in Nigeria: Onchocerciasis, Lymphatic Filariasis, and Schistosomiasis

In an exciting new program piloted in Nigeria, The Carter Center is assisting in treating three diseases at one time. Above, we see the measuring sticks used to determine dosages for each disease.

Figure C

The "Oncho Flag": Uganda's plan for onchocerciasis elimination (as of Feb. 2007)

No.	Focus	Vector	District	Support up to 2006	# of annual rounds of MDAs up to 2006	Total Pop	2007		Transmission Status	Year of transmission elimination	Treatment Plan 2007	Vector Treatment
							UTG1	UTG2				
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*
	Sub-Total					**1,363,911**	**199,324**					
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*
	Sub-Total					**658,021**	**584,134**	**1,168,268**				
10	Imaramagambo	*S.neavei?*	Bushenyi	GOV	14	84,119	65,408		ongoing		Annual	
11	Maracha-Terego	*S.neavei/S.damnosum*	Maracha-Terego	GOV	14	110,000	90,000		ongoing		Annual	
12	Okoro/Nyagak	*S.neavei*	Nebbi	TCC	13	120,000	100,000		ongoing		Annual	
13	Bondo /Arua	*S.neavei/S.damnosum*	Arua	GOV	14	140,000	123,000		ongoing		Annual	
14	Nyamugasani	*S.damnosum*	Kasese	TCC	14	100,000	82,000		ongoing			
15	Obongi / Moyo	*S.neavei*	Moyo	TCC	13	62,267	49,710		ongoing		Annual	
	Sub-Total					**616,386**	**510,118**					
16	Madi	*S.damnosum*	Moyo	TCC	13	129,192	108,123		ongoing		Annual	
			Adjumani	TCC	13	184,286	157,833		ongoing		Annual	
17	West Nile	*S.neavei/ S. damnosum*	Yumbe	GOV	14	120,000	103,500		ongoing		Annual	
			Koboko	GOV	14	80,000	67,000		ongoing		Annual	
			Arua	TCC	14	50,000	38,000		ongoing		Annual	
			Nebbi (Padyere)	TCC	13	89,574	71,660		ongoing		Annual	
18	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	?	6000	4500		ongoing		Annual	
			Kitgum	TCC	?	10,000	7000		ongoing		Annual	
19	Lubilia	*S.damnosum*	Kasese	TCC	13	70,000	57,000		ongoing		Annual	
	Sub-Total					**957,652**	**794,924**					
	GRAND TOTAL					**4,063,165**	**2,540,313**					

Green = transmission eliminated
Yellow = Implement elimination policy
Blue = Priority for epi studies for delineation of each focus before semi-annual treatment decision
Red = Not much is known (Need for Epi stidies)
Purple = Updated census data needed

Group Photo: 2006 Program Review for The Lions-Carter Center SightFirst River Blindness Programs

In Memoriam

This document is dedicated to the memory of Dr. Enyinnaya Uchechukwu ("Uche') Enyinnaya

The Carter Center lost a colleague and friend last October. Dr. Enyinnaya Uchechukwu "Uche" Enyinnaya, project administrator in Imo and Abia states for the Carter Center River Blindness Program in Nigeria, was aboard a plane that crashed less than a mile after leaving the runway of the Abuja airport. He was part of a team headed to Kebbi to perform a project evaluation for the African Programme for Onchocerciasis Control (APOC). Dr. Enyinnaya, the other members of the APOC team—Dr. Nakijwa Kanyiko and Dr. Moshi Ruhiso—and most others aboard were killed. Dr. Enyinnaya was 36 years old.

Dr. Enyinnaya was born in Nigeria but raised in Ames, Iowa. He returned to Nigeria for schooling. He was a medical officer in the Department of Public Health at the Abia state Ministry of Health in 1998 and was appointed the Abia state project officer in charge of the River Blindness Programme, working with The Carter Center and APOC. Between 1998 and 2002, the Abia program he directed provision of 1,896,420 Mectizan® treatments. In 2003, he was appointed project administrator for the Carter Center Imo/Abia states project. Between that time and his passing, Dr. Enyinnaya helped to deliver another 3,274,503 Mectizan treatments in the two states. Millions of people suffer less because of his work.

Dr. Enyinnaya served as secretary of the Abia state Blindness Prevention Committee and enjoyed track and field competition and lawn tennis. Dr. Enyinnaya is survived by his wife of almost four years, Barrister Chinwe Enyinnaya (nee Onu); his parents, Dr. and Mrs. Anosike Enyinnaya; and four sisters: Chinenye Onyeagba, Uzoma Okoronkwo, Oluchi Anagbo, and Nkechi Enyinnaya. He will be missed by all who knew him.

Thanks to Dr. Emmanuel Emukah, director of Southeast programs, Nigeria, who provided most of the content for this piece.

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INTRODUCTION AND OVERVIEW

The River Blindness Program (RBP) of The Carter Center assists the ministries of health (MOHs) of 11 countries (Figure 1) to distribute Mectizan® (ivermectin, donated by Merck & Co., Inc.) through programs that aim to control or eliminate onchocerciasis. In 2006, the RBP and its partners assisted in the 88 millionth (cumulative) Mectizan® treatment since RBP was launched in 1996, and celebrated the third year in which the program helped to treat more than 10 million people.

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 the 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 (See Annex 1 and 6 for further details).

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 an important one. In the former, Mectizan® distribution must continue indefinitely because onchocerciasis transmission persists; sustainability of programs is vital 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 and when possible is an important goal of the RBP.

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 former collaboration with local Lions Clubs in Cameroon and Nigeria for community mobilization, health education, and supervision of Mectizan® distribution activities. Since 1997, LCIF has generously provided grants through their SightFirst Initiative to The Carter Center for the control of RB and trachoma, including a five year grant of $16 million in 1999. Through the SightFirst Initiative, LCIF and The Carter Center expanded their partnership to encompass controlling RB in five countries in Africa (Cameroon, Ethiopia, Nigeria, Sudan, and Uganda) and eliminating RB altogether in the six endemic countries of the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela).

In 2003, the Bill & Melinda Gates Foundation made a $10 million challenge grant to The Carter Center in support of our elimination efforts in the Americas. The grant provided $5 million as an outright contribution and challenged the Center to raise an additional $5

million, which was matched dollar-for-dollar by the Gates Foundation. With support from LCIF, Merck & Co., Inc., and more than 70 other donors, the matching funds were raised in 2005, four years ahead of the challenge grant deadline.

Other partners in Africa and the Americas include Merck & Co., Inc., the U.S. Centers for Disease Control and Prevention (CDC), WHO, the African Program for Onchocerciasis Control (APOC), and The World Bank, as well as other foundations, corporations, governments, and nongovernmental development organizations (NGDOs).

The RBP hosted its eleventh annual Program Review on April 19 - 21, 2007 at The Carter Center in Atlanta. The main purposes of the review were to assess the status of each program, celebrate successes, and determine impediments and problems in program 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. (See The Carter Center's website for other information on Carter Center activities at www.cartercenter.org)

RBP program review participants included the following: Carter Center country representatives Dr. Albert Eyamba (Cameroon), Mr. Teshome Gebre (Ethiopia), Ms. Peace Habomugisha (Uganda), Dr. Emmanuel Miri (Nigeria), and the resident technical advisor of the Khartoum office, Mr. Miles Kemplay (Sudan). Dr. Mauricio Sauerbrey, director of the Onchocerciasis Elimination Program for the Americas (OEPA), presented progress made in the six endemic countries in the Americas. Other technical staff members included Drs. Abel Eigege and Emmanuel Emukah (Nigeria); and Dr. Estifanos Biru and Mr. Abate Tilahun (Ethiopia). MOH representatives included Mr. Thomas Lakwo (Uganda), Dr. Jermias Inrombe (Cameroon), Dr. A. Ngozi Njepuome (Nigeria), and Drs. Kamal Hashim Osman and Tongh Chor Malek Duran (Sudan). Special guests included Honorable Dr. World Laureate Tebebe Y. Berhan (Lions – Ethiopia); Mr. James Ervin and Mr. Philip Albano (Lions Clubs International Foundation); Drs. Mary Alleman and Bjorn Thylefors (Mectizan® Donation Program), Professor Ekanem Ikpi Braide (Cross River University of Technology, Nigeria) who represented the Director of APOC, Ms. Minne Iwamoto (GlaxoSmithKline PLC), and Ms. Catherine Bryant (Izumi Foundation). Dr. Frank Richards (Director of The Carter Center's Malaria, RB, Lymphatic Filariasis and Schistosomiasis Programs) chaired the meeting. (See Annexes 3, 4 and 5 for a complete participant list, contact list, and the agenda of this meeting.)

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 for 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 at health care units located in hypo-endemic communities

(where estimated onchocerciasis nodule rates are under 20%) in the control program strategy.

Summary of the Meeting

In 2006, MOHs in Carter Center-assisted areas provided over ten million (10,832,153) mass Mectizan® treatments for onchocerciasis in active treatment villages (Figures 2 and 3), and nearly one half million (469,151) passive treatments in hypoendemic areas. This represented a 5% increase from the 10,798,434 treatments in 2005. This number constituted 93% of the UTG in the assisted areas (Figure 4), and brought the cumulative number of treatments assisted by the program since its inception in 1996 to 89,013,818. About 46% of treatments were provided in Nigeria (Figure 5). Nearly 90% of treatments (all but Uganda) were supported by LCIF (Figure 6).

Americas: In the Americas, Mectizan® treatments are given twice per year; the goals are to eliminate clinical manifestations of onchocerciasis by 2007 and to interrupt transmission of the disease so that ocular treatment programs can ultimately be stopped. The InterAmerican Conference on Onchocerciasis (IACO'06) held in Antigua, Guatemala, in November 2006 included an exciting development: the Ministry of Health of Guatemala (MOHG) decided to cease treatment in the Santa Rosa focus, based on important research done by CDC in collaboration with the MOHG and OEPA that showed transmission had been eliminated in that focus. The program will launch post treatment surveillance to monitor the area, and hopes that three or more foci will follow suit in 2007. Regionally, recently available data suggest no new cases of blindness attributable to onchocerciasis in the region since 1995, and microfilaria in the anterior segment of the eye at rates of >1% were only detected in two of the 13 foci, with one focus needing reevaluation in 2007 (see Figure A, inside cover).

Cameroon: In 2006, the MOH and The Carter Center integrated Vitamin A distribution into the ivermectin distribution campaign in most Carter Center-assisted areas in West and North Provinces. A challenge is that the strategy for vitamin A supplementation is twice-per-year, compared to the once-per-year treatment approach of community-directed treatment with ivermectin (CDTI) for RB control.

Ethiopia: At the request of the Ethiopian government, The Carter Center Ethiopia has become a partner in distributing long-lasting insecticide treated bed nets (LLIN) in the areas where we assist, with a target of full population coverage. The Carter Center and the government of Ethiopia will launch an integrated malaria/RB effort in Ethiopia in 2007.

Nigeria: The Nigerian program continued incorporating malaria activities into the pre-existing integrated (onchocerciasis control, lymphatic filariasis elimination, and schistosomiasis control) activities. See Figure B, inside cover. Two new grants from the Bill and Melinda Gates Foundation will support integration of interventions (both involving neglected tropical diseases and malaria) in 2007, in hopes that an integrated strategy will reduce costs, strengthen healthcare systems and infrastructure, and make the best use of scarce human and material resources.

Sudan: The Ministry of Health of Sudan (Government of Sudan [GOS]) launched a policy for onchocerciasis elimination where technically feasible with twice-per-year treatment with ivermectin, with plans to launch semi-annual treatment in the isolated Abu Hamad focus on the River Nile.

Uganda: After preparations in 2006, twice-per-year treatment for onchocerciasis elimination was launched in the focus of Wadelai in Nebbi District. Plans were developed by the MOH to launch other onchocerciasis elimination activities in foci where technically feasible. The MOH has strong technical expertise in vector control, which will be a component of the Ugandan onchocerciasis elimination program. The Carter Center agreed to partner with the MOH in all the foci targeted for elimination (see Figure C, inside cover).

GENERAL RECOMMENDATIONS 2007 FOR THE CARTER CENTER'S RIVER BLINDNESS PROGRAM

All Carter Center-assisted projects should continue to monitor their APOC, government and Carter Center funding figures in 2007 in all their assisted African projects. Monitor how The Carter Center might be asked to fund the 'post APOC gap.' All Carter Center-assisted projects should continue to refine government and Carter Center funding figures in 2007, including any additional funds coming in from APOC. Separate from cash contributions, programs should begin to count consumables (gasoline, impregnated bed nets, etc.) and capital items (vehicles, motorcycles, bicycles) as part of government contributions.

Consider twice-per-year treatment in isolated foci where governments are willing to fund the additional efforts in order to focally eliminate onchocerciasis, if the Mectizan® Donation Program approves.

Programs that have not yet done so should seek to demonstrate the impact of ivermectin treatment on ocular disease. Program staff should review available data from past sentinel areas that may have baseline data pertaining to visual impairment or ocular disease due to onchocerciasis. In those areas having baseline data, surveys for anterior segment disease should be conducted.

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

Seek to increase training, supervision, involvement of kinship groups, and improve gender balance among CDDs.

Better information is needed on CDD attrition, CDD training, and CDD retraining. Indices for CDDs should include CDDs/village, CDDs/total population, CDDs/persons treated, and CDDs/kinship group.

Enhance CDC collaboration with Carter Center programs (particularly those aiming for elimination).

Work to delimit international border issues regarding onchocerciasis distribution in Carter Center RBP assisted areas between Uganda and Sudan, Uganda and the Democratic Republic of Congo, Uganda and Kenya, and Sudan and Ethiopia. Ask for this to be addressed in the ministerial meetings on cross border health issues. Encourage APOC to assist us in evaluating cross border issues.

If the government wants to support integration in areas where we work, we cannot refuse to participate. 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 finding to do so.

Carter Center program staff must complete the Emory IRB ethics test when involved with research on human subjects.

Figure 1

Carter Center-Assisted Onchocerciasis Programs

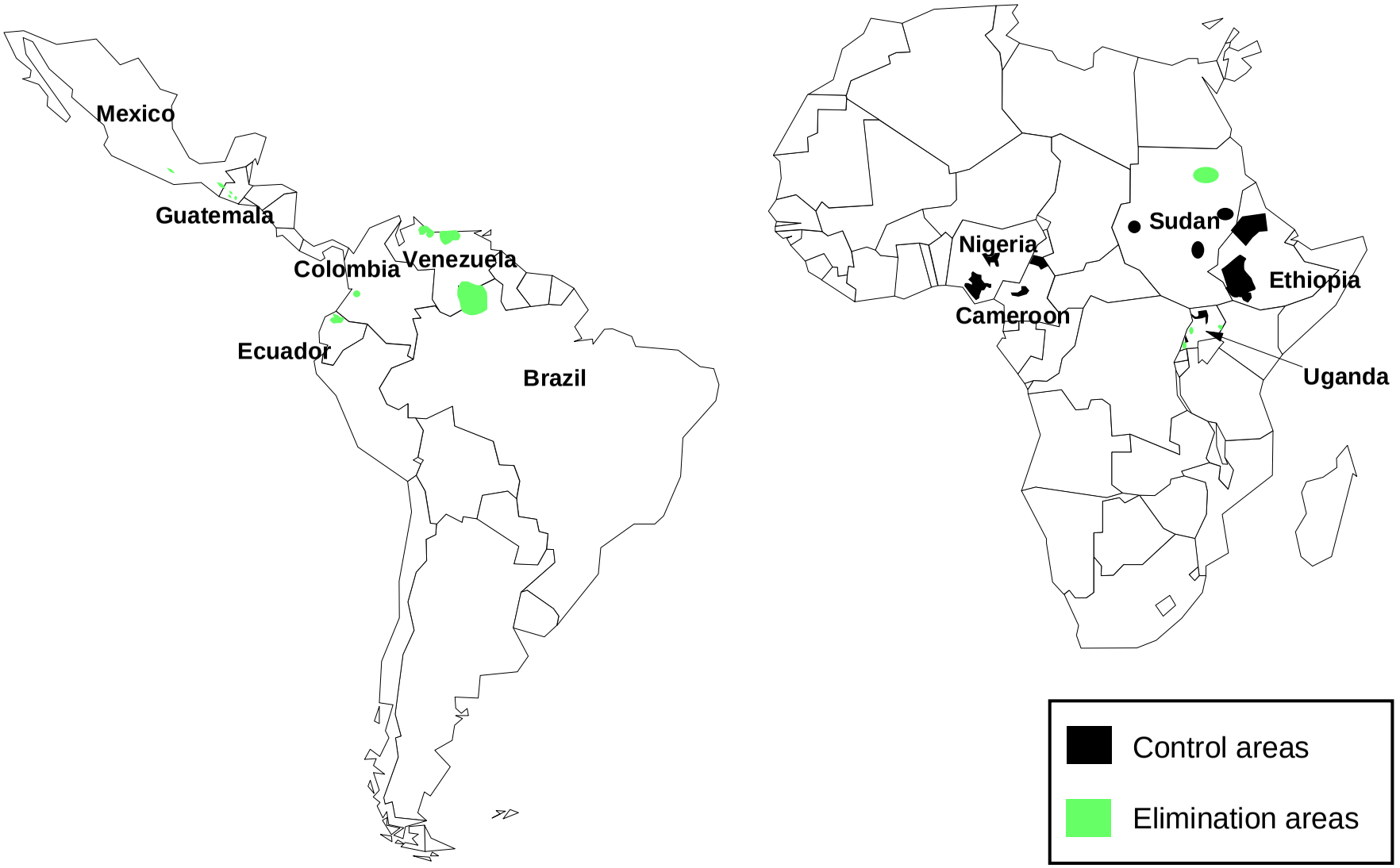


Figure 2

2006 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 RBP TX
NIGERIA	***UTG=**	**4,943,904**		**UTG(arv)=**	**7,917**										
Treatments	0	131,740	85,645	55,800	261,960	871,683	1,264,163	470,354	483,938	522,971	472,152	118,486	**4,738,892**	96%	44%
Villages treated	0	96	80	63	358	1,106	2,048	1,097	1,061	903	701	196	**7,709**	97%	27%
UGANDA	***UTG=**	**1,072,134**		**UTG(arv)=**	**2,386**										
Treatments	0	0	67,507	131,090	306,715	223,315	96,082	153,625	64,044	0	0	0	**1,042,378**	97%	10%
Villages treated	0	0	246	322	821	518	474	822	222	0	0	0	**2,386**	100%	8%
CAMEROON	***UTG=**	**1,679,804**		**UTG(arv)=**	**3,631**										
Treatments	0	0	0	0	0	0	213,445	163,000	364,936	427,674	357,343	3,933	**1,530,331**	91%	14%
Villages treated	0	0	0	0	0	0	297	341	986	967	956	82	**3,629**	100%	13%
OEPA	****UTG(2)=**	**917,264**		**UTG(arv)=**	**1,950**										
Treatments	0	0	0	0	0	429,188	0	0	0	0	0	423,533	**852,721**	93%	8%
Villages treated	0	0	0	0	0	1,867	0	0	0	0	0	1,859	**1,867**	96%	6%
ETHIOPIA	***UTG=**	**2,757,533**		**UTG(arv)=**	**13,046**										
Treatments	0	0	0	0	0	188,895	911,016	902,204	455,498	96,963	0	0	**2,554,576**	93%	24%
Villages treated	0	0	0	0	0	858	2,548	7,557	12,781	0	0	0	**13,046**	100%	45%
SUDAN	***UTG=**	**220,203**		**UTG(arv)=**	**391**										
Treatments	0	0	0	0	0	0	30,709	45,810	0	14,721	0	22,015	**113,255**	51%	1%
Villages treated	0	0	0	0	0	0	51	58	0	0	0	0	**109**	28%	28%
TOTALS	***UTG=**	**11,590,842**		**UTG(arv)=**	**29,321**										
Treatments	**0**	**131,740**	**153,152**	**186,890**	**568,675**	**1,713,081**	**2,484,706**	**1,703,904**	**1,368,416**	**1,069,623**	**851,510**	**567,967**	**10,832,153**	**93%**	**100%**
Villages treated	**0**	**96**	**326**	**385**	**1,179**	**1,624**	**2,870**	**2,318**	**2,269**	**1,870**	**1,657**	**2,137**	**28,746**	**98%**	**100%**

Cumulative RBP-assisted treatments (1996 - 2006) = 89,014,044

2006 Mass Treatments	10,832,153
2006 Passive Treatments	469,151
2006 TOTAL TREATMENTS	**11,301,304**

Cumulative (includes passive)	
1996	3,973,894
1997	5,186,842
1998	5,748,435
1999	6,766,967
2000	7,486,181
2001	8,019,098
2002	8,964,465
2003	9,658,793
2004	11,109,631
2005	10,798,434
2006	11,301,304
TOTAL	**89,014,044**

***UTG**: Ultimate Treatment Goal

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

Figure 3

Carter Center-Assisted Programs: Annual Mectizan Treatments, 1996 - 2006

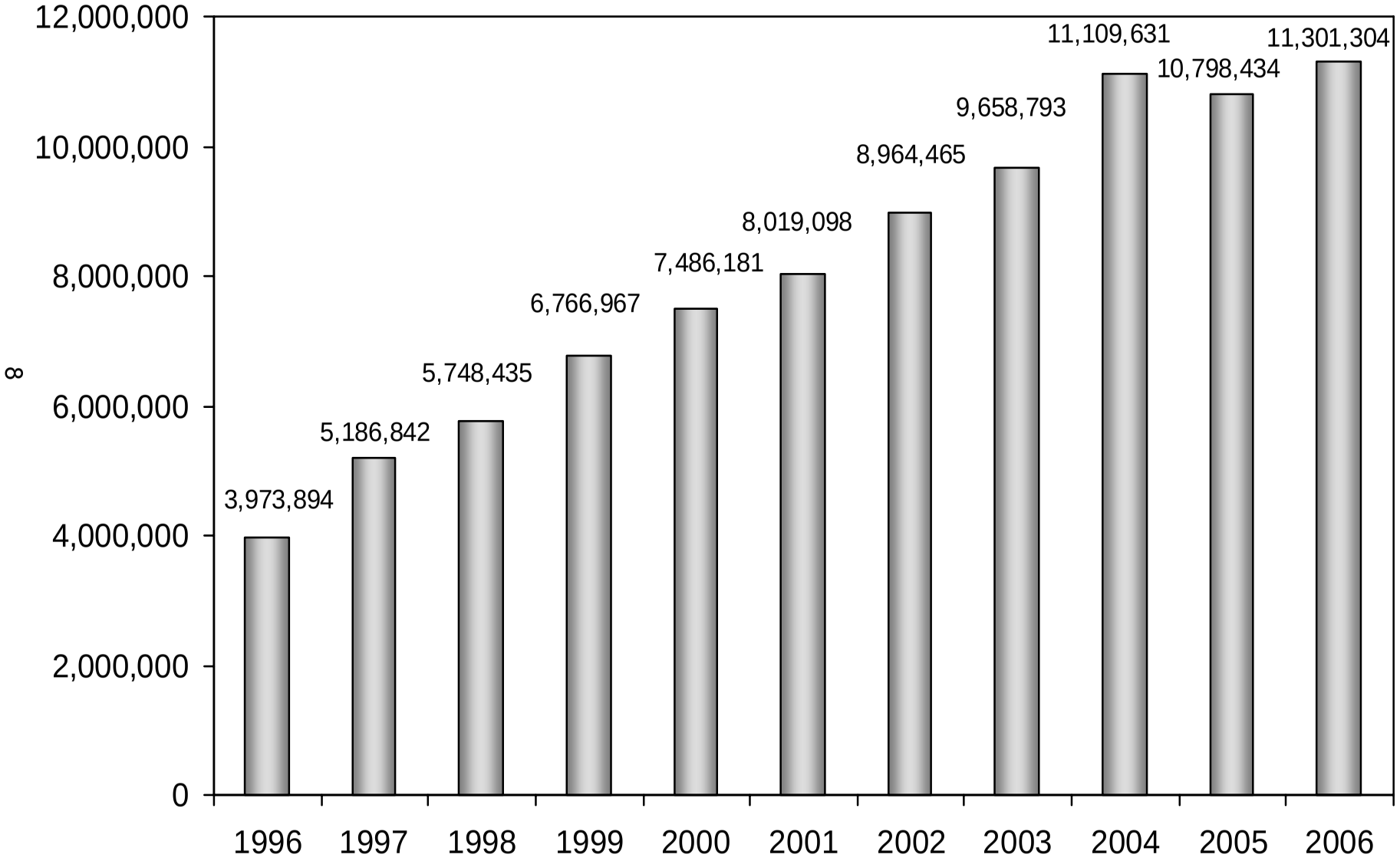


Figure 4

Carter Center-Assisted Programs: Percent of Ultimate Treatment Goals reached in 2005 and 2006

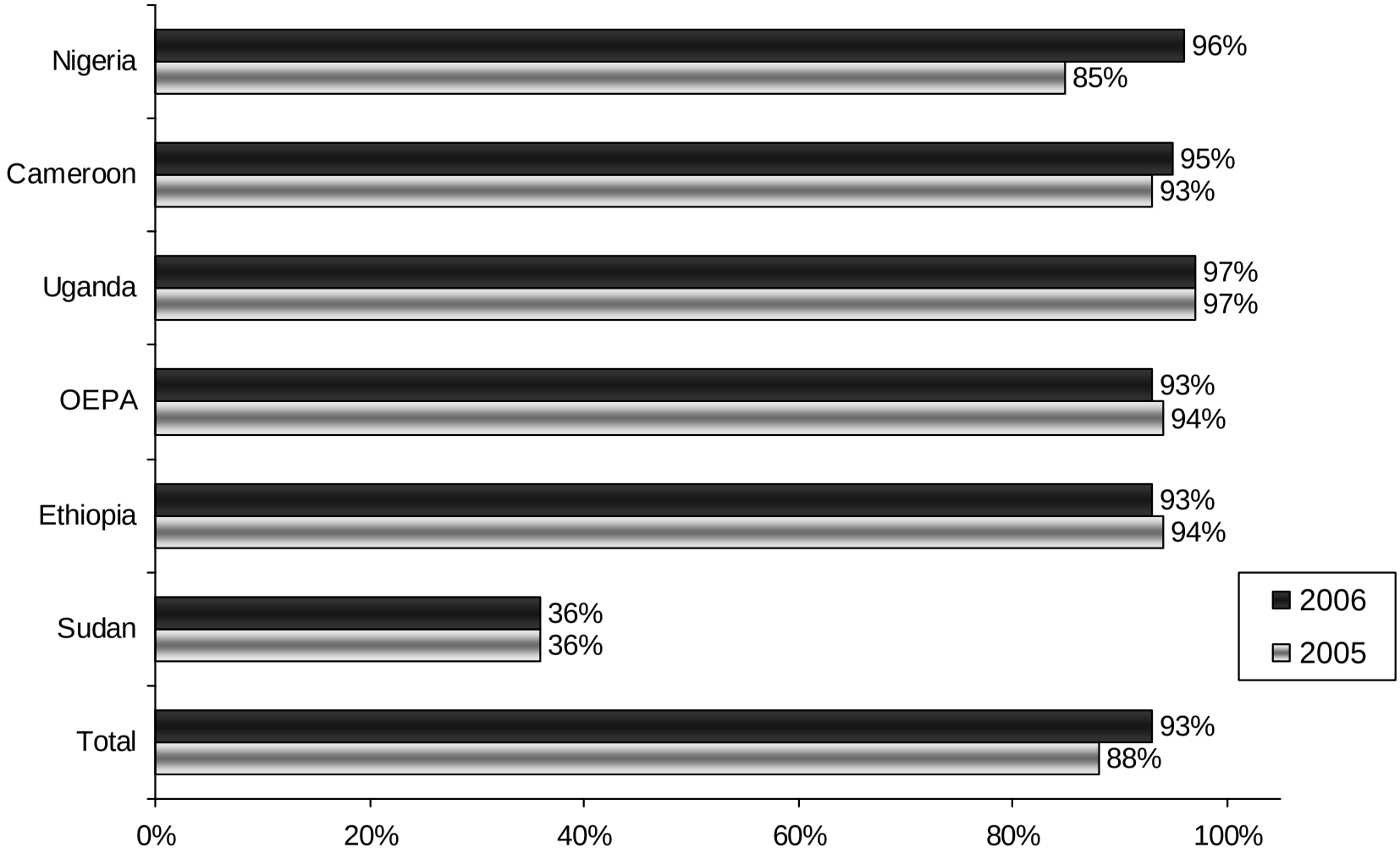


Figure 5

Carter Center-Assisted Programs: 1996 - 2006 Mectizan Treatments, by program

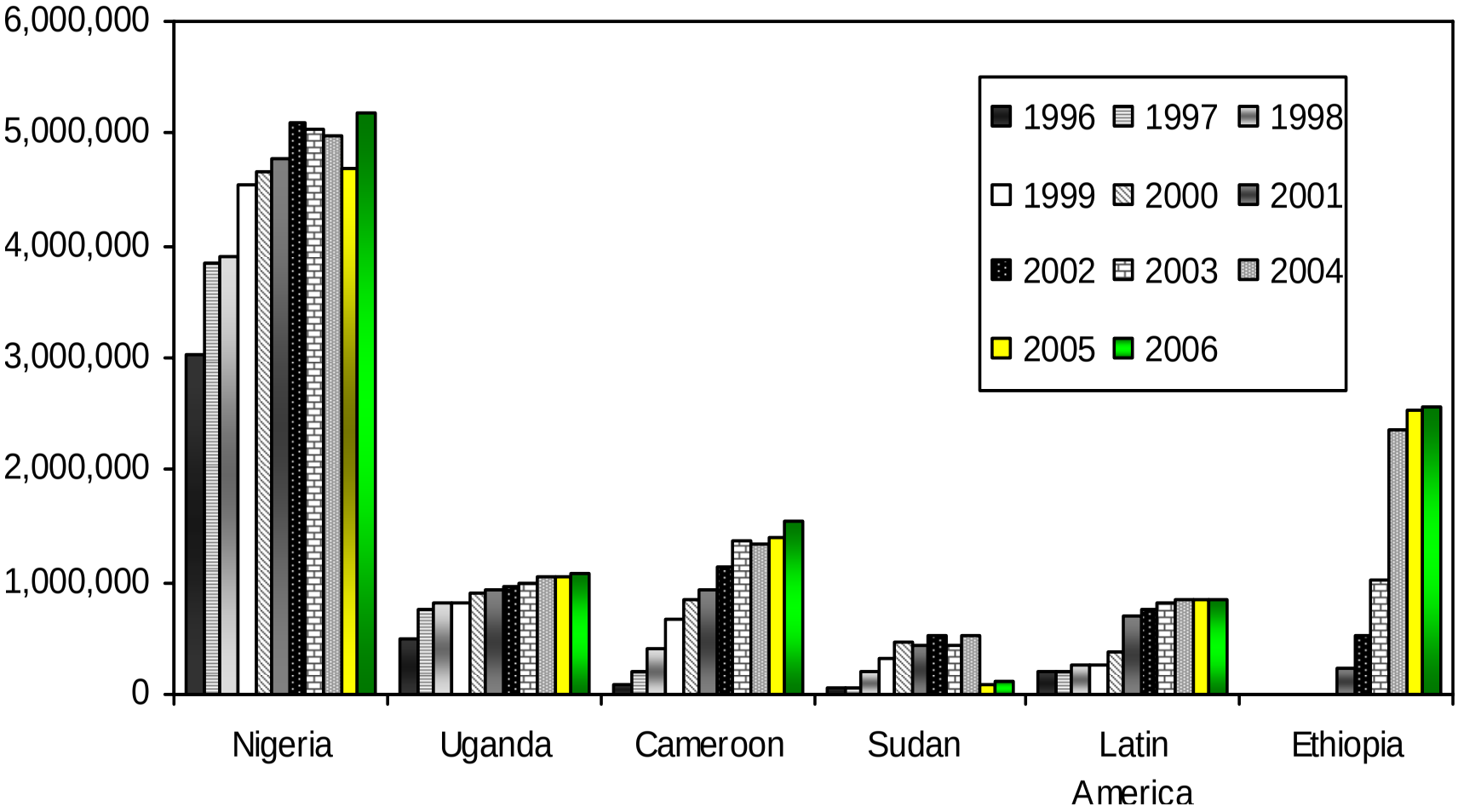
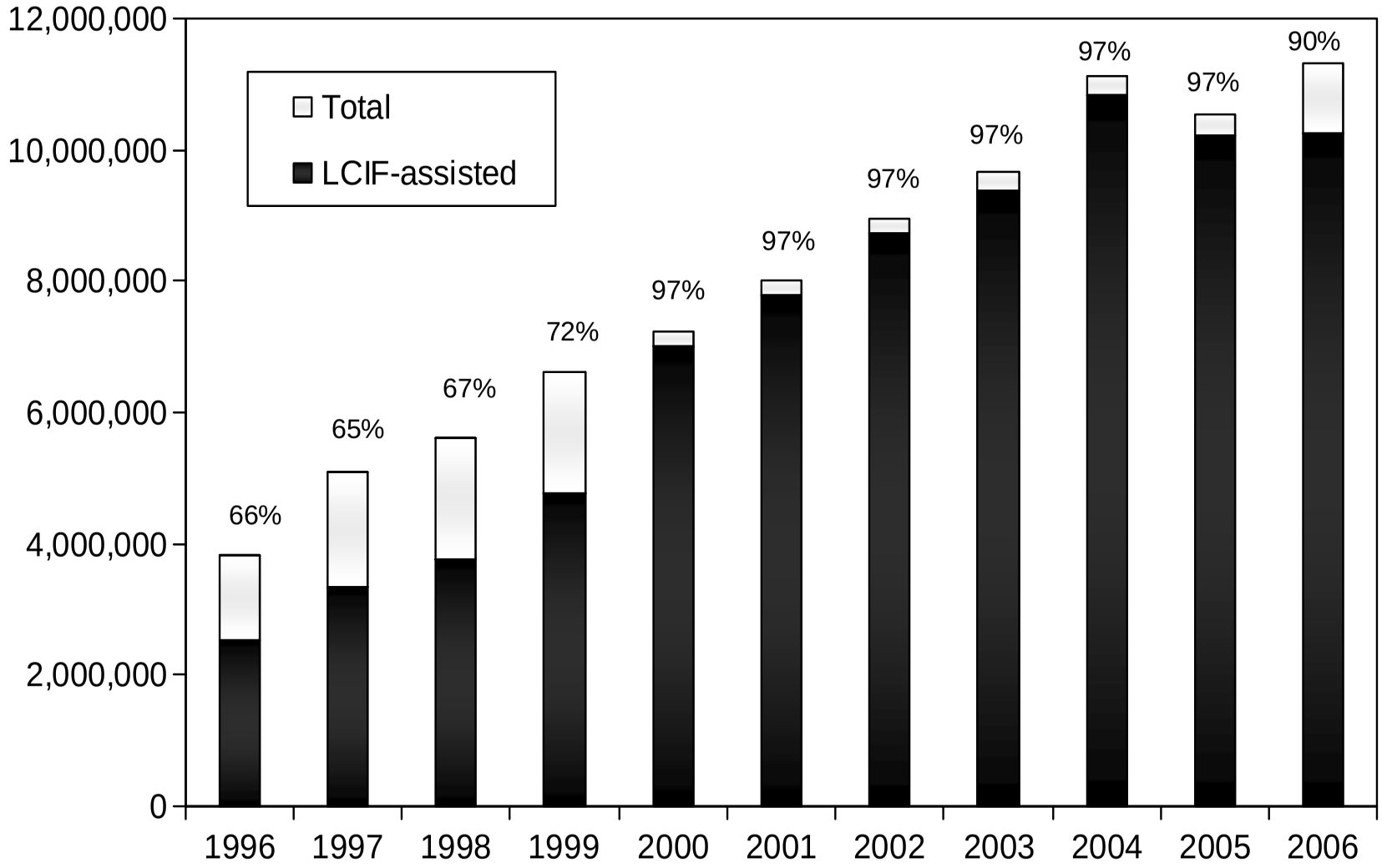


Figure 6

Annual Mectizan Treatments, Carter Center-Assisted and Carter Center / Lions-Assisted Programs*



* All treatments were covered in 2006 but those in Uganda.

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 sustained, semi-annual (i.e., every six months) distribution of Mectizan® in the 13 endemic areas of the region (Figure 7). The initiative began shortly after passage in 1991 of 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, 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) provides representation for these partners and serves as a steering committee for OEPA staff, who are based in Guatemala City. The Carter Center coordinates technical and financial assistance to the six countries through the OEPA office.

There are 13 onchocerciasis foci within the six endemic countries (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela) in the region. Approximately 500,000 persons are at risk, and in 2006, 456,803 persons were eligible for ivermectin treatment. This population is referred to as the ultimate treatment goal (UTG). Since the OEPA goal is to provide ivermectin treatment twice a year, 913,606 treatments were expected, which is twice the UTG. This is referred to as the UTG(2). Treatment coverage is expressed as a percentage of UTG(2) treated. In 2006, 852,721 ivermectin treatments were delivered, which corresponds to 93% of the regional UTG(2) of 913,606 (see Figures 8 and 9). The required ivermectin treatments in the region of the Americas are distributed among the endemic countries in the following order: Guatemala (38.5%), Mexico (33.2%), Venezuela (21.8%), Ecuador (4.6%), Brazil (1.7%), and Colombia (<1%). Guatemala, Mexico and Venezuela together comprise 93.5% of the regional UTG(2). The UTG(2) for 2007 is 891,484 (Figure 10), a decrease of 22,122 treatments from 2006 due to the removal of the Santa Rosa focus from treatment (see below).

Four important milestones were accomplished in 2006:

- ***The Santa Rosa Decision:*** The MOH of Guatemala concurred with the conclusion of the OEPA steering committee (the PCC) that onchocerciasis no longer exists in the Santa Rosa focus of Guatemala. 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. The PCC made its recommendation with reference to 2002 WHO guidelines for the certification of onchocerciasis elimination. This is the first of the 13 foci in the Americas where such a decision has been made. The 2006 status of transmission in all foci is shown in Figure 11. At the present time, active transmission is believed to be ongoing in seven foci (all three foci in Venezuela, Brazil, Ecuador, the South Chiapas focus in Mexico, and the Central focus of Guatemala), and suppressed

in remaining foci. PCC will deliberate on withdrawal of treatment from Colombia and Escuintla (Guatemala) in early 2007. Other foci preparing for similar withdrawal deliberations by PCC in late 2007 or early 2008 include Oaxaca and N. Chiapas foci (Mexico), the Huehuetenango focus (Guatemala), and Ecuador.

- **Success in South Venezuela:** For the first time, the Southern Venezuela focus surpassed their 85% coverage goal, making 2006 the first year that all 13 foci in the Americas surpassed the 85% UTG(2) coverage goal (Figure 12). Since the South focus of Venezuela is continuous 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 is important to implement and fully fund the Venezuelan Government's "Yanomami Health Plan" since this plan provides for the air transport and critical on-ground infrastructure needed to deliver Mectizan® treatments as part of an integrated essential health care package.

- ***2007 Goal of the Elimination of Ocular Morbidity by 2007:*** The OEPA initiative was launched in response to Resolution XIV by PAHO's XXXV Directing Council which, in 1991, called for the elimination of all new morbidity caused by onchocerciasis by the year 2007. In recognition of the need to report to PAHO on progress in 2008, ophthalmological survey data on baseline and recent (2004-2007) eye disease from onchocerciasis data were collected and organized for each of the 13 foci. Nine of the 13 foci have eliminated new cases of eye disease attributable to onchocerciasis (defined as <1% prevalence of microfilariae in the cornea and/or anterior chamber of the eye—see Figure A, inside cover and Figure 13). The four foci that have not yet met the ocular morbidity elimination goal are the Northeast Venezuela, North Central Venezuela, and the two cross-border foci of the Yanomami Area: the Brazilian Amazonas–Roraima focus and South Venezuela focus. South Venezuela will be reassessed in early 2008.

- ***Clarification of entomological transmission thresholds:*** The PCC, in a special meeting attended by entomologists from all endemic countries, decided that it should accept the transmission suppression threshold being used by Special Programme for Research and Training in Tropical Diseases (TDR) in West Africa of <1 infective fly per 1,000 parous flies ("absence or near absence" of infective flies per the WHO Certification guidelines). Given that Polymerase Chain Reaction is often used to determine infection rates, and black fly parity cannot be determined in PCR testing, the PCC set PCR determined suppression thresholds to 1/2000 flies (assuming 50% parity). This is also consistent with TDR African thresholds (set at <0.5/1000). The PCC recommended that OEPA sampling be sufficient to meet the upper 95% confidence limit with this threshold.

Country specific information:

Brazil's population in need of treatment for onchocerciasis resides in a vast area which is continuous with Venezuela's South focus (the Amazonas-Roraima focus). The entire bi-national endemic zone is called the Yanomami area. Brazil provided 13,562 ivermectin treatments in 2006, 88% of its UTG(2) of 15,496. Brazil reached the treatment coverage goal for the sixth consecutive year.

Colombia has a single focus (López de Micay, Cauca). Its program provided 2,278 ivermectin treatments in 2006, 96% of its UTG(2) of 2,364. Colombia exceeded the treatment coverage goal for the eighth consecutive year.

Ecuador has a single endemic focus in Esmeraldas Province (the Esmeraldas–Pichincha focus). The program achieved a treatment coverage of >85% for the sixth consecutive year, providing 41,391 ivermectin treatments, 99% of the UTG(2) of 41,894.

Guatemala has four endemic foci: Central, Huehuetenango (bordering the Southern Chiapas focus in Mexico), Escuintla–Guatemala and Santa Rosa. The Guatemalan programme provided 331,661 ivermectin treatments in 2006, 94% of its UTG(2) of 351,762. The country surpassed the coverage goal for the fifth consecutive year.

Mexico has three endemic foci (Oaxaca, Northern Chiapas and Southern Chiapas) where >85% coverage was achieved for the sixth consecutive year by providing 277,369 ivermectin treatments, 92% of the UTG(2) of 303,122. Mexico has also been providing ivermectin four times a year (i.e. quarterly) in 50 of its most highly endemic communities in the Southern Chiapas focus since 2003, in a trial aimed at hastening onchocerciasis elimination.

Venezuela, which also has three endemic foci (North-central, North-eastern and Southern – the latter bordering the Brazilian focus) reached the treatment coverage goal for the fourth consecutive year by providing 186,460 treatments, 94% of the UTG(2) of 198,968. For the first time, the poorly accessible South focus in the Yanomami area was able to distribute 4,374 (86%) treatments during the first round and 4,408 (87%) during the second to an eligible population of 5,069.

IACO 2006:

The MOH of Guatemala and OEPA convened the sixteenth annual Inter-American Conference on Onchocerciasis (IACO) at Porta Hotel Antigua in Antigua Guatemala, Guatemala, November 7-9, 2006. The theme of IACO'06 was "Elimination of Ocular Morbidity by 2007: Are we prepared?" Ninety-two persons attended the meeting, including government/MOH representatives, and Lions Clubs representatives, from the six endemic countries. Representatives from PAHO, Merck & Co., Inc., Lions Clubs and the Lions Clubs International Foundation, The Scripps Research Institute, the University of Alabama at Birmingham, the University of Arizona, and the American Society of Tropical Medicine and Hygiene also participated in the conference. Special guests included Drs. Dennis K.W. Lamafwa and Ambrose Onapa of the Ugandan MOH.

The Guatemalan organizing delegation included both high level health authorities from the Guatemalan MOH and 35 field workers from the endemic areas in Guatemala. Dr. Víctor Manuel Gutiérrez, Guatemalan Minister of Health, opened the meeting by announcing the decision to cease treatment in the Santa Rosa focus. The Guatemalan press provided extensive coverage of this announcement, including a television interview with national program director Dr. Eduardo Catu (see photos below).

Dr. Eduardo Catu of the Guatemala MOH at IACO 2006, announcing a halt to treatments in the Santa Rosa focus beginning in 2007

Carter Center staff and Lions attendees from left to right: Dr. Frank Richards (Carter Center Atlanta), Dr. Florencio Cabrera Coello (Lion – Mexico), Ms. Holly Becker (Lion – U.S.), Dr. Ricardo Gurgel (Lion – Brazil), Dr. Moses Katabarwa (Lion – Carter Center Atlanta), Dr. Libardo Bastidas Passos (Lion – Colombia), Dra. Lidia Morilla de Valencia (Lion – Venezuela), Ing. Ramiro Peña Constante (Lion – Ecuador) and his wife Sra. Margarita Peña.

The Minister of Health of Guatemala, Dr. Víctor Manuel Gutiérrez, shares the good news that the Santa Rosa focus has interrupted transmission and can stop giving Mectizan® treatments. Post treatment surveillance in the focus will be conducted by the MOH for three years, with assistance by OEPA and CDC.

RECOMMENDATIONS 2007 for OEPA

Complete all ocular assessments by early 2008 and provide a report of progress to PAHO's Directing Council.

Work to add ATP and mathematical transmission modeling results to the 13-foci table in 2007. Particular urgency should be given to the model for *S. ochraceum*.

Improve data management in sentinel villages, consider monitoring individuals or cohorts, and establish serological (OV-16) monitoring.

Stop treatments in one or two other foci (candidates include Colombia and Escuintla) if the PCC and governments agree. Establish activities to allow stopping treatments in other foci where transmission is suppressed in Mexico (Oaxaca, N. Chiapas), Ecuador, and Guatemala (Huehuetenango).

Set up a monitoring plan for Santa Rosa, where treatments were stopped in 2007.

Publish results of certification exercises performed in collaboration with CDC in Escuintla (Guatemala).

Assist the Mexican program in the important four times-per-year treatment protocol being conducted in Chiapas.

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.

Consider adding other interventions (nodulectomy, focal vector control), when appropriate, that could be applied in specific foci, with decisions based on improved epidemiology.

Maintain CDC, University del Valle/Guatemala, and University of Alabama/Birmingham lab involvement, particularly in serology, nodule histology, molecular entomology, modeling and drug studies.

Promote cross fertilization with African elimination programs, especially the Uganda elimination program.

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

Work on improving the coverage surveys being performed.

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

Carter Center program staff must complete the Emory Institutional Review Board (IRB) ethics test when involved with research on human subjects.

Figure 7

Distribution of Onchocerciasis in the Americas

MÉXICO

1. Oaxaca focus

2. North-Chiapas focus

3. South-Chiapas focus

GUATEMALA:

4. Huehuetenango focus

5. Central focus:

•Solola

•Suchitepequez

•Chimaltenango

6. Escuintla focus

7. Santa Rosa focus

COLOMBIA

12. Lopez de Micay focus

ECUADOR:

13. Esmeraldas focus

•Cayapas River

•Santiago River

•Onzole River

•Satellite foci:

- Canandé and others

VENEZUELA

8. North-Central focus

9. North-Eastern focus

10. South focus

BRAZIL:

11. Amazonas focus

(Yanomami area)

Figure 8

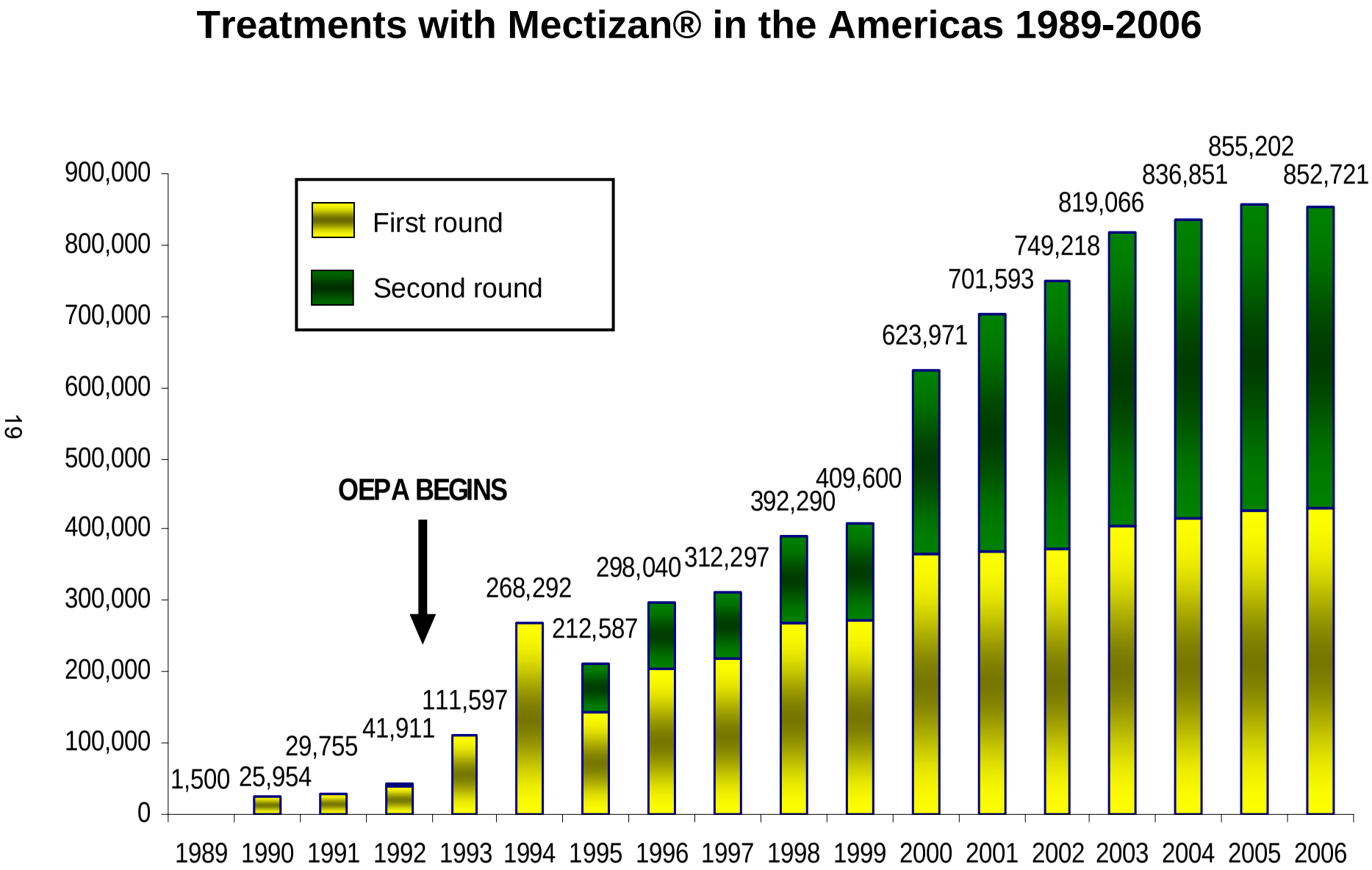

Treatments with Mectizan® in the Americas 1989-2006
First round
Second round
OEPA BEGINS
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1,500
25,954
29,755
41,911
111,597
268,292
212,587
298,040
312,297
392,290
409,600
623,971
701,593
749,218
819,066
836,851
855,202
852,721
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006

Figure 9

Carter Center-Assisted Treatments in the Americas by focus, 2006

Focus	Population	UTG	Treated First Round	% UTG treated in first round	Treated Second Round	% UTG treated in second round	UTG(2)	Total treated	% UTG(2) treated
Esmeraldas-ECU	24,378	20,947	20,357	97%	21,034	100%	41,894	41,391	99%
Lopez-COL	1,213	1,182	1,125	95%	1,153	98%	2,364	2,278	96%
Amazonas-BRA	9,657	7,748	6,836	88%	6,726	87%	15,496	13,562	88%
South-VEN	6,320	5,069	4,374	86%	4,408	87%	10,138	8,782	87%
Northeast-VEN	91,839	82,573	78,079	95%	75,797	92%	165,146	153,876	93%
Northcentral-VEN	13,033	11,842	11,954	101%	11,848	100%	23,684	23,802	100%
Sta. Rosa-GUA	10,923	9,818	9,685	99%	9,546	97%	19,636	19,231	98%
Escuintla-GUA	49,616	45,224	43,116	95%	43,269	96%	90,448	86,385	96%
Central-GUA	107,969	95,409	89,299	94%	87,530	92%	190,818	176,829	93%
Huehue-GUA	30,051	27,259	26,607	98%	26,167	96%	54,518	52,774	97%
South Chiapas-MEX	109,716	102,698	93,866	91%	92,515	90%	205,396	186,381	91%
North Chiapas-MEX	7,092	6,528	5,918	91%	6,050	93%	13,056	11,968	92%
Oaxaca-MEX	46,592	42,335	39,747	94%	39,273	93%	84,670	79,020	93%
TOTAL	**508,399**	**458,632**	**430,963**	**94%**	**425,316**	**93%**	**917,264**	**852,721**	**93%**

Figure 10

Population at risk in the Americas in each focus, 2007

Country	Focus	Population at risk	%	Eligible Population	%	# Communities	%
GUA	Central	107,366	22%	95,352	21%	321	17.7%
MEX	South Chiapas	106,994	21%	96,774	22%	559	30.9%
VEN	Northeast	90,642	18%	82,538	19%	465	25.7%
GUA	Escuintla	54,464	11%	47,031	11%	117	6.5%
MEX	Oaxaca	45,435	9%	41,604	9%	98	5.4%
GUA	Huehuetenango	30,425	6%	27,605	6%	43	2.4%
ECU	Esmeraldas	25,285	5%	21,799	5%	119	6.6%
VEN	North Central	13,142	3%	12,150	3%	45	2.5%
BRA	Amazonas	9,987	2%	8,020	2%	17	0.9%
MEX	North Chiapas	7,070	1%	6,255	1%	13	0.7%
VEN	South	6,914	1%	5,409	1%	11*	0.6%
COL	Lopez de Micay	1,225	0.25%	1,205	0%	1	0.1%
Total		**498,949**	**100%**	**445,742**	**100%**	**1,809**	**100%**

*The South Focus has now 11 geographic areas, instead of 115 communities.
Note that the Santa Rosa Focus has been removed from the treatment inventory starting 2007.

Figure 11

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 rec)
Escuintla, GU	Yes	Yes (2007 rec)
Huehuetenango, GU	Yes	Suppressed
Oaxaca, MX	Yes	Suppressed
North Chiapas, MX	Yes	Suppressed
South Chiapas, MX	Yes	Suspected suppressed
Central focus, GU	Yes	Suspected suppressed
Esmeralda, EC	Yes	Suspected suppressed
North Central, VZ	Yes	No
North Eastern, VZ	Yes	No
Amazonas, BR	Yes	No
South, VZ	Yes	No

Figure 12

Evolution of treatment coverage UTG(2) in the Americas, by country, 2001 - 2006

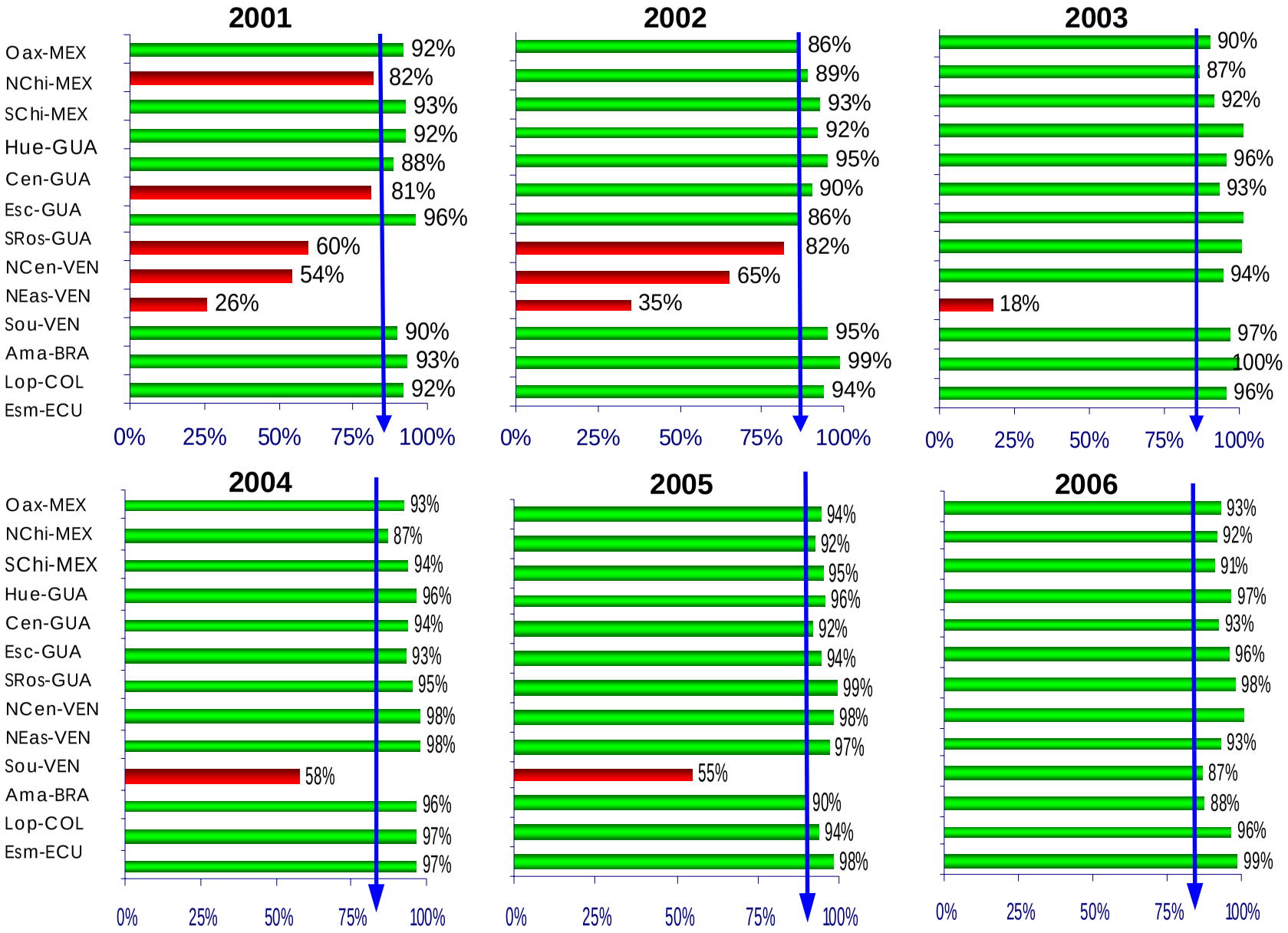


Figure 13

New Cases of Ocular Morbidity from onchocerciasis in the 13 foci of the Americas (baseline and most recent evaluation in both sentinel and non-sentinel areas)

Country	Focus	Baseline evaluation*		Most recent evaluation			
		Year	Prevalence	Year	Prevalence MfCA	Prevalence KP	Prevalence MfCA & KP**
Brazil	Amazonas	1995	31.2%	2007	2.2%	4.3%	6.5%
Colombia	Lopez de Micay	1996	2.2%	2006	0%	0%	0%
Ecuador	Esmeraldas	1991	24.7%	2006	0%	0%	0%
Guatemala	Central Focus	1981	20.7%	2007	0%	0.4%	0.4%
	Escuintla	1979	6.2%	2006	0%	0%	0%
	Huehuetenango	1981	7.2%	2006	0%	0%	0%
	Santa Rosa		N/A	2005	0%	0%	0%
México	Chiapas South	1995	1.5%	2007	0.07%	0%	0.07%
	North-Chiapa	1995	0.6%	2006	0%	0%	0%
	Oaxaca	1995	0%	2004	0%	0%	0%
Venezuela	Nor Central	1999	31%	2005	0%	1.7%	1.7%
	Nor Oriental	1999	21.7%	2006	3.3%	0.7%	4.0%
	Sur	1998	10.5%	2001	5.8%	18.6%	24.4%

* Based on finding microfilariae in the anterior chamber of the eye

** All persons positive for MfAC or PK

UGANDA

Background: Onchocerciasis affects 29 of 80 districts in Uganda. The Carter Center assists community-directed treatment with ivermectin (CDTI) in 12 of those 29 endemic districts: Kabale, Kanungu, Kasese, and Kisoro, in the Southwest area bordering the Democratic Republic of Congo (DRC); Adjumani, Moyo, and Nebbi, in the West Nile region bordering Sudan and DRC; Apac District; Gulu District in the Middle North areas; and Manafua, Mbale, and Sironko, in the Mount Elgon focus in the east, bordering Kenya (Figure 14). In 2006, the Carter Center's UTG in Uganda accounted for 59% of that country's national UTG.

Local Lions Clubs in Uganda have been active participants in the Carter Center-assisted river blindness control activities since 2000, although 2006 was the last year for LCIF funding to Uganda. 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. Lions established new Lions Clubs in endemic districts, the latest being in Adjumani District. 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 1996, The Carter Center and the African Programme for Onchocerciasis Control (APOC) helped support those established projects. APOC also supported successful elimination efforts in two foci using focal vector control and annual Mectizan® distribution. Armed with this success (and the memory of a 1970s elimination victory in the Victoria focus, affecting 3 million people), the government of Uganda and its partners envisioned a bold national elimination policy as the most viable option for success. In 2005, the government of Uganda made a decision to pursue elimination of onchocerciasis (as opposed to control) in several areas in Uganda.

The goal of the new effort is to eliminate onchocerciasis in all foci of Uganda where technically feasible. In order to rapidly interrupt transmission in such foci, Uganda plans to carry out twice-per-year Mectizan® treatments (every six months rather than annually) and provide targeted vector control or vector elimination through ground larviciding. New epidemiological and entomological surveys will be conducted. The Carter Center, with support from Merck & Co. through the NGDO group, launched semiannual treatments in Wadelai, 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 Directors. The Merck & Co. 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.

Treatments: The Carter Center Uganda assisted in the treatment of 1,042,378 persons in 2006. Excluding passive and visitor treatments totaling 25,986, Uganda reached 97% of its UTG of 1,072,134 persons (Figure 15). This was the 10th straight year of more than 85% coverage of the UTG in Carter Center-assisted areas, and the ninth successive year of coverage exceeding 90% of the UTG. All of the 2,386 high-risk villages were treated during the year. In 2006, Carter Center-assisted areas provided 68% of the country's total of 1,747,768 treatments (Figure 16). The elimination effort using semi-annual treatment with Mectizan® was initiated in the isolated Wadelai focus in Nebbi District. Geographical coverage was 100% in both rounds, and UTG coverage was 98% and 97% for the first and second rounds of treatment, respectively.

The "Oncho Flag" Map: Uganda Ministry of Health representatives at The Carter Center program review unveiled the "oncho flag" map: green shows foci where transmission has already been interrupted and yellow shows the priority foci for new elimination activities. The map also shows blue areas, requiring further assessments to determine if elimination is feasible, and red areas, unlikely candidates for elimination at this time (because some of the transmission foci cross international borders into south Sudan or the DRC). The goal of the "oncho flag" map is to eventually move all onchocerciasis endemic communities from the yellow, blue, and red zones into the green zone, thus marking transmission interruption, and subsequently, onchocerciasis elimination. The immediate objective, however, is to launch focused elimination efforts by "working in the yellow" and to demonstrate success to the international community. The Carter Center program will assist in all yellow areas, thus expanding beyond where it has traditionally worked. The UTG for 2007 in Carter Center-assisted areas targeted for an annual dose of ivermectin is 819,009, while UTG and UTG(2) in the areas targeted for semi-annual treatment are 584,134 and 1,168,268 persons, respectively (refer to Figure C, inside cover). Thus, a total of 1,987,277 treatments is the goal for 2007, nearly double the number of treatments provided in 2006. The Center will also assist in monitoring and evaluation, including laboratory assessments and field entomology surveillance related to vector control.

Training and Health Education: Uganda trained or retrained 21,339 Community-Directed Distributors (CDDs) and 4,217 Community-Directed Health Supervisors (CDHSs) in 2005. Of these, 40% of the CDDs and 46% of the Community Supervisors were female. The current ratio of CDDs to population served is about 1 to 42, with 14 CDDs per community. This is the best ratio of all Carter Center river blindness programs. The Uganda program was awarded a 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 improve prospects of sustainability.

Financial Contribution: In 2006, support to the program was provided by APOC, The Carter Center, and the NGDO Coordination Group for Onchocerciasis Control (with funds from Merck & Co. for Wadelai elimination work). 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. All districts completed their fifth year of APOC funding between 2002 and 2005. See Figure 17 for APOC, Carter Center, and state, local, and national financial contributions from 2001 to 2006.

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 from districts, sub-districts, and sub-counties continue to decline, from approximately U.S. $9,000 in 2004 to $6,552 in 2005, and $6,394 in 2006. 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 CDHSs demonstrate high levels of involvement in other types of interventions, most commonly water and sanitation, malaria control, and immunization.

Monitoring, Evaluation and Research: Annual monitoring of CDTI activities was carried out in four randomly selected districts: Kisoro, Manafua, Moyo, and Nebbi. Overall, there was general improvement in the percentage of persons who received health education in 2006 compared to 2005 (Figure 18). Health education during 2005 may have been affected by reduced funding from APOC as most of the districts had completed their mandatory five-year support from APOC. However, for the last three years, health education, selection of CDDs by community members, shorter distances from individuals' homesteads to treatment locations, 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.

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

Wadelai focus: Seven nodules collected from individuals affected by onchocerciasis showed no *Onchocerca* worms. One section had a degenerated female worm. No microfilariae were detected in any of the 513 persons whose skin was snipped and tested. The nodule rate was 1.5%, the onchodermatitis rate was 5.1%, and the leopard skin rate was 1%.

Bwindi focus: Of the 559 persons assessed from Kisoro (n=263) and Kanungu (n=296) districts, microfilaria carriers had reduced by over 99% compared to baseline data (from 36.3% in 1993 to 0.34% in 2006). Community Microfilaria Load (CMFL) had reduced from 3.09 to 0.003-- a 99.9% reduction. Onchodermatitis had decreased from 4.8% to zero, while nodule carriers decreased from 2.4% to 0.7%.

Mt. Elgon Focus: Entomological studies in this focus commenced during 2006 in preparation for an Abate® larviciding campaign. This focus is earmarked for possible vector elimination. Crab trapping conducted in 22 sites in rivers and streams showed 33% of 614 crabs had immature stages of *Simulium neavei spp* (*S. neavei* must be hosted by a crab during its life cycle, so without the crabs there can be no black fly vector). Infestation was highest in Mbale (73.5%), followed by Bududa district (33.5%) and Sironko district (16.7%). There was no infestation in Manafwa district, and the black fly infestation was mainly confined in the Namatala river system. Of 286 adult flies caught from three sites and dissected, 57 were parous. Of these, 7.0% had O. volvulus in the L1 or L2 stages; no L3 larvae were found. The Mt. Elgon focus will launch twice-per-year treatments in 2007.

2007 RECOMMENDATIONS FOR CARTER CENTER UGANDA

Publish the impact assessment results with the Atlanta and Cameroon offices.

Train as many CDDs as is practical in each endemic community, using the kinship structure in all Carter Center-supported districts (in keeping with the purpose of the Lavelle Fund grant). Include details in monthly reports.

Establish the PCR & OV 16 lab in Uganda with the help of OEPA experts.

Assist in the purchase of Abate® for Mt. Elgon and Kashoya-Kitomi foci.

Carry out semi-annual treatment with ivermectin in onchocerciasis endemic districts (Kashoya-Kitomi focus - Bushenyi, Ibanda, Kamwenge; Mt. Elgon focus- Bududa, Manafua, Mbale, and Sironko) falling within the yellow region of the “oncho flag” map (see Figure C, inside cover).

Create and maintain tables of epidemiological indicators for the green and yellow regions in the “oncho flag” map, as is done with the OEPA foci.

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.

Continue to monitor APOC, government, and Carter Center funding for all Carter Center-assisted projects in 2007. In particular, monitor government financial contribution to the elimination efforts.

Carter Center program staff must complete the Emory IRB ethics test when involved with research on human subjects.

Figure 14

Uganda
Carter Center - Assisted Districts

*** Pader received only passive treatments in 2006**

Figure 15

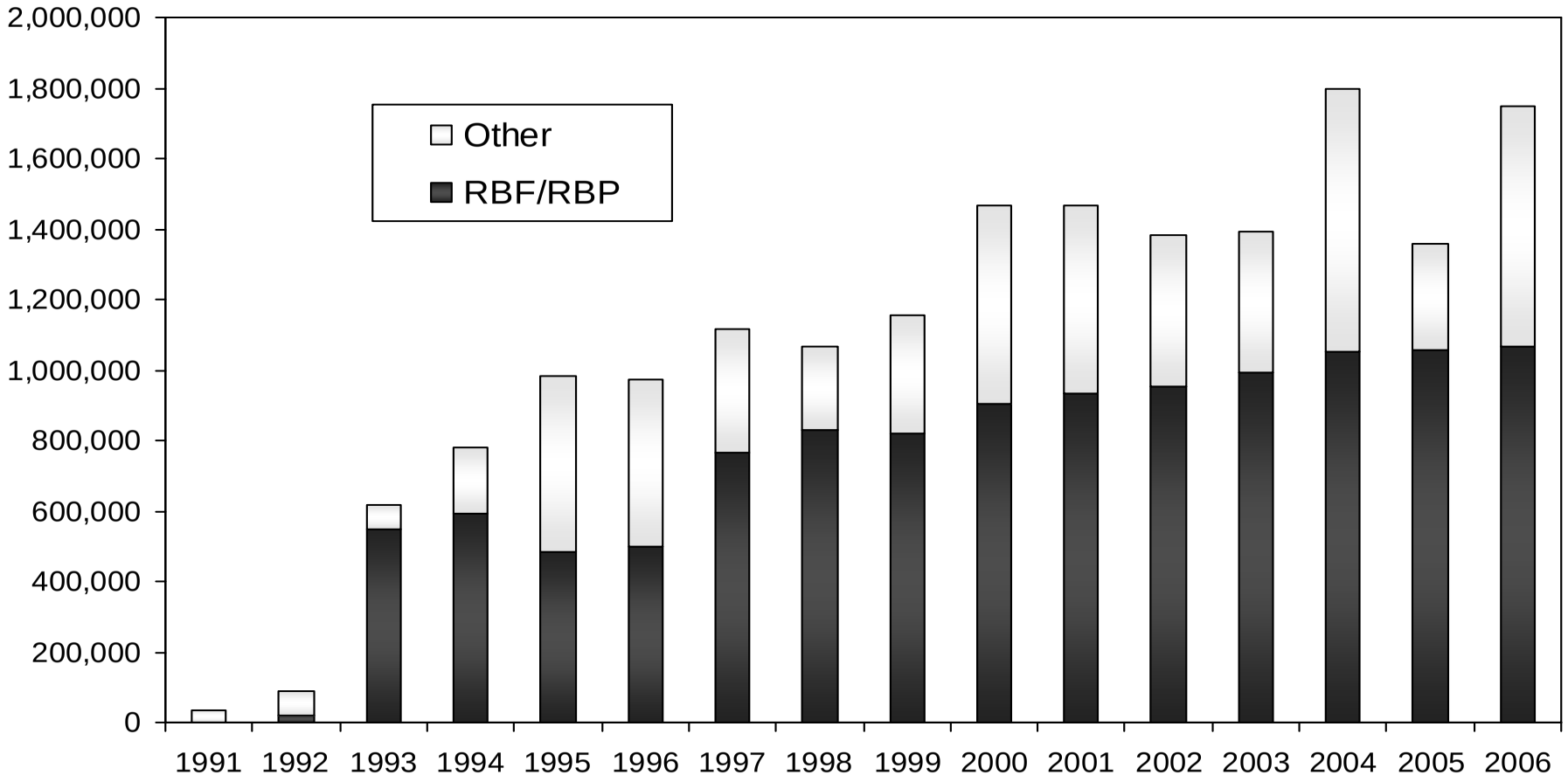
Uganda: Carter Center-Assisted Areas: 2006 Mass, Passive and Visitor River Blindness Treatments

District	Total Popn for 2006	Ultimate TX Goal (UTG) for 2006	Popn treated cumulative for 2006	% Total Popn TX for 2006	% UTG TX 2006	Active villages treated 2006	Active villages UTG for 2006	% of Active villages covered
Adjumani	179,791	153,983	146,957	82%	95%	218	218	100%
Apac	16,466	13,467	13,388	81%	99%	35	35	100%
Gulu	215,250	158,288	152,853	71%	97%	187	187	100%
Kabale	17,912	15,616	13,337	74%	85%	48	48	100%
Kanungu	48,799	40,841	39,507	81%	97%	105	105	100%
Kasese	100,563	83,669	82,698	82%	99%	131	131	100%
Kisoro	22,394	18,766	16,122	72%	86%	32	32	100%
Manafwa	141,950	105,377	104,873	74%	100%	471	471	100%
Mbale	46,899	38,216	38,040	81%	100%	109	109	100%
Moyo	186,789	147,160	146,016	78%	99%	189	189	100%
Nebbi	297,872	244,319	237,661	80%	97%	670	670	100%
Sironko	62,816	52,432	50,926	81%	97%	191	191	100%
TOTAL	**1,337,501**	**1,072,134**	**1,042,378**	**78%**	**97%**	**2,386**	**2,386**	**100%**

Passive and visitor treatments 2006: 25,986

Figure 16

Uganda: Carter Center-Assisted treatments and total Mectizan treatments provided, 1991-2006*



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

Figure 17

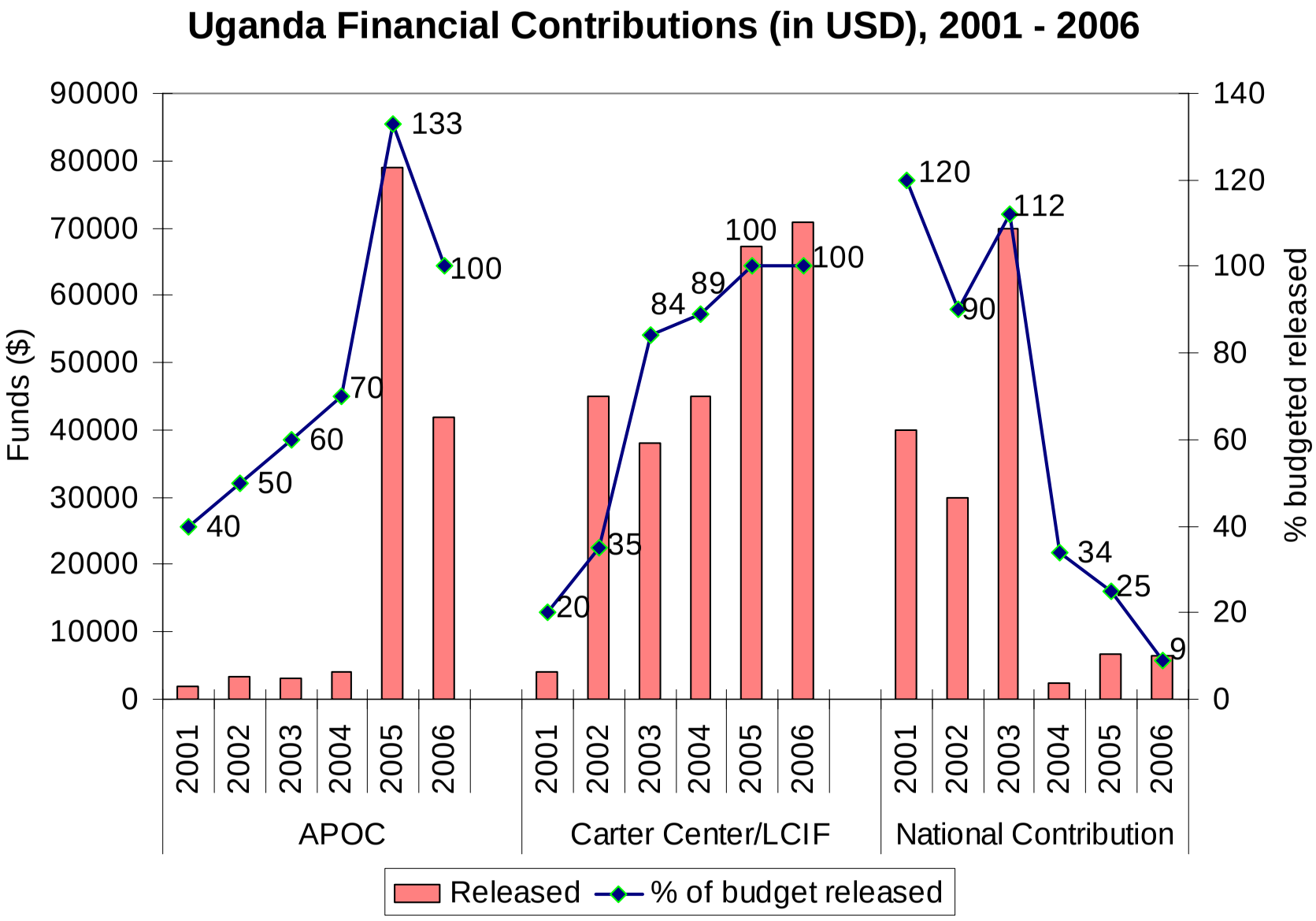
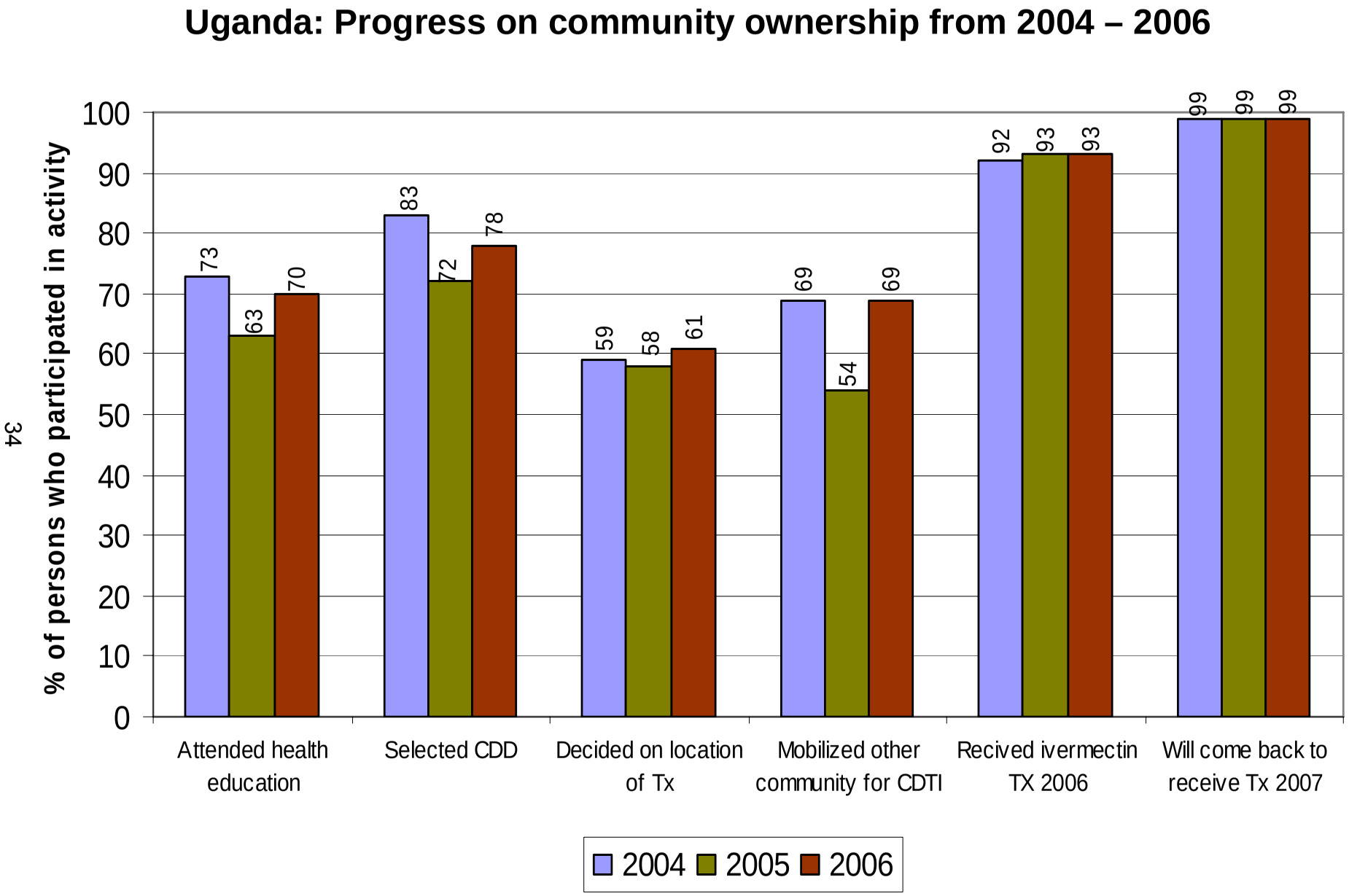

Uganda Financial Contributions (in USD), 2001 - 2006
Funds ($)
% budgeted released
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
140
120
100
80
60
40
20
0
40
50
60
70
133
100
20
35
84
89
100
100
120
90
112
34
25
9
2001
2002
2003
2004
2005
2006
APOC
Carter Center/LCIF
National Contribution
Released
% of budget released

Figure 18


Uganda: Progress on community ownership from 2004 – 2006
% of persons who participated in activity
100
90
80
70
60
50
40
30
20
10
0
73
63
70
83
72
78
59
58
61
69
54
69
92
93
93
99
99
99
Attended health education
Selected CDD
Decided on location of Tx
Mobilized other community for CDTI
Recived ivermectin TX 2006
Will come back to receive Tx 2007
2004
2005
2006

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. The Comprehensive Peace Agreement, signed in January 2005, put an end to the decades-old civil war, and also created a Government of South Sudan (GOSS). With the Peace Agreement, The Carter Center's River Blindness Program ceased its support of river blindness control activities in GOSS areas of the country during 2005 after APOC and Christoffel Blinden mission (CBM) signed a comprehensive agreement to conduct onchocerciasis activities in the new South Sudan. As a result, Carter Center activities in southern areas of the country controlled by GOSS declined, particularly as garrison areas were turned over from northern sector (Khartoum-based) Government of Sudan (GOS) to GOSS. The flux in Mectizan treatment responsibilities between north and south, as well as the return of internally displaced peoples flowing from north (GOS) to south (GOSS) treatment responsibilities has resulted in diminished Mectizan® treatments in GOS areas in compared to previous years. In 2006, the Carter Center's UTG in Sudan accounted for 6% of that country's national UTG. When referring to the area controlled by the Government of Sudan (GOS), we will use the term Sudan. When referring to the area controlled by the Government of South Sudan (GOSS), we will use Southern Sudan.

The GOS launched a new onchocerciasis elimination policy directed toward the isolated desert foci of Abu Hamad and Sundus in 2006 (Figure 19). In these areas, the strategy will be 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 The GOS strategy to eliminate the isolated Abu Hamad focus in River Nile State using twice per year treatments was approved by the MEC in 2006. Elsewhere in the country, treatments will continue to be provided annually. An expanded Carter Center Lions assistance to the new elimination effort was likewise approved in 2006. The launching of elimination policy by The Vice-President of Sudan occurred in December, 2006.

Treatments: Twice per year treatments were not satisfactorily delivered in Abu Hamed in 2006: 71,318 persons or 98% of the UTG in the first round, and 22,015 persons or only 30% of the UTG in the second round. A total of 93,333 treatments were delivered, for 64% coverage of the UTG (2) of 145,230. Coverage for the second round was lower than expected as the official government launch of semi-annual distribution of Mectizan in Abu Hamed focus was delayed.

Elsewhere, the program treated 19,922 persons (101% of a UTG of 19,723) in Radom. Thus, total treatments delivered in the northern Sudan program in 2006 were 113,255.

See Figure 20 for Carter Center-supported treatments over the years in Sudan, and see Figure 21 for a summary of treatments in Sudan in 2006.

Training and Health Education: The program trained and retrained 810 and 90 CDDs respectively during 2006 in Abu Hamad focus.

Mectizan: During 2006, 289,876 tablets were distributed in Abu Hamad and Radom foci. This included a few tablets (2,876) provided for passive treatment. No severe adverse effects were reported.

Sustainability and Integration: Sustaining the gains achieved by mass treatments with Mectizan® since 1995 has been a particularly difficult challenge in Sudan and Southern Sudan given the civil war and the dynamic nature of shifting responsibilities for managing the program between north and south, and various external donors. The approach to elimination in Abu Hamad is a major opportunity to achieve elimination of onchocerciasis. See Figure 22 for APOC, Carter Center, and national (including state and local) financial contributions from 2001 – 2006.

RECOMMENDATIONS 2007 FOR CARTER CENTER KHARTOUM OFFICE

Abu Hamad:

- Continue to implement twice per year treatment in Abu Hamad focus, which is targeted for elimination.

- It is vital that we refine our UTG in Abu Hamad focus. Carry out a household census using community registers in order to ascertain total population, and eligible population (ultimate treatment goal).

- Train as many CDDs as practical in each onchocerciasis endemic community targeted for elimination of control.

- Discuss with MOH details related to the Merowe dam and population displacement issues pertaining to onchocerciasis transmission.

- Promote coordination and collaboration between elimination efforts in Sudan and Uganda, including travel between countries by appropriate professionals and support staff. Send Sudanese specimens for OV-16 and PCR for analysis in the Uganda laboratory.

Develop a strategy for conducting assessments and delimitating transmission zones in Sundus, especially with respect to its continuity with Ethiopia. Ask for this to be addressed in the ministerial meetings on cross border health issues.

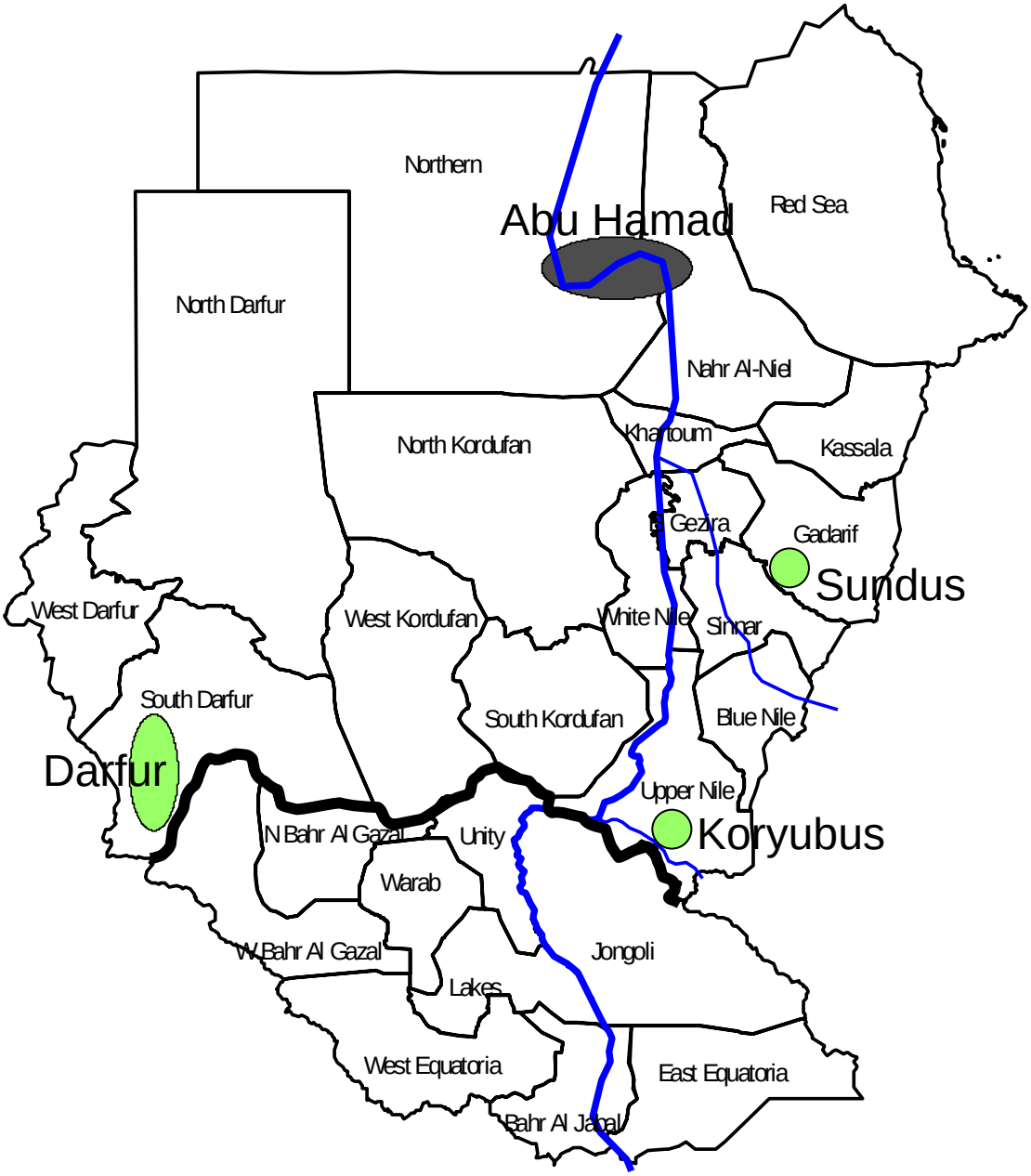
Provide appropriate support to maintain professional staff who are assigned to the national onchocerciasis control program secretariat.

All Carter Center-assisted projects should continue to refine their government and Carter Center funding figures in 2007.

Carter Center program staff must complete the Emory IRB ethics test when involved with research on human subjects.

Figure 19

Sudan:
Carter Center-LCIF-Assisted Areas



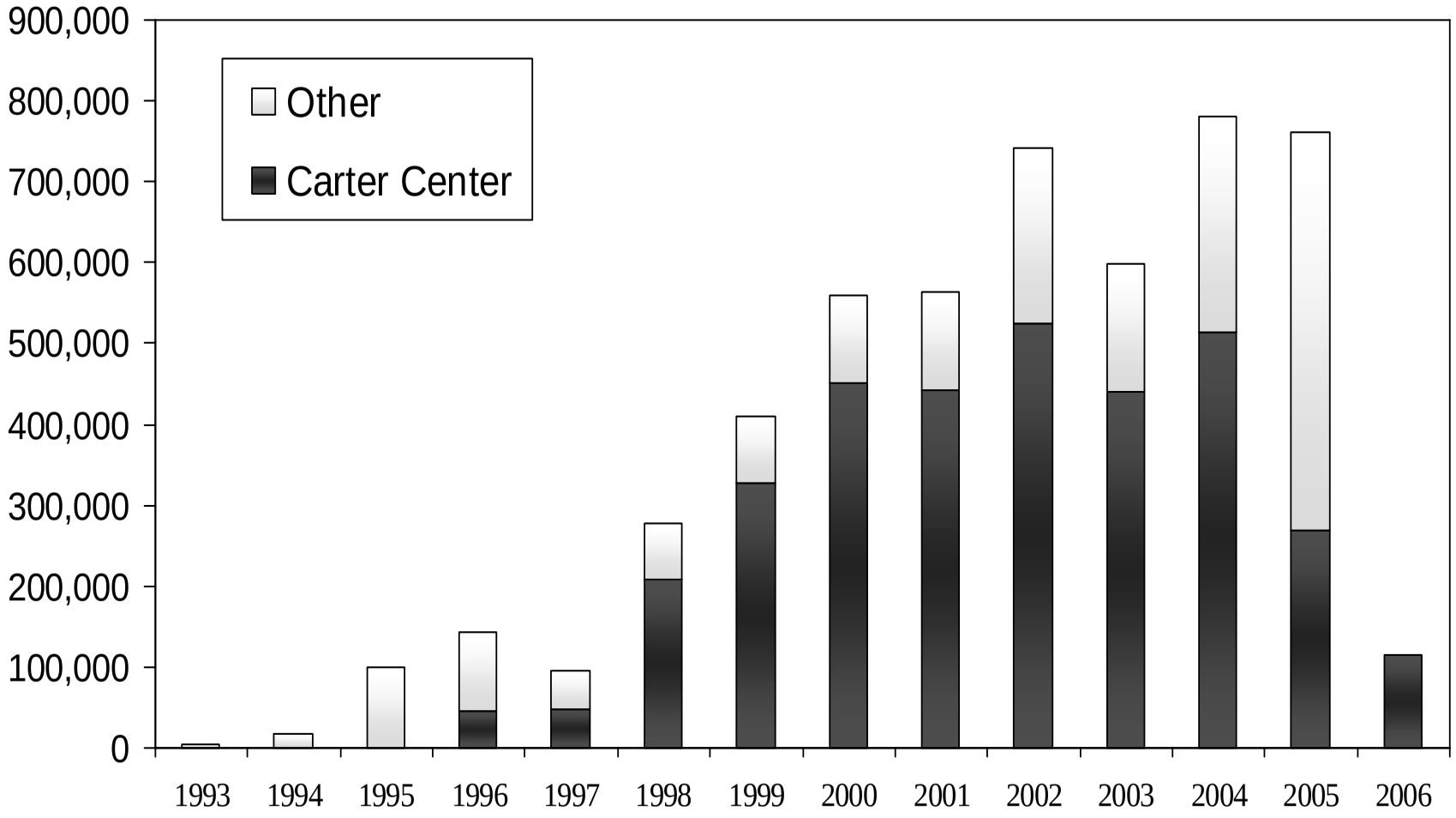
Carter Center river blindness control activities

Carter Center river blindness elimination activities

Figure 19

Figure 20

Sudan: Carter Center-Assisted Mectizan Treatments as Part of the Total Treatments Provided, 1993-2006*



* Since 1997, Carter Center activities in Sudan have been supported by Lions Clubs International Foundation. Source of non-Carter Center figure: NGDO coordinating office.

Figure 21

Sudan: Carter Center-Assisted Areas: 2006 River Blindness Treatments

Control Projects

State	Focus	Total Popn for 2006	Popn treated cumulative for 2006	Ultimate TX Goal (UTG) for 2006	% UTG treated in 2006	% of total popn treated in 2006
S.Darfour	Radom	23,203	19,922	19,723	101%	86%
Gadarif	Sundus	65,000	0	55,250	0%	0%
TOTAL		88,203	19,922	74,973	27%	23%

Elimination Focus

State	Focus	Total Popn for 2006	UTG	Treated First Round	% UTG treated in first round	Treated Second Round	% UTG treated in second round	UTG(2)	Total treated in both rounds	% UTG(2) treated
River	Abu Hamad	100,000	72,615	71,318	98%	22,015	30%	145,230	93,333	64%

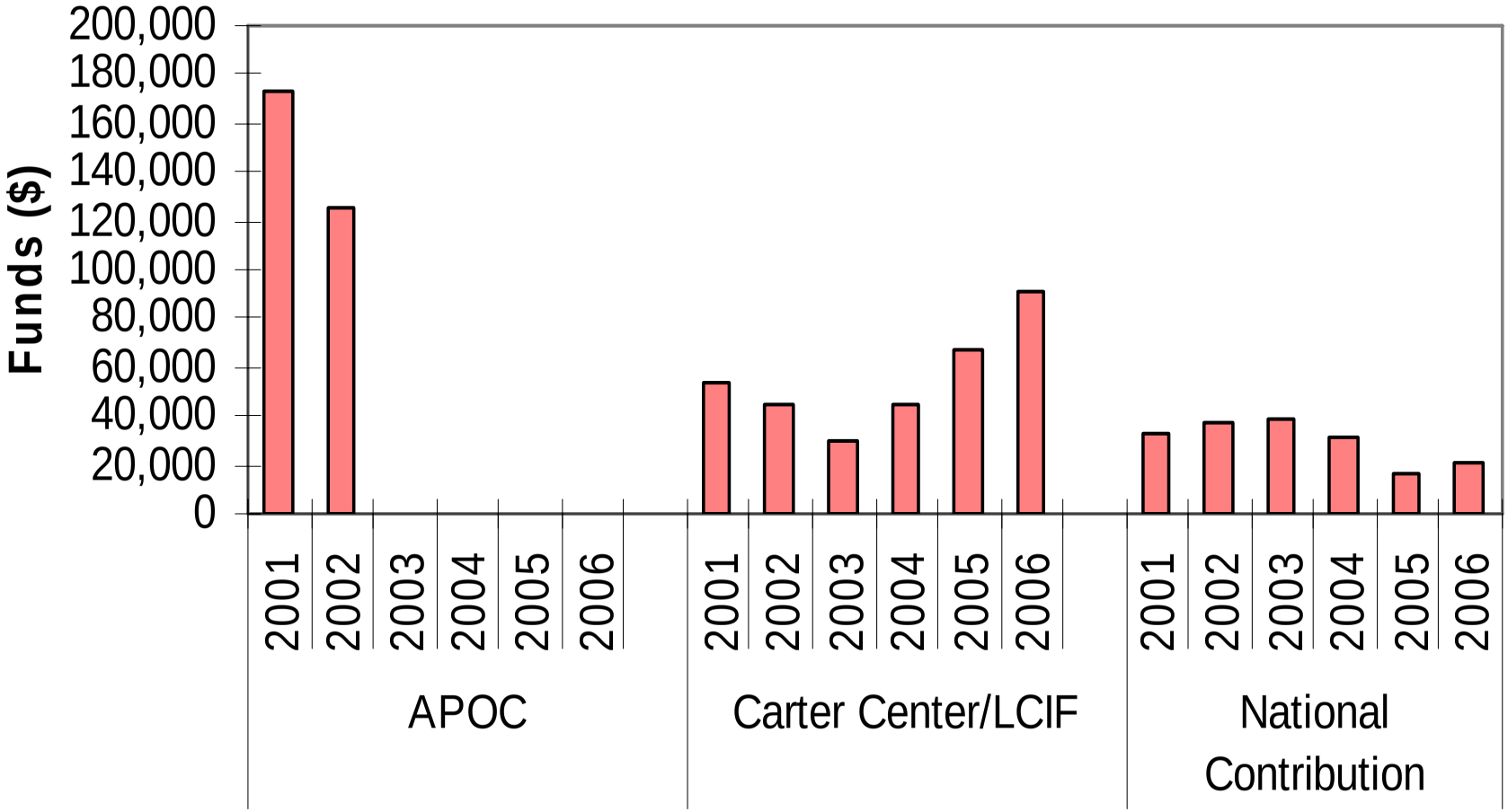
Total Treatments in Sudan in 2006: 113,255

Total UTG + UTG(2) in Sudan in 2006: 220,203

Percent of UTG + UTG (2) reached in 2006: 51%

Figure 22

Sudan Financial Contributions (in USD), 2001 - 2006



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. 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)--Helen Keller Worldwide, International Eye Foundation, and SightSavers International--to distribute Mectizan® in three additional provinces (Adamaoua, Centre, and West). 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. Both North and West Provinces have enjoyed past APOC support. In 2006, the Carter Center's Ultimate Treatment Goal (UTG) in Cameroon accounted for 42% of that country's national UTG.

The Lions-Carter Center Sight First Initiative, which is coordinated by Lions District 403B, in partnership with the Cameroonian MOH, and local Lions in West Province, are strong advocates for support of onchocerciasis control.

Treatments: Carter Center-assisted areas (Figure 23) in Cameroon provided 1,530,331 treatments in 2006 (Figure 24), or 94.3% of the ultimate treatment goal (UTG) of 1,622,822, and 42% of the national treatment coverage. This included 1,174,268 treatments in West Province and 356,063 treatments in North Province (Figure 25). Both provinces provided 99 passive treatments. All six health districts in the North Province achieved UTG coverage of at least 91%, while in the West Province, 19 health districts achieved at least 96% UTG coverage.

Mectizan®: The Carter Center/Cameroon assisted program received a total of 4,454,684 Mectizan® tablets from the Mectizan® Donation Program (MDP) in 2006, and assisted in distributing 4,315,376 tablets; only about 16,109 (0.36%) tablets were wasted/unaccounted for during the period of distribution in both provinces. The balance of 489,266 tablets was returned through the health system to the Drug Procurement and Delivery Agency (DPDA). No severe adverse reactions were reported during 2006. The average number of tablets per treatment was 2.8.

Training and Health Education: In 2006, the Program trained a total of 8,369 community-directed distributors (CDDs) in West and North Provinces.

Loa loa: No cases of serious adverse reactions potentially related to *Loa loa* were reported in Carter Center-assisted areas of Cameroon in 2006, making this the fifth year free of serious reactions.

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). However, support resumed during 2006 with emphasis on continued government support, especially at the provincial level.

There was evidence of a dramatic increase in government investment in the community-directed treatment with ivermectin (CDTI) program in the West Province (from U.S. $7,750 in 2005 to U.S. $ 69,958 in 2006) compared to a drop in the North Province (from U.S. $37,951 in 2005 down to US $ 27,267 in 2006). See Figure 26 for APOC, Carter Center, and national (including state and local) financial contributions from 2001 to 2006.

Sustainability and Integration: Prior to 2002, the Cameroonian MOH used a "cost recovery" system, under which 100 and 10 Central African Francs (CFAs) (equivalent to U.S. $0.20 and U.S. $0.02) were charged to adults and children, respectively, for each Mectizan® treatment, in order to cover distribution costs. The transition to the CDTI strategy, with elimination of cost recovery, became policy after 2002, with transition in the two provinces about two-thirds complete in 2002 and concluded in 2003.

To address the concern that CDDs would be less motivated to do their jobs without funds generated for them through cost recovery, the Cameroon program began to implement the kinship strategy in Carter Center-assisted areas to reduce the expectation that CDDs would not demand payment. Health workers were trained in the kinship strategy and the need for community selected and health workers' trained community supervisors, who in turn are expected to train and supervise CDDs. The number of trained CDDs increased from 5,037 in 2004 to 8,023 (2005), and to 11,158 (2006). Also, trained community supervisors (trainers of trainees) increased from 2,277 in 2005 to 3,203 in 2006.

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 would like to almost double the number of CDDs from the current 11,158 to 22,310 in 2007. This would raise the average of three per community in 2006 to six during 2007. The promotion of the kinship strategy has resulted in improvement in certain key sustainability indices (Figure 27): decision-making by the community itself on the location of treatment increased from 28% in 2004 to 94% in 2006; community selection of CDDs increased from 28% to 98% between 2004 and 2006; and the percentage of health educated community members improved from 37% in 2004 to 64% in 2006. Among 338 CDDs interviewed (of which the majority [73%] were male), 99% in 2006 (compared to 90% in 2005) voiced intent to continue distributing in the following year. Mectizan® UTG treatment coverage improved from 93% to 96%. These achievements were made without paying CDDs, a policy carried out prior to 2004.

In terms of integration, a sample of 237 CDDs showed that 72.3% also were involved in other community health activities, such as national immunization days, an expanded program of immunization, family planning, HIV/AIDS, malaria fever control, TB and water and sanitation. This was not significantly different from CDD involvement in community health activities during 2005. The CDDs also are utilized to assist in immunization activities, social mobilization, and the distribution and impregnation of mosquito nets for malaria.

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 Expanded Program on Immunization (EPI) for children between 6-12 months. As NIDs are coming to an end (as successful elimination of polio results in decreased funding for NIDs), new supplementation mechanisms must be identified. All the 19 health districts in West Province and two out of six in North province were allowed to integrate VAS with Mectizan® Distribution. Helen Keller International, with a grant from USAID, has helped train health workers at Carter Center-assisted areas at the provincial level. Training at district, health area and community levels was supported and carried out by the MOH with assistance from The Carter Center. Working with the Provincial Nutrition Coordinator, estimates of Vitamin A needs for children 6-59 months of age were made from the community CDTI household registers. The community registers were also adjusted to capture VAS data. As a result of these efforts, 195,866 young children received VAS in West Province, 95% of the UTG of 195,866 (children of 12-59 months). North Province provided a VAS to 34,183, 80% of the UTG of 42,952 of the same age group. A second round of supplementation was not carried out. It was noted during the meeting that The Carter Center could not financially support the second round of VAS (which is recommended for twice per year).

It is believed that VAS has helped strengthen the sustainability of CDTI programs in the post APOC era. It is likely that the addition of malaria control (in West Province) and lymphatic filariasis interventions (in North Province) into the CDTI framework would likewise strengthen sustainability.

Monitoring, Evaluation and Research: Cameroon engaged in routine monitoring of coverage, involvement of community members in decision-making, health education, involvement of women, monetary incentives, and attrition rate of CDDs. Among these activities were impact assessments in North Province. Data from four communities from four health districts in 2006 showed rates of nodule carriers at 0.8%-2.9% (microfilaria carriers at 1.7%-3.8%). Unfortunately, North Province does not have baseline information to which to compare these results; however, all results are below the CDTI thresholds for mass drug administration (MDA) with annual distribution of Mectizan® of 20% nodules rate (40% microfilararia carriers). The results do not provide information on whether onchocerciasis transmission has been interrupted.

RECOMMENDATIONS 2007 FOR CARTER CENTER, CAMEROON

- Publish, with Atlanta and Uganda office, the impact assessment results.

- Seek to increase training, supervision, involvement of kinship groups, and improve gender balance.

- At least one round of Vitamin A supplementation (VAS) should be linked to CDTI, but The Carter Center cannot provide financial support for a second round of VAS. 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.

- The Carter Center Atlanta headquarters office is extremely interested in lymphatic filariasis mapping results for North and Extreme North Provinces.

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

- All Carter Center-assisted projects should continue to monitor their APOC, government and Carter Center funding figures in 2007.

- Carter Center program staff must complete the Emory Institutional Review Board (IRB) ethics test when involved with research on human subjects.

Figure 23

Cameroon
Carter Center - Assisted Provinces

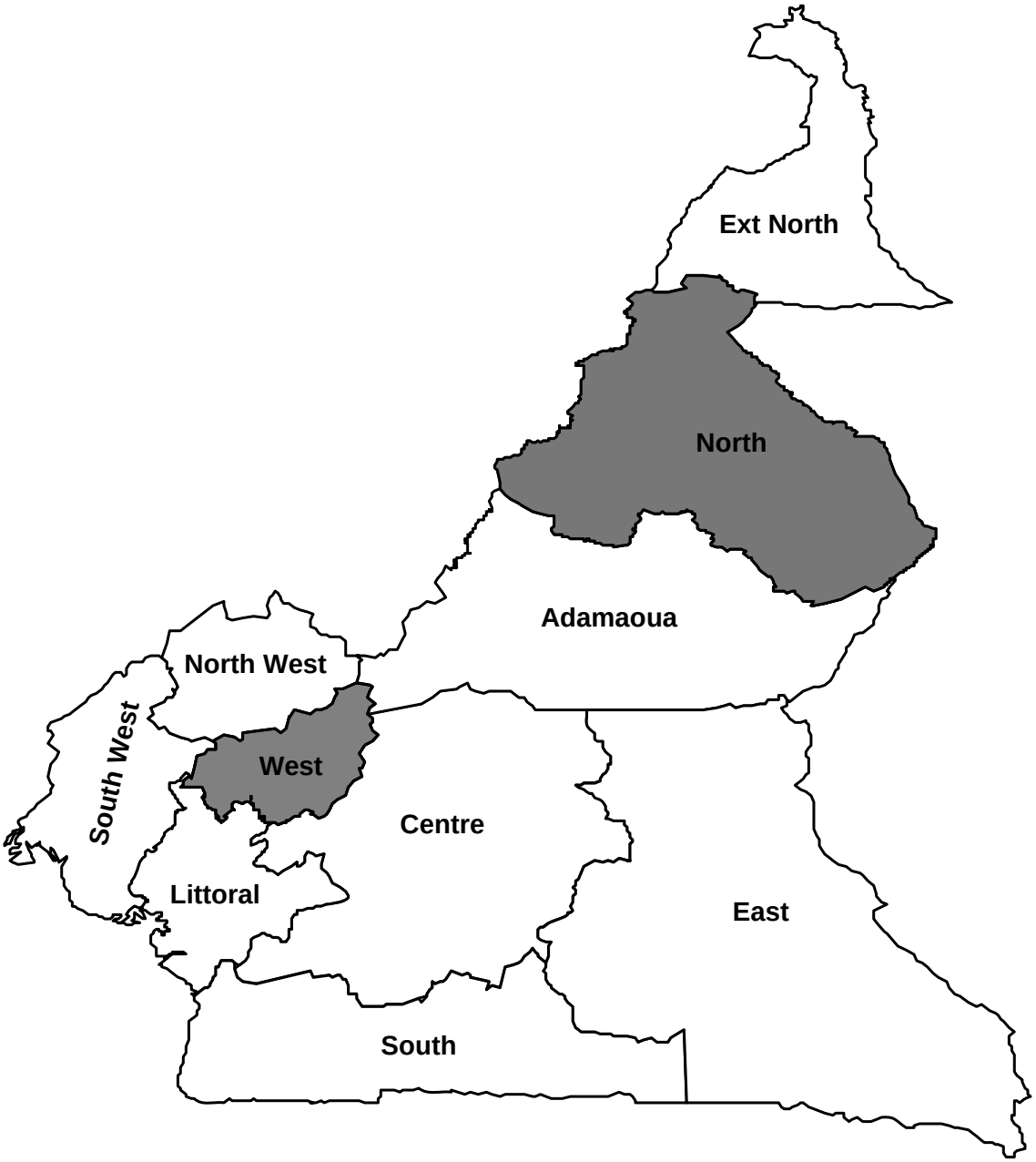
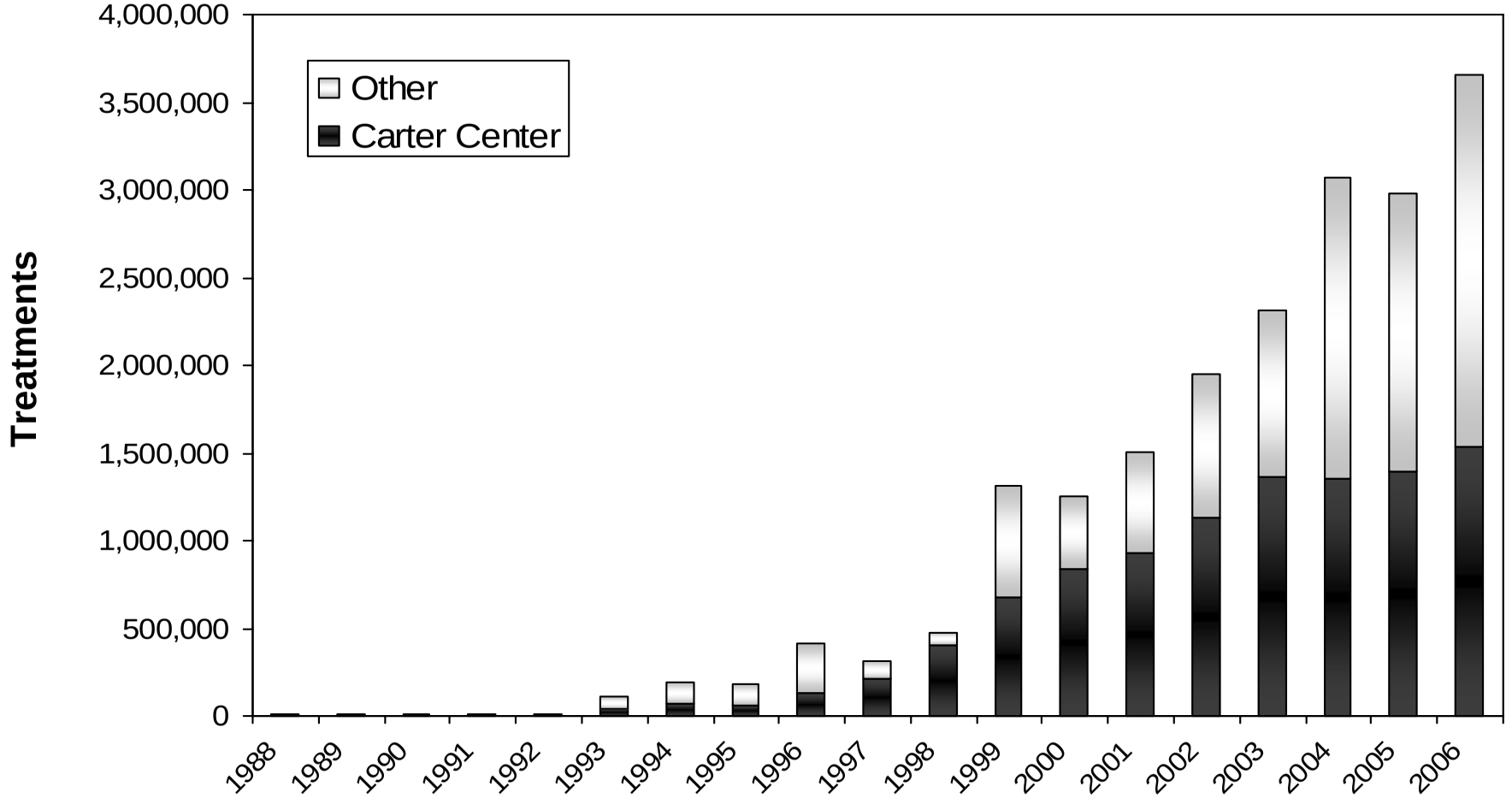


Figure 23

Figure 24

Cameroon: Carter Center-Assisted Mectizan Treatments as Part of Total Treatments Provided, 1988-2006*



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

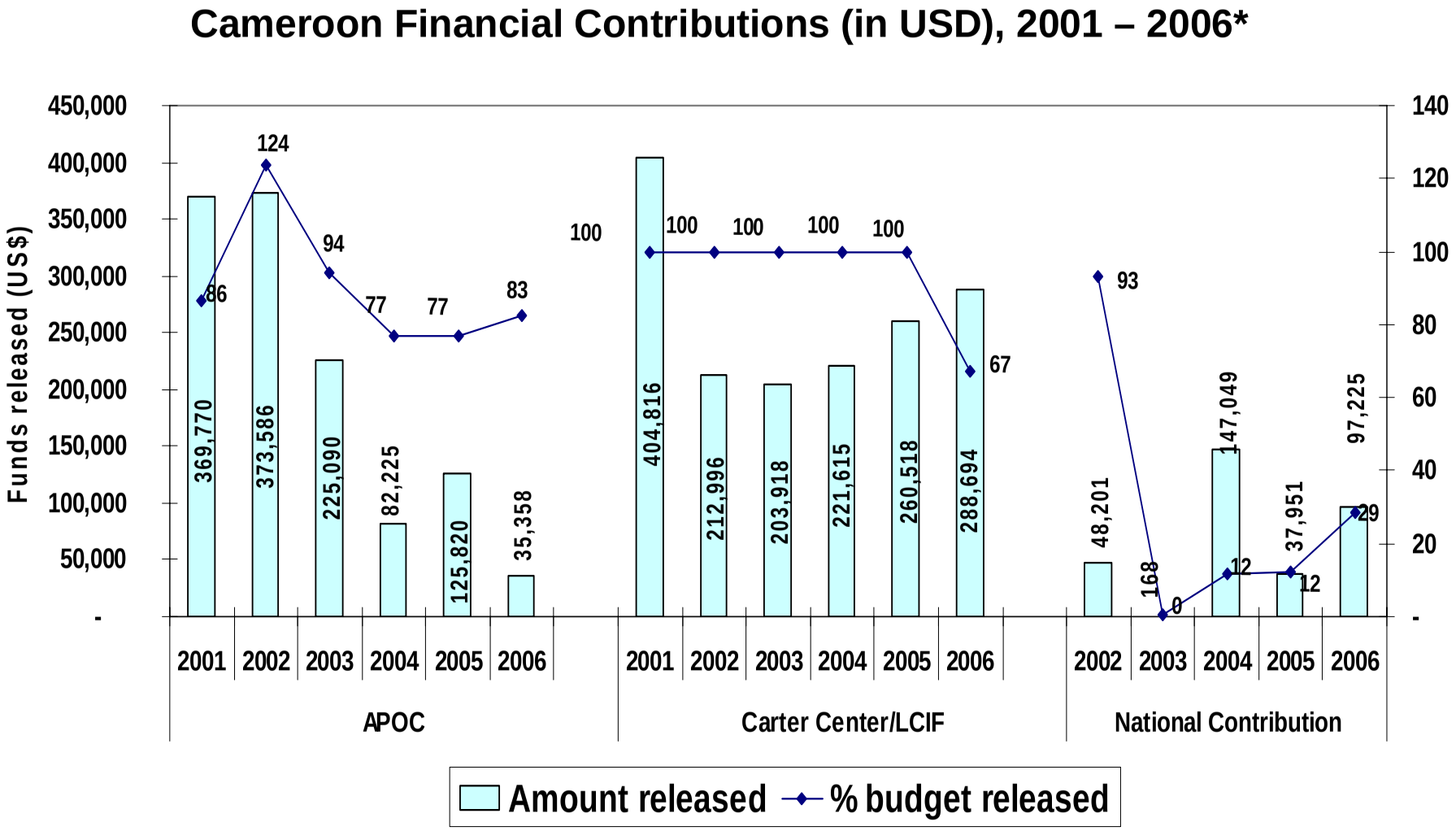
Figure 25

Cameroon: Carter Center-Assisted Areas: 2006 Mass and Passive River Blindness Treatments

Province	Number of Districts	Popn treated cumulative for 2006	UTG for 2006	% UTG treated	Total Popn for 2006	% Total Pop treated	Active communities cumulative for 2006	Active Com UTG For 2006	% UTG treated
West	17	1,174,268	1,220,330	96%	1,452,774	81%	2,474	2,474	100%
North	6	364,664	402,492	91%	479,157	76%	1,157	1,157	100%
Total	23	1,538,932	1,622,822	95%	1,931,931	80%	3,631	3,631	100%

Passive Treatments: 99

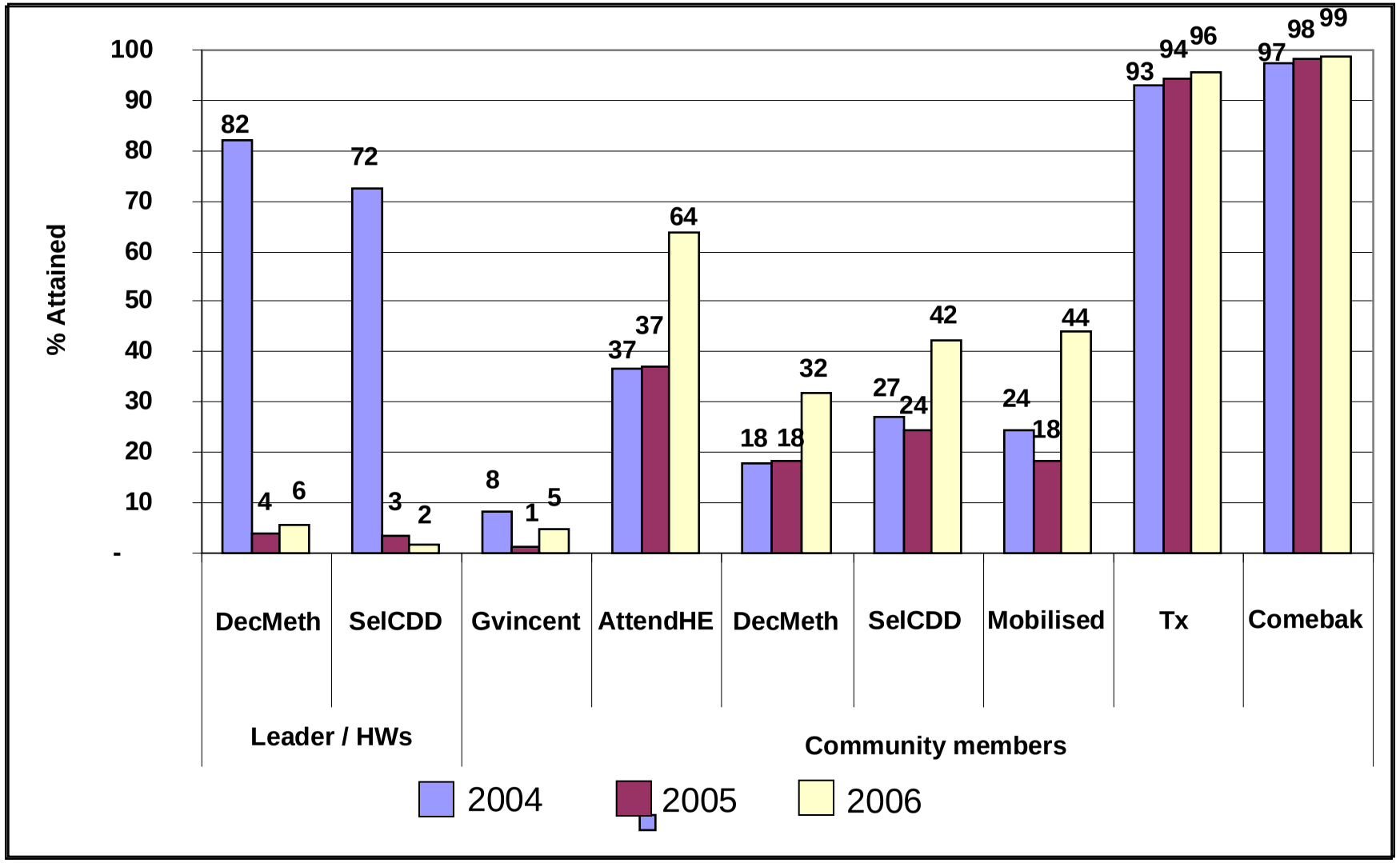
Figure 26



* National contribution includes workshops and coordination meetings for all other health programs in an integrated manner

Figure 27

Comparison of performance on community policy factors in the Carter Center in Cameroon (2004-2006)



NIGERIA

Nigeria is the most highly endemic country in the world for river blindness, having as much as 40% of the global disease burden. It is estimated that 27 million Nigerians living in 32 endemic states need curative or preventative treatment with Mectizan® for RB (the UTG is 27 million). The National Onchocerciasis Control Program (NOCP) is the largest Mectizan® distribution program in the world and provided over 21 million treatments (76% of the UTG) in 2006 (provisional number from Nigerian Federal Ministry of Health, see Figure 28). In 2006, The Carter Center's UTG in Nigeria accounted for 22% of that country's 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 29). All Carter Center Nigeria RB projects previously enjoyed APOC support.

The Lions Clubs International Foundation SightFirst Initiative is 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 river blindness (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 2006, the Lions-Carter Center-assisted program in Nigeria provided health education and Mectizan® treatments to 5,181,958 persons (Figure 30 – 31), 91.4% of whom were in community-directed mass treatment in at-risk villages. Treatments reflected an 11% increase over 2005. Treatments were conducted in 9,519 villages, including the 1,810 hypo-endemic villages in the southeastern states that received passive treatment (no passive treatments are provided in Plateau and Nasarawa States). The treatments assisted by The Carter Center represented approximately 25% of the total treatments estimated to have occurred in 2006 in Nigeria.

The Carter Center Nigeria Program received about 23.6 million Mectizan® tablets for 2006, and the average number of Mectizan® tablets per person treated was three. About 1.6 million Mectizan® tablets remained at the end of 2006.

No Serious Adverse Events (SAEs) were reported as a result of Mectizan® treatments in Nigeria in 2006. 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. Because all Carter Center-assisted states have now had six to seven years of mass treatment, the risk of SAEs is low.

Training and Health Education: The nine states assisted by The Carter Center conducted training or retraining for 13,894 health workers involved in Mectizan® distribution in 2006. This marks a continuing decline that has been observed over the last two years, with about 6,000 fewer health workers trained in 2006 than in 2005. This year's total included 9,297 Community-Directed Distributors (CDDs), 2,537 Community Supervisors, and 2,060 Frontline Health-Level Workers. The average number of CDDs per village was about 1.2. The ratio of persons treated per one CDD remained very high, at 532.

Financial Contribution: Overall, the funding for Carter Center-assisted programs in Nigeria during the period 2001-2006 was characterized by a lack of core APOC funding (see Annex 2), insufficient government contributions, and increasing Carter Center funding to fill the 'APOC gap' following APOC's withdrawal. In 2006, contributions from all levels of the government amounted to approximately 20% of total funds. APOC contributed 10% (for non-core purposes), and The Lions-Carter Center SightFirst Initiative contributed the remaining 70%.

At the community level, 2,118 villages, or 27% of all at risk villages receiving mass treatment, supported their CDDs with cash. The amount contributed per CDD averaged U.S. $2.69 (at 127 Naira to the dollar). Total village-level contributions equaled about 2.1 million Naira (U.S. $16,535), remaining roughly similar to 2005. LGA-level contributions in eight of the nine states (Nasarawa excluded) totaled more than 9.5 million Naira (U.S. $74,889), a 150% increase from 2005. State-level contributions in seven of the nine states (Plateau and Nasarawa excluded) totaled about 3.3 million Naira (U.S. $25,839), a 54% decline from 2005. See Figure 32 for APOC, Carter Center, and national, state, and LGA contributions from 2001 to 2006.

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, saves costs and is highly efficient.

The initiative's central platform is public health intervention, delivering annual combination Mectizan®/ albendazole community-based mass treatment for lymphatic filariasis (LF) and RB. The initiative partners with Nigeria's FMOH and with the state governments of Plateau and Nasarawa. The program integrated river blindness interventions with interventions against four other priority health conditions of neglected populations: urinary schistosomiasis, trachoma, malaria, and Vitamin A deficiency. A secondary goal is to establish LF's potential for eradication, using combination therapy with ivermectin and albendazole in *Anopheles* transmission zones. Background information on LF and urinary schistosomiasis (*Schistosomiasis haematobium, or* SH) is given in Annex 7.

The Bill and Melinda Gates Foundation awarded The Carter Center funding for Plateau and Nasarawa States in 2006 (the proposal was entitled, "Proof of Concept for Integrated Health Intervention in Nigeria"). The new funding expanded the scope of the

program to include assessing cost-effectiveness and sustainability of integrated interventions (including for trachoma) and helped position the project for national replication. Replication depends on whether support can be secured from of the Government of Nigeria. The Center partnered with the CDC and Emory University in the execution of the cost and sustainability (managerial) dimensions of integration. We also have partnered with Emory University in the execution of the cost study. President Carter is a strong and vocal advocate for this concept, promoting it to 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. These two states' current estimated population is 4.5 million. A total of 3,344,896 persons in the two states received health education and mass treatment for LF in 2006, which was 93% of the UTG of more than 3.6 million treatments (see Figures 33 – 34). 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, about one third (1,046,514) were in RB target areas, and the remaining 2,298,382 were in LF-only areas (some of which are also hypo-endemic for RB). This year marked the fourth 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. About 129,000 albendazole tablets remained at the end of 2006.

The LF program is an elimination effort (unlike RB and schistosomiasis), so impact monitoring and evaluation activities are critical. Monitoring focuses on LF infection rates in mosquitoes and humans.

Mosquito infection rates in LF sentinel areas continued to decrease compared to baseline data, but the trend suggests a leveling-off of the decline (Figure 35). A total of 5,583 (primarily anopheline) mosquitoes were collected in 2006. The average infection rate for the six sentinel sites was 0.5%. The sentinel village of Gwamlar recorded the highest infection rate, with 9/290, or 3.1%. Piapung followed, with 7/564, or 1.2%. The following sentinel villages found less than 1% infection rates: Lankan (6/745 or 0.8 %), D/Tofa (5/548 or 0.9%), Maiganga (5/976 or 0.5%), Seri (2/379 or 0.5%), and Gbuwhen (2/858 or 0.2%). Other villages recorded zero percent infection rates. This leveling-off of mosquito infection rates may indicate that large numbers of mosquitoes must be dissected to detect further declines.

Monitoring human LF infection rates in 2006 was accomplished with nocturnal blood thick smears. The smears were examined for *Wuchereria bancrofti* microfilariae and were carried out in sentinel sites. While we question the reliability of the thick smear results (because they are insensitive and subject to fluctuation, based on timing with the last drug administration), The Carter Center conducts these tests in accordance with WHO guidelines. A comparison of the percentages of persons found to be microfilariae-positive in 2006 against the baseline data of 2002-2003 is found in Figure 36. We have seen a drop in microfilaremia from five percent to 1.7 percent over time (the desired threshold is under 1%). Immunochromatographic Tests (ICTs) are considered a more

reliable way to detect human LF infection, but production difficulties prevented ICT testing in 2006. ICT data from previous years (Figure 37) have shown diminishing LF prevalence toward the desired 1% threshold. Further evaluations, including cluster surveys outside of the sentinel areas, are planned for 2007.

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. Linking MDA with malaria control is one of the best ways to promote better health in Nigeria.

The FMOH and the MOHs of Plateau and Nasarawa provided those two programs with about 165,000 ITNs. Logistical systems were developed and distributors were trained to enable distribution of ITNs during the MDA for LF/ RB. The ITNs are provided free of charge to children under five and to pregnant women ('malaria vulnerable groups').

Since 2004, 121,614 ITNs (73%) have been distributed during MDA in eight LGAs in Plateau and Nasarawa, 64,547 of those in 2006 (Figure 38). Most distributed nets have been conventionally impregnated, not long-lasting insecticidal nets (LLIN). We have adopted a policy to retreat the nets (using retreatment sachets) upon distribution, but this slows the distribution process and funding is limited to purchase the retreatment kits. For 2007, the MOH will provide the program with 100,000 LLINs, which will be a major improvement in the overall malaria program. A major challenge is the need to annually reimpregnate with insecticide those ITNs that have already been distributed. Program staff are pursuing a way to convert conventional nets to LLINs by acquiring and treating with KOTAB123, a chemical produced by Bayer.

In 2006, The Bill and Melinda Gates Foundation also awarded The Carter Center funding for three states in southeast Nigeria in 2006 (Anambra, Ebonyi and Imo States) in a proposal entitled, "*Loa loa* Paralyzes LF MDA in Central Africa: Integration of LF and Malaria Programs Can Resurrect a Continental Initiative." The goal is integration of malaria and lymphatic filariasis (LF) programs in a field demonstration that will test whether insecticide treated nets (ITNs) alone, without adjunctive mass drug administration (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. We therefore wish to find alternative methods to MDA for controlling LF disease. We have partnered with Emory University and the CDC in the execution of the study.

Schistosomiasis (program includes also Delta State): A total of 152,302 persons in Plateau, Nasarawa and Delta states received health education and mass praziquantel treatment for schistosomiasis in 2006 (Figure 33 and Figure 39), which was 87% of the

Annual Treatment Objective (ATO) of 174,414. About 385,000 praziquantel tablets were used, at an average dose of 2.2 tablets per person, and 40,000 praziquantel tablets were remaining at the end of 2006. Schistosomiasis assessments were carried out in seven LGAs in Delta and Plateau States in 2006. Assessments in three LGAs determined that no villages had an SH prevalence greater than or equal to 20%, so no villages in those three LGAs qualified for praziquantel mass treatment. The other four LGAs yielded 18 hyper-endemic communities (50% of school children or more infected) qualifying for community-wide treatment and 47 meso-endemic communities (20-49% of children infected) qualifying for school-based treatment.

Tedious assessment, costs, the need to rotate treatment, and a costly and difficult-to-identify second type of schistosomiasis are some of the obstacles faced by the program. The Carter Center explored each of these challenges in 2006 in a *Bull. WHO* publication and two abstracts/presentations at the meeting of the American Society of Tropical Medicine and Hygiene (Annex 9). Village-by-village SH assessments, in which we test urine samples from school-aged children for the presence of blood, and by the cost of praziquantel tablets (averaging about US $0.20 per treatment) slow our progress. The MOHs of Plateau and Nasarawa States began rotating praziquantel mass treatment so that treatments could be extended to new areas and more people could benefit. Praziquantel treatments were temporarily halted in LGAs where treatment had reduced the rate of blood in urine (hematuria) to below the 20% mass treatment threshold, and treatments were moved to other LGAs that had yet to be treated. Monitoring shows that once praziquantel treatment is halted, hematuria prevalence slowly begins to increase, indicating a return of the infection (Figure 40). These observations suggest that treatments can be withheld from an area for three to four years before recrudescence brings the rate to 20% or more again. A third challenge to the schistosomiasis program is the difficulty in rapidly assessing the second type of schistosomiasis found in Nigeria: the intestinal form of the disease caused by *S. mansoni,* or SM.

We assessed the prevalence of SM in communities that had not qualified for treatment based on their levels of urinary schistosomiasis (SH) with the assistance of consultant Dr. Julie Gutman of Emory University. Unlike SH, in which diagnosis is cheap, rapid and easy, SM requires a relatively expensive and time-consuming stool examination. SM surveys were done in 30 villages in Plateau State that had not qualified for praziquantel treatment. Stool examinations from a convenience sample of 924 10-14 year-old schoolchildren showed SM infection in 25%. 16 villages (53%) excluded for praziquantel based on SH actually qualified for praziquantel MDA when surveyed for SM, based on 2002 WHO recommendations (prevalence of 10% or more in school-aged children). It was concluded that intestinal schistosomiasis is a common health problem in villages excluded from praziquantel treatment. Dr. Gutman recommended that the State MOH change its policy to provide universal MDA to all school-aged children. Village-by-village diagnosis is too costly to undertake for SM. The approach to SM is still being considered.

Co-administration (Triple Drug Administration): Praziquantel (PZQ) was shown to be safe for combined treatment with Mectizan® and albendazole in a WHO-sponsored clinical trial in Thailand that found no clinically relevant pharmacokinetic changes or

adverse reactions to this triple drug administration (TDA). This was great news for our integrated program, where savings are based on the ability to provide multiple treatments in a single village encounter. Before launching extended TDA treatment throughout the Plateau and Nasarawa integrated program areas, however, a protocol was developed by the MOH and The Carter Center to monitor the initial TDA work in five communities in Mikang LGA, Plateau State. This roll-out took place in October, 2006 (See Figure B). A TDA health education program was designed and tested in all the selected villages, and focused on RB, LF and SH. Education topics included the rationale for the combination therapy; methods to avoid confusing drugs and dosages; use of a multipurpose dosing pole (with color coded dosing by height for praziquantel on one side and ivermectin on the other); possible side effects; and locations to seek treatment should side effects occur. Out of the 5,084 people who received TDA, 56 (1.1 percent) had mild adverse reactions such as headache, dizziness, vomiting, abdominal pain, nausea and fatigue. There were zero severe adverse reactions, and no dosing errors. It was concluded that TDA is very safe. The results have been written up and accepted for publication in the *Annals of Tropical Medicine and Hygiene*. In 2007, the integrated program will conduct TDA wherever possible and needed. It should be noted that WHO recommends that TDA not be given until there has been at least one separate round of praziquantel. Therefore, planning will have to consider both the praziquantel rotation scheme and the TDA schedule, making the schistosomiasis program the most challenging in the overall integration scheme.

2007 RECOMMENDATIONS FOR THE CARTER CENTER NIGERIA

All States

Continue to monitor APOC, government and Carter Center funding figures for Carter Center-assisted projects in 2007.

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.

Encourage the Lions Clubs District 404 to be more involved in advocacy at the state levels. Advocate strongly for the release of counterpart funding from states and LGAs.

Pursue donation of PZQ from Merck KGaA.

Carter Center program staff must complete the Emory IRB ethics test when involved with research on human subjects.

Plateau and Nasarawa States' Integrated Program:

Advance Triple Drug Administration (TDA) treatments to approximately 100,000 in 2007.

Publish the results of a field trial on TDA.

Integrate Vitamin A supplementation and trachoma activities into the overall program.

Work with Emory (Dr. McFarland) on economic studies related to integration and CDC (Dr. Amann) on management issues related to integration.

<u>Lymphatic Filariasis:</u>

Keep ITNs in sentinel villages impregnated. Monitor mosquito numbers. Pursue FMOH contributions of ITNs and treatment kits.

Increase ITN distribution to more LGAs, based on availability of nets. Accept no further conventional ITNs, only long-lasting insecticide treated nets (LLIN) since we have no funding to keep up the reimpregnation needs. Keep ITNs in two sentinel villages (Seri and Mhaganga) impregnated annually, and seek to use KO-Tab 123 there to re-impregnate in 2007.

Monitor mosquito numbers, parity and infection rates in all sentinels per protocol.

Design impact and evaluation studies on transmission, including cohort studies, to mark the fifth year of MDA. Consider extra-sentinel, community-wide surveys in communities we have previously surveyed in 2000-2001 or a cluster survey. If ICT and/ or

microfilaria prevalence are less than 1%, consider stopping MDA. If not, consider additional interventions in collaboration with the new Gates 'end game' LF grant.

Evaluate the impact of MDA on LF in urban areas using xenomonitoring (*Culex* traps).

Continue to support "Mass Hydrocele Surgery Days" on a limited scale in areas where patients have been identified in The Carter Center-supported hydrocele prevalence surveys. Publish paper on Dr. Thomas' results in 2007. Focus on pre-op screening, sterility during surgery, timely removal of stitches, and postoperative follow-up. Consider integrating LF surgery days with trichiasis surgery days, if cost savings would result.

Schistosomiasis:

Increase PZQ treatments to over 200,000 in 2007. Restart treatments in Nasarawa LGA (both community-wide and school-based). Rotate LGAs Pankshin and Akwanga back to school-based treatments after 3 years of "PZQ holiday." As a general principle, for the time being, all LGAs that have had three years without treatment should end their PZQ holiday, recommencing with school based treatment in the fourth year. Begin school-based treatments in *S. mansoni* villages identified by Dr. Julie Gutman.

Continue to monitor schistosomiasis prevalence in areas where treatment has been withdrawn. Analyze baseline data of hematuria from the 20 sentinel villages, with assistance from headquarters.

Complete mapping of urinary schistosomiasis in all unmapped LGAs, integrated with trachoma mapping. In 2008, use these data to create state-wide plans for PZQ treatment and rotation, taking into account the TDA areas.

Conduct surveys with headquarters assistance in areas where treatment has been withdrawn to gauge community KAP and compliance. Determine why some communities recrudesce and others do not.

Strengthen health education in areas of PZQ withdrawal, as well as those with impending withdrawal. Set and reach definite goals for number of persons trained, number of training sessions, etc., monitored in monthly reports.

Develop evaluation tools for the impact of trachoma latrines on the prevalence of schistosomiasis (urinary and intestinal).

Onchocerciasis:

Monitor impact of the program on onchocerciasis, or RB. Design a study to evaluate impact of combined albendazole and Mectizan® on RB transmission.

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.

Southeastern States:

Gates Project:

Complete surveys required for the selection of the four LGAs to be tracked for LF and malaria work. More communities need to be assessed to allow for both sentinels and a group of communities that can serve as "spot-check" areas.

Upgrade Owerri and Enugu offices: obtain internet access and otherwise improve communications. Complete the Owerri laboratory as planned in time for LF assessments in June 2007.

Complete agreements with Imo State University, and conduct entomology training with assistance from the Jos office team.

Complete community-wide LF surveys in sentinel villages. Establish longitudinal entomology monitoring with monthly baseline data in all villages during the rainy season.

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

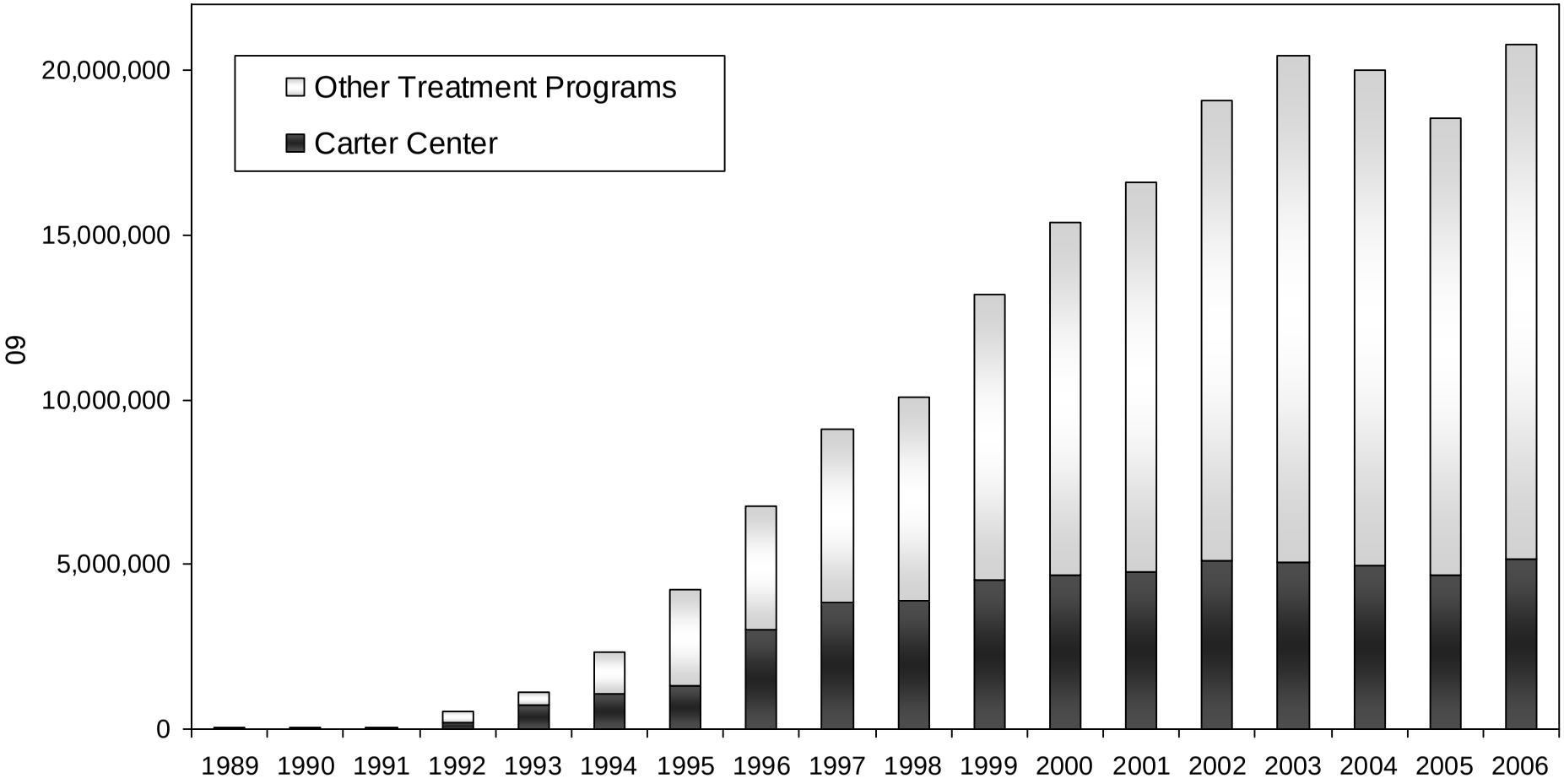
The Imo and Abia Post APOC Post NGDO scenario study:

This study will continue through 2007 and will then be prepared for publication. Accordingly, Imo and Abia should continue to log all Carter Center spending, monitor changes in treatment processes (including RB treatment numbers, % of UTG attained, tablet supply, logistical chain issues, duration of village treatment exercises, CDD and health worker training, and number of communities promptly reporting).

Closely monitor new investments from APOC in the two states.

Figure 28

Nigeria: Lions/Carter Center-Assisted treatments and total Mectizan treatments provided in, 1989-2006*



* Treatments from 1992-1995 by RBF. Source of provisional 2005 national figure: Nigerian Federal Ministry of Health.

Figure 29

Nigeria: Lions/Carter Center-assisted States

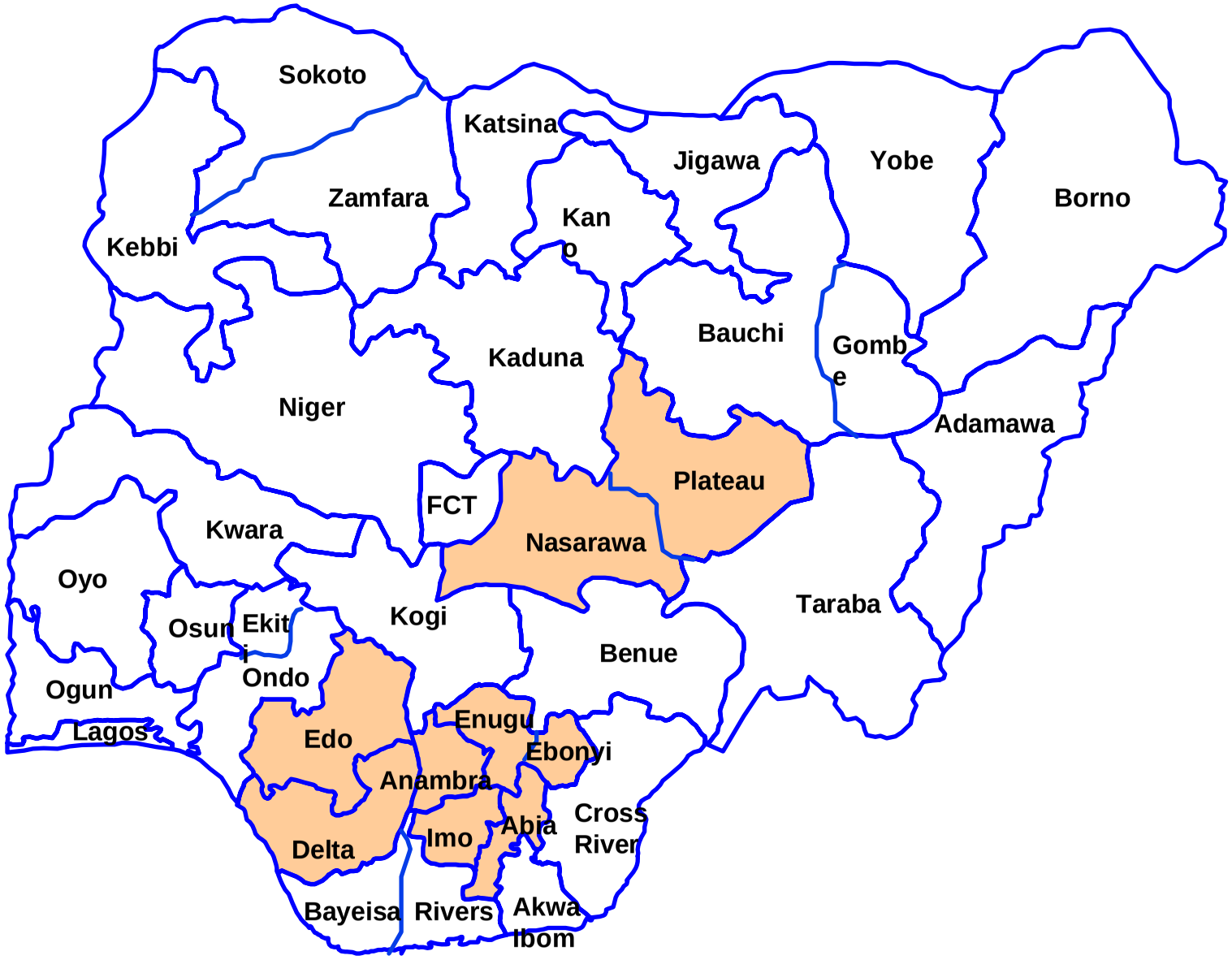


Figure 30

Nigeria: Lions-Carter Center-Assisted Areas: 2006 Mass River Blindness Treatments

State	Number of LGAs	Popn treated cumulative for 2006	2006 UTG	% UTG treated in 2006	Total Popn 2006	% of total popn treated in 2006	Active villages cumulative for 2006
ENUGU	16	783,843	790,071	99%	948,581	83%	1,353
ANAMBRA	16	576,774	610,494	94%	577,958	100%	1,063
EBONYI	10	478,166	508,453	94%	610,810	78%	973
EDO	12	552,446	556,659	99%	731,900	75%	530
DELTA	9	453,370	455,720	99%	568,063	80%	470
IMO	20	552,052	641,203	86%	805,208	69%	1847
ABIA	12	295,727	351,501	84%	422,920	70%	659
PLATEAU	5	323,495	298,623	108%	373,279	87%	293
NASARAWA	7	723,019	731,180	99%	913,975	79%	589
TOTAL	107	4,738,892	4,943,904	96%	5,952,694	80%	7,777

Figure 31

Nigeria: Lions-Carter Center-Assisted Areas: 2006 Passive River Blindness Treatments

STATE	Number of LGAs	Popn treated cumulative 2006	ATO for 2006	% ATO for 2006	Passive villages cumulative for 2006	Passive villages ATO for 2006	Passive villages % ATO for 2006
ENUGU	2	8,540	6,737	127%	42	37	114%
ANAMBRA	5	55,242	24,511	225%	132	132	100%
EBONYI	3	18,074	4,627	391%	93	93	100%
EDO	6	118,573	180,000	66%	156	220	71%
DELTA	16	38,689	100,000	39%	280	280	100%
IMO	9	113,032	125,140	90%	659	738	89%
ABIA	9	90,916	92,302	98%	448	618	72%
TOTAL	50	443,066	533,317	83%	1,810	2,118	85%

Figure 32

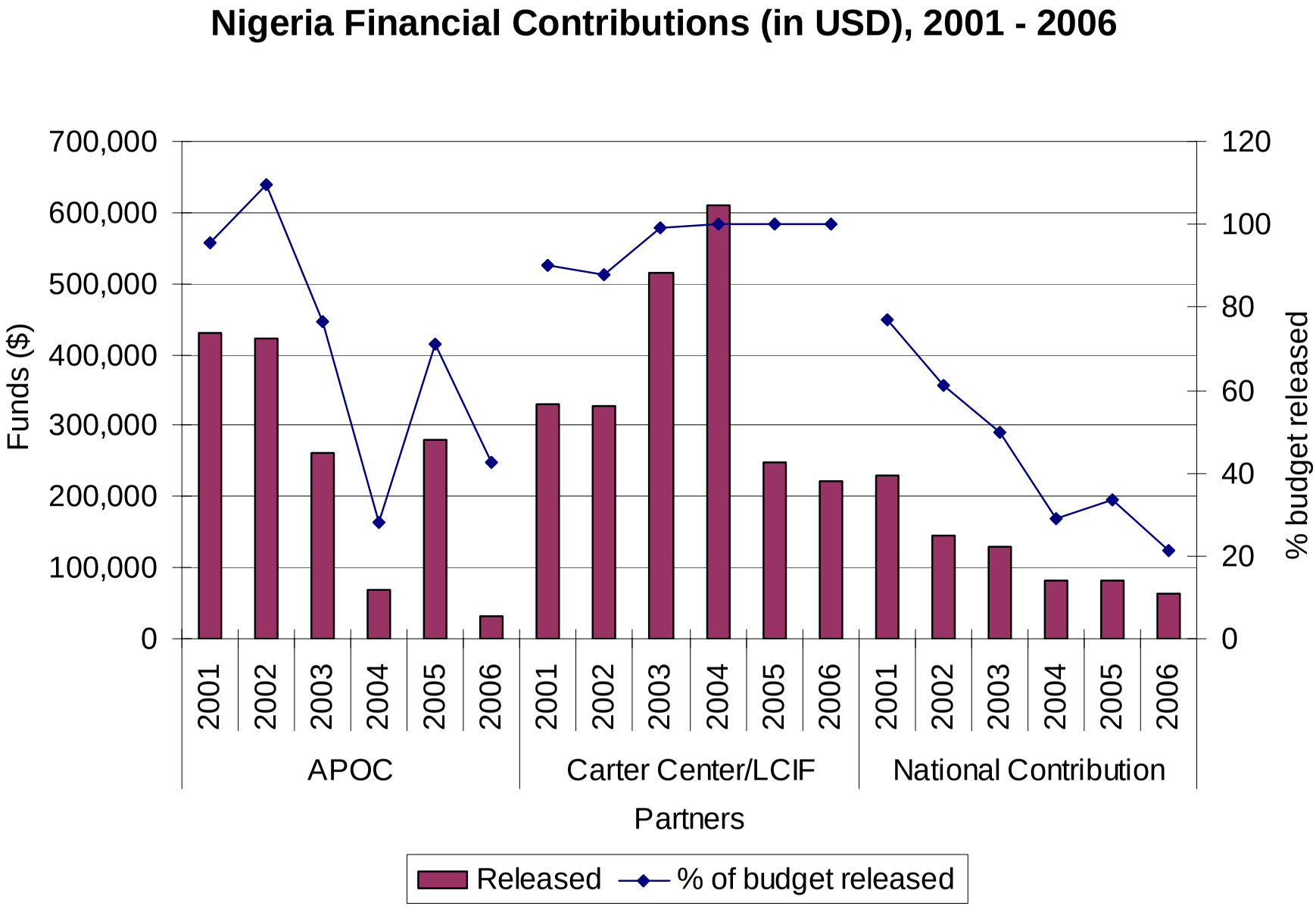

Nigeria Financial Contributions (in USD), 2001 - 2006
Funds ($)
% budget released
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
120
100
80
60
40
20
0
2001
2002
2003
2004
2005
2006
APOC
Carter Center/LCIF
National Contribution
Partners
Released
% of budget released

Figure 33

Nigeria: 2006 Lymphatic Filariasis and Schistosomiasis Treatments

Lymphatic Filariasis Treatments

Name of State	No. of LGAs	Popn treated cumulative 2006	Ultimate TX Goal (UTG) 2006	% UTG treated 2006	Total Popn 2006	% of total popn treated 2006	Active villages cumulative 2006	Active villages UTG 2006	Active villages % UTG treated 2006
Plateau	17	1,891,429	2,100,775	90%	2,625,969	72%	2,571	2,577	100%
Nasarawa	13	1,453,467	1,498,101	97%	1,872,626	78%	1,061	1,061	100%
TOTAL	**30**	**3,344,896**	**3,598,876**	**93%**	**4,498,595**	**74%**	**3,632**	**3,638**	**100%**

Cumulative LF treatments since 2000: 15,964,463

Schistosomiasis Treatments

Name of State	No. of LGAs	Popn treated cumulative	ATO for Y2006	Total Popn for Y2006	% ATO for 2006	% Total Pop. for 2006
Plateau	4	49,599	71,712	566,897	69%	9%
Nasarawa	4	56,716	62,107	411,925	91%	14%
Delta	8	45,987	40,595	82,008	113%	56%
TOTAL	**16**	**152,302**	**174,414**	**1,060,830**	**87%**	**14%**

Cumulative SH treatments since 1999: 947,606

Figure 34

Lymphatic Filariasis Treatments: Plateau and Nasarawa States (Nigeria); by Year

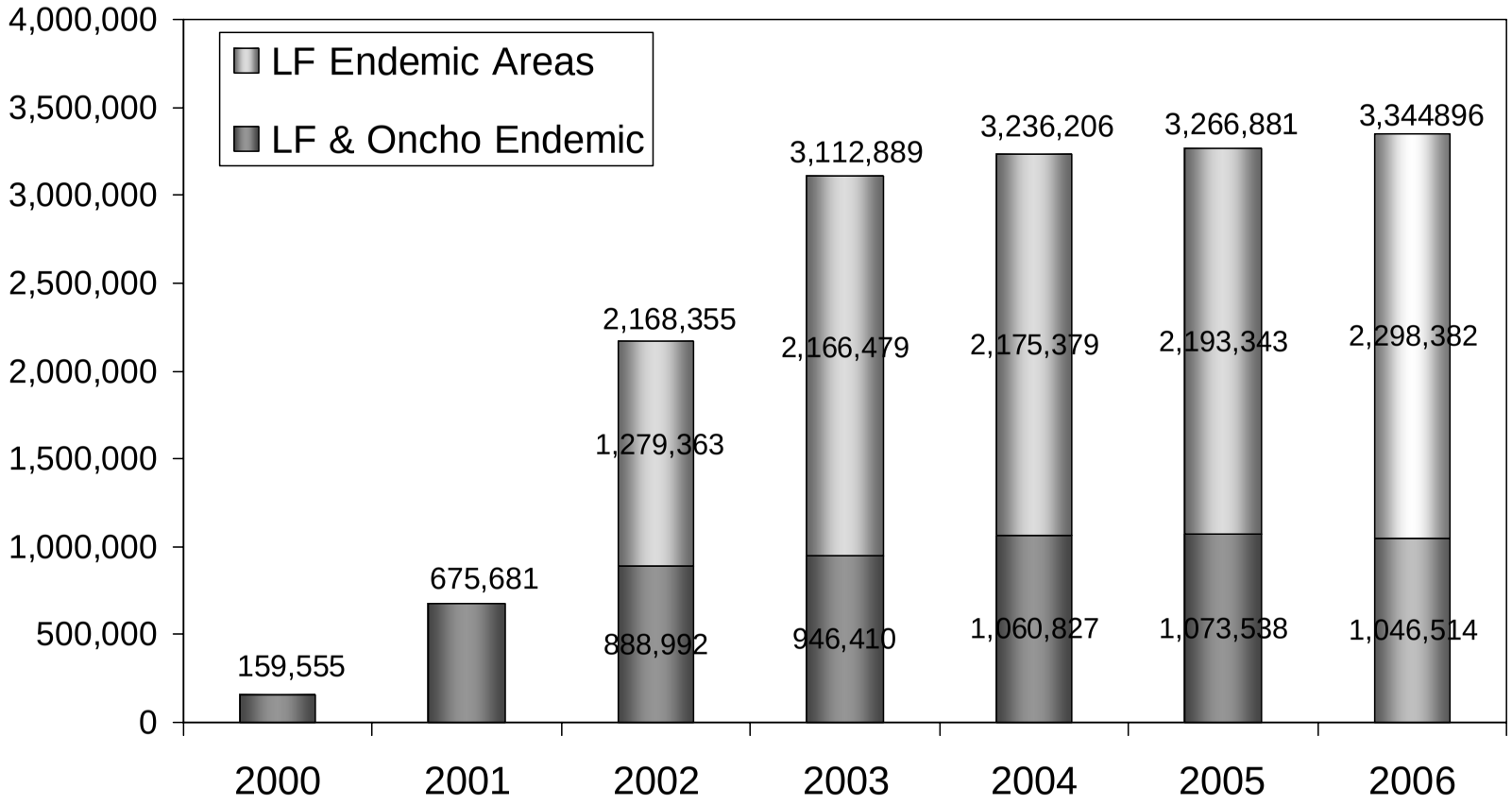


Figure 35

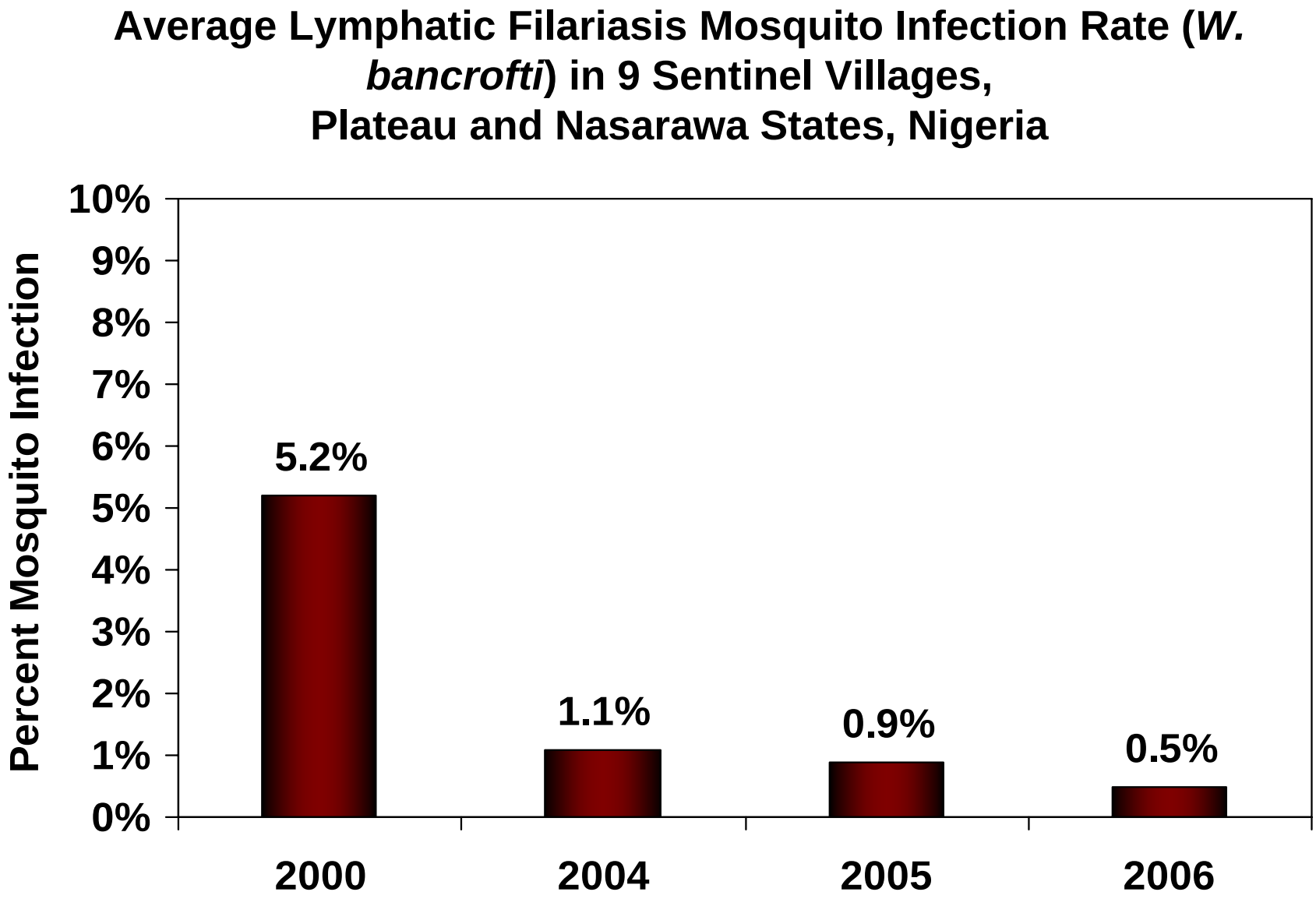

Average Lymphatic Filariasis Mosquito Infection Rate (W. bancrofti) in 9 Sentinel Villages, Plateau and Nasarawa States, Nigeria
Percent Mosquito Infection
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
5.2%
1.1%
0.9%
0.5%
2000
2004
2005
2006

Figure 36

Thick smear results (LF) compared with baseline data from 2002 to 2006 in 10 of the sentinel sites of Plateau and Nasarawa States

Village	*Baseline Data: 2002/2003*			*2006 Data*		
	Number Positive	*Sample size*	*% Positive*	*Number Positive*	*Sample size*	*% Positive*
Babale	12	261	4.6%	-	29	0.0%
D/Tofa	21	419	5.0%	-	132	0.0%
Lankan	9	274	3.3%	2	81	2.5%
Piapung	41	403	10.2%	6	160	3.8%
Seri*	56	527	10.6%	2	157	1.3%
Akwete	2	424	0.5%	1	144	0.7%
Azara	1	402	0.2%	1	151	0.7%
Gbuwhen*	19	508	3.7%	1	183	0.5%
Maiganga	23	486	4.7%	7	126	5.6%
TOTAL	**184**	**3,704**	**5.0%**	**20**	**1,163**	**1.7%**

* began receiving insecticide-treated bed nets in 2004

Figure 37

Lymphatic Filariasis ICT positivity in 12 Nigerian villages, shown in relation to treatment years

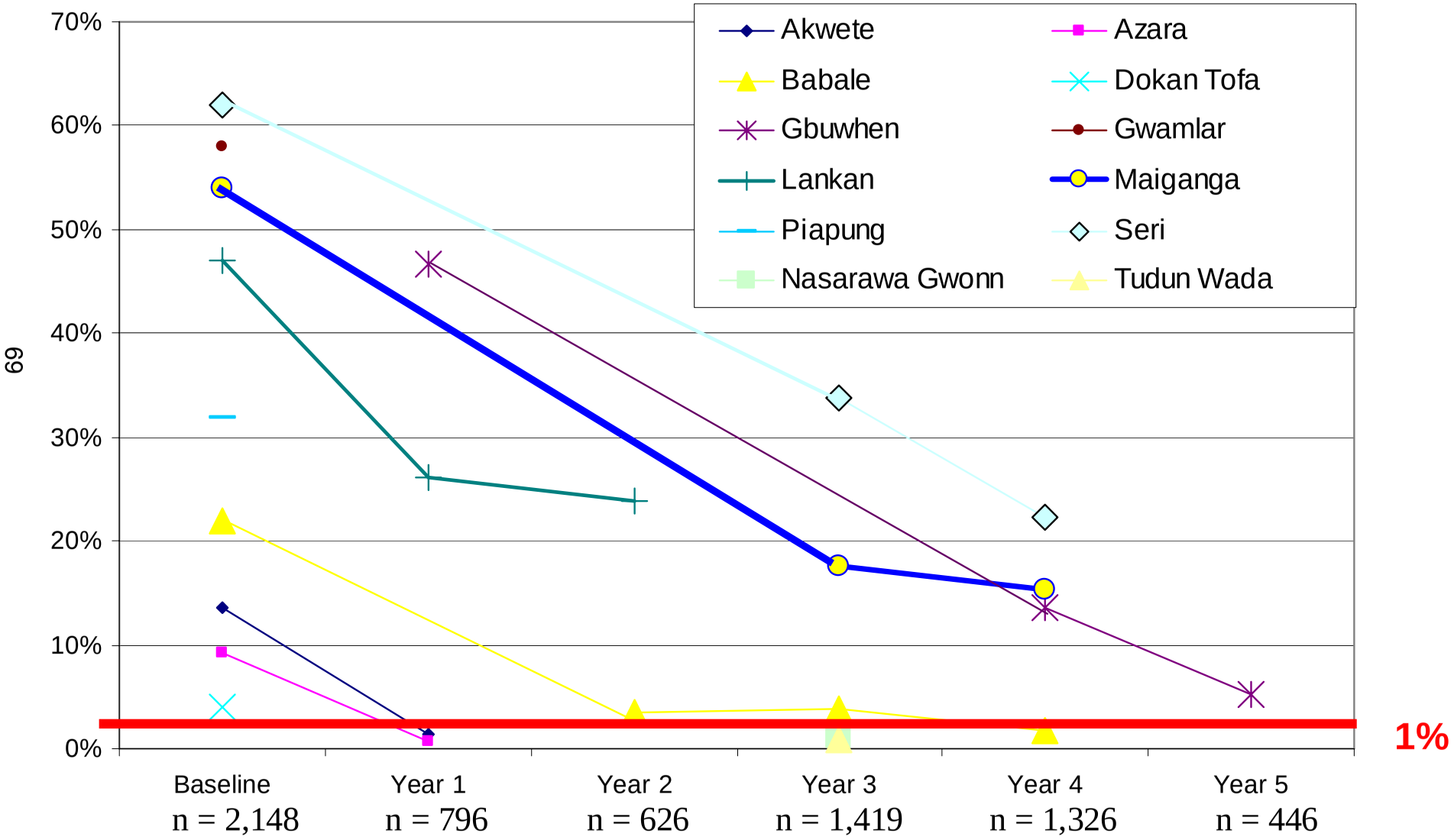


Figure 38

Nigeria: 2006 Collaboration between LF and Malaria Programs

Collaboration between LF and Malaria Programs: Bednet Distribution

Name of State	No. of LGAs	Popn recvd ITN cumulative	Distribution objective (ADO) for	Total Popn for Y2006 of LGA	ATO (Villages)	Cum no. villages covered	% ADO coverage	% village coverage
Plateau (Jos East and Kanke L/North, Q/Pan and Mangu LGAs)	5	63,547	73,236	213,720	732	732	87%	100%
Nasarawa (Keana, Nasarawa and Akwanga LGAs)	3	1,000	32,398	452,632	348	1	3%	0%
TOTAL	**8**	**64,547**	**105,634**	**666,352**	**1,080**	**733**	**61%**	68%

Cumulative bednet distribution since 2004: 121,614

Collaboration between LF and Malaria Programs: Bednet Retreatment

Name of State	No. of LGAs	ITN treated/ retreated cumulative	ITN Treatment/ Retreatment objective for Y2006	Total Popn. for Y2006 of LGA	ATO (Villages)	Cum no. villages covered	% ADO coverage	% village coverage
Plateau	3	20,806	24,244	137,872	732	521	86%	71%
Nasarawa	3	1,000	40,653	218,527	348	6	3%	2%
TOTAL	**6**	**21,806**	**64,897**	**356,399**	**1,080**	**527**	**34%**	**49%**

Cumulative bednet retreatment since 2005: 37,351

Figure 39

Schistosomiasis Treatments: Plateau, Nasarawa and Delta States, Nigeria, by Year

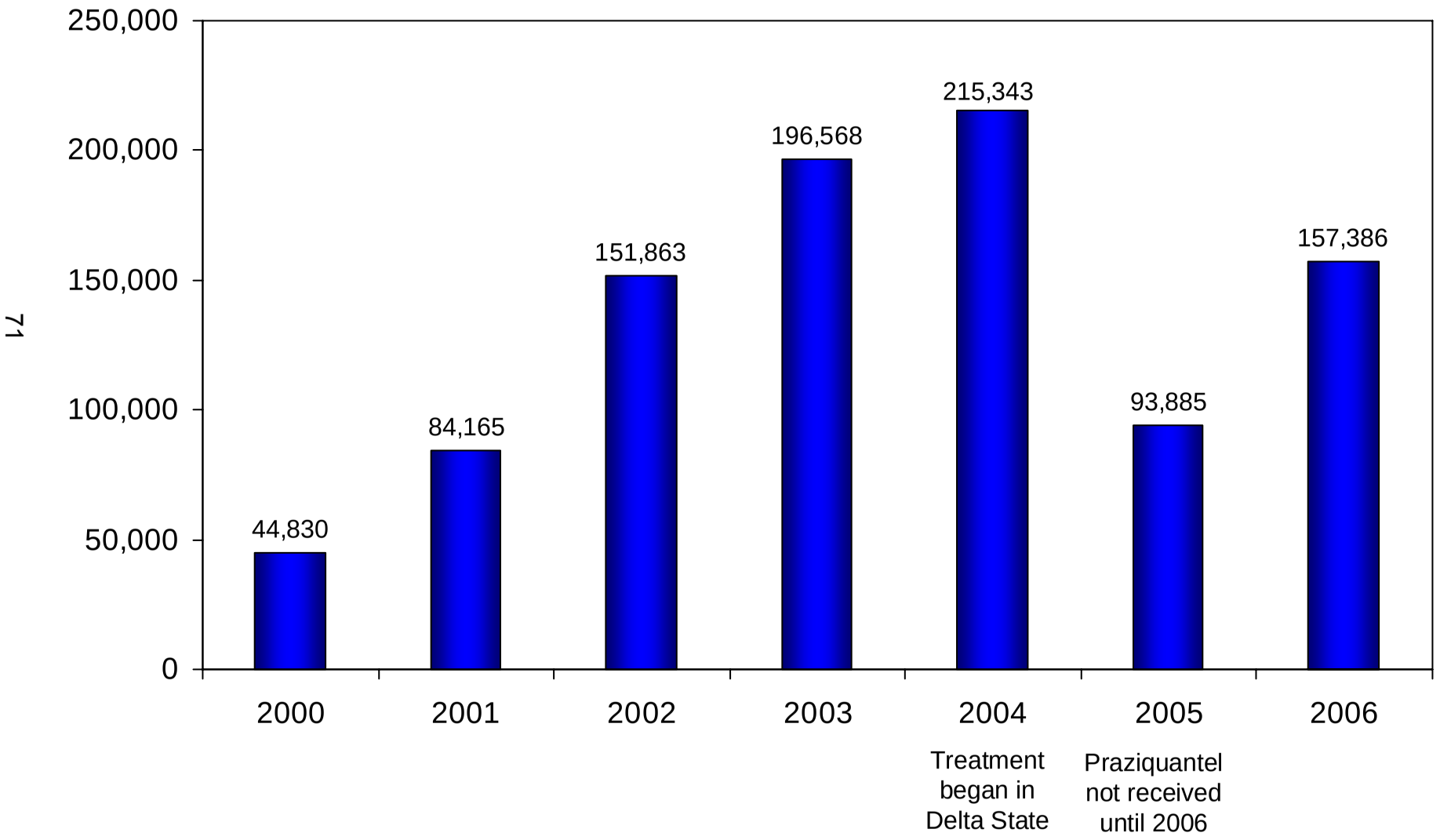
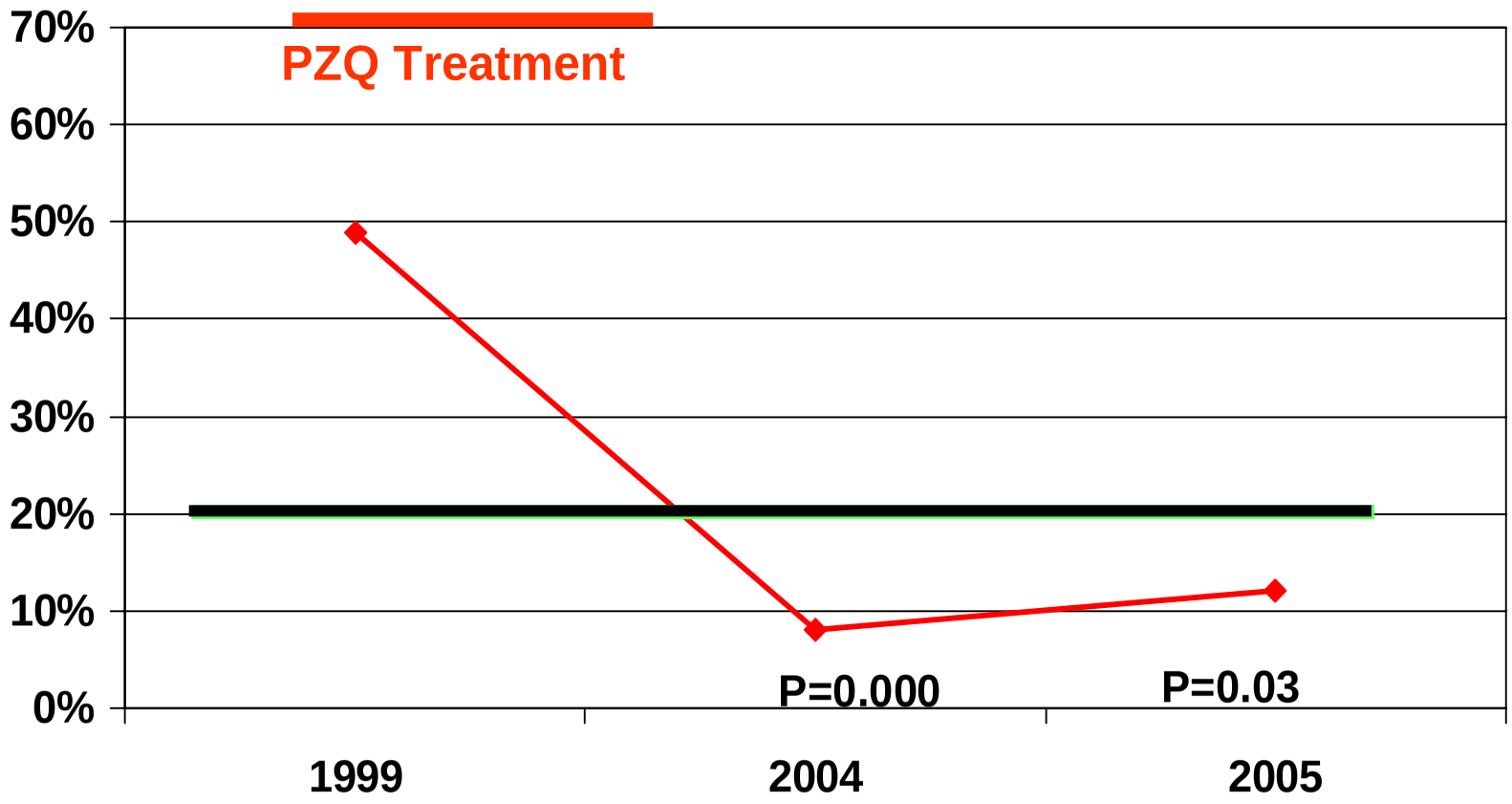


Figure 40

Recrudescence of Schistosomiasis haematobium in 19 villages in Plateau and Nasarawa States
(n = 570 school children per year)



ETHIOPIA

Background: Ethiopia is the largest, most populous country in the Horn of Africa (with population of about 75 million). Onchocerciasis was first reported in southwestern regions in 1939, while the northwestern part of the country was recognized to be endemic much later, in studies conducted in the 1970s. 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 eligible for APOC's community-directed treatment with ivermectin (CDTI) projects (Figure 41). The Carter Center and Lions partnered with APOC and the MOH in eight of these ten projects (Map 15), beginning with Kaffa and Sheka zones in 2001. Other areas of assistance include Bench-Maji, North Gondar, Illubabor and Jimma, and in 2006 Metekel and Gambella were added. The 2006 population in the areas where The Lions-Carter Center is the NGDO partner is 3,446,916 people, with a UTG of 2,757,532 people. Mectizan® treatment is very popular in Ethiopia, in part because of its additional and highly popular benefits from purging intestinal helminthes. In 2006, the Carter Center's UTG in Ethiopia accounted for 82% of that country's national UTG.

Members of Lions District 411A play an important role in both The Carter Center's river blindness and trachoma control programs in the Lions-Carter Center-assisted areas of Ethiopia. Mr. Teshome Gebre, The Carter Center country representative, and himself a Lion, is co-chair of the NOTF and chair of the NGDO coalition, and so plays a leadership role in the national effort against river blindness. Thus, 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 participated actively in the annual Carter Center staff retreat and the Honorable Dr. World Laureate Tebebe Y. Berhan attended the Program Review in Atlanta.

Treatments: During 2006, 2,554,576 people were treated, reaching 93% of the UTG in The Carter Center-assisted zones of Kaffa, Sheka, Bench-Maji, North Gondar, Illubabor and Jimma (Figures 42 – 43). This is a slight increase (0.8%) in treatments over 2005. In 2007, the program will continue to aim to reach its UTG of 2,840,259. There were no Severe Adverse Events (SAEs) reported in 2006.

Mectizan®: In 2006, in addition to 1,854,255 tablets left from 2006, a total of 7,079,500 tablets were received from NOTF and made available for distribution to The Carter Center's assisted areas. Through the course of the year, 6,531,754 tablets were distributed, while 48,957 (0.6%) were damaged and 828,651 expired. The balance returned was 1,168,863. The average number of tablets per person treated was 3.

Training and Health Education: Training was provided to 33,299 community-directed distributors (CDDs), achieving 98% of the training target of 34,059. This is a 2% increase over CDDs trained in 2005. A total of 2,072 community supervisors were

trained, representing 92% of the training target of 2,245. Health education was provided in all 13,046 targeted communities, representing 100% geographical coverage.

Financial Contribution: Although CDTI is being implemented through government health care delivery structures, key funding comes from the Lions Clubs International Foundation. The Ethiopia-assisted areas are the last of the Carter Center RB programs to continue to enjoy funding from APOC through 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.

The MALONC Integration Initiative:

The Ethiopian Minister of Health made an explicit request in February 2006, for The Carter Center's involvement 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 work in Ethiopia. The new project was christened MALONCHO, with an initial goal of providing an average of two long lasting insecticide-treated nets (LLINs) per household. The initial activities in 2006 were focused on the SNNPR and Oromiya regions.

The Carter Center and its partners hope to show an additive affect of community health benefits through the marrying of one of the "big three" diseases (malaria, tuberculosis and AIDS) with a neglected tropical disease, onchocerciasis. The rationale for an integrated approach is based upon the cost-effectiveness of using an existing community intervention system started by the onchocerciasis program; CDDs selected from their own communities will become engaged in behavioral change communication training regarding malaria and its prevention. By putting the MALONCHO project into the heart of all the communities currently engaged in CDTI, impact on the mortality and morbidity associated with malaria could be enhanced.

In late 2006, approximately 752,000 LLINs were purchased for delivery to distribution sites throughout the onchocerciasis and malaria co-endemic areas of SNNPR and Oromiya. Health extension workers (HEWs) and CDDs played a key role in LLIN distribution, which began in early 2007. Additionally, a baseline LLIN coverage survey (prior to LLIN distribution) and a malaria prevalence survey were conducted in late 2006 in the SNNPR and Oromiya regions. The survey involved visits to 1,607 households. All members of the household were tested for malaria through a rapid diagnostic test and microscopy. Information was gathered at the household level regarding malaria risk indicators and the availability and utilization of LLINs. GPS coordinates (altitude, latitude, and longitude) were recorded for each household as well. Preliminary results of the baseline LLIN survey indicate that 35.1% of the households had at least one LLIN, while 2.4% of blood slides examined under microscopy were positive for malaria parasites.

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 distribution. It is difficult to use reports of lymphedema/extremity swelling to assess the likely distribution of LF because of the presence of non-filarial elephantiasis (podoconiosis) in Ethiopia. The Carter Center is supporting an expert team 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 is led by Dr. Hailu and Dr. Kassahun, who, following the WHO recommended approach, have reviewed all previous reports of LF in the country to guide village sampling methods. The national survey will be launched in Gambella and Benishangul-Gumuz Regional States, the western lowlands of Oromia Regional State, the south-western localities of SNNPR, and in parts of North Gondar zone of Amhara. These areas include the Lions-Carter Center focus areas for onchocerciasis elimination by CDTI, and will also be receiving LLINs as part of the MALONCHO initiative.

RECOMMENDATIONS 2007 FOR CARTER CENTER ETHIOPIA

Integration with the Malaria program (MALONCHO)

- Establish and implement a strategy for involvement of CDDs in LLIN use (health education provision and checking for use of LLINs during ivermectin distribution) and malaria surveillance activities.
- Establish a strategy for involvement of the 3000 Health Extension Workers in the MALONCHO program.
- Establish malaria activities (MALONCHO) within all Carter Center-assisted river blindness projects in Ethiopia, including Gambella and Metekel. Include all river blindness areas in LLIN surveys planned for late 2007.

If possible, survey the extent of the river blindness focus in Ethiopia opposite the Sudanese focus of Sundus (Gadarif State).

Consider establishment of river blindness sentinel villages. Request (through the MOH) results of APOC sentinel evaluations (including ocular evaluation) performed in Ethiopia.

Develop the collaborative relationship with Addis Ababa University for lymphatic filariasis mapping in Western Ethiopia. The LF prevalence survey that is funded by The Center should include Carter Center river blindness assisted areas.

Carter Center program staff must complete the Emory Internal Review Board ethics test when involved with research on human subjects.

All Carter Center-assisted projects should continue to monitor their APOC, government and Carter Center funding figures in 2007.

Figure 41

Lions-Carter Center-Assisted CDTI Projects in Ethiopia

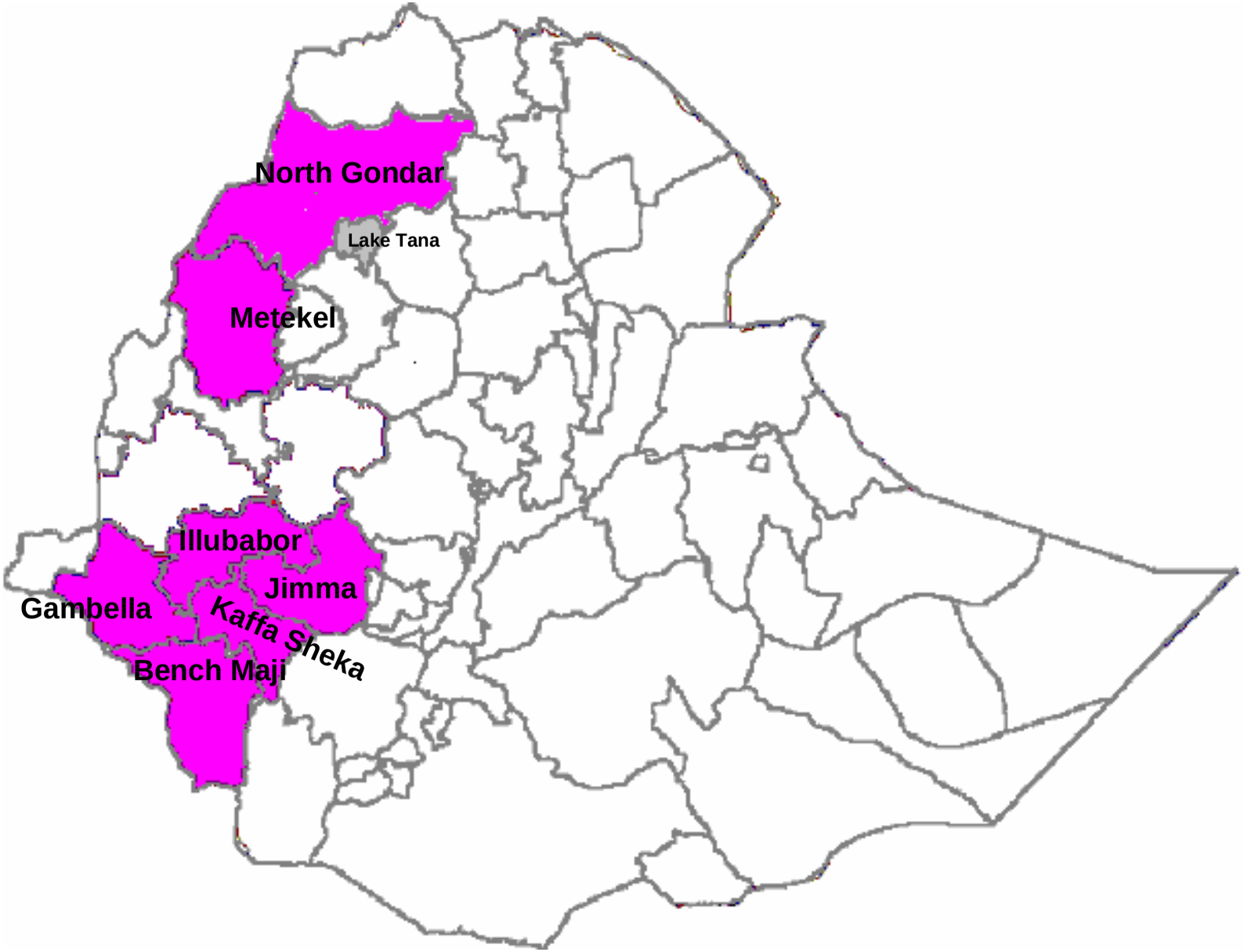


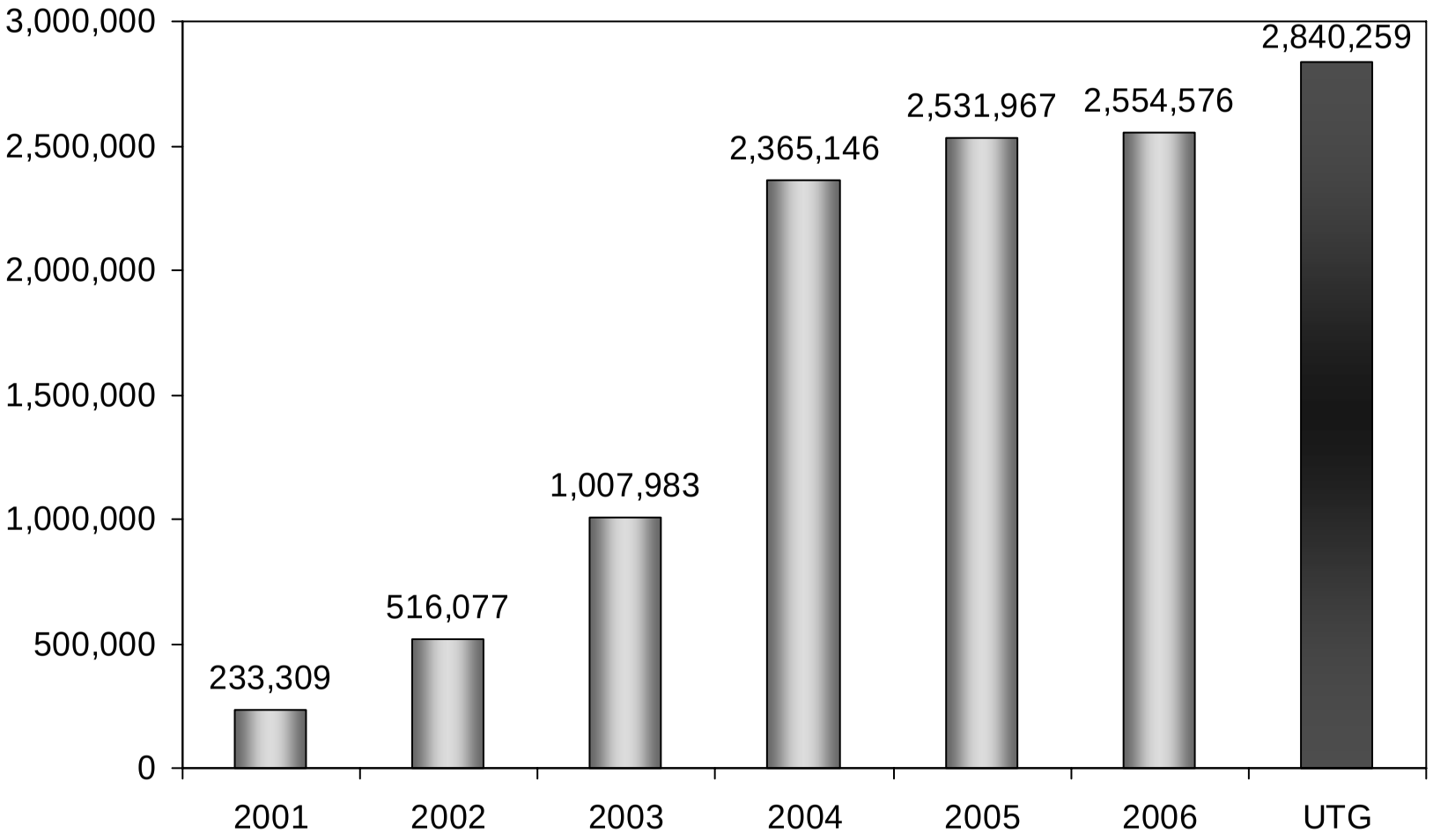
Figure 42

Ethiopia: Lions-Carter Center-Assisted Areas: 2006 River Blindness Treatments

CDTI Zone	Popn treated cumulative 2006	Ultimate TX Goal (UTG)	% UTG treated	Total Popn 2006	% total popn treated	Active villages UTG	Active villages treated as % UTG
Kaffa	623,786	652,890	96%	816,113	76%	2,984	100%
Sheka	154,402	157,198	98%	196,498	79%	293	100%
Bench Maji	403,744	444,234	91%	555,293	73%	1,053	100%
N. Gondar	182,329	199,476	91%	249,345	73%	914	100%
Illubabor	479,509	499,643	96%	624,554	77%	3,503	100%
Jimma	571,039	640,742	89%	800,927	71%	3,607	100%
Metekel	79,113	94,737	84%	118,421	67%	289	100%
Gambella	60,654	68,612	88%	85,765	71%	403	100%
TOTAL	2,554,576	2,757,532	93%	3,446,916	74%	13,046	100%

Figure 43

Ethiopia: 2001-2006 Mectizan Treatments and 2007 UTG*



Acronyms

APOC ..... African Program for Onchocerciasis Control
arvs ..... at-risk villages (villages requiring community-wide active mass therapy)
ATO ..... Annual Treatment Objective
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
CSA ..... Committee of Sponsoring Agencies
earp ..... eligible at-risk population
DEC ..... diethylcarbamazine
DPD ..... Division of Parasitic Diseases, CDC
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
IACO ..... InterAmerican Conference on Onchocerciasis
ICT ..... immunochromatographic card test (for Lymphatic Filariasis diagnosis)
IEC ..... Information, Education, and Communication
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
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
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

RBF .....River Blindness Foundation
RBP..... River Blindness Program of The Carter Center
REA..... Rapid Epidemiological Assessment
REMO ..... Rapid Epidemiological Mapping of Onchocerciasis
SAE.....Severe Adverse Event
SH .....*Schistosomiasis haematobium* (urinary schistosomiasis)
TCC..... Technical Consultative Committee of APOC
TDR..... Special Programme for Research and Training in Tropical Diseases
TX..... treatments
UNICEF.....United Nations Children's Emergency Fund
UTG..... Ultimate Treatment Goal
VAS..... Vitamin A Supplementation
WHO ..... World Health Organization

ANNEXES

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 easily felt under the skin. The parasites are very thin male and female worms that measure up to six inches in length and are long-lived (between five and 15 years). Female worms release embryonic stage called microfilariae that emerge from the nodules. The transmission cycle is carried on as these microfilariae are picked up and re-transmitted by black flies when they bite humans. The microfilariae swarm under the skin and can enter the eyes, where they cause inflammation and ocular damage. The World Health Organization (WHO) estimates that approximately 17.6 million people are infected and 770,000 are blinded or severely visually impaired in the 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. 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 availability of microfilariae to black flies, which are infected when they bite an infected person. Twice per year treatment (e.g., every six months) can completely interrupt transmission of the disease if treatment coverage is high, as this keeps microfilariae levels (and thus fly infection rates) extremely low.

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)/Mectizan® Donation Program (MDP) was 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 70 million treatments per year, and has cumulatively provided over 500 million treatments valued a over three quarters of a billion US dollars. The donation has stimulated what is widely considered a model of 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. 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 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 eradicate 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.

In 2006, The Carter Center and its partners assisted in the 88 millionth (cumulative) Mectizan® treatment, and celebrated the third 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, which are executed within and through the indigenous primary health care system. The Carter Center and MOH staff work closely with the afflicted rural communities, and the Center provides technical assistance and assists in information, education, and communication (IEC); a 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 long and evolving partnerships with Lions Clubs and the Lions' SightFirst Initiative, supported by the Lions Clubs International Foundation (see Introduction section for more details), 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, and Merck, SightSavers International, and the U.S. Committee for UNICEF.

The African Program for Onchocerciasis Control (APOC), which is executed by the 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 in an estimated 19 African countries. Carter Center disease control experts Dr. Donald Hopkins, Dr. Frank Richards, and Dr. Moses Katabarwa have all served on the Technical

Consultative Committee of APOC. APOC, 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, twelve no longer receive core APOC funding. Only Ethiopian RBP projects continue to receive APOC core support (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. Thus, most Carter Center projects are no longer supported by APOC for implementation (field) activities such as community mobilization, health education, supervision, monitoring, data collection, reporting and feedback (which should then be the responsibility of government and communities).

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 2007. 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. (Please see the third paragraph of the OEPA section for more details about the Lions partnership.) Since 2003, the Bill & Melinda Gates Foundation has been an important partner in the regional initiative.

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

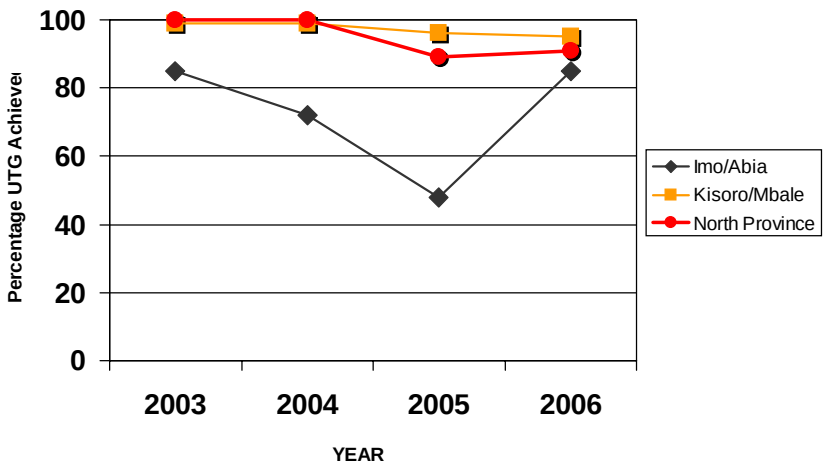
The African Program for Onchocerciasis Control (APOC), which administers a large World Bank trust fund for onchocerciasis, has markedly reduced World Bank support in recent years to Carter Center-assisted African onchocerciasis projects, with the exception of Ethiopia. Twenty-five Carter Center-assisted 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 APOC pull out, a 'Post APOC funding gap' was established, with added funding demands being placed on The Carter Center RBP. 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 end 2005. The purpose was to determine if activities needed 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 below shows the treatment performance during this period (2003-2006). Annex Figures 3 – 5 show each country's performance over that period, including some non-PAPN areas for comparison. Annex Figure 6 shows the coverage in each of the Carter Center projects with respect to APOC year.

An effort is underway to try to determine the financial factors that resulted in the return to high treatment levels in Nigeria in 2006. This study will continue through 2007 and will then be prepared for publication.

Annex Figure 2

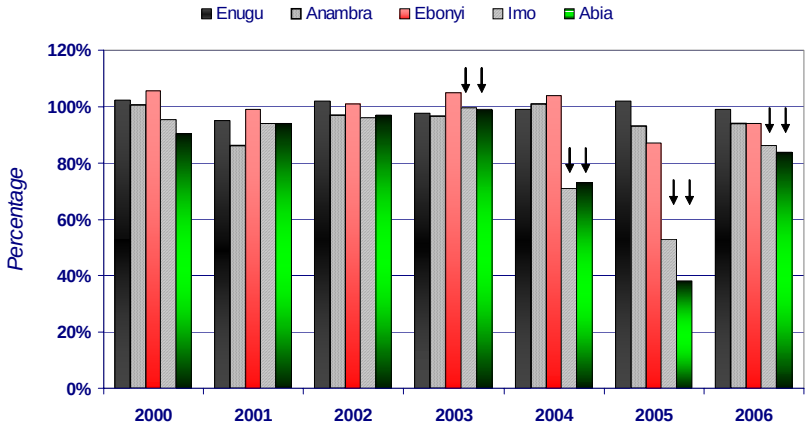
Post-APOC, Post-NGDO Projects Mass Treatment Coverage, 2003 – 2006*



* In 2003, APOC funding ceased and Carter Center withdrew activity funding to test post-APOC, post-NGDO scenario in 2004 and 2005.

Annex Figure 3

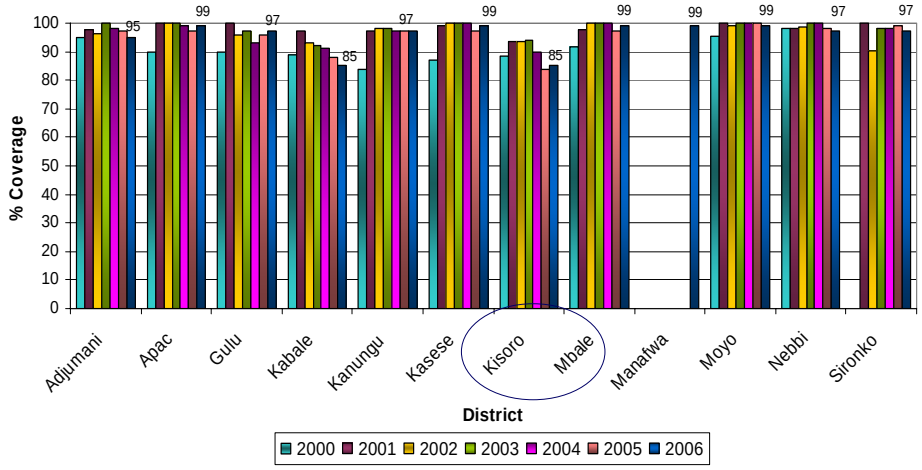
Nigeria: Treatment coverage contrast between 2 PAPN scenario states (Imo and Abia) compared to 3 other Southeastern states*



*Arrows show PAPN trial in Imo and Abia States, where major APOC funds ceased in 2003, and Carter Center/Lions funds ceased in 2004-2005. The Carter Center/Lions reinstated funding in 2006 in Imo and Abia States and treatment coverage rebounded. Other states had APOC funding cease but Carter Center/Lions funds continued, and were unaffected

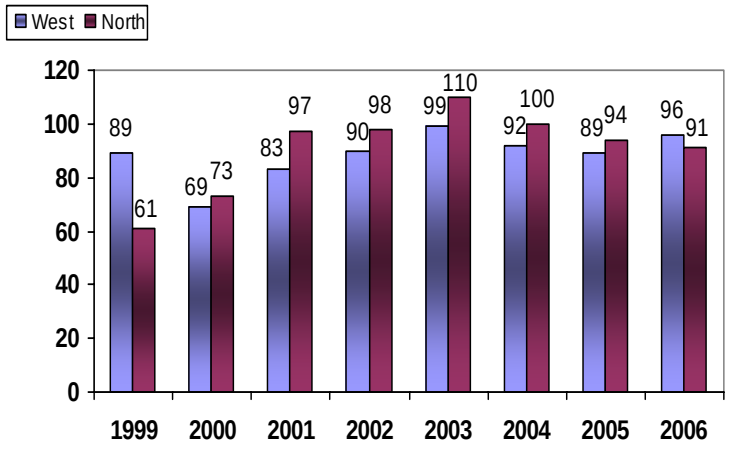
Annex Figure 4

Uganda: Mean coverage by district, 1997-2006 (post-APOC, post-NGDO scenario districts circled)



Annex Figure 5

Cameroon: Performance of West Province vs. PAPN scenario in North Province*



* North Province ceased to receive funding from APOC in 2003, and Carter Center did not fund activities there in 2004 through 2006.

Annex Figure 6: Carter Center/Lions-Assisted project coverage as it relates to year of APOC funding

				Coverage (UTG)						
COUNTRY	PROJECT	Overall APOC Sustainability Score	First year with APOC	5th year funding ends	1 Year before APOC stopped funding	Year when APOC funding stopped	Year after APOC funding stopped	Second year after APOC funding stopped	Third year after APOC funding stopped	Fourth year after APOC funding stopped
Cameroon	North*	2.9	1998	2003	98	110	100	89	91	-
	West	2.5	2001	2006	94	96	-	-	-	-
Ethiopia	Illubabor	n/a	2004	2008	-	-	-	-	-	-
	Jimma	n/a	2004	2008	-	-	-	-	-	-
	Kaffa	3.0	2000	2005	91	96	-	-	-	-
	Sheka	3.0	2000	2005	95	98	-	-	-	-
	Bench Maji	n/a	2002	2007	-	-	-	-	-	-
	North Gondar	n/a	2002	2008	-	-	-	-	-	-
	Metekel	n/a	2004	2008	-	-	-	-	-	-
	Gambella	n/a	2004	2008	-	-	-	-	-	-
Nigeria	Enugu	1.9	1998	2003	86	93	99	100	100	-
	Anambra	3.2	1998	2003	86	88	100	93	94	-
	Ebonyi	2.4	1998	2003	86	88	100	87	94	-
	Edo	3.1	1999	2004	92	93	100	100	99	-
	Delta	2.5	1999	2004	85	91	99	97	99	-
	Imo*	3.6	1998	2003	90	92	76	55	86	-
	Abia*	2.6	1998	2003	90	92	76	39	84	-
	Plateau	2.4	1998	2003	94	90	97	95	108	-
	Nasarawa	2.4	1998	2003	100	96	108	109	99	-
South Sudan	Juba	n/a	n/a	2003	63	63	38	not known	not known	-
Sudan	Khartoum	2.4	1997	2003	78	60	96	37	36	-
Uganda	Kasese	2.9	1997	2002	99	100	100	99	97	9
	Kisoro*	2.5	1997	2002	93	94	94	89	84	8
	Mbale*	3.1	1998	2003	100	100	100	97	100	-
	Kabale	2.4	1998	2003	93	92	90	88	85	-
	Kanungu	2.6	1998	2004	98	97	97	97	-	-
	Nebbi	3.0	1998	2004	100	100	98	97	-	-
	Moyo	n/a	1999	2005	99	99	99	-	-	-
	Gulu	n/a	1999	2005	93	96	97	-	-	-
	Apac	n/a	1999	2005	100	97	99	-	-	-
	Adjumani	n/a	1999	2005	98	97	95	-	-	-
Average performance with respect to APOC year					**92**	**93**	**94**	**86**	**90**	**9**

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

ANNEX 3: LIST OF PARTICIPANTS

The Carter Center Atlanta

Ms. Meryl Bailey
Ms. Becky Brookshire
Ms. Kelly Callahan
Ms. Elizabeth Cromwell
Mr. Don Denard
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Lions Clubs International Foundation

Mr. Phillip Albano
Dr. Tebebe Y. Berhan - Ethiopia
Mr. James Ervin

Other University and NGDO personnel and special guests

Dr. Mary Alleman – Mectizan Donation Program
Ms. Catherine Bryant – The Izumi Foundation
Ms. Catherine Cross - Sight Savers International
Dr. Julie Gutman – Emory University
Ms. PJ Hooper – Mectizan Donation Program
Ms. Minne Iwamoto – GlaxoSmithkline PLC
Dr. Charles Katholi - University of Alabama
Dr. Dominique Kyelem – Task Force for Child Development & Survival
Dr. Charles Mackenzie - Michigan State University
Dr. Deborah McFarland – Emory University
Dr. Faith McLellan - The Lancet
Dr. Eric Ottesen - Task Force for Child Development & Survival
Dr. Mark Rosenberg - Task Force for Child Development & Survival
Dr. Yao Sodahlon – Mectizan Donation Program
Ms. Julia Suddath-Ranne and Mr. Michael Ranne
Dr. Thomas Unnasch - University of Alabama
Dr. Steven Williams - Task Force for Child Development & Survival

Centers for Disease Control & Prevention

Dr. Josef Amann
Dr. Stephen Blount
Ms. Janna Brooks
Dr. Mark Eberhard
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ANNEX 5

AGENDA: Eleventh Annual River Blindness Program Review

Thursday April 19 – Saturday April 21, 2007
The Carter Center, Atlanta, GA

Day 1: Thursday April 19, 2007

9:00 – 9:10	Welcome, introduction and remarks	Dr. Donald Hopkins Dr. Frank Richards (chair)
Part 1: 2006 Treatment Activity Summary		
9:10 – 9:15	Introduction to Day 1	Dr. Moses Katabarwa
9:15 – 9:45 9:45 – 10:00	Uganda presentation *Discussion (Comments by Dr. Thomas Lakwo)*	Ms. Peace Habomugisha
10:00 – 10:30 10:30 – 10:45	Cameroon presentation *Discussion*	Dr. Albert Eyamba
10:45 – 11:00	***Coffee Break***	
11:00 – 11:30 11:30 – 11:45	OEPA presentation *Discussion*	Dr. Mauricio Sauerbrey
11:45 – 12:15 12:15 – 12:30	Ethiopia presentation *Discussion (Comments by Lion Dr. Tebebe Y. Berhan)*	Mr. Teshome Gebre
12:30 – 2:00	***Lunch and optional museum tour***	
2:00 – 2:30 2:30 – 2:45	Sudan presentation *Discussion*	Mr. Miles Kemplay
2:45 – 3:15 3:15 – 3:30	Nigeria: Onchocerciasis *Discussion (Comments by Dr. Emmanuel Miri)*	Dr. Emmanuel Emukah
3:30 – 3:45	***Coffee Break***	
3:45 – 4:15 4:15 – 4:30	Nigeria: Lymphatic Filariasis, Schistosomiasis and Malaria *Discussion (Comments by Dr. Miri)*	Dr. Abel Eigege
4:30 – 5:00 5:00 – 5:15	Missed treatment opportunities: *Schistosomiasis mansoni* study. Do we need to map for *S haematobium*? *Discussion (comments by Dr. Richards)*	Dr. Julie Gutman
5:15 – 5:45	Mectizan® Issues	MDP/Carter Center Staff
5:45 – 6:00	Day 1 Conclusions	Dr. Frank Richards
6:00	***Session Adjourned***	

Day 2: Friday April 20, 2007

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	Ms. Lindsay Rakers
9:05 – 9:35 9:35 – 9:50	Uganda (with focus on the new Lavelle grant) *Discussion (comments by Dr. Katabarwa)*	Ms. Peace Habomugisha
9:50 – 10:20 10:25 – 10:35	OEPA presentation: details on foci outside of Guatemala *Discussion*	Dr. Mauricio Sauerbrey
10:35 – 10:50	***Coffee Break***	
10:50 – 11:20 11:20 – 11:35	Elimination assessments in Escuintla and Huehuetenango, Guatemala *Discussion*	Dr. Kim Lindblade
11:35 – 12:05 12:05 – 12:20	Poolscreen: new techniques for determining Annual Transmission Potential *Discussion (Comments by Dr. Tom Unnasch)*	Dr. Charles Katholi
12:20 – 1:15	***Lunch***	
1:15 – 1:45 1:45 – 2:00	Sudan presentation *Discussion*	Dr. Tong Chor Malek Duran
2:00 – 2:30 2:30 – 2:45	Nigeria presentation (Plateau and Nasarawa) *Discussion*	Dr. Abel Eigege
2:45 – 3:15 3:15 – 3:30	Imo/Abia assessment, Southeast Nigeria *Discussion (Comments by Dr. Emukah)*	Ms. Lindsay Rakers
3:30 – 4:00	***Coffee Break and Group Photo***	
4:00 – 4:30 4:30 – 4:45	Integration of malaria and onchocerciasis efforts in Ethiopia *Discussion*	Dr. Estifanos Biru
4:45 – 5:15 5:15 – 5:30	Cameroon cost recovery reanalysis *Discussion (Comments by Dr. Eyamba)*	Ms. Jennifer Lasley
5:30 – 5:45	Day 1 Conclusions	Dr. Frank Richards
5:45	***Session Adjourned***	

Day 3: Saturday April 21, 2007

Part 3: Research and reports on specialized program activities

9:00 – 9:10	Introduction to Day 3	Dr. Frank Richards
9:10 – 9:40 9:40 – 9:55	How Guatemala will eliminate onchocerciasis in the Central Endemic Zone: the strategic plan *Discussion (Comments by Dr. Sauerbrey)*	Dr. Guillermo Zea-Flores
9:55 – 10:25 10:25 – 10:40	Different approaches to stopping treatment for LF: PacELF, Egypt, and WHO. What to do in Nigeria? *Discussion (Comments by Dr. Richards)*	Dr. Patricia Graves
10:40 – 11:00	***Coffee Break***	
11:00 – 11:30 11:30 – 11:45	Protocol for LF mapping in Ethiopia *Discussion (Comments by Mr. Gebre)*	Dr. Patricia Graves
11:45 – 12:15 12:15 – 12:30	Uganda: update on twice-per-year treatment experience and other items related to elimination in Uganda *Discussion (Comments by Dr. Katabarwa)*	Ms. Peace Habomugisha
12:30 – 1:30	***Lunch***	
1:30 – 2:00 2:00 – 2:15	Withdrawal of praziquantel in Nigeria and praziquantel rotation schedules. What are our options? *Discussion (Comments by Dr. Richards)*	Dr. Abel Eigege
2:15 – 2:45 2:45 – 3:00	Gates LF program in SE Nigeria: A review of the approach and an update on mapping *Discussion (Comments by Dr. Miri)*	Dr. Emmanuel Emukah
3:00 – 3:30 3:30 – 3:45	Sudan presentation on the twice-per-year treatment experience *Discussion (Comments by Dr. Katabarwa)*	Mr. Miles Kemplay
3:45 – 4:00	***Coffee Break***	
4:00 – 4:30 4:30 – 4:45	Integration of Vitamin A with CDTI in Cameroon *Discussion (Comments by Dr. Katabarwa)*	Dr. Albert Eyamba
4:45 – 5:45	Summary	Dr. Donald Hopkins and Dr. Frank Richards
5:45 – 6:00	Closure of Eleventh Session	Dr. Frank Richards
6:00	***2006 Carter Center River Blindness Program Review Adjourned***	

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 varies 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% 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'). Those 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 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 would 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 >3%) 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 site visits 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 (in meetings) to the PCC.

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 each 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, 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).

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 should be 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 treatment with the combination of Mectizan® and albendazole 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 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 can significantly reduce schistosomiasis morbidity. Praziquantel kills the adult worms and so prevents the eggs from accumulating in tissues. Unfortunately, praziquantel is not 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 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). 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 by Roll Back Malaria). 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. Praziquantel, however, is not being routinely donated to the program, although in past years The Carter Center has 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 through funds raised from other donors. Shin Poong Pharmaceutical Company, Ltd. has offered praziquantel tablets with a favorable pricing. The national programs for LF and schistosomiasis in Nigeria are actively involved in The Carter Center-assisted program.

ANNEX 8
Publications Pertaining to the Program

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ANNEX 9: ABSTRACTS PRESENTED AT 52nd MEETING OF THE AMERICAN SOCIETY OF TROPICAL MEDICINE AND HYGIENE IN 2006

ABSTRACT 1

MISSED TREATMENT OPPORTUNITIES FOR SCHISTOSOMIASIS MANSONI IN AN ACTIVE URINARY SCHISTOSOMIASIS TREATMENT PROGRAM IN PLATEAU AND NASARAWA STATES, NIGERIA

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Background. Schistosomiasis is a parasitic disease affecting 200 million people worldwide. Urinary (*S. hematobium, SH*) and intestinal (*S. mansoni, SM*) schistosomiasis are coendemic in Nigeria. Since 1999 the ministries of health of Plateau and Nasarawa States, assisted by The Carter Center, have provided mass drug administration (MDA) with praziquantel (PZQ) for SH in villages with microhematuria in >20% of school aged children. These states are also endemic for *SM*. We conducted a cross sectional survey of the prevalence of *SM* in 30 villages with <20% prevalence of hematuria to determine missed PZQ treatment opportunities for SM in this SH program.

Methods. 30 villages with SH prevalence <20% were randomly selected from 4 of the 12 Local Government Areas previously screened for SH. At least 30 children, age 10-15, were randomly selected in each village. A fecal specimen was collected and processed by Kato-Katz method; heme tests were performed on 170 SM (+) and 284 (-) samples. The number of *SM* eggs per slide was recorded. PZQ was offered to SM infected children.

Results. 924 children were examined in the villages. Overall prevalence of *SM* infection was 24.9%; 16 villages (53%) qualified for PZQ MDA for SM, based on 2002 WHO recommendations (>10% prevalence in school aged children). Most infections were light; 59% of children had ≤48 eggs per gram (epg) of feces; only 1% of children had heavy infections (>400 epg). Children with *SM* had an increased risk for positive occult blood test (OR=3, $p=10^{-8}$), but the predictive value positive (58%) and negative (70%) of a hemetest was not enough to recommend its use as a rapid screen for intestinal schistosomiasis.

Conclusion. We conclude that intestinal schistosomiasis is an important health problem in villages excluded from praziquantel treatment by the SH treatment program in this part of Nigeria. If sufficient praziquantel could be afforded, we recommend universal MDA targeting all school-aged children, without village by village diagnosis, which for SM is too costly to undertake to define specific villages in need of PZQ.

ABSTRACT 2

AFTER A DECADE OF ANNUAL DOSE OF IVERMECTIN TREATMENT IN CAMEROON AND UGANDA, ONCHOCERCIASIS TRANSMISSION CONTINUES

MOSES KATABARWA[1], PEACE HABOMUGISHA [2], TOM LAKWO [3], RICHARD NDYOMUGYENYI [3], AMBROSE ONAPA [3], ALBERT EYAMBA [4]; JOSEPH KAMGNO J [5], THOMAS KUETE [6] , MKPOUWOUEIKO SALIFOU[7], NTEP MARCELLINE[7] AND FRANK O. RICHARDS, JR [1]

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Background: Onchocerciasis is the world's second leading infectious cause of blindness, and severe skin disease. It is caused by *Onchocerca volvulus*, a parasitic worm that forms nodules under the skin and is transmitted by black flies that breed in fast flowing rivers and streams. Ivermectin kills the microfilaria, and, while it reduces the fecundity of adult worms, it does not kill them. Mass drug administration (MDA) in Africa with single annual doses of ivermectin (Mectizan®, donated by Merck & Co.) has a goal of 'eliminating onchocerciasis as a public health problem.' The World Health Organization's African Programme for Onchocerciasis Control (APOC) cites 10-15 years as the standard duration for such MDA programs to achieve that goal while preventing recrudescence.

Methods: Baseline nodule and skin snip microfilaria prevalence data were available for sentinel communities in Cameroon (from 1996) and Uganda (from 1993). We returned to those sentinel communities in 2005 to repeat cross sectional surveys after 10 (Cameroon) and 13 (Uganda) years of ivermectin distribution. Treatment coverage of the total population over this time period was reported to be over 65% in the sentinel communities as well as other affected communities in the same districts in both countries. Over six hundred persons over 10 years of age were examined in each of the surveys. We also examined children less than 10 years old from Cameroon (1996, n=206; 2005, n=447; and Uganda (1993, n=234; 2005, n=278). The baseline information from 28 excised nodules in 1992 was compared with that from eighty excised nodules in 2005 from some sentinel communities of Uganda.

Results: Results at 95% confidence interval showed that microfilaria carriers in Cameroon sentinel communities reduced from 74.9% to 7.8% ($p < 0.0001$), and then increase to 12.7% six months after treatment. Nodule carriers reduced from 69.7% to 8.0% ($p<0.00001$) from 1996 to 2005. Similarly, for Uganda, microfilaria carriers reduced from 72.9% to 6.66% ($p<0.00001$) from 1993 to 2005. Nodule carriers in the same period reduced from 47.1 % down to 8.8% ($p<0.0001$) while onchodermatitis reduced from 51.2% to 7.0% ($p<0.00001$). Microfilaria carriers among children under 10 years of age in Cameroon reduced, 34.5% to 3.8% from 1996 to 2005 ($p<0.0001$), and in Uganda, 20.1% to 1.4% from 1993 to 2005 ($p<0.00001$). Ugandan nodule histological

results showed a majority of female (64%) and male (81%) worms still living, and 24% of live female worms still inseminated.

Conclusion: The study concluded that 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%), but onchocerciasis transmission continues. It was recommended that mass treatment with ivermectin continue past 15 years if control programs do not wish to risk recrudescence. Also a combination of already tested and acceptable methods where feasible for elimination of transmission should be implemented.

ABSTRACT 3

MONITORING URINARY SCHISTOSOMIASIS INFECTION IN COMMUNITIES GIVE A PRAZIQUANTEL 'HOLIDAY' AFTER FIVE ROUNDS OF TREATMENT

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Mass drug distribution of praziquantel (PZQ) at a dose of 40 mg/kg every 1-3 years can significantly reduce schistosomiasis morbidity in areas of high endemicity. However, the optimal interval for such treatment is debated. PZQ, which is not donated by pharmaceutical companies to National Control Programs, costs about US $0.08 per 600 mg tablet. Therefore, drug costs in mass treatment programs can become substantial, and economizing through drug PZQ 'holidays' could allow more people to be treated by programs using drug rotation schemes through different endemic areas. In the local government area (LGA) of Pankshin in Plateau State, Nigeria, PZQ treatment for urinary schistosomiasis was launched in 1999. PZQ was administered in schools in communities where a sample of 30 children aged 10-14 were found to have a hematuria prevalence by dipstick of $\geq$20%-<50%. In communities with higher prevalence ($\geq$50% hematuria) PZQ was administered community wide (e.g., including adults). In eight sentinel villages in the LGA (4 receiving school based treatment and 4 receiving community wide treatment) we observed a dramatic decline in hematuria over a four year period from a baseline mean of 40% (village range 30%-77%) hematuria prevalence among 240 children in 1999 compared to a mean of 5% (range 0-27%) among a independent group of 240 just prior to the fifth PZQ treatment administration in 2003. In consultation with the ministry of health of Nigeria, PZQ treatments were stopped after the fifth dose, while simultaneously intensifying a schistosomiasis health education campaign throughout the LGA. Two years after stopping PZQ mass treatments, in 2005, we again evaluated 240 children in the eight sentinel villages to look for evidence of recrudescence. We found the 2% hematuria rate (range 0-7%) to be essentially unchanged from 2003. We concluded that recrudescence had not occurred after a 2 year 'drug holiday' interval and a three year rotation would be 'safe.'

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)