THE
CARTER CENTER

Waging Peace. Fighting Disease. Building Hope.

Summary
2012 Program Review for The Lions-Carter Center SightFirst

RIVER BLINDNESS PROGRAMS

Ethiopia, Nigeria, OEPA, Sudan, and Uganda

5-7 March 2013
The Carter Center
Atlanta, GA

Lions Clubs International
FOUNDATION

THE CARTER CENTER
River Blindness Program

October 2013

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Estate of Mr. Gordon Toft

UNICEF

United States Agency for International Development

Mr. Eric Wepsic and
Mrs. Patricia Pacelli

And to many others, our sincere gratitude

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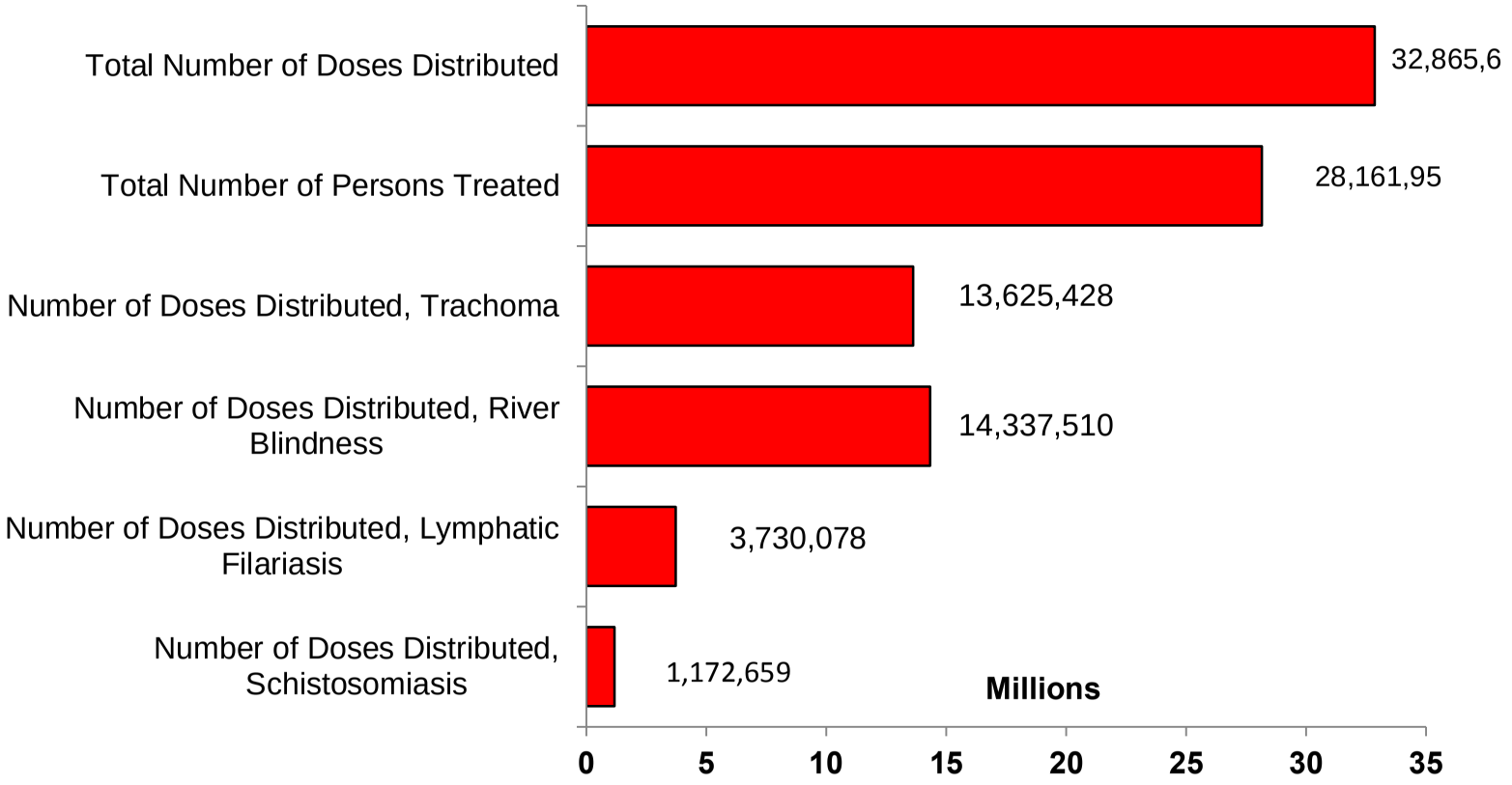

The Carter Center is grateful for our Ministry of Health partners, and the many donors and pharmaceutical companies who have made financial and in-kind contributions to make possible these treatments.

Treatment for trachoma is azithromycin (donated by Pfizer); river blindness is ivermectin (Mectizan, donated by Merck); lymphatic filariasis is albendazole (donated by GSK) and ivermectin (Merck), and schistosomiasis is praziquantel (mostly donated by Merck KGaA)

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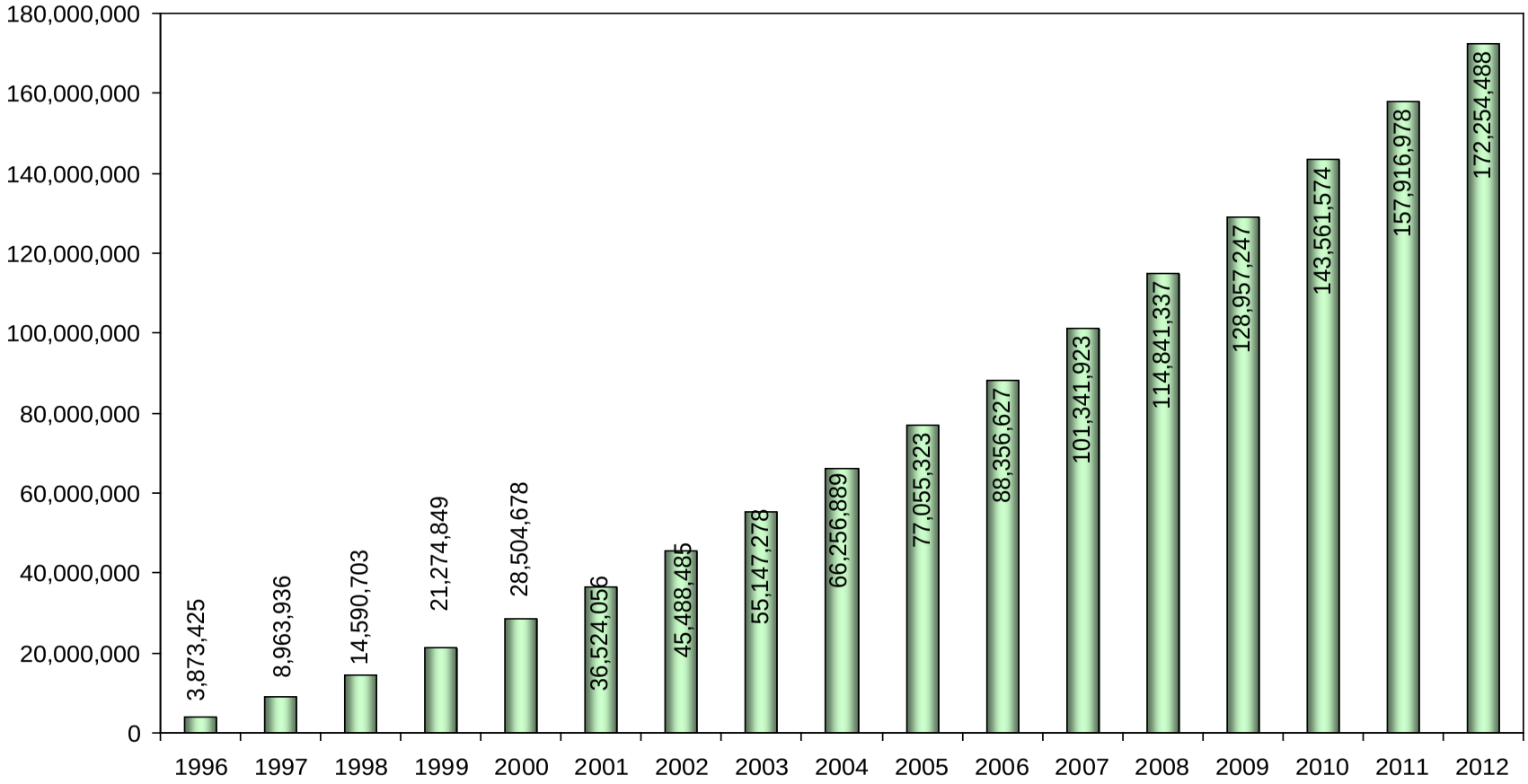
Figure C

172m Cumulative Mectizan® Doses (Treatments) for RB Delivered by Carter Center (RBP)-Assisted Programs 1996 – 2012*



*RB = River Blindness, RBP = River Blindness Program

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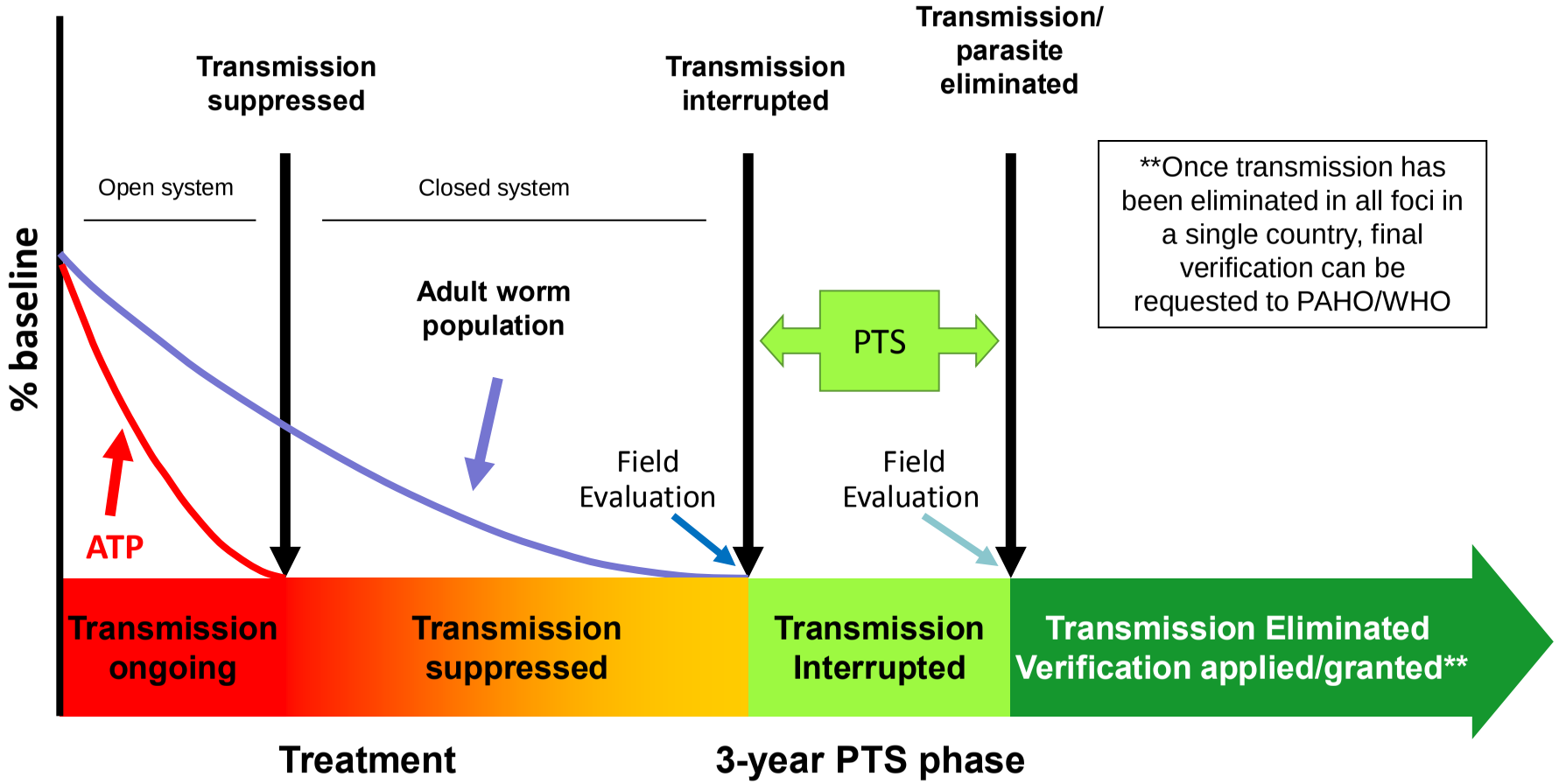
Phases of the Elimination of Onchocerciasis (Based on WHO's* certification/verification guidelines 2001)



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

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Figure E

Onchocerciasis transmission in Abu Hamad declared Interrupted by Dr. El Khair El Noor EL Mubarak of the Sudan Federal Ministry of Health Khartoum– May 2012

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Figure F

بسم الله الرحمن الرحيم

Republic of Sudan
Federal Ministry of Health
State Minister

جمهورية السودان
وزارة الصحة الإتحادية
وزير الدولة

Khartoum: May 02, 2012 الخرطوم في :

No/Min/O.H/: النمرة : و ص / م و ص /:

Sudan Federal Ministry of Health
Primary Health Care Directorate
The National Program for Prevention of Blindness

Press Release by Mr. Alkhair Alnour Almoubarak, State Minister of Federal Health Ministry, to declare interruption of transmission of River Blindness (Onchocerciasis) in Abu Hamad focus, River Nile State

Introduction:

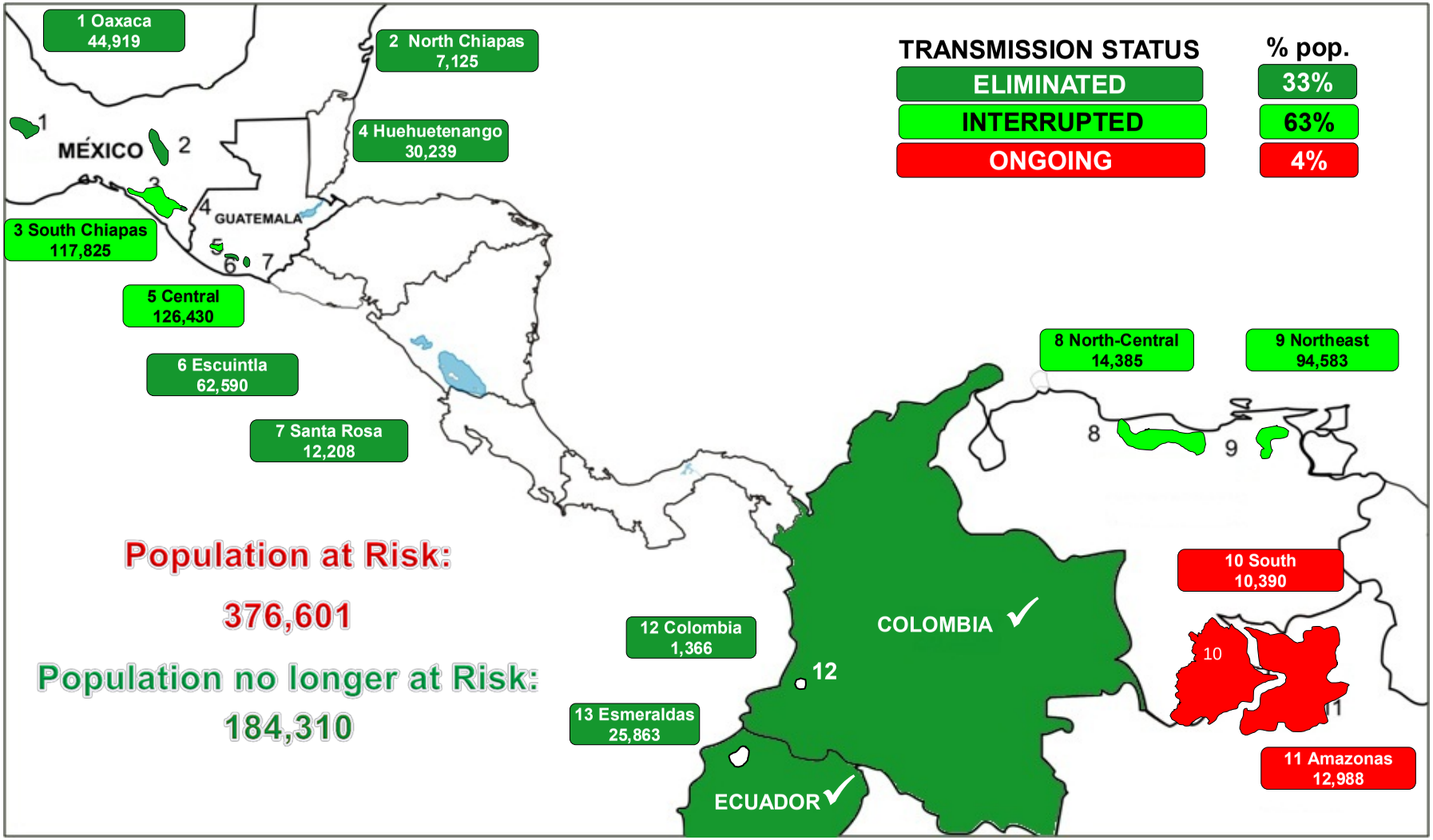
River Blindness is a parasitic disease that affects the eye and skin in human beings. It is caused by the filarial worms known as Onchocerca volvulus, a parasite that can live up to 14 years in the human body. The disease is transmitted by the black fly 'Simulium', which is known locally in River Nile State as 'Kunteeb". The fly breeds in fast flowing waters like cataracts, waterfalls and fast streams.

The disease is widely spread in Central and South America, Asia (Yemen,) and in about thirty countries in the tropical and equatorial regions of Africa. About 17 million people were already affected by this disease, while about 120 millions are at risk of being infected with it. Same time, the number of blind people amounts to about 270 thousand people, and 500 thousand people have some sort of visual impairment. The inflammation caused by larvae that die in the eye results initially in reversible lesions on the cornea that without treatment progress to permanent clouding of the cornea, resulting in blindness. There can also be inflammation of the optic nerve resulting in vision loss, particularly peripheral vision, and eventually blindness. This will definitely have a socio-economic impact on those countries in addition to being a public health problem.

ص.ب : ٣٠٣ الخرطوم - تلفون : ٨٣٧٧٢٤٢٢ - ٢٤٩+ العنوان التلغرافي: وزير دواء - تلكس : ٢٢٨٩٦ شفاء
P.O.Box : 303 KHARTOUM - TEL : (+249) 83773422 TELEGRAPHIC ADDRESS (WAZEER DAWA) TELEX : 22896 SH

Frontispiece
Figure G

Geographic distribution of onchocerciasis and transmission status in the Americas, 2012



✓ Country has satisfied the criteria to apply for certification of elimination

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Figure H

Uganda's three newest foci to interrupt transmission of onchocerciasis 2012

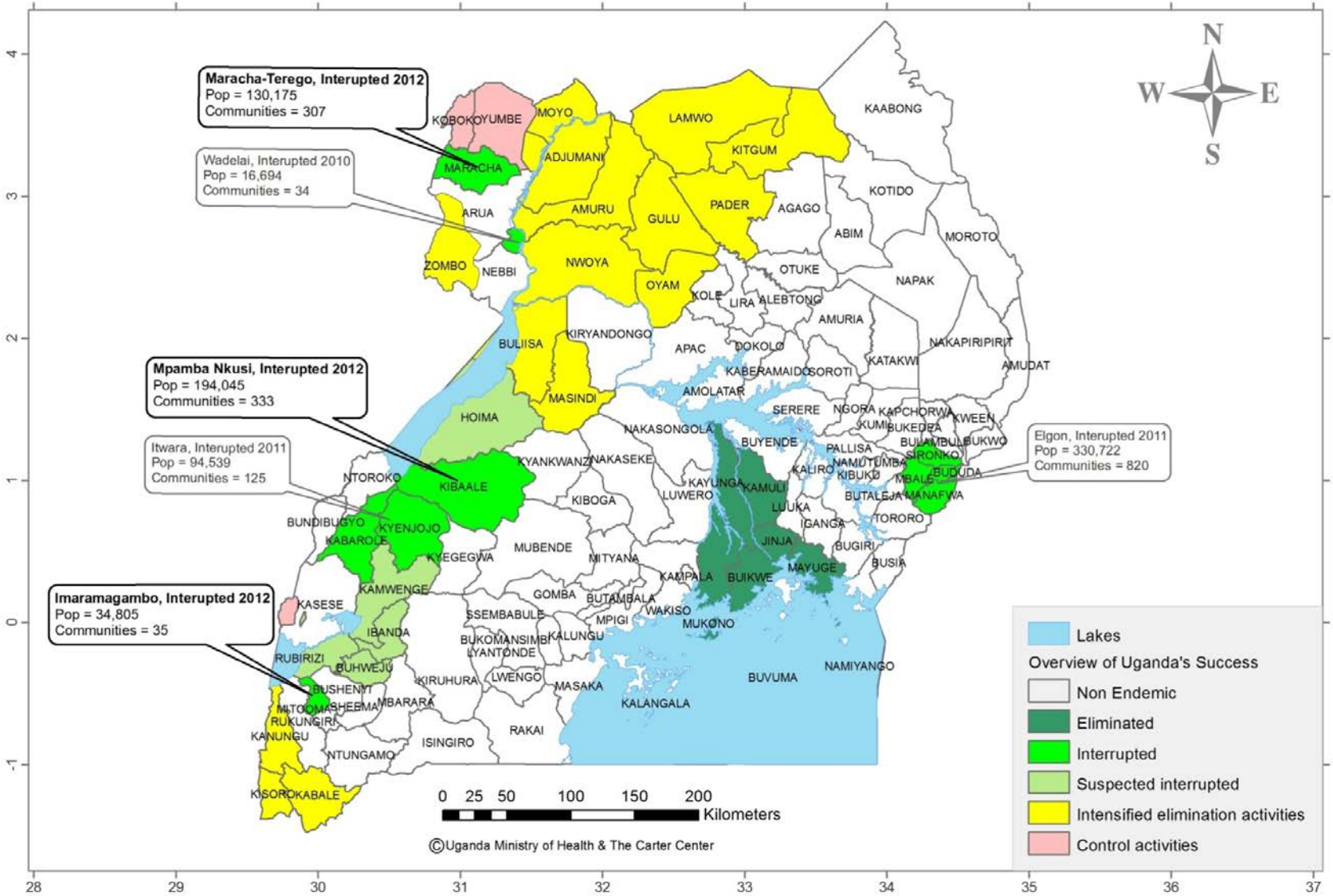

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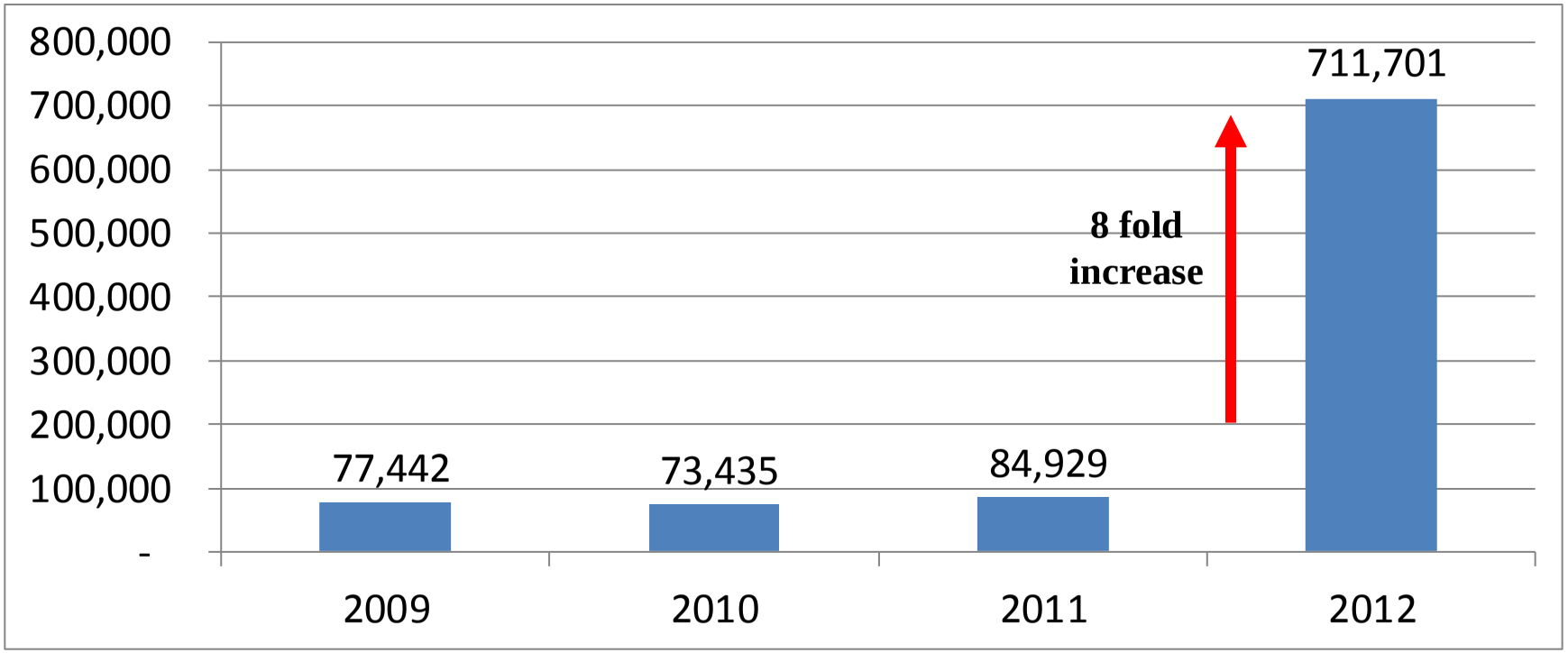
Figure I

Ethiopia: an 8 fold increase in The Carter Center assisted Lymphatic Filariasis (Mectizan and albendazole) treatments in 2012



There are no other LF MDA programs operating in Ethiopia during this time period

Frontispiece
Figure J

Recognition of outstanding Carter Center staff!

Dr. Emmanuel S. Miri, Carter Center Country Director, Nigeria, receives status as 2012 Officer of the Order of the Federal Republic (OFR) of Nigeria

Dr. Mauricio Sauerbrey, Carter Center Director, OEPA, with his OEPA team showing his 2012 Mectizan® Award on the 25th anniversary of the donation!

Dr. Alfredo Dominguez, Carter Center senior epidemiologist, OEPA, receiving 2012 Science Award from Mexico's Chiapas state.

Frontispiece
Figure K

Uganda: 2012 Treatment Coverage in Semiannual Treatment Areas

Transmission Interrupted
Transmission Interruption Suspected
Implementing Elimination Policy

Name of Focus	Name of District	Total Popn (Projection)	Popn treated cumulative for 2012 for 1st rd	Popn treated cumulative for 2012 for 2nd rd	Popn treated cumulative for both rounds	Ultimate Tx Goal (UTG 1) for 2012	Ultimate Tx Goal (UTG 2) 2012 for both rounds	TX cov of (UTG 1) for 2012 1st round	TX cov of (UTG1) for 2012 2nd round	TX cov of UTG 2 2012 for both Rounds	Active villages cumulative for 2012		Active villages UTG for 2012	Active villages coverage of UTG for 2012	
											1st Rd	2nd Rd		1st Rd	2nd Rd
Mpamba-Nkusi	Kibaale	194,045	157,099	158,370	315,469	160,062	320,124	98%	99%	99%	330	330	330	100%	100%
Kashoya-Kitomi	Buhweju	58,217	47,036	47,433	94,469	47,838	95,676	98%	99%	99%	96	96	96	100%	100%
	Rubirizi	74,638	59,774	60,358	120,132	61,523	123,046	97%	98%	98%	170	170	170	100%	100%
	Ibanda	25,260	20,604	20,910	41,514	21,068	42,136	98%	99%	99%	60	60	60	100%	100%
	Kamwenge	44,083	35,422	35,631	71,053	35,916	71,832	99%	99%	99%	53	53	53	100%	100%
Wambabya-Rwamarongo	Hoima	73,172	57,686	58,764	116,450	60,535	121,070	95%	97%	96%	70	70	70	100%	100%
Budongo	Hoima	72,778	57,275	59,017	116,292	60,120	120,240	95%	98%	97%	70	70	70	100%	100%
	Buliisa	26,206	21,004	21,338	42,342	21,744	43,488	97%	98%	97%	30	30	30	100%	100%
	Masindi	46,132	36,778	36,680	73,458	37,709	75,418	98%	97%	97%	60	60	60	100%	100%
Bwindi	Kabale	28,433	22,037	21,976	44,013	22,657	45,314	97%	97%	97%	38	38	38	100%	100%
	Kanungu	54,816	43,413	43,856	87,269	44,384	88,768	98%	99%	98%	105	105	105	100%	100%
	Kisoro	35,046	27,392	27,675	55,067	28,265	56,530	97%	98%	97%	45	45	45	100%	100%
Nyagak-Bondo	Nebbi	120,916	96,950	97,088	194,038	98,589	197,178	98%	98%	98%	168	168	168	100%	100%
	Zombo	234,294	189,396	182,246	371,642	194,730	389,460	97%	94%	95%	625	625	625	100%	100%
	Arua	155,405	116,427	130,795	247,222	131,614	263,228	88%	99%	94%	325	325	325	100%	100%
Mid North 1	Gulu	31,373	17,910	26,523	44,433	27,041	54,082	66%	98%	82%	24	24	24	100%	100%
	Amuru	29,924	24,510	24,771	49,281	24,759	49,518	99%	100%	100%	16	16	16	100%	100%
	Pader	231,874	113,874	0	113,874	197,093	394,186	58%	0%	29%	602	0	612	98%	0%
	Kitgum	128,259	64,900	0	64,900	109,497	218,994	59%	0%	30%	272	248	272	100%	91%
	Lamwo	122,181	65,031	0	65,031	97,745	195,490	67%	0%	33%	271	0	271	100%	0%
Grand total		**1,787,052**	**1,274,518**	**1,053,431**	**2,327,949**	**1,482,889**	**2,965,778**	**86%**	**71%**	**78%**	**3,430**	**2,533**	**3,440**	**100%**	**74%**

Frontispiece
Figure L

Carter Center staff (Frank Richards, Craig Withers, Amy Patterson, Becky Brookshire & Darin Evans) attend national meeting for malaria and LF in Abuja (March 27-28, 2012).

HIGHLIGHTS OF THE PROGRAM REVIEW

Over 80 professionals and donors from 11 countries attended the 17th Review of the River Blindness Program (RBP) of The Carter Center (TCC), which was held from March 5-7, 2013 (Frontispiece Figure A). Former U.S. President Jimmy Carter attended the session on March 7.

The RBP assists the ministries of health (MOHs) of 10 countries[1] to distribute Mectizan® (ivermectin, donated by Merck) through programs whose goal is to control or eliminate onchocerciasis. Most of these activities are undertaken in collaboration with Lions Clubs International Foundation (LCIF) under the Lions-TCC SightFirst Initiative. The RBP also helps countries integrate river blindness (RB) efforts with activities against lymphatic filariasis (LF), malaria, schistosomiasis, and trachoma when feasible. In 2012, all TCC programs providing mass drug administration (MDA) for the neglected tropical diseases (NTDs) assisted ministries of health to provide 32.8 million treatments to 26.1 million persons (Frontispiece Figure B); the RBP and its partners provided more than 14.3 million Mectizan® treatments for RB. From 1996 to 2012, TCC's RBP has assisted over 172 million Mectizan® treatments (Frontispiece Figure C).

In 2012, TCC's RBP obtained our Board of Trustees' approval for an 8-year plan to interrupt RB transmission everywhere we assist by 2020. The change in goals in Africa was due in large part to decisions made by the ministries of health of Ethiopia and Nigeria to make their goal RB transmission elimination, rather than control, to be coordinated with LF elimination activities. The approach to elimination is defined by 4 phases (Frontispiece Figure D): 1) Transmission ongoing ('open system'); 2) Transmission suppressed ('closed system'); 3) Transmission interrupted; 4) Transmission eliminated. In 2013, the Board of Trustees of TCC agreed to change the name of the TCC's RBP to the TCC River Blindness ***Elimination*** Program (RBEP) to reflect this paradigm shift of focusing all efforts on taking the areas where RBEP works through these stages. Note that because this report is based on 2012 work done before the RBEP name change occurred, "RBP" will be used in most of the text.

The Federal Ministry of Health of Sudan declared the interruption of onchocerciasis from the Abu Hamad focus in May 2012 and stopped treatment there (Frontispiece Figures E and F). TCC will continue to assist in the 3-year post treatment surveillance phase of that program, required prior to declaration of transmission elimination (Frontispiece Figure D). The report of this effort has been published in the *American Journal of Tropical Medicine and Hygiene* (Higazi et al, 2013).

TCC's Onchocerciasis Elimination Program for the Americas (OEPA) recommended that the Northeast focus in Venezuela (the third largest in the Americas region) stop mass treatments at the end of 2012. The Ministry of Health of Venezuela agreed. Of 13 endemic foci in 6 countries in the Americas, 11 have now stopped MDA

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

(Frontispiece Figure G). Colombia became the first country in the Americas to receive verification of elimination from the World Health Organization (WHO). Ecuador is now poised to request verification from WHO in 2013.

In Uganda, the Ugandan Onchocerciasis Elimination Expert Advisory Committee recommended to the Ministry of Health that treatments be halted in 3 more foci (Maracha-Terango, Mpamba Nkusi, and Imaramagambo – Frontispiece Figure H) where transmission has been determined to be interrupted through a series of serological and entomological studies. Of 18 Ugandan foci, 1 has eliminated transmission, 6 have interrupted transmission (of which 4 are under post-treatment surveillance (PTS), and 2 continue ivermectin/albendazole treatment due to LF) 3 are suspected to have interrupted transmission, and in 8 transmission is continuing. Twice per year treatment (semiannual) is being widely used in Uganda with good treatment coverage (Frontispiece Figure K).

In Ethiopia, TCC-assisted RB program increased treatments by 50%, and the TCC-assisted Lymphatic Filariasis (LF) Elimination Program increased total ivermectin and albendazole (donated by GSK) treatments 8 fold over 2011 (Frontispiece Figure I). Both TCC-assisted RB and LF programs are the largest of their kind in Ethiopia.

In Nigeria, TCC assisted the Ministry of health to conduct a WHO LF Transmission Assessment Survey (TAS) among over 7,000 children ages 6-7 years in Plateau and Nasarawa states following 9 or more years of ivermectin/albendazole MDA according to recently published WHO guidelines. Overall mean LF circulating antigen levels were 0.35% (25 positives). The results determined that LF transmission had been interrupted and that MDA for LF could be stopped in the two states (population ~4 million) in 2013. Recent mass distribution of long lasting insecticidal nets (LLINs) for malaria throughout two states contributed to this victory. A national meeting between the LF and malaria programs was held to seek synergies for common action (Frontispiece Figure I).

TCC RBP staff who were recognized with major awards in 2012 include: 1) Dr. ES Miri, TCC Country Director, Nigeria, received the Order of the Federal Republic (OFR) of Nigeria; 2) Dr. Mauricio Sauerbrey, OEPA Director, won the 2012 Mectizan Award on the 25th anniversary of the donation; and 3) Dr. Alfredo Dominguez, OEPA Epidemiologist, won the 2012 Chiapas Award on Sciences by the governor of his home state in Mexico (Frontispiece Figure J).

TCC endorsed the 2012 London Declaration, “Uniting to Combat NTDs,” with a commitment to help expand or extend NTD programs where we work. Under new NTD national plans in Nigeria and Ethiopia, TCC will assist those 2 countries as resources allow, in an effort to scale up MDA under their national NTD plans, especially in LF, soil-transmitted helminths (STH), and urinary and intestinal schistosomiasis.

Lastly, the RBP Program Review meeting honored the memory of highly esteemed colleague and friend, Nancy Cruz Ortiz, who passed away August 3, 2012. Nancy supervised the critical work of the Universidad del Valle onchocerciasis elimination

reference laboratory, assisting in epidemiological evaluations of the OEPA program since 2005. Her work contributed to the transition of seven of the thirteen foci in the Americas from “transmission ongoing” to “transmission eliminated.” She also was key in helping to establish the Ministry of Health laboratory in Kampala that supports the Ugandan elimination effort. Nancy will be fondly remembered.

BACKGROUND

Human onchocerciasis, an infection caused by the parasitic worm *Onchocerca volvulus,* causes chronic skin disease and severe itching, as well as eye lesions that can progress to visual loss or complete blindness. The worms live in fibrous ‘nodules’ that often can be felt just under the skin. Onchocerciasis is transmitted by small black flies that breed in rapidly flowing rivers and streams, thus leading to the common name for the disease, “river blindness” (RB). The WHO estimates that approximately 37.2 million people are infected and 770,000 are blinded or severely visually impaired in 38 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 the oral tablet Mectizan® (ivermectin, donated by Merck & Co.) prevents eye and skin disease caused by *O. volvulus* and may also be used to reduce or even interrupt transmission of the disease depending on the duration and frequency of treatment per year and the geographic extent of the distribution programs. (See Annex 1 and 2 for further details.)

TCC’s RBP is dedicated to safe and sustainable mass distribution of Mectizan® with health education to control or eliminate onchocerciasis. The distinction between control and elimination is important. In the control approach, Mectizan® distribution likely will need to continue indefinitely because onchocerciasis transmission persists and people continue to get new infections (‘open system,’ Frontispiece D); sustainability of control programs is vital. In the elimination approach, Mectizan® treatment is used more intensively to ‘close the system’ so that transmission can eventually be broken. At that point, the MDA can be stopped. In 2012, trying to eliminate onchocerciasis was the RBP goal in the Americas, Uganda and the Abu Hamad focus in Sudan. In 2013, a new goal was set to stop transmission in all areas where RBP assists. Of note, onchocerciasis elimination is now the stated goal of all the governments and their MOHs where RBP assists.

Local Lions Clubs and the LCIF are special partners of TCC in the battle against RB under the Lions-TCC SightFirst Initiative. When TCC assumed the functions of the River Blindness Foundation (RBF) in 1996, it also entered into RBF’s collaboration with local Lions Clubs in Cameroon and Nigeria. Since 1997, LCIF has generously provided grants to TCC for the control or elimination of RB through their SightFirst I and SightFirst II Initiatives. Through the Lions SightFirst I Initiative, LCIF and TCC expanded their partnership to encompass controlling RB in five countries in Africa (Cameroon, Ethiopia, Nigeria, Sudan, and Uganda) and eliminating RB altogether in the

six endemic countries of the Americas. The SightFirst II Initiative currently provides support for RB elimination work in Ethiopia and Uganda.

In 2003, TCC's RBP received its first support from the Bill & Melinda Gates Foundation for OEPA through a matching grant that drew additional funding from LCIF, Merck, and more than 70 other donors. The Gates Foundation provided a supplemental grant of $2 million to OEPA in 2011. Between 2006 and 2011, the Gates Foundation provided support to TCC's integrated programs (which include RB) in Nigeria.

In 2012, the U.S. Agency for International Development (USAID) pledged significant financial support to TCC for OEPA, in partnership with the U.S. Centers for Disease Control and Prevention (CDC). Other external RBP partners include the WHO, the African Program for Onchocerciasis Control (APOC)[1], and the World Bank, as well as other foundations, corporations, governments, and nongovernmental development organizations (NGDOs). Of course, the RBP would not be possible without Merck's donation of Mectizan®.

A major focus of TCC is reaching the best possible treatment coverage, monitored through routine monthly reports by assisted programs (Figure 1) and periodic coverage surveys. Annex 2 is a discussion of this reporting process and treatment indices used by the program and in this report. Important coverage terms include the **Ultimate Treatment Goal** (**UTG**), which is the number of treatment-eligible people living in a program area (persons >5 years of age); the **UTG(2) and UTG(4)**, used by elimination programs in areas where semiannual or quarterly treatments are required to break transmission; the **Annual Treatment Objective** (**ATO**), which is an interim target population in programs that are not operating at full scale due to initial operational limitations or financial resource constraints; and **full coverage**, which is defined as >90% achievement of the UTG, UTG(2), or UTG(4) (85% for OEPA). **Passive treatments** are Mectizan® treatments for onchocerciasis provided through health care units located in hypoendemic communities (where estimated onchocerciasis nodule prevalence is under 20%) in the control program strategy. In elimination programs, hypoendemic villages receive mass treatment (not passive). As our programs transition to the elimination mode, passive treatments will no longer be part of our strategy. Refer to Figure 2 to see coverage of treatment goals over time; this figure demonstrates the impressive progress each program has made toward the high coverage we are now seeing.

Mectizan® tablets are distributed in Africa at the community level by grassroots community volunteers known as Community Directed Distributors (CDDs) through a process known as Community Directed Treatment with Ivermectin (CDTI); CDTI was validated by the Tropical Disease Research (TDR) programme of WHO and broadly introduced into APOC supported project areas throughout Africa in the late 1990's. In some areas, TCC's RBP focuses on "kinship-enhanced CDTI," an approach that seeks

[1] TCC RB projects no longer receive substantial APOC support; they are beyond the 5 year APOC project horizon. (See Annex 8.)

to train more CDDs than is done in classic CDTI. In kinship-enhanced CDTI, CDDs serve within their own kinships or neighborhoods within every community where decisions and activities about treatments are handled. This strategy seeks to increase the active participation of members of the affected communities over the years by: 1) training as many inhabitants of endemic villages as possible to serve as distributors; 2) encouraging the involvement of women; 3) reducing the demand for financial or other "incentives"; and 4) letting community members choose their own health workers and the location of treatment centers. The monitoring indices of the kinship approach include: 1) attaining at least 1 CDD per 100 persons to be treated in all communities; 2) sustaining treatment coverage of at least 90% of treatment-eligible persons; and 3) increasing involvement of women as CDDs and community supervisors. The CDDs and community supervisors are often highly engaged in other community based health interventions, such as water provision and sanitation, malaria control, immunization, and integrated NTD control efforts.

SUMMARY OF THE MEETING

The RBP hosted its 17th annual Program Review meeting on 5 – 7 March 2013, at TCC's headquarters in Atlanta, Georgia. The meeting focused on the achievements, challenges and research of TCC-assisted onchocerciasis elimination programs in 2012. The Review also addressed other diseases and public health initiatives in which TCC helps countries integrate RB programs with LF, malaria, schistosomiasis, soil-transmitted helminths, trachoma, and Vitamin A supplementation programs. A major goal of this meeting was to provide recommendations for each program. The Review is modeled after similar reviews developed by TCC and CDC for national Guinea Worm Eradication Programs since 1988.

Dr. Frank Richards, director of TCC's LF, Malaria, RB, and Schistosomiasis Programs, chaired the meeting. Special guest Dr. Adetokunbo Lucas, recipient of the 2013 Jimmy and Rosalynn Carter Humanitarian Award from the National Foundation for Infectious Diseases, discussed the impact of RB treatments in Nigeria. Former U.S. President Jimmy Carter, who attended the Program Review sessions on March 7, offered additional perspectives on the program's many accomplishments. Other attendees included representatives from the following: the ministries of health of Ethiopia, Nigeria, Sudan, and Uganda; APOC; the Bill & Melinda Gates Foundation; CBM; Center for Child Well-Being; CDC; Children Without Worms; Eck Institute for Global Health at the University of Notre Dame; GlaxoSmithKline; Harvard University; International Task Force for Disease Eradication; Izumi Foundation; LCIF; Liverpool School of Neglected Tropical Diseases; Mectizan Donation Program; Ohio University; RTI International; Sightsavers International; Saudi Fund for Development; Task Force for Global Health; and University of South Florida. (See Frontispiece Figure A for the group photo of participants and Annexes 3, 4 and 5 for a complete participant list, contact list, and agenda.)

In 2012, TCC delivered 14,337,510 Mectizan® (donated by Merck) treatments in 37,544 villages in 10 countries, reaching 94% of the 2012 UTG (detailed data are presented in the table in Figure 1). Overall, 172,254,488 cumulative treatments have been provided since the RBP was launched in 1996. Approximately 56% of the 2012 treatments were supported by Lions. See Figure 3 for an illustration of treatments over the years by project. Approximately 150,000 CDDs working at the grass roots community level were trained during the year to accomplish the 2012 treatments.

TCC-assisted programs have worked continually to enhance sustainability. One strategy is to include more women in the training sessions so that they can participate in community-directed treatment. Figure 4 shows the progress of these efforts. In 2001, 19% of CDDs were female; that number rose to 44% in 2012.

***Americas*:** TCC's OEPA coalition includes MOHs of the six endemic countries, Lions Clubs and LCIF, the Bill & Melinda Gates Foundation, the Pan American Health Organization (PAHO)/ WHO, MDP, the CDC and USAID.

A total of 236,272 ivermectin treatments were given in the Americas in 2012 in the three remaining endemic areas in Brazil and Venezuela, which accounted for 86% of the treatment goal. In 2013, only 5% of the original population at risk in the Americas is now receiving treatment and experiencing disease transmission. This population resides in two foci in Venezuela and Brazil. In reality, these foci make up a single focus that crosses the border between the two countries. The total population of these foci is less than 25,000, but the difficult Amazonia terrain will make this last bastion of onchocerciasis in the Americas a big challenge to eliminate. The indigenous (Yanomami) people who live here are migratory, difficult to locate in dense jungle and frequently cross the border. Effective air transport and binational cooperation are critical to stamping out the remaining onchocerciasis in the Americas. Since 2007, active eye disease attributable to onchocerciasis was found only in this shared focus, and since 1995, no new cases of blindness attributable to onchocerciasis have been reported by MOHs in the Americas.

***Uganda*:** The Lions-TCC assisted Uganda RBP administered 2,871,760 Mectizan® treatments in 2012 (81% of its target), provided by over 38,000 CDDs. Of the 2012 treatments, 543,811 were annual treatments in control areas and 2,327,949 were twice per year treatments in elimination areas (Figure 1, Frontispiece Figure K). In 2012, the Lions-TCC assisted Uganda program expanded into a large, previously untreated area called 'North I focus.' This area, which is highly endemic for onchocerciasis, was previously embroiled in conflict and thus unreachable. The Lions-TCC-assisted program in Uganda also is receiving RTI ENVISION support for onchocerciasis elimination.

***Sudan*:** Sudan's Lions-TCC RB elimination effort supported the ministry of health in delivering 266,233 treatments, administered by 2,365 CDDs. RBEP will wind down its program in Sudan.

***Nigeria*:** A total of 6,056,437 Mectizan® mass treatments for RB were distributed in Nigeria in 2012 by the ministry of health with assistance from TCC. Nigeria trained or re-trained over 38,000 CDDs to accomplish the distribution.

The Federal Ministry of Health of Nigeria convened a two day meeting in Abuja, co-sponsored by TCC, to explore the opportunities for co-implemented programs to address both malaria and LF. The Abuja meeting focused on identifying areas of programmatic synergy, and promoting active collaboration to improve efficiency and increase the impact of both programs. Integrated efforts could accelerate the scale-up of long lasting insecticidal net (LLIN) and MDA interventions, with increased reductions in attributable-morbidity and transmission for both diseases. The event was presided over by former head of state General Dr. Yakubu Gowon, who opened the meeting with the Permanent Secretary of Health, Mrs. Fatima Bamidele. Over 200 people attended, including Federal and State Ministry personnel, NGDOs, partner organizations, donor agencies, and the mass media. Participants from TCC included Frank Richards, Amy Patterson, Craig Withers, Darin Evans and Becky Brookshire (Frontispiece Figure L).

In 2012, TCC assisted 1,172,859 praziquantel treatments for schistosomiasis in four assisted states (Delta, Edo, Nasarawa and Plateau). The majority of the praziquantel used in Nigeria is donated to TCC through WHO by Merck KGaA (E-Merck), Germany. Whenever possible and appropriate, praziquantel treatments are given simultaneously with LF and/or RB treatments, as the three drugs involved (ivermectin, albendazole, and praziquantel) can be safely taken at one time (albendazole is donated by GSK). The Izumi Foundation supports this program in Delta and Edo states.

In 2013, USAID and RTI are supporting surveys for soil-transmitted helminths, schistosomiasis, trachoma, and *Loa loa* in the nine states assisted by TCC in southeastern Nigeria. If resources are made available, the program may soon begin to address LF in *Loa loa* endemic areas (parts of southeastern Nigeria) using monotherapy albendazole MDA combined with LLIN use, in accordance with new WHO guidelines. Over 60 million LLINs have already been distributed throughout Nigeria for malaria control.

***Ethiopia*:** In Ethiopia, 4,882,782 persons were treated with ivermectin in 2012 in TCC assisted areas, a 52% increase over 2011 treatments as the program moved into newly identified endemic districts. Over 70,000 CDDs were responsible for these treatments. In 2013, Ethiopia will begin twice per year treatments in support of its national plan to eliminate onchocerciasis. TCC onchocerciasis efforts in Ethiopia are based on a long standing partnership with the ministry of health, Lions Clubs and the Lions Clubs SightFirst Program.

2013 GENERAL RECOMMENDATIONS FOR THE CARTER CENTER RIVER BLINDNESS ELIMINATION PROGRAM

In 2013, we will embrace the opportunity to work closely with the USAID/RTI/ENVISION project, which will provide support for TCC/RBP NTD mapping and potentially for subsequent RB elimination efforts within the context of other 'integrated' NTD efforts in Ethiopia, Nigeria and Uganda.

In collaboration with the host governments, RBEP will move to help interrupt onchocerciasis transmission ('elimination') in all TCC-assisted RBP areas in Nigeria, Uganda and Ethiopia by 2020. This will include new assessments, and enhanced interventions (twice or four times per year ivermectin treatment) where transmission persists or in new areas where treatments have never been given. Seek dedicated funding that will support enhanced RB elimination interventions.

Encourage WHO (APOC, PAHO) and the concerned Ministries of Health to evaluate and treat cross border foci in a coordinated manner. In OEPA, work with Venezuela and Brazil to identify all as yet unknown endemic villages in the Venezuelan side of the Yanomami focus and launch four times per year ivermectin treatment in all meso and hyperendemic villages. In Uganda, work with DRC at the Bwindi focus border with particular urgency.

Help delimit the precise borders of African onchocerciasis foci targeted for elimination in TCC/RBP assisted areas. This involves new work in defining transmission within the so called 'hypoendemic' onchocerciasis areas that have traditionally not been targeted for Mectizan® treatment under previous WHO/APOC disease control policy.

All RBEP African programs should undertake treatment coverage questionnaire surveys that provide 95% confidence intervals.

Submit drug applications to MDP as early as possible, and no later than August of the year before the drug is needed. This is especially important as TCC/RBP moves in many assisted areas to twice per year treatments. Work with federal agencies to facilitate appropriate documentation and clearance for all medications. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year.

Changes in UTG denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made. Headquarters should be alerted if additional drug is needed in these cases. National program authorities and MDP should be advised accordingly. Changes in numbers of treatments to be administered (numerators) require discussion and approval by the MOH/NOTF, MDP and TCC HQ.

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

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

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

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

Overall Treatment Objective for onchocerciasis for 2013: 20,741,917

Quarterly UTG(4):	**50,402 treatments**
Semiannual UTG(2):	**11,646,084 treatments**
Annual UTG:	**9,045,431 persons/treatments**

Training Objective for 2013:

CDDs:	**206,752**
Community supervisors:	**40,535**

Figure 1

2012 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=**	**6,045,518**		**UTG(arv)=**	**8,124**										
Treatments	0	0	0	0	0	310,496	1,104,709	1,124,186	1,656,451	1,054,048	589,009	217,532	**6,056,431**	100%	42%
Villages treated	0	0	0	0	0	398	1,795	1,929	1,862	1,173	877	151	**8,185**	101%	22%
UGANDA	***UTG=**	**571,029**		**UTG(arv)=**	**768**										
Treatments	0	0	0	0	16,948	0	24,779	171,403	113,522	211,181	0	5,978	**543,811**	95%	4%
Villages treated	0	0	0	0	35	0	9	184	206	334	0	0	**768**	100%	2%
UGANDA ELIMII	****UTG(2)=**	**2,965,778**		**UTG(arv)=**	**3,440**										
Treatments	0	0	0	0	449,955	20,604	236,421	189,396	378,142	35,631	769,224	248,576	**2,327,949**	78%	16%
Villages treated	0	0	0	0	927	60	324	625	1,494	0	0	0	**3,430**	100%	9%
OEPA	****UTG(2)=**	**149,948**		**UTG(arv)=**	**384**										
Treatments	0	0	0	0	0	64,488	0	0	0	0	0	71,583	**136,071**	91%	1%
Villages treated	0	0	0	0	0	331	0	0	0	0	0	364	**364**	95%	1%
OEPA	****UTG(4)=**	**125,371**		**UTG(arv)=**	**288**										
Treatments	0	0	13,091	0	0	29,374	0	0	28,228	0	0	29,508	**100,201**	80%	1%
Villages treated	0	0	169	0	0	278	0	0	270	0	0	266	**278**	97%	1%
ETHIOPIA	***UTG=**	**5,128,685**		**UTG(arv)=**	**24,367**										
Treatments	0	0	0	0	0	0	3,393,740	0	0	0	0	1,489,042	**4,882,782**	95%	34%
Villages treated	0	0	0	0	0	0	14,434	0	0	0	0	9,844	**24,278**	100%	65%
SUDAN	****ATO=**	**19,723**		**UTG(arv)=**	**20**										
Treatments	0	0	0	0	0	0	0	0	0	0	0	18,617	**18,617**	94%	0%
Villages treated	0	0	0	0	0	0	0	0	0	0	0	19	**19**	95%	0%
SUDAN ELIMIN	****UTG(2)=**	**204,862**		**UTG(arv)=**	**153**										
Treatments	0	0	0	0	0	122,302	0	0	0	0	0	125,314	**247,616**	121%	2%
Villages treated	0	0	0	0	0	153	0	0	0	0	0	153	**153**	100%	0%
TOTALS	***UTG=**	**15,210,914**		**UTG(arv)=**	**37,544**										
Treatments	**0**	**0**	**13,091**	**0**	**466,903**	**547,264**	**4,759,649**	**1,484,985**	**2,176,343**	**1,300,860**	**1,358,233**	**2,206,150**	**14,313,478**	**94%**	
Villages treated	**0**	**0**	**169**	**0**	**962**	**1,220**	**16,562**	**2,738**	**3,832**	**1,507**	**877**	**10,797**	**37,475**	**100%**	

Cumulative RBP-assisted treatments (1996 - 2012) = 172,254,488

2012 Mass Treatments	14,313,478
2012 Passive Treatments	24,032
2012 TOTAL TREATMENTS	**14,337,510**

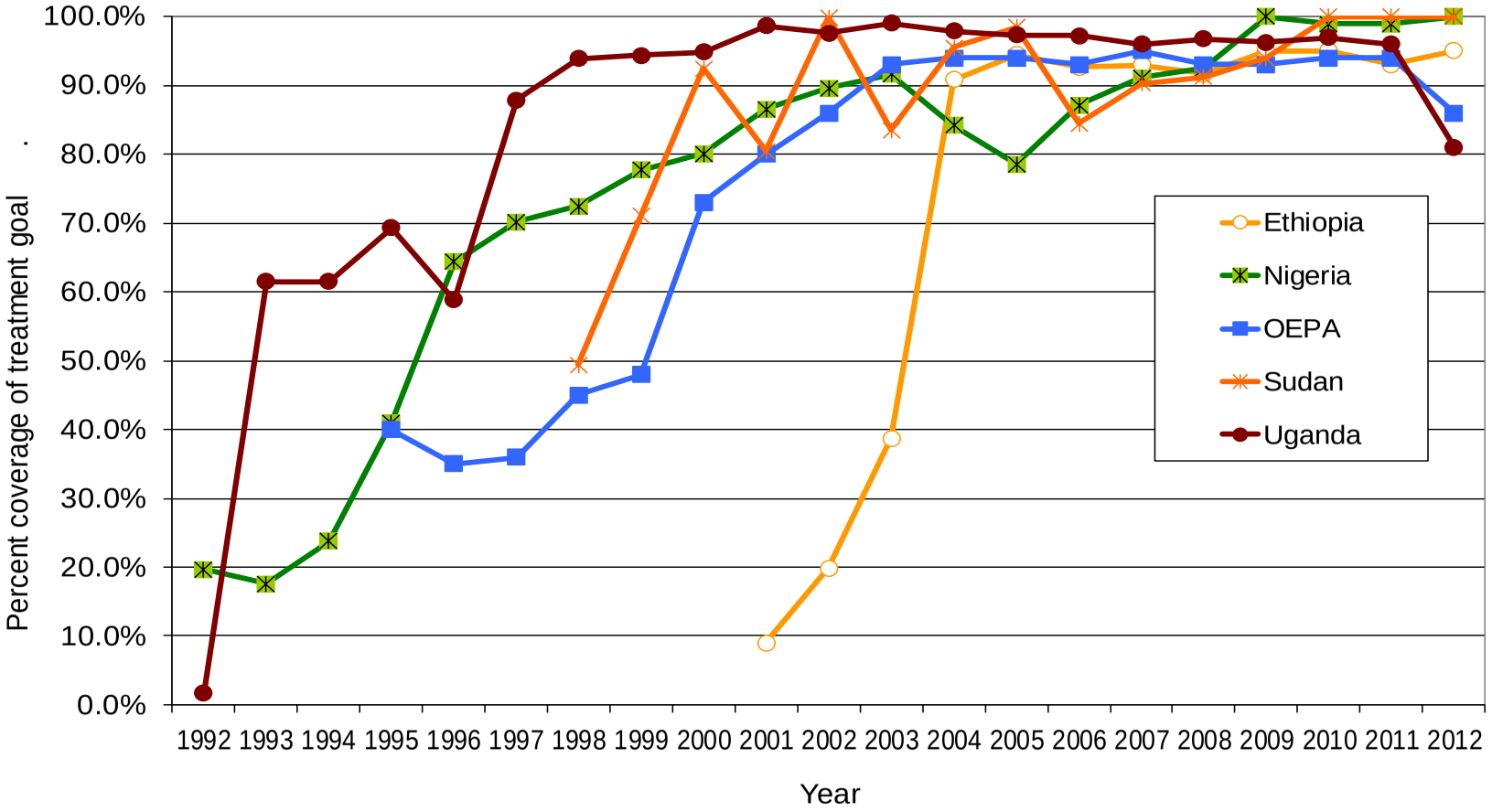
***UTG**: Ultimate Treatment Goal (all the treatment-eligible population in a program area, i.e. healthy persons >5 years of age)

OEPA's **UTG(2) and UTG(4) are the Ultimate Treatment Goal times 2 or 4, since OEPA treatments are semiannual or quarterly

****ATO**: Annual Treatment Objective: used in this case because population is unknown

Figure 2

River Blindness Program: Treatment coverage (eligible population) by project: UTG, UTG(2) or UTG(4) 1992 – 2012*



* 1992 – 1995 treatments were provided by River Blindness Foundation.

Figure 3

Carter Center-Assisted Programs: 1996 – 2012 Mectizan® Treatments by Program

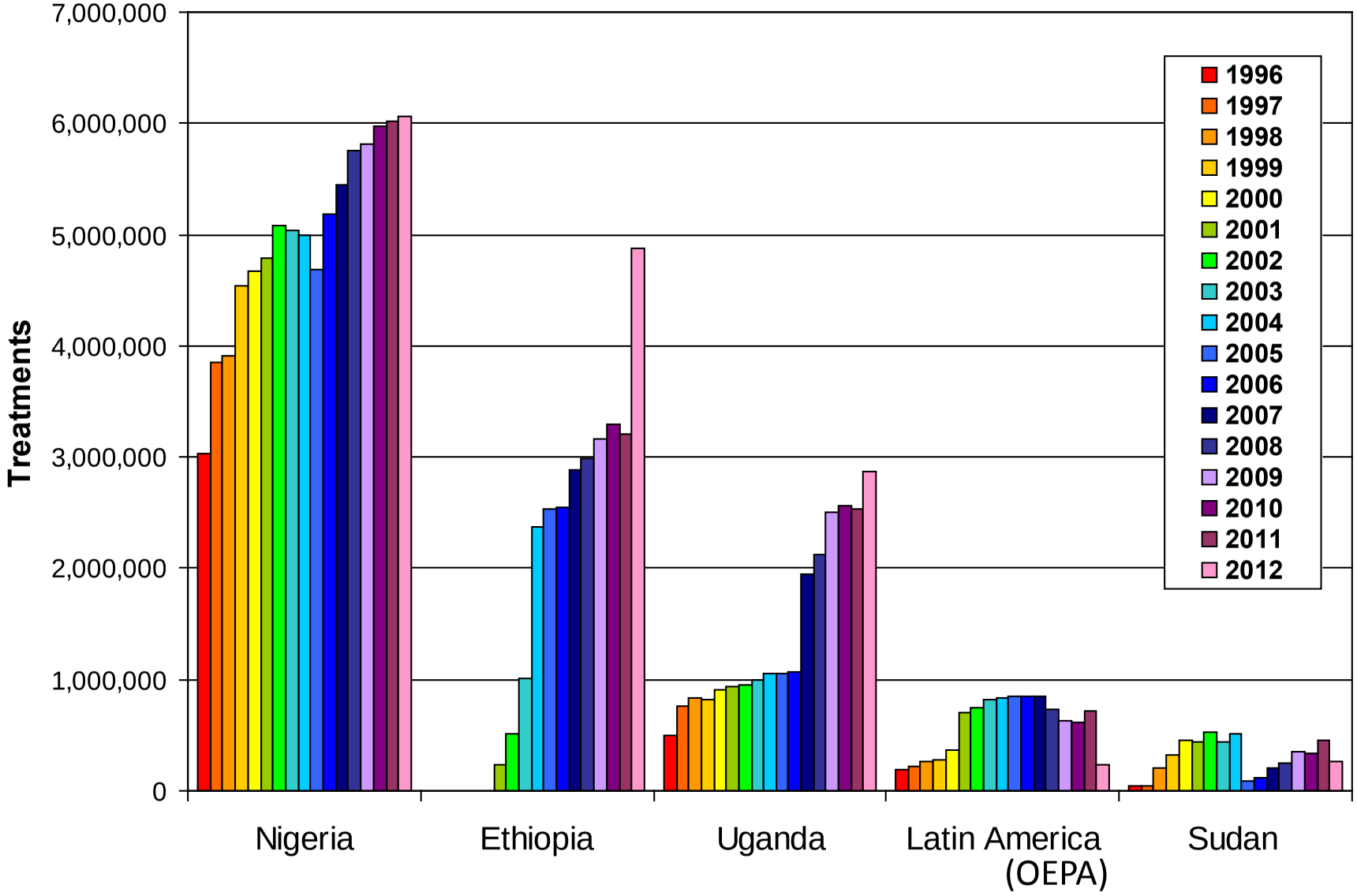
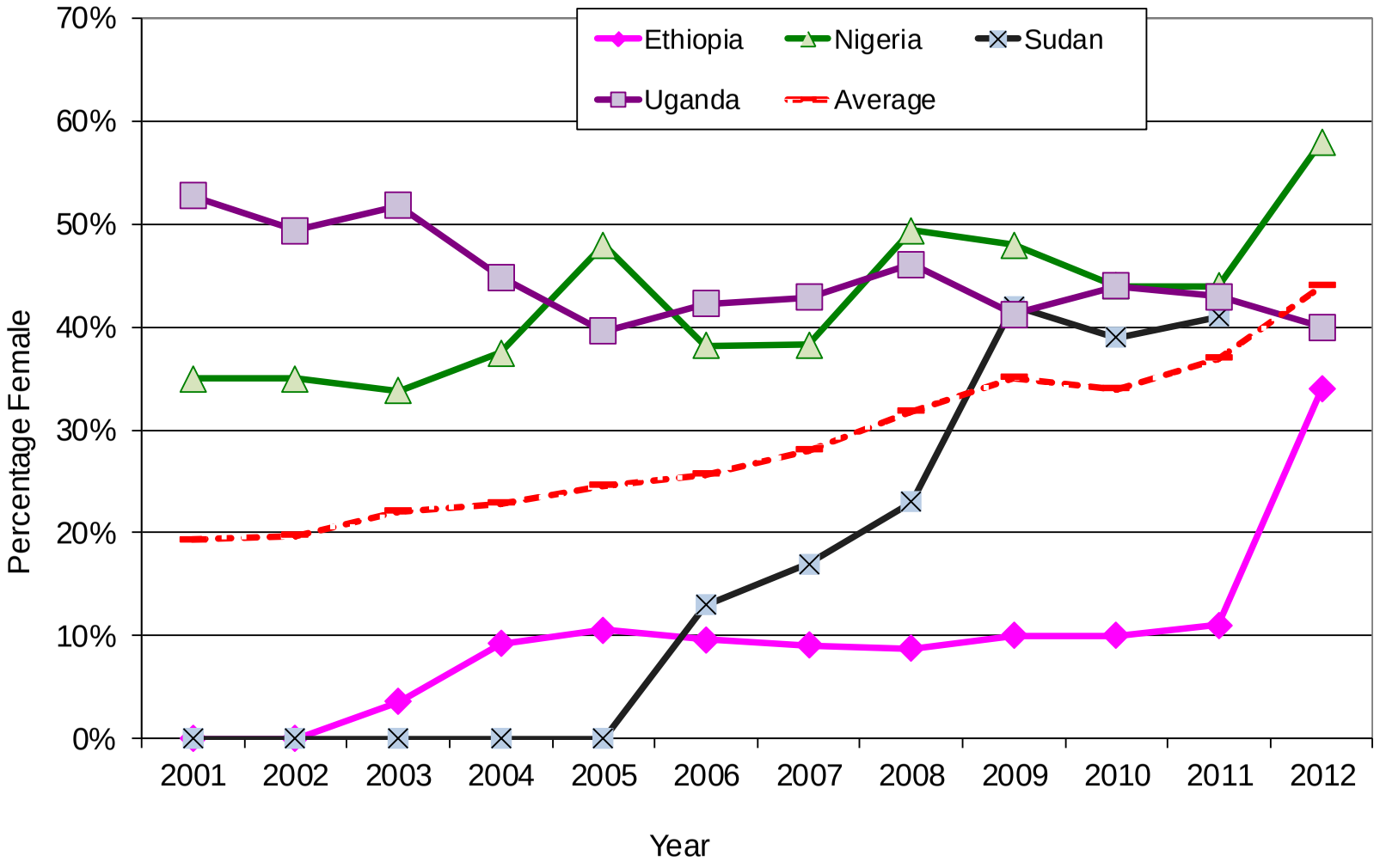


Figure 4

Increasing Percentage of Female Community Distributors in Carter Center-assisted River Blindness Programs in Africa: 2001 – 2012



ONCHOCERCIASIS ELIMINATION PROGRAM FOR THE AMERICAS (OEPA)

Summary

Transmission of onchocerciasis in the Americas has been interrupted or eliminated in all but two of the original 13 foci (Frontispiece Figure G); 4 of 6 countries (Colombia, Ecuador, Guatemala, and Mexico) have stopped treating and the population targeted for treatment has decreased by 95% compared to 2005 peak (Figure 5). The final challenge is the Yanomami Area, which is a focus shared by Brazil and Venezuela. This is the last active transmission zone for onchocerciasis in the Americas and the only area still under treatment. Transmission is believed to have been eliminated entirely in Colombia and Ecuador. Elimination verification of Colombia by a WHO team was completed in 2012; a similar verification visit to Ecuador may be accomplished in 2013.

In 2012, The Carter Center received significant financial support from the United States Agency for International Development (USAID) for OEPA.

BACKGROUND

The Onchocerciasis Elimination Program for the Americas (OEPA) is a Carter Center-led program that serves as the vanguard of the regional initiative working to eliminate both morbidity and transmission of onchocerciasis from the Americas through distribution of Mectizan® every 6 months, and in some areas every 3 months, in all affected communities of the 13 endemic areas of the Americas region. Mass Drug Administration (MDA) aims at reaching ≥85% coverage of the population eligible for treatment. In addition to The Carter Center, the OEPA coalition includes ministries of health (MOHs) of the 6 countries with onchocerciasis in the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela), the Lions Clubs International Foundation (LCIF) and local Lions Clubs, the Bill & Melinda Gates Foundation, Pan American Health Organization/World Health Organization (PAHO/WHO), Merck and the Mectizan® Donation Program (MDP), USAID, the U.S. Centers for Disease Control and Prevention (CDC), and several US and Latin American universities. A Program Coordinating Committee (PCC) serves as the steering committee for Carter Center OEPA staff, who are based in Guatemala City, Guatemala. Technical and financial assistance to the 6 countries flows through the OEPA office.

The OEPA initiative was launched by the River Blindness Foundation in 1993 in response to the 1991 Resolution XIV of the 35th PAHO Assembly that called for the elimination of onchocerciasis morbidity from the Americas by the year 2007. The Carter Center assumed administrative responsibilities for OEPA in 1996. In 2008, PAHO renewed the call to eliminate onchocerciasis (Resolution CD48.R12) throughout the region. A subsequent 2009 PAHO Resolution (CD49.R19), calling for the elimination or drastic reduction of 12 neglected infectious diseases of poverty in the Americas by 2015, includes onchocerciasis as an elimination target.

In 2001, the WHO established a set of guidelines to assist onchocerciasis programs to determine whether interruption of transmission had occurred and MDA with ivermectin could be stopped. The process is shown diagrammatically in Frontispiece Figure D and

involves three key points depicted by the three vertical arrows: 1) Suppression of transmission, when infective stage larvae are no longer introduced into the human population by the vectors (Annual Transmission Potential [ATP] is at or near zero), but the parasite population maintains the ability to recover if interventions are withdrawn; 2) Interruption of transmission, when the parasite population is thought to be unable to recover and ivermectin treatment can be halted; and 3) Elimination of transmission and the parasite, after a post-treatment surveillance (PTS) period confirms no return of transmission in the absence of treatment or other interventions. Once all country foci reach the elimination stage, final country verification can be considered by an independent international team meeting under the auspices of the WHO.

The primary strategy for eliminating onchocerciasis from the Americas is ivermectin MDA every 3-6 months, with health education and community mobilization, in all affected communities of the 13 endemic foci in the six affected countries. MDA aims to achieve at least 85% coverage of the population at risk and eligible for treatment. Communities targeted for MDA are divided by baseline onchocerciasis prevalence into hyperendemic (≥60%), mesoendemic (≥20%, but <60%), and hypoendemic (evidence of autochthonous cases, but with prevalence <20%). Transmission is most difficult to break in hyperendemic areas, where the current strategy is to provide MDA every 3 months.

By the end of 2012, *O. volvulus* transmission was interrupted or eliminated in 11 of the 13 foci in the Americas. The status of each focus is provided in Figure 6. In 2012 a total of 136,071 semiannual Mectizan® treatments were given in three foci in Venezuela and Brazil (Figure 7, top panel). Two of six rounds (33%) were below the target 85% coverage. In hyperendemic areas in those same foci, 100,201 quarterly treatments were given, with coverage in 7 of 12 rounds (58%) being below the target 85% (Figure 7, bottom panel).

The Yanomami Area shared by shared by Brazil and Venezuela (Figure 8) is the last active transmission zone for onchocerciasis in the Americas and the only area that will be under treatment in 2013. The treatment scheme for the area is shown in the Figure, with hyperendemic areas targeted for quarterly treatment.

A country by country update follows:

Country Updates

Venezuela. The three foci in northcentral, northeast, and south Venezuela comprise 119,358 persons at risk for onchocerciasis infection, the third highest national total in the Americas. The focus in south Venezuela had the second highest rate of microfilariae measured in the skin at baseline among the 13 foci in the Americas (See Figure 6). Since 2000, Venezuela has conducted MDA semiannually in 100 hyperendemic, 212 mesoendemic, and 297 hypoendemic communities. In 2010, the program began conducting MDA quarterly in 66 hyperendemic communities in the

south and northeastern foci, eventually extending this to an additional 35 hyperendemic and five mesoendemic communities. When transmission was interrupted in the northcentral and northeast foci in 2010 and 2012, respectively, programs in those two foci had administered 17 and 20 rounds of mass treatment, with overall annual reported coverages of ≥85%. In 2013, treatments will be halted in the northeast focus. The main challenges for the southern focus (which had completed 14 rounds of MDA between 2006 and 2012) now are to search the remaining suspect areas for any still-unidentified endemic Yanomami communities and immediately increase MDA frequency to quarterly in all hyperendemic villages. Discovery of new communities in the area has continued to be a common occurrence (Figure 9); 17 communities were discovered in 2012 and since 2008, a provisional total of 51 communities have been discovered. Thirty nine (76%) of these are hyperendemic. These communities are small, with an average population of only 42 persons.

Brazil. The single focus of onchocerciasis in Brazil is among the Yanomami population living in an area contiguous with the endemic focus in south Venezuela. Brazil's focus includes 12,988 persons in 22 endemic administrative areas (7 hyperendemic, 9 mesoendemic, and 6 hypoendemic) called "polos bases." As in Venezuela, the affected area is remote and densely forested, and the migratory Yanomami move across the border at will. The Brazilian program administered 24 semiannual MDAs with at least 85% coverage between 2001 and 2012. The program began administering MDA treatments quarterly to 7 hyperendemic and 3 mesoendemic polo bases in 2011. The latest surveys suggest that Brazil is close to suppressing onchocerciasis transmission in its part of the shared Yanomami Area.

Guatemala. With four foci and 231,467 persons at risk, Guatemala had the greatest number of persons at risk for onchocerciasis in the Americas. The four foci encompass a total of 518 endemic communities (42 hyperendemic, 15 mesoendemic, and 461 hypoendemic). Between 2001 and 2011, Guatemala conducted MDA and health education semiannually, achieving a reported 21 rounds of coverage of at least 85%. In 2006 and 2007, respectively, Guatemala's Santa Rosa and Escuintla foci were the first in the region to interrupt transmission in the Americas, (Figure 6), followed by the Huehuetenango focus in 2008. MDA ended in Guatemala with cessation of treatment in the Central focus in 2012.

Mexico. The second-highest number of persons at risk for onchocerciasis (169,869) in the Americas is in three foci and 670 communities (39 hyperendemic, 220 mesoendemic, and 411 hypoendemic) in Mexico (Figure 6). Mexico achieved 25 consecutive rounds of MDA with coverage of at least 85% between 2001 and 2011. In 2003, Mexico began quarterly MDA in 37 hyperendemic communities in the largest of its foci (southern Chiapas) in an effort to accelerate interruption of transmission, becoming the first country to adopt this innovation. Northern Chiapas became the third focus to interrupt transmission in the Americas and Oaxaca was the sixth. MDA ended in Mexico with cessation of treatment in southern Chiapas in 2012.

Ecuador. The single focus of onchocerciasis in Ecuador includes 119 communities (42 hyperendemic, 23 mesoendemic, and 54 hypoendemic) distributed among three river valleys in the Province of Esmeraldas. Although Ecuador's population at risk for onchocerciasis was relatively small (25,863), this focus had the highest prevalence of microfilariae in the skin at baseline of the 13 American foci. One of the two black fly vectors here, *Simulium exiguum*, is one of the most efficient transmitters of onchocerciasis in the Americas, comparable to *Simulium damnosum*, the major vector in Africa. Ecuador completed 23 MDA semiannual rounds of at least 85% coverage before interrupting transmission in 2009 and halting MDA in 2010. Post treatment surveillance was completed successfully throughout the country in 2012. In 2013, Ecuador should become the second country in the Americas to request verification of elimination of onchocerciasis from the WHO.

Colombia. The single focus of onchocerciasis in Colombia was a mesoendemic community. Colombia conducted 20 rounds of MDA coverage of at least 85% before it interrupted transmission in 2007 and halted MDA in 2008. Colombia successfully completed post treatment surveillance in 2010, and applied to the WHO for verification of elimination of onchocerciasis in 2012. Verification was granted by the WHO Director General in 2013.

The Program Coordinating Committee (PCC): Two meetings of the PCC were held in 2012. During those meetings the Post Treatment Surveillance (PTS) data from Ecuador were reviewed and discussed. The PCC concluded that the evaluations demonstrated that onchocerciasis has been eliminated from that country and recommended to the MOH of Ecuador that it formally request certification of onchocerciasis elimination from the WHO. Ecuador agreed with the recommendation and, with assistance from OEPA, began to compile the detailed documentation (the disease 'dossier') required to initiate the process. The MOH will file this dossier with WHO in 2013 and so be the second country to make such a request, after Colombia. PCC and OEPA staff published the annual WHO *Weekly Epidemiological Record* report for IACO 2011 (Inter American Conference on Onchocerciasis, 2011: Interruption of transmission in Guatemala and Mexico. *Wkly Epidemiol Rec.* 2012; 87:309-15). PCC reviewed data from the Northeast focus of Venezuela and recommended to the MOH that it halt interventions (having met the necessary epidemiological criteria to be declared 'transmission interrupted'). The Venezuelan MOH approval was provided in December 2012, and approximately 53,000 treatments will be stopped in 2013. PCC also published its recommendations for PTS activities (Guide to detecting a potential recrudescence of onchocerciasis during the post treatment surveillance period: the American paradigm. *Research and Reports in Tropical Diseases* 2012; 3: 21-33).

The 22nd annual Inter-American Conference on Onchocerciasis (IACO'12) was held in the city of Tuxtla Gutiérrez, Chiapas State, Mexico, October 24 – 26, 2012. The theme was "25 years of Mectizan donation: achieving the impossible dream." IACO'12 was convened by the Ministry of Health of Mexico, The Carter Center, and PAHO, with support from USAID, the U.S. Centers for Disease Control and Prevention, The Bill &

Melinda Gates Foundation, the Alwaleed Bin Talal Foundation, and the OPEC Fund for International Development. Over 90 people attended, including representatives of the Mexico and Chiapas Ministry of Health (MOH) and about 30 “Brigadiers” (the Mexican foot soldiers in the battle against river blindness). The governor of the state of Chiapas, Mr. Juan Sabines Guerrero, addressed the conference during the opening ceremony, sharing details on the fight against onchocerciasis over the years in his state, and congratulating the partners on their accomplishments. This meeting was a proud one for Mexico, particularly the state of Chiapas, which interrupted onchocerciasis in the south Chiapas focus (the last and largest of Mexico’s three endemic foci) in 2011 and hopes that three years of post treatment surveillance (PTS) will prove that the nation has eliminated the disease for good. The south Chiapas focus was once one of the most severe foci for onchocerciasis in all of the Americas.

The four times per year treatment strategy was discussed and strongly recommended by IACO to accelerate transmission interruption in hyperendemic and mesoendemic Yanomami communities. Considerable time was spent discussing the challenges of working in the Yanomami Area, most important of which are the nomadic lifestyle of the people and the remote, difficult terrain that often can only be accessed by helicopter. In addition, illegal mining groups encroach in the region, meaning land travel is not just extremely arduous, but dangerous.

IACO’12 concluded with the pledge by all participants and all six countries to continue to work to make onchocerciasis history in the Americas!

2013 RECOMMENDATIONS FOR THE ONCHOCERCIASIS ELIMINATION PROGRAM FOR THE AMERICAS (OEPA)/CARTER CENTER

Recommendations

Obtain the highest level of political support from Venezuela and Brazil for the elimination of onchocerciasis from the Yanomami Area, for a plan of operations and the ability to work across the borders. Collaborate with PAHO to enhance the impact of these advocacy efforts.

Establish an MOU between the two countries, and perhaps the formation of a binational commission to oversee these teams is an important step to address this delicate political issue on the frontier.

Establish cross border collaboration and launching of binational implementation teams operating out of Surucucu in Brazil, where infrastructure is greatest and where OEPA can contract aerial transportation.

Detect any unidentified communities as soon as possible. There is a particularly urgent need to arrange a fixed wing or helicopter 'fly over' photography exercise to ground truth all 149 potential community 'remote sensing signature' coordinates identified by Dr. Unnasch's project .

Implement immediate 4-times-per-year treatment, prioritizing hyperendemic areas. High treatment coverage (>85%) in each round should be considered essential. In newly identified villages, to the program will report year treatment was launched, number of rounds with any treatment coverage, number of rounds with>85% treatment coverage and number of consecutive rounds of >85% coverage.

Secure flexible funds for continuing support of OEPA activities (2012-2016) that can be used in Venezuela.

Brazil: Begin entomological evaluations in 3 polos base.

Mexico and Guatemala: Initiate final PTS entomological evaluations in Southern Chiapas focus, Mexico, and Central Focus, Guatemala. Continue health education in the foci where transmission has been eliminated.

Venezuela: Conduct final PTS entomological evaluations in Northcentral. In Northeast focus, halt treatment and launch PTS. Conduct an in-depth epidemiological evaluation in South Focus.

Assist Ecuador, which has successfully completed PTS, in preparing a formal application to WHO/PAHO for verification of elimination of onchocerciasis transmission.

Publish papers for all foci where treatment has been halted in the peer reviewed scientific literature. The Colombia paper needs to be published as soon as possible.

Develop an approach in mathematical modeling that can be applied to PTS activities as described in the PCC PTS flow chart.

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

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

Carter Center program staff must complete or renew the Emory IRB certification.

Treatment Objectives for onchocerciasis for 2013:
UTG(2): 15,714 treatments
UTG(4): 50,402 treatments

Figure 5

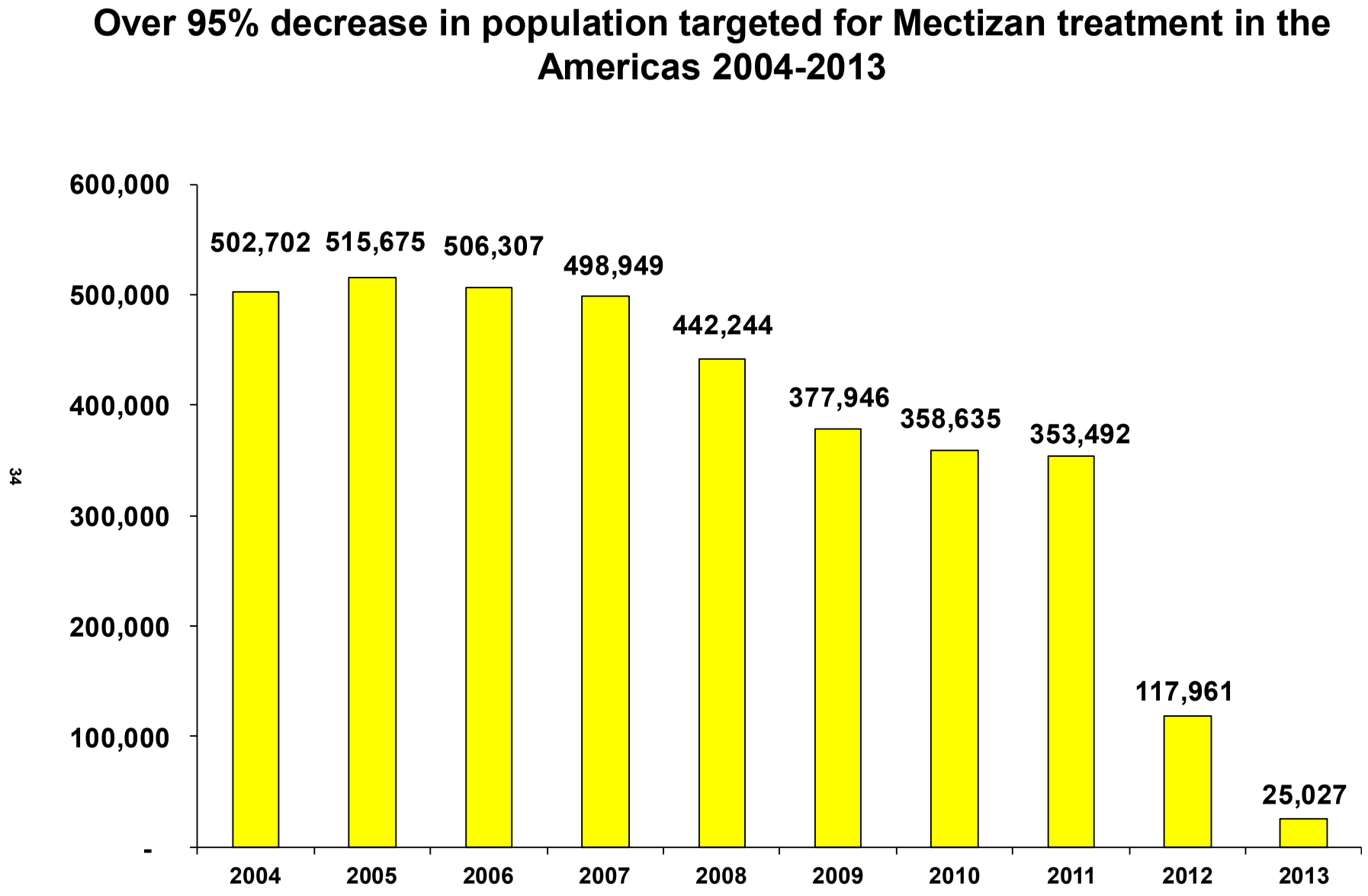

Over 95% decrease in population targeted for Mectizan treatment in the Americas 2004-2013
600,000
500,000
400,000
300,000
200,000
100,000
-
502,702
515,675
506,307
498,949
442,244
377,946
358,635
353,492
117,961
25,027
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

Figure 6

The Thirteen Onchocerciasis Foci in the Americas: Baseline indices and current transmission status

ID #**	Focus	Population at Risk	Vector(s)	Baseline Indices (year)		Transmission and Ocular Morbidity Status
				mf in skin	mf in eyes (MfAC***)	
7	Santa Rosa, Guatemala	12,208	*S. ochraceum*	3% (1983)	NA	Interrupted in 2006 Eliminated in 2010
6	Escuintla, Guatemala	62,590	*S. ochraceum*	29.5% (1979)	6.2% (1979)	Interrupted in 2007 Eliminated in 2010
2	N. Chiapas, Mexico	7,125	*S. ochraceum*	1.5% (1995)	0.6% (1995)	Interrupted in 2007 Eliminated in 2010
12	Lopez de Micay, Colombia	1,366	*S. exiguum*	39.6% (1995)	0% (1996)	Interrupted in 2007 Eliminated in 2010
4	Huehuetenango, Guatemala	30,239	*S. ochraceum*	2.9% (1987)	7.2% (1981)	Interrupted in 2008 Eliminated in 2011
1	Oaxaca, Mexico	44,919	*S. ochraceum*	7.3% (1983)	0% (1995)	Interrupted in 2008 Eliminated in 2011
13	Esmeraldas, Ecuador	25,863	*S. exiguum* *S. quadrivittatum*	78.7% (1991)	24.7% (1991)	Interrupted in 2009 Eliminated in 2012*
8	Northcentral, Venezuela	14,385	*S. metallicum*	44.3% (1999)	31% (1999)	Interrupted in 2010
3	S. Chiapas, Mexico	117,825	*S. ochraceum*	14.5% (1995)	1.5% (1995)	Interrupted in 2011
5	Central, Guatemala	126,430	*S. ochraceum*	52.2% (1994)	20.7% (1981)	Interrupted in 2011
9	Northeast, Venezuela	94,583	*S. metallicum*	28% (1999)	21.7% (1999)	Interrupted in 2012
11	Amazonas, Brazil	12,988	*S. guianense* *S. oyapockense* *S. incrustatum*	63.3% (1995)	31.2% (1995)	Ongoing (possibly suppressed)
10	South, Venezuela	10,390	*S. guianense* *S. oyapockense*	75% (1998)	10.5% (1998)	Ongoing. Only focus with demonstrable ocular morbidity
	Total/mean	**560,911**	-	**33.80%**	**12.90%**	-

NA: not available

* Pending review by Ecuador Ministry of Health

** ID# is shown on Map in Frontispiece Figure X

*** MfAC: Microfilariae in Anterior Chamber of the Eye

Figure 7

2012: OEPA Targets and Final Treatment Data

TWICE PER YEAR TREATMENT AREAS

Focus	Number of communities treating twice per year	At risk population in those communities	Population Eligible for Treatment in those communities	UTG (2)*	Pop treated Both Rd 2011	% UTG(2) reached 2012	Pop treated 1st Rd 2012	% UTG 1st Rd 2012	Pop treated 2nd Rd 2012	% UTG 2nd Rd 2012
Amazonas-BZ	12	5,907	4,765	9,530	8,259	87%	3,917	**82**	4,342	**91**
South-VZ	42	3,331	2,728	5,456	4,673	86%	2,510	**92**	2,163	**79**
Northeast -VZ	330	72,289	67,481	134,962	123,139	91%	58,061	**86**	65,078	**96**
Total	**384**	**81,527**	**74,974**	**149,948**	**136,071**	91%	**64,488**	**86%**	**71,583**	**95%**

FOUR TIMES PER YEAR TREATMENT AREAS**

Focus	Number of communities treating four times per year	At risk population in those communities	Population Eligible for Treatment in those communities (UTG)	UTG (4)*	Total treatments 2012	% UTG(4) reached 2012	Pop treated 1st Rd 2012	% UTG 1st Rd 2012	Pop treated 2nd Rd 2012	% UTG 2nd Rd 2012	Pop treated 3rd Rd 2012	% UTG 3rd Rd 2012	Pop treated 4th Rd 2012	% UTG 4th Rd 2012
Amazonas-BZ	10	7,081	5,777	21,043	18,003	86%	3,147*	85%	4,800	83%	4,861	84%	5,195	90%
South-VZ	143	7,059	5,863	23,159	18,294	79%	4,114	70%	4,819	82%	4,801	82%	4,560	82%
Northeast – VZ	135	22,294	20743	81,169	63,904	79%	5,830	31%	19,755	95%	18,566	90%	19,753	95%
Total	**288**	**36,434**	**32,383**	**125,371**	**100,201**	**80%**	**13,091**	**46%**	**29,374**	**91%**	**28,228**	**87%**	**29,508**	**92%**

* Some villages received epidemiological evaluations and thus were not targeted for treatment in round 1.

** In 2012, 30% of the regional eligible population was targeted for 4x/year.

Figure 8

Endemicity levels and number of annual MDA treatments, Venezuela and Brazil, 2012

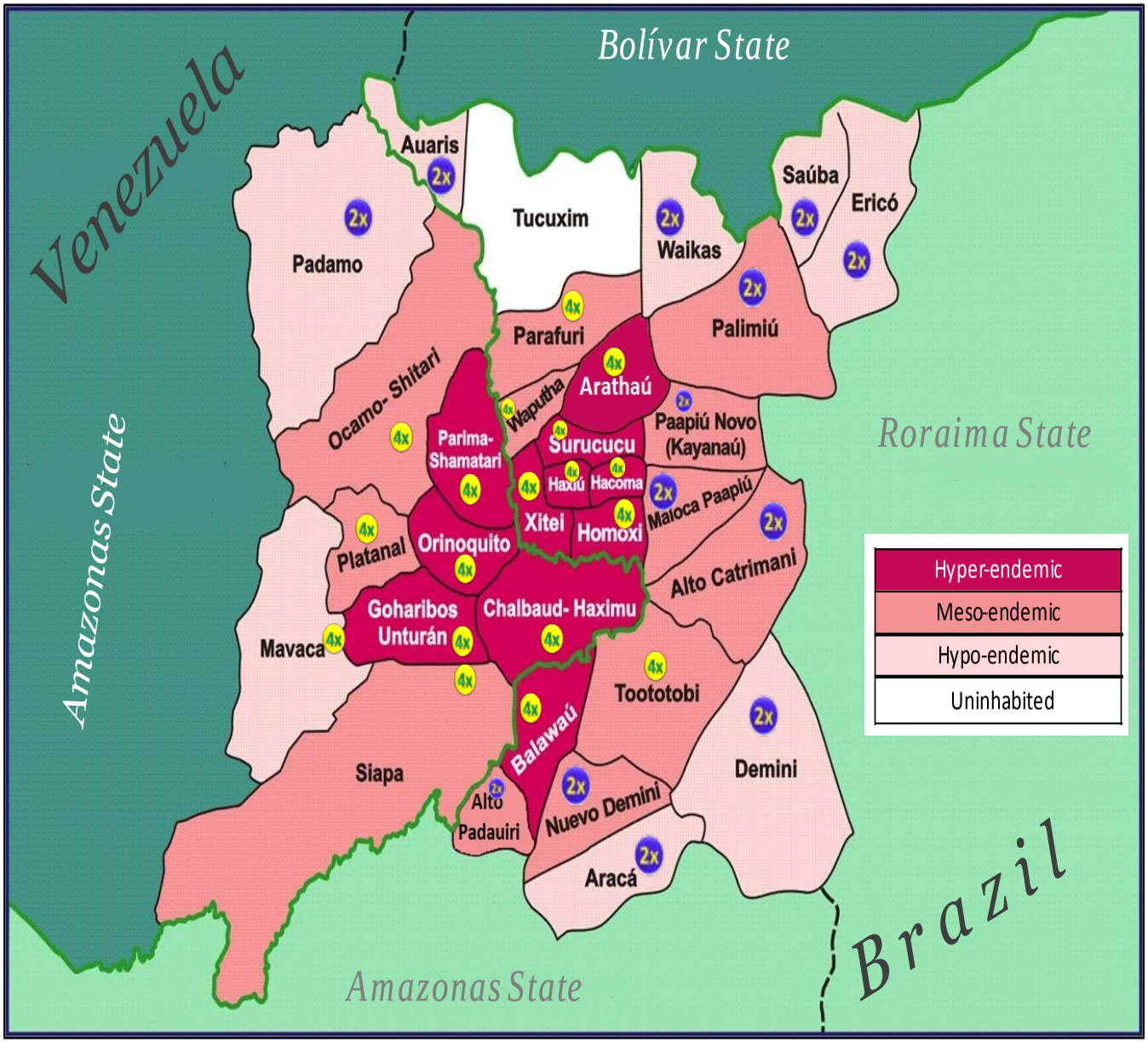


Figure 9

New endemic communities recently discovered in the South Focus of Venezuela 2008 - 2012

Year	Hyper	Meso	Hypo	Communities	Population
2008	7	2		9	421
2009	10	1		11	366
2010	5	2		7	247
2011	7			7	245
2012	10	5	2	17	838
Total	39	5	2	51	2117

Source: Venezuelan South Focus Program
Data remain provisional

UGANDA

Summary

Since the inception of its onchocerciasis elimination program in 2007, Uganda has interrupted transmission of onchocerciasis in six of the seventeen recently existing foci (Frontispiece Figure H Uganda map that shows all 18 foci in boxes and districts in colors). The Victoria focus, which was the eighteenth focus, was eliminated in early 1970s. The six foci where onchocerciasis transmission was recently interrupted include: Wadelai in 2010, Mt. Elgon and Itwara in 2011, and Mpamba-Nkusi, Imaramagambo and Maracha-Terego in 2012. This translates into about 1.3 million treatments for onchocerciasis no longer being required in Uganda.

Onchocerciasis interventions will be halted in 2013 in Mpamba-Nkusi and Imaramagambo, but in Maracha-Terego (as with Wadelai) mass treatment with ivermectin and albendazole will continue because of co-endemic LF. The populations in Mpamba-Nkusi and Imaramagambo will receive health education so as to be prepared for treatments stopping and entry into the three years of post-treatment surveillance (PTS) to monitor for recrudescence of transmission.

Interruption of transmission is suspected in Kashoya-Kitomi, Nyamugasani, and Wambabya-Rwamarongo foci. Complete information on parasitology, serology, and entomology as stated in the Uganda guidelines will be required at the next UOEEAC meeting if they are to be considered for halting of interventions, and moved to a three year PTS period.

Major challenges remain to expand the treatment program in the Mid North focus, an area that has only recently become accessible due to previous insecurity. The President of Uganda, His Excellency, Yoweri Museveni, launched semi-annual treatment with ivermectin in Mid North focus in May 2012. He also authorized an estimated US$500,000 Ugandan funding for 2012 entomological surveys and aerial spraying of insecticide for vector control in that focus.

Background: Onchocerciasis affects 36 of the 112 districts in Uganda. The first Ugandan onchocerciasis transmission zone ('focus') to successfully eliminate the disease was Victoria, which claimed victory in the 1970s following a vector control campaign based on DDT spraying of rivers that liberated 3 million people from the threat of the disease. Onchocerciasis control using annual mass treatment with Mectizan® began in 1991. The original ministry of health ivermectin program enjoyed financial support from The River Blindness Foundation (RBF), Christoffel Blindenmission (CBM), and Sightsavers. In 1996, The Carter Center (TCC) assumed the activities of RBF. In 1997, the African Program for Onchocerciasis Control (APOC) began supporting some Ugandan efforts and introduced the community-directed approach to Mectizan® distribution. APOC also supported successful vector elimination efforts in 2 foci (Itwara and Mpamba-Nkusi) that used ground larviciding with Temephos™ (trade name Abate) together with annual Mectizan® distribution. In 2006,

The Carter Center helped launch semi-annual treatments (every 6 months) to eliminate onchocerciasis from the Wadelai focus in Nebbi District, with support from Merck (funding being administered through the NGDO Coalition for Onchocerciasis Control). Wadelai's success was confirmed in 2010, but annual treatment has to continue as the entire Nebbi District is also endemic for lymphatic filariasis (LF). The Uganda Ministry of Health (MOH) was emboldened by these APOC and Lions-Carter Center-assisted elimination successes, and announced a nationwide elimination policy in 2007 that was to be based on twice-per-year treatment (where necessary) and (where feasible) vector elimination/control (using ground-based larviciding), in addition to health education in the affected communities. The new flexible elimination policy, which aims for nationwide elimination of onchocerciasis by the year 2020, was immediately applauded and supported technically and financially by the Lions-Carter Center partnership and Sightsavers.

A host of partners now assist Uganda in onchocerciasis control and elimination activities. The Carter Center River Blindness Program (RBP) assists in 36 (94%) of the onchocerciasis endemic districts: Bushenyi, Kabale, Kanungu, Kasese, Kisoro, Rubirizi, Buhweju, Kamwenge Ibanda, Mitooma (in southwest Uganda); Bulisa, Hoima, Kabarole, Kibaale, Kyenjonjo, and Masindi (in western Uganda); Adjumani, Arua, Koboko, Yumbe, Maracha, Moyo, Nebbi, Yumbe, and Zombo (in the West Nile region bordering the Democratic Republic of the Congo or DRC); Amuru, Gulu, Kitgum, Lamwo, Lira, Nwoya, Oyam and Pader Districts (in the Mid North focus); and Bududa, Manafua, Mbale, and Sironko (in the Mount Elgon focus in the east, bordering Kenya). The Carter Center supports technical services and vector elimination activities and some community-directed treatment with ivermectin (CDTI) activities in Bulisa, Kibaale, Hoima, and Masindi, in partnership with Sightsavers, which operationally supports these districts. The Carter Center also supported technical services in Kabarole and Kyenjojo district in Itwara focus, and Arua, Koboko, Yumbe and Maracha in West Nile focus. Ivermectin distribution through CDTI in West Nile focus is supported by APOC and the Ministry of Health of Uganda. A few other districts continue to receive some level of support from APOC. Also of note is that a single transmission focus may cross over several district borders and may not involve the entire population of each district (for example the Elgon Focus includes part of four districts (Bududa, Manafua, Mbale, and Sironko).

Two more foci (Mid North and Nyagak-Bondo) have been added to the 7 already targeted for elimination activities (Frontispiece Figure H).

Lions have supported the Uganda effort through the Lions Club International Foundation (LCIF) SightFirst program. The first phase of LCIF funding to Uganda ended in 2005. In 2009, with support from Noor Dubai, LCIF provided additional funding to the program. In 2011, LCIF awarded a new two year grant. Ugandan Lions Clubs are very active participants in and advocates for the Carter Center-assisted river blindness control and elimination activities, including engaging and mobilizing

members of parliament and other government officials. The Carter Center's Country Representative in Uganda, Ms. Peace Habomugisha, is a Lions Club member.

Uganda laboratory activity: In support of the elimination effort, The Carter Center has funded equipment, reagents, and training for the MOH laboratory that provides state-of-the-art diagnostic support to the elimination program. The laboratory is located at the MOH Vector Control Division in Kampala and provides polymerase chain reaction (PCR) testing for black flies and skin snips, and serologic enzyme-linked immunosorbent assay (ELISA) testing for OV16 antibodies. Technical backup and reference lab support is provided by Dr. Tom Unnasch's laboratory at the University of South Florida in Tampa, FL. In 2012, the laboratory analyzed more than 9,650 blood spots for OV16 antibodies and 16,100 Simulium black fly vectors for O. volvulus DNA using PCR. Since its launching, the Uganda lab has analyzed 39,444OV16 specimens and as a result has the greatest operational experience using this test of any lab in the world.

Expert advisory committee for national onchocerciasis elimination: To ensure that the elimination decisions are supported with the best scientific and technical advice, the Uganda MOH established the Ugandan Onchocerciasis Elimination Expert Advisory Committee (UOEEAC). The UOEEAC meetings are supported financially by The Carter Center. UOEEAC responsibilities are to: 1. review programmatic activity reports from each elimination-targeted focus in Uganda annually; 2. advise the MOH on focus-specific monitoring and evaluation activities, and recommend halting of interventions when appropriate in accord with international and national guidelines; and 3. make any other recommendations to the MOH on activities needed to reach the national 2020 elimination goal. In addition to MOH representatives, the UOEEAC includes several members-at- large who are recognized for their international expertise in onchocerciasis: Chair Dr. Tom Unnasch (University of South Florida), Dr. Dennis Lwamafa, (Commissioner of National Disease Control, MOH), Professor Rolf Garms (Bernhard-Nocht Institute), Dr. Frank Walsh (former director of entomology of the WHO Onchocerciasis Control Program), and institutional representatives from the Carter Center, Sightsavers, and APOC. The national coordinator for the onchocerciasis elimination program of the Ministry of Health is the committee's secretary assisted by The Carter Center country representative (Ms Habomugisha) as a co-secretary. The World Health Organization (WHO) Uganda representative attends these meetings as an observer, to avoid any conflict of interest since WHO will likely coordinate future verification of the elimination activities. NTD representatives, the Uganda LF coordinator, local Lions, Mectizan Donation Program representatives, RTI, and other donors and technical bodies also attend as observers.

At its fourth session (August 7-9, 2012) the UOEEAC concluded that onchocerciasis transmission had been interrupted in Imaramagambo, Maracha-Terego, and Mpamba-Nkusi (Frontispiece Figure H). The UOEEAC recommended to halt all interventions in Imaramagambo and Mpamba-Nkusi, and move them to the post-treatment surveillance (PTS) phase. However, Maracha-Terego continued with ivermectin (and albendazole) due to being located in an LF-endemic district. The MOH approved the above

recommendation (Figure 10). The UOEEAC also noted that interruption of transmission may have already taken place in Kashoya-Kitomi focus, Nyamugasani focus and Wambabya-Rwamarongo focus, but additional epidemiological information was needed to meet the guidelines before this could be concluded.

Treatments: The Carter Center assisted about 87% (UTG=3,536,807) of 4,061,207 national UTG treatments during 2012 (Figure 11). Treatment coverage attained was 81% (2,871,760 treatments) of UTG treatments in the Carter Center-assisted districts. Treatments in the Ministry of Health- and APOC-assisted areas of West Nile focus were not available. The Ultimate Treatment Goal (UTG) for Carter Center- assisted areas using a control strategy with annual ivermectin treatment was 571,029 in 2012 (Figure 12). The 2012 coverage of the UTG was 95% (543,811 treatments provided). In the areas targeted for elimination where the strategy was semiannual treatment, the 2012 UTG(2) was 2,965,778 (Frontispiece Figure K). The 2012 coverage of UTG(2) was 78% (2,327,949 treatments provided). In total, the Uganda RBP assisted in a total of 2,871,760 mass treatments in 2012 (as well as 28,643 passive and visitor treatments). This was a 13% increase over 2011 treatment numbers. The Uganda RBP reached 100% of 768 villages targeted for control; for villages targeted for semi-annual treatment, 100% (3,430) were reached in round one and 87% in round two. Uganda reached 96% of its ultimate treatment goals and provided CDTI in all 4,198 villages targeted (100% geographic coverage). The program did not cover all the communities requiring mass treatment due to challenges experienced in expansion areas of the Mid North focus. All other Carter Center-assisted foci, due to well-established infrastructure, attained more than 90% coverage of the UTG.

Training and Health Education: Uganda trained or retrained 38,149 Community-Directed Distributors (CDDs) and 8,882 Community-Directed Health Supervisors (CDHSs) in 2012. Fewer CDDs and CDHSs were trained as compared to 2011 because the emphasis was only on communities and districts that had not satisfactorily trained as planned during the previous year. Of these, 40% of the CDDs and 30% of the CDHSs were female. The current ratio of CDDs to population served is the best of any Carter Center-assisted program, at 1 CDD to 65 persons served, and the supervisor-to-CDD ratio was 1:5.

Financial Contribution: Figure 13 shows APOC, Carter Center/LCIF, and government (district and national) financial contributions to onchocerciasis control/elimination in areas assisted by the RBP. Starting in 2007, The Carter Center dramatically increased its funding with the launching of the new national elimination policy; APOC increased its funding in 2011. During 2012, the political support for onchocerciasis activities within the primary healthcare system remained strong, and the national government contributed US$500,000 towards vector control in Mid North focus.

Sustainability and Integration: The RBP-assisted CDTI program actively co-implements with the national lymphatic filariasis elimination effort in Adjumani and Moyo districts, reaching 246,484 persons with combination ivermectin and albendazole treatments in 2012 for UTG coverage of 95%. Also, co-implementation with

albendazole is done in onchocerciasis-endemic Kabale and Kanungu districts, where only 16,266 children were treated in the first round and 9,707 in the second round in 2012. The failure to cover the UTG of 44,653 in both rounds was due to a chronic shortage of albendazole for deworming. In Kabale, out of 6,443 children (6-59 months) 3,673 (57%) children were provided with Vitamin A supplementation. The low coverage was due to an inadequate supply of Vitamin A.

2013 RECOMMENDATIONS FOR CARTER CENTER UGANDA

Elimination Efforts

Onchocerciasis interventions will be halted in 2013 in Mpamba-Nkusi, and Imaramagambo foci, but ivermectin treatments will continue in Maracha-Terego focus, an LF endemic area. This brings the total number of foci where interruption of transmission has been attained to seven, including Elgon and Itwara in 2012, and Wadelai in 2011 based on the National Onchocerciasis elimination guidelines and Victoria eliminated in 1960s inclusive.. Mpamba-Nkusi and Imaramagambo will begin the post-treatment surveillance (PTS) period of three years to monitor for recrudescence of transmission.

Publish the elimination experiences of Imaramagambo, Mpamba-Nkusi and Maracha-Terego as a matter of priority.

Expand twice-per-year treatment coverage to the entire population in northern Uganda's mid north focus (covering parts of or entire districts of Agago, Amuru, Gulu, Kitgum, Lamwo, Lira, Nwoya, Oyam and Pader).

The program should complete a detailed table of epidemiological indicators (the "oncho flag") for each focus targeted for elimination. The foci numbers on the flag should correspond to those on the accompanying map. A new page of the flag should be updated before the next UOEEAC meeting (August, 2013) that has all baseline data and the most recent epidemiological and entomological indices. The new page will also track the cumulative number of rounds with >90% UTG coverage, by focus.

The mapping of the foci and their limits should be completed, but the current 18 foci listed should not change, and focus names should not be changed.

Consider changing the color of the Uganda oncho flag to only reflect transmission status (eliminated, interrupted, suppressed, or ongoing) of the 18 foci. Currently the flag reflects both transmission status (eliminated and interrupted) as well as programmatic status (implementing elimination strategy vs implementing control strategy).

Five more foci will be examined for potential halting of interventions at the UOEEAC meeting in August 2013. In order for the committee to complete its deliberations, field work must be completed before the UOEEAC August 2013 meeting as follows:

1. Kashoya- Kitomi – conduct OV16 and epidemiological surveys and continue with the entomological surveys.
2. Wambabya-Rwamarongo – carry out epidemiological surveys.
3. Bwindi – conduct cross border epidemiological study to verify the situation on the side of DR Congo and improve on the *Simulium neavei* collections through identification of more productive sites.

4. Budongo – carry out coverage surveys and initiate larviciding.
5. Madi – carry out entomological surveys, collect blood spots for OV16 in the buffer area (Adjumani district- Zones A and B).

The lab should continue to submit a monthly report showing what was accomplished in terms of numbers of specimens tested, the results obtained, and reagents used. The report should also outline any challenges, such as reagent and supply needs, with sufficient lead time to avoid disruption of work.

Control Efforts

In Madi (Adjumani and Moyo districts) and Lubilia foci (Kasese District) with a cross border onchocerciasis situation, annual distribution of ivermectin should continue during 2013.

Other Recommendations

Encourage the national secretariat for onchocerciasis elimination to submit accurate Mectizan® applications as early as possible, and no later than August of the year before the drug is needed. Work with federal agencies to facilitate appropriate documentation and clearance for all medications. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year.

Changes in UTG denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and the Mectizan Donation Program (MDP) should be advised accordingly. Changes in numbers of treatments to be administered (numerators), and frequency of administration (once versus twice per year) require discussion with Carter Center headquarters and approval by the MOH/NOTF and MDP.

Work closely with USAID/RTI/ENVISION, which will provide support in 2013 for TCC/RBP elimination efforts that will co-implementation with LF in at least one annual treatment round where twice-per-year treatment is in place.

Seek funds for local Lions in order to promote the Lions' involvement to help maintain program visibility and support for onchocerciasis elimination activities in northern Uganda, where onchocerciasis is blinding. Ugandan Lions are interested not only in onchocerciasis elimination, but also promotion of community eye care services.

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

Conduct Carter Center monitoring protocol annually in a sample of districts to assess coverage, health education, community involvement and ownership, using the treatment coverage questionnaire surveys that provide 95% confidence intervals.

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

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

Treatment Objective for onchocerciasis for 2013:

Semiannual UTG (2)	**2,970,590**
Annual UTG (confirmed)	**377,450**

Training Objective for 2013:

CDDs:	**38,220**
Community supervisors:	**9,686**

Figure 10

THE REPUBLIC OF UGANDA

MINISTRY OF HEALTH

PRESS STATEMENT

Uganda Interrupts the Transmission of River Blindness in Three more areas. (Part of Nationwide Elimination Targets).

Uganda has successfully interrupted the transmission of Onchocerciasis (river blindness) in three more foci in four districts: Kibaale (Mpamba-Nkusi focus), Maracha (Maracha-Terego focus) and, Mitooma and Bushenyi (Imaramagambo focus).

Under the National Onchocerciasis Control Programme, the country has for the last 18 years (1993-2011) distributed ivermectin in these districts. In Kibaale district, semi-annual treatment with oral drug ivermectin (Mectizan®), donated by the US Company called Merck, was supplemented by vector elimination.

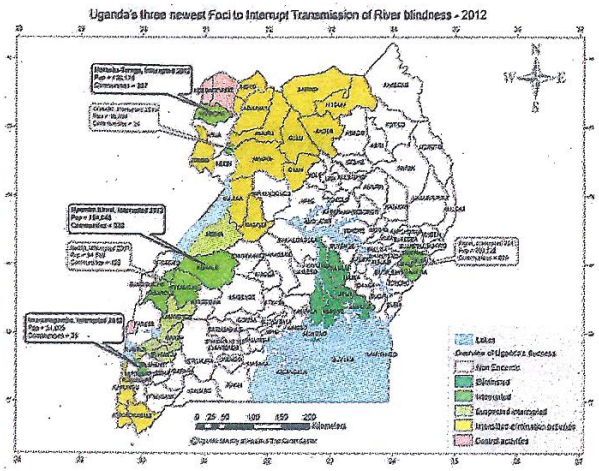
This latest achievement continues to demonstrate that river blindness elimination is possible in Africa, and follows the February 2012 announcement that Uganda interrupted transmission in its first three foci. A phased approach is being implemented with the goal of interrupting transmission of this age old scourge in the whole country by 2020.

Currently, there are no cases attributable to onchocerciasis (river blindness) in the three foci. In light of this evidence, suspension of treatment with ivermectin (Mectizan®) was recommended for river blindness endemic communities in these foci. The recommendation was made by the 5th session of the Uganda Onchocerciasis Elimination Expert Advisory Committee (UOEEAC) in August 2012 based on Uganda guidelines for interruption of transmission that were adapted from the WHO Criteria for certification of elimination of onchocerciasis. The recommendation was later endorsed by the National Certification Committee (NCC) of the Ministry of Health during their 5th meeting at the end of October 2012, meaning the foci will begin a three year post-treatment surveillance (PTS) period before the areas can be declared free from the disease. .

As a result 561,170 ivermectin donated by Merck & Co, USA will no longer be needed for these foci. This brings the total treatments to be stopped to approximately 1,232,568 people since the programme launched the elimination policy in 2007. To date, Uganda has interrupted transmission in six of the 18 originally endemic-foci. In this regard, Uganda has rapidly made great strides towards elimination of onchocerciasis and this is in line with the shift from control to elimination of onchocerciasis being supported internationally.

River blindness is a parasitic disease and is transmitted through the bites of female black flies that breed in fast flowing rivers. This disease affects 35 districts in Uganda with 3.5 million people at risk. It is one of the Neglected Tropical Diseases (NTDs) that causes severe itching, skin lesions, visual impairment, and can lead to permanent blindness.

The success of these interventions has been through the effort of the National Onchocerciasis Control program of the Ministry of Health with support of the implementing partners, The Carter Center, African Programme for Onchocerciasis Control (APOC), Sightsavers, ENVISION/RTI, and Merck Pharmaceutical company. We also acknowledge the support of Kibaale, Mitooma, Bushenyi and Maracha District Local Governments, the district onchocerciasis coordinators/ NTD Focal persons, supervisors, Community medicine distributors and the communities for their support and cooperation that allowed this to be achieved.



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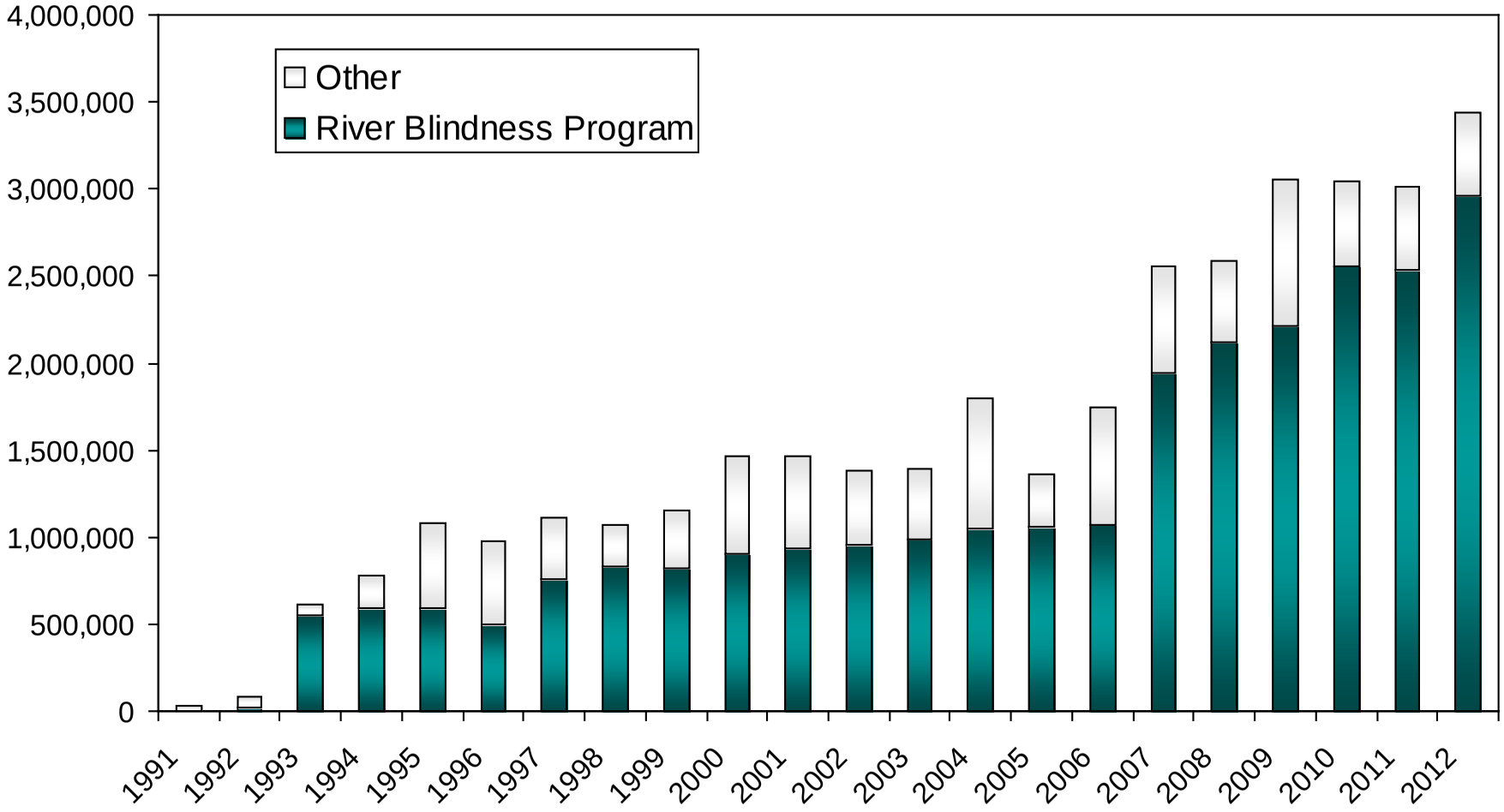
THE CARTER CENTER APOC Sightsavers envision a world free of NTDs

Figure 11

Uganda: Carter Center-Assisted Treatments and Total Mectizan® RB Treatments Provided, 1991-2012*



* Treatments in 1992-1995 assisted by River Blindness Foundation. National numbers are provisional and incomplete for 2012 figure.

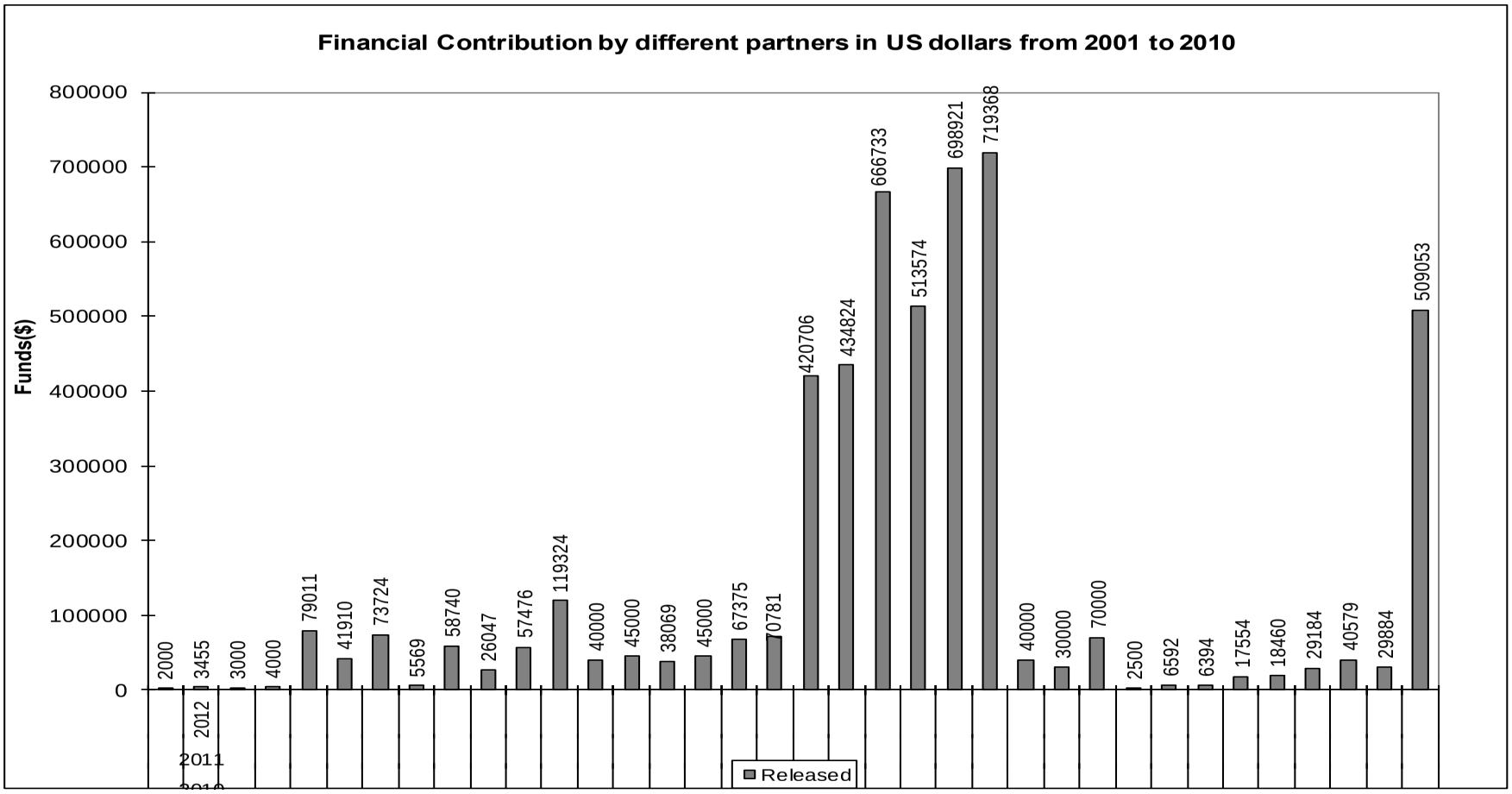
Figure 12

Uganda: 2012 Treatment Coverage in Annual Treatment Areas

Focus	Name of District	Total Popn	Popn Treated Cumulative 2012	Ultimate Tx Goal (UTG) 2012	Total Popn Tx % 2012	% Tx cov. of UTG 2012	Active Villages Cumulative 2012	Active Villages UTG 2012	Active Villages % UTG 2012	Transmission Status
Nyamugasani	Kasese	10,632	9,140	9,141	86%	100%	7	7	100%	Interruption Suspected
Obongi	Moyo	36,270	28,577	29,805	79%	96%	47	47	100%	
Lhubiliha	Kasese	115,040	94,121	95,441	82%	99%	124	124	100%	
Mid-North 2 (now part of Mid-North Focus)	Oyam	20,367	16,948	17,183	83%	99%	35	35	100%	
	Amuru	30,262	24,779	24,955	82%	99%	9	9	100%	
	Nwoya	93,203	68,142	69,900	73%	97%	53	53	100%	
	Gulu	114,548	83,535	94,304	73%	89%	109	109	100%	
Madi	Adjumani	151,053	119,500	126,441	79%	95%	206	206	100%	
	Moyo	126,629	99,069	103,859	78%	95%	178	178	100%	
TOTAL		**698,004**	**543,811**	**571,029**	**78%**	**95%**	**768**	**768**	**100%**	Continues

Figure 13

Uganda: Financial Contributions in US Dollars (2001-2012)



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

The APOC and government contributions are reported by our Carter Center country representatives based on their best possible determinations from information available in country through the National Onchocerciasis Task Force and other local sources. Capital equipment replacement provided by APOC and government salaries are not considered.

SUDAN

Summary

In early 2012, the Government of Sudan declared that transmission had been interrupted in the Abu Hamad focus, and as a result halted about 220,000 treatments and launched post treatment surveillance (PTS) there (Frontispiece Figures E and F). During 2012, health education was provided at the community level, schools and mosques in order to inform community members that a three year PTS period had commenced and will end in 2014. If there is no disease recrudescence, onchocerciasis will be declared eliminated in Abu Hamad area.

Background: The River Blindness Program (RBP) in Sudan supports river blindness activities with Lions Clubs International Foundation support in three foci: Abu Hamad (River Nile state), Radom (South Darfur state), and Galabat (Gedarif state) (Figure 14).

In December 2006, the Government of Sudan (GOS) changed its onchocerciasis goals from control to elimination, concentrating initially on the isolated desert focus of Abu Hamad in River Nile state. RBP, with Lions SightFirst support, has principally worked on the elimination effort in Abu Hamad (Figure 15). The strategy there was based on increasing Mectizan® distribution from annually to every six months ('semi-annual treatment') and expansion of treatment into hypoendemic areas (Figure 16). Based on the WHO guidelines for interruption of transmission of onchocerciasis, the Sudan Ministry of Health announced the achievement the interruption of transmission of onchocerciasis in Abu Hamad focus. The details of these assessments, some of which are shown in Figure 17, were published by Tarig et al. (Interruption of Onchocerciasis Transmission in the Abu Hamed focus, Sudan. *American Journal of Tropical Medicine and Hygiene* 2013; 89: 51-57). The MOH did not provide Mectizan in 2012, but instead moved the focus to a three-year period of Post Treatment Surveillance (PTS—see Frontispiece Figure D).

RBP and Lions have also worked to launch the elimination strategy with semi-annual treatment in Galabat in Gedarif state during 2011. The Government of Sudan also has an onchocerciasis control effort based on annual Mectizan® distribution in Radom area of South Darfur state (Figure 18).

Treatments: A total of 266,233 treatments were delivered by the Sudan program in 2012 in Galabat and Radom. In Galabat, 122,302 treatments were given in round one (119% treatment coverage), and 125,314 in round two (122% coverage). Treatment of more than 100% relates to incomplete census updates, and visitors who come from outside the area to work on farms during the treatment periods. In Radom, 18,617 annual treatments were delivered, 94% of the annual treatment objective (ATO). Details of treatments are provided in Figure 18. Due to civil conflict, a proper census of the affected population in Radom is unknown, so an ultimate treatment goal, or UTG (defined as all treatment eligible persons within the area) cannot be determined. Accordingly, an ATO based on the Mectizan® drug order request is used as the denominator. In 2012, 153 communities in Galabat and 19 in Radom were treated.

Training and Health Education: The program trained 307 new community-directed distributors (CDDs) and retrained 2,328, for a total of 2,635 CDDs trained in 2012 in Galabat and Radom. The program also trained 90 community supervisors and retrained 326, for 416 trained in 2012.

Mectizan®: During 2012, 613,000 tablets were distributed in the Galabat and Radom foci with an average of 2.3 tablets per person (the low tablet ratio per treatment is low due to many children in the program). No severe adverse effects were reported. The program began 2011 with a balance of 1,212,500 tablets.

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

2013 RECOMMENDATIONS FOR CARTER CENTER SUDAN

Abu Hamad:

Make provision for Atlanta Headquarters program grant monies to be available to assist the MOH to maintain supplies to the MOH lab, and to help the MOH keep its capacity to conduct a PTS assessment in Abu Hamad in FY15.

Galabat focus in Gedarif State:

Cross border surveys on the border of Ethiopia and Sudan are needed in order to ascertain if cross border transmission of river blindness exists.

Treatment Objective for onchocerciasis for 2013:

Semiannual UTG(2):	**204,862**
Annual UTG:	**19,723**

Training Objective for 2013:

CDDs:	**263**
Community supervisors:	**41**

Figure 14

Map of Sudan Program Areas

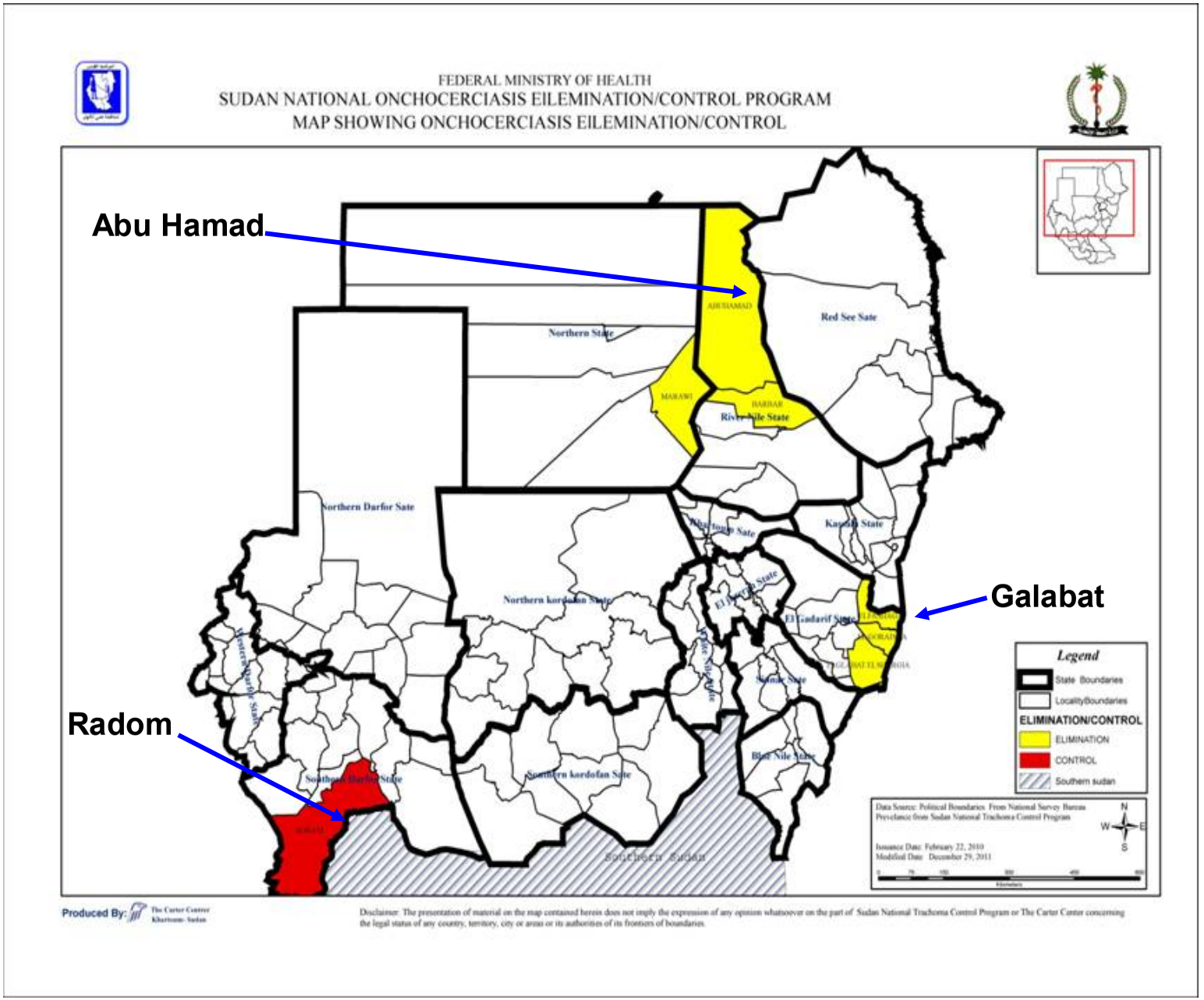


Figure 15

Map showing study sites of Abu Hamad onchocerciasis focus, communities displaced from Abu Hamad, and communities beyond the limits of the focus

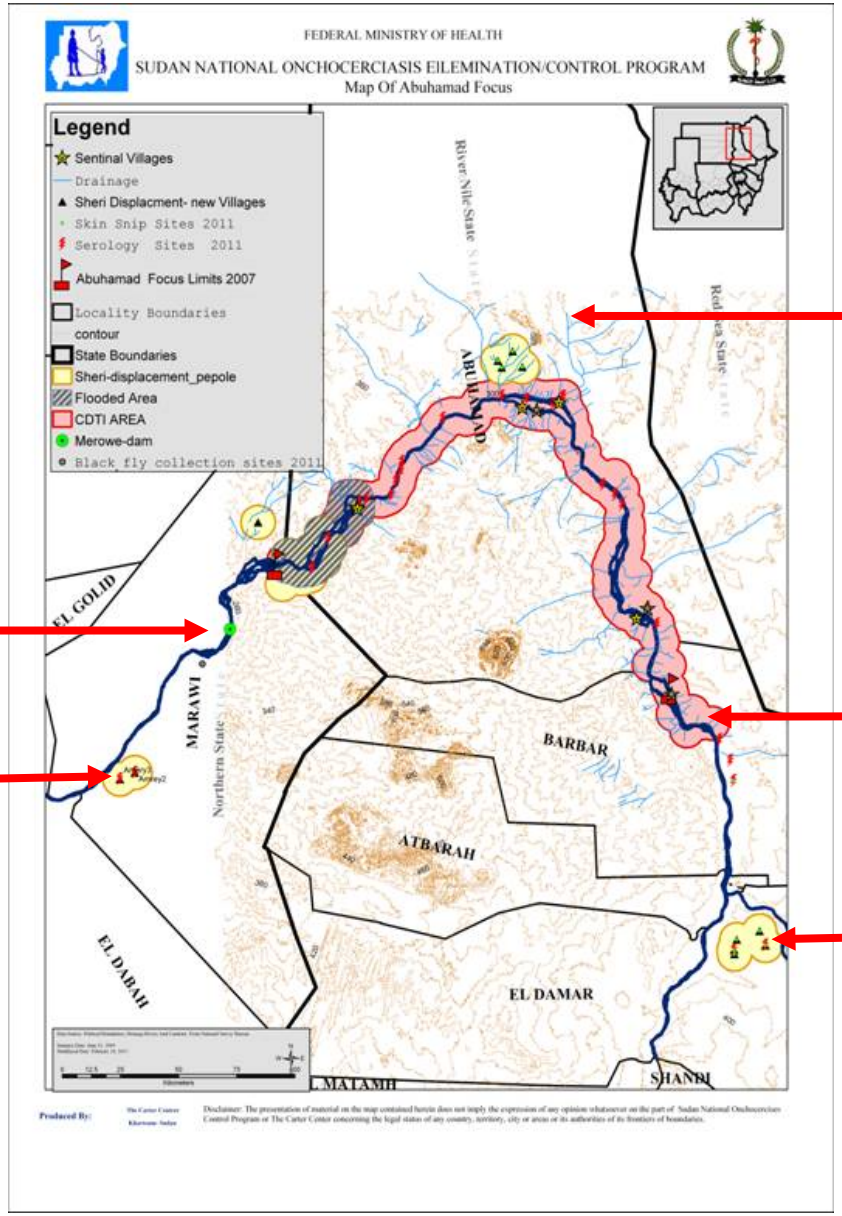
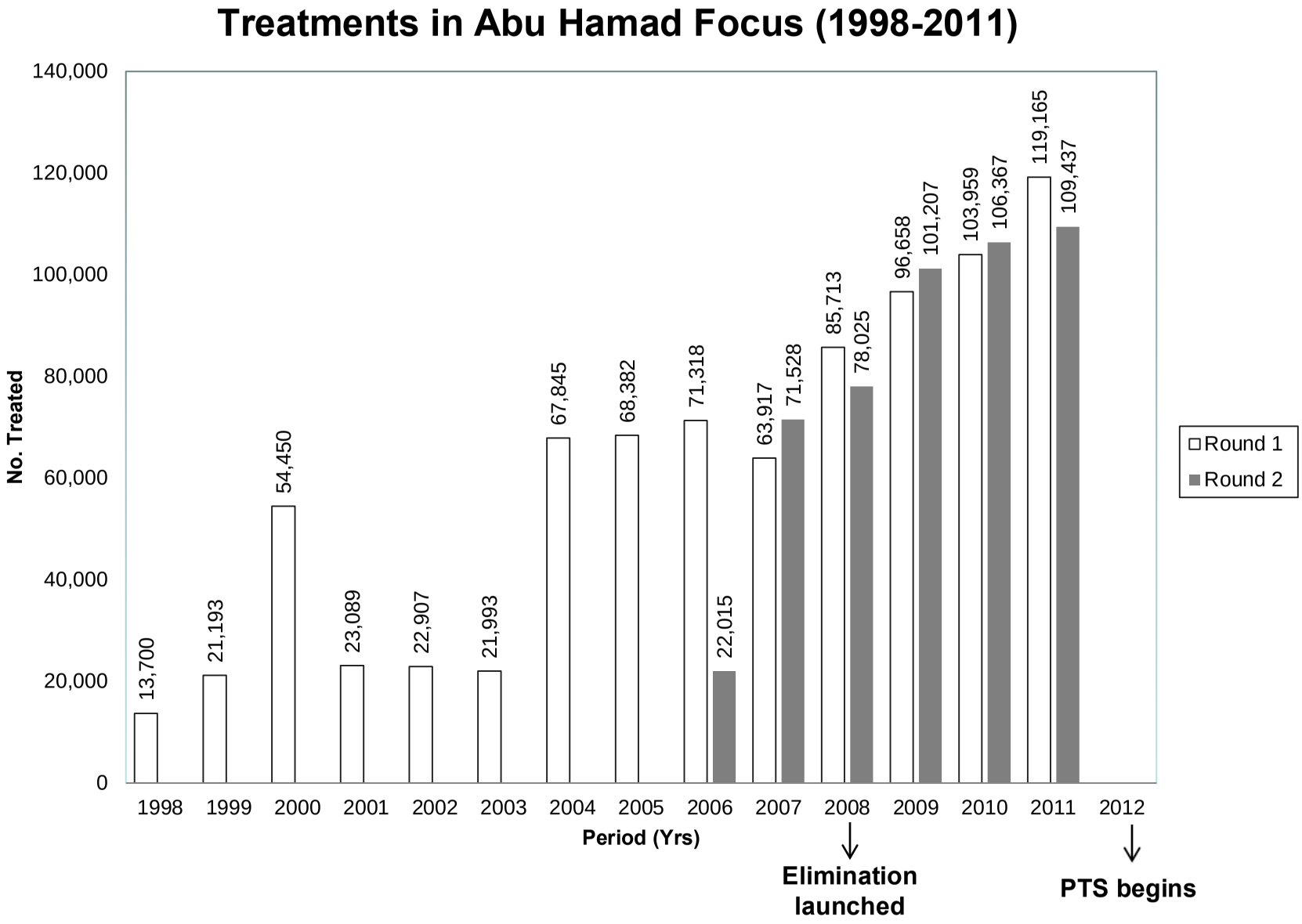


Figure 16



All treatments from 1998 to 2002 were assisted by APOC/Carter Center and from 2003 to date by Carter Center/Lions

Figure 17

Indicators of Onchocerciasis Infection in Abu Hamad Focus (1985-2011)

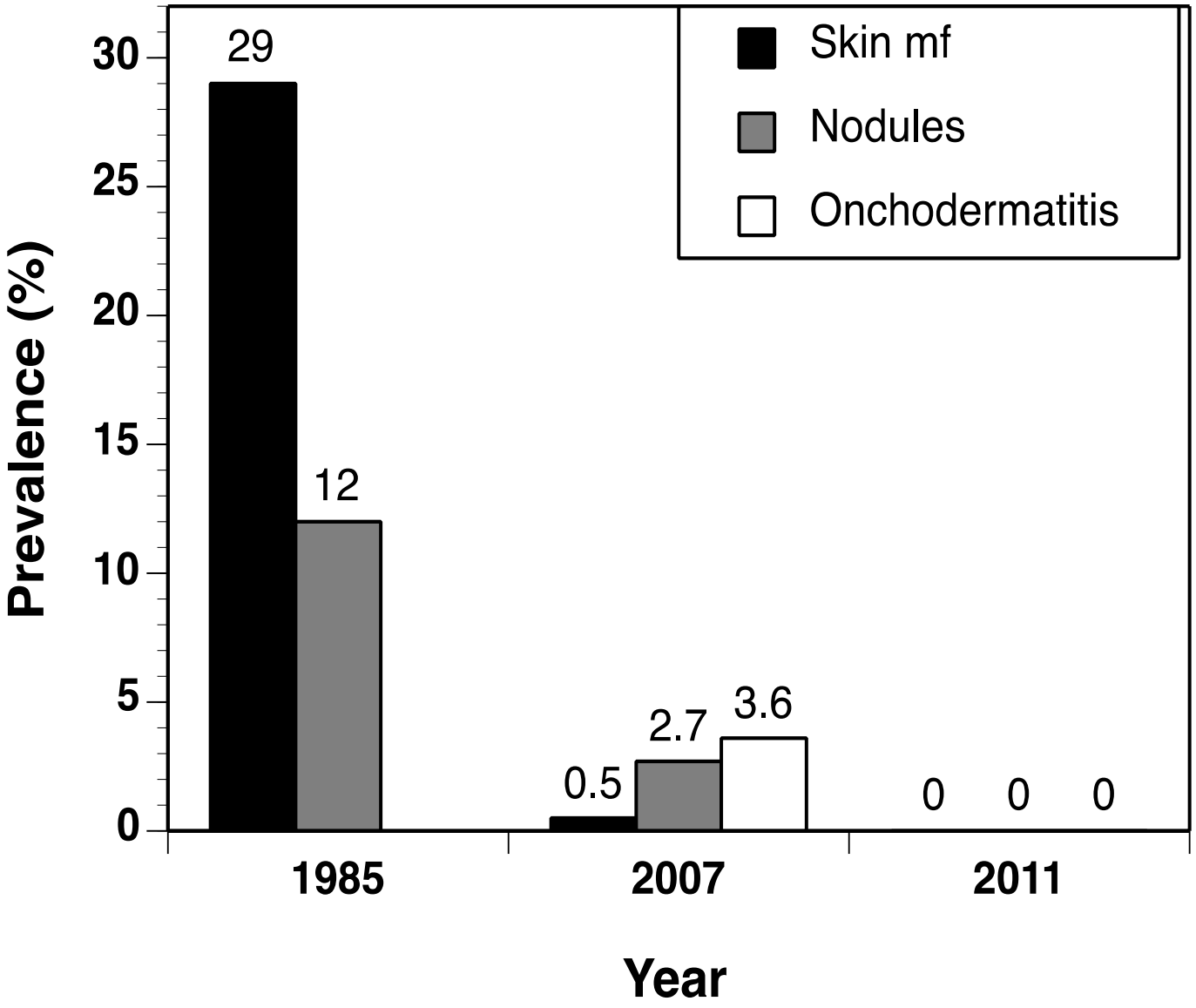


Figure 18

Sudan: 2012 Treatment Coverage

Strategy	State	Focus	Total Population	UTG1	Treated in R1	Treated in R2	%UTG Covered R1	%UTG Covered R2	Total Treated	UTG 2	% UTG 2 Covered	Active Villages treated 2011
Elimination	Gedarif	Galabat	77,270	65,680	80,714	84,708	123%	129%	165,422	131,360	126%	130
		Ghorisha	43,236	36,751	41,588	40,606	113%	111%	82,194	73,502	112%	23
Subtotal			120,506	102,431	122,302	125,314	119%	122%	247,616	204,862	121%	153
Control	Southern Darfur	Radom	23,203	19,723	18,595	-	94%	0%	18,595	19,723	94%	19
	Passive		-	-	22	-	0%	0%	22	-	0%	-
Subtotal			23,203	19,723	18,617	-	94%	0%	18,617	19,723	94%	19
Grand Total			**143,709**	**122,154**	**140,919**	**125,314**	**115%**	**103%**	**266,233**	**224,585**	**119%**	**172**

NIGERIA

Summary

The Federal Ministry of Health (FMOH) of Nigeria has a new master plan for NTDs, along with a new FMOH policy of onchocerciasis elimination. The Carter Center's River Blindness Program (RBP) will seek to play an expanded role in integrated NTD activities in the nine states currently being assisted in Nigeria. The Carter Center will continue to provide leadership for elimination activities related to river blindness (RB) and Lymphatic Filariasis (LF). The Center has also worked in efforts to coordinate LF and malaria activities, including cosponsoring a national meeting for malaria and LF in Abuja (March 27-28, 2012) together with the FMOH.

A total of 6,056,437 Mectizan® mass treatments (with health education) for RB were distributed in Nigeria in 2012 by the ministry of health with assistance from RBP. The LF Elimination Program is integrated with the RBP in Plateau and Nasarawa States, combining Mectizan® treatments with albendazole. In 2012, 3,147,903 combined treatments were assisted. Also in 2012, TCC conducted an LF Transmission Assessment Survey (TAS) in Plateau and Nasarawa following recently published WHO guidelines. The TAS determined that LF transmission had been interrupted and that MDA could be stopped in 2013. Longstanding MDA distribution (9 or more years) with high coverage as well as recent mass distribution of long lasting insecticidal nets (LLIN) throughout the two states contributed to this victory.

In 2012, Carter Center assisted 1,172,859 praziquantel treatments (with health education) for schistosomiasis in the four assisted states (Delta, Edo, Nasarawa and Plateau). Schistosomiasis activities are integrated with our other RBP/LF work whenever possible, and praziquantel treatments are given simultaneously with LF and/or river blindness treatments, as the three drugs involved (ivermectin, albendazole, and praziquantel) can be safely taken at one time.

In 2013 USAID and RTI are supporting mapping and assessments of trachoma, soil transmitted helminths, schistosomiasis, and *Loa loa* in nine the states assisted by TCC. If resources are made available, the program may soon begin to address LF in *Loa loa* endemic areas (which occur throughout southeast Nigeria) using monotherapy albendazole MDA combined with LLIN use, in accordance with new WHO guidelines. Over 60 million LLIN have already been distributed throughout Nigeria for malaria control, which also impacts LF transmission.

Background: Nigeria is the most endemic country in the world for river blindness (RB), with as much as 40% of the global onchocerciasis disease burden. The National Onchocerciasis Control Program (NOCP) is the largest Mectizan® distribution program in the world, reporting between 20-35 million treatments per year (Figure 19). Treatments assisted by The Carter Center (TCC) annually typically represent 25-30% of the total treatments in Nigeria.

TCC RBP in Nigeria is headquartered in Jos, Plateau state, with supporting sub-offices in Benin City, Enugu, Lagos, and Owerri. The program assists treatment activities in 9 RB endemic states: Abia, Anambra, Delta, Ebonyi, Edo, Enugu, Imo, Nasarawa, and Plateau (see Figure 20). Abia, Anambra, Delta, Ebonyi, Edo, Enugu, and Imo are collectively referred to in this document as 'southeast.' The Carter Center's River Blindness Program (RBP) enjoyed LCIF support from 1999 to 2008 and core APOC support from 2000 to 2005. Local Lions (District 404) have been active participants in the Carter Center-assisted RB control activities in Nigeria since 1996 and remain involved in RB advocacy efforts.

Treatments: In 2012, the Carter Center-assisted program in Nigeria provided health education and Mectizan® treatments to 6,102,188 persons (Figure 21); 6,056,431 of those were mass (active) treatments in 8,185 villages; 45,757 passive treatments were delivered in 490 hypo-endemic areas in the 7 states located in the southeastern part of the country.

The Carter Center Nigeria Program had approximately 21.8 million Mectizan® tablets available for 2012 (used for both RB and LF), and the average number of Mectizan® tablets per person treated was 2.7. There were 399,488 Mectizan® tablets remaining at the end of 2012.

No severe adverse events (SAEs) were reported as a result of Mectizan® treatments in Nigeria in 2012. Particularly close monitoring for adverse reactions is carried out in the southeastern states because of the presence of *Loa loa* in that part of the country. *Loa loa* parasites release large numbers of microfilariae into the blood stream that are killed by Mectizan®. Death of *Loa loa* microfilariae after treatment can, in rare cases, provoke serious adverse reactions (SAEs). Fortunately, no treatment-related SAEs have ever been reported in TCC-assisted areas in Nigeria.

The Carter Center also assisted in 3,147,903 treatments for lymphatic filariasis (LF) and 1,172,859 treatments for schistosomiasis in Nigeria in 2012 (Figure 22), discussed in the Integrated Programs sections that follow.

Training and Health Education: The 9 states assisted by The Carter Center conducted training or retraining for 51,759 professional and lay health personnel involved in Mectizan® distribution in 2012. Kinship-enhanced training in the southeast, which utilizes the extended family structure to provide treatment to small groups of related persons, included 35,236 Community-Directed Distributors (CDDs), 5,259 Community Supervisors (CS), and 5,739 Frontline Health-Level Workers. The ratio of CDDs to population in the southeast was 1 CDD per 95, slightly exceeding the goal of 1:100. In Plateau and Nasarawa, where the kinship system is not used, the ratio was 1:584. In the southeast states, just over 50% of CDDs were female, versus 6% in Plateau and Nasarawa states. Supervision of CDDs in the southeast has been challenging, and more CSs are needed if CDD numbers are to be further expanded. Overall in the program, each CS oversees approximately 6 CDDs (ratio of 1:6).

Financial Contribution: The Carter Center-assisted RBP in Nigeria received APOC core funding during 1998-2003. Since then, some funding has been received through special APOC initiatives (Figure 23). The Nigeria RBP-assisted areas have had chronically insufficient government contributions. In 2009, a spike in state government support was seen in Delta state to support schistosomiasis control but this level of support was limited and focal. The increase in funding by The Carter Center (2008-10) was due to funding from two Bill & Melinda Gates Foundation (BMGF) grants to RBP for integrated neglected tropical disease (NTD) research ("Proof of Concept for Integrated Health Interventions in Nigeria" and "*Loa loa* Paralyzes LF MDA in Central Africa: Integration of LF and Malaria Programs Can Resurrect a Continental Initiative"). These grants (and their research associated field costs) ended in 2011. Several research papers have been produced as a result of these studies; others will follow.

Monetary community level support for the program in 2012 increased compared to 2011: 5,909 villages (or 72.0% of all at-risk villages receiving mass RB treatment) supported their CDDs with direct monetary support. Total village-level contributions equaled approximately 7.3 million Naira ($49,052 USD at 150 Naira to the dollar). This contribution was a 32% increase over 2011 village level contributions, and averaged to $3.32 USD/CDD/year in those villages that supported their CDDs.

In contrast, local government area (LGA)-level and state contributions in 2012 decreased compared to 2011. LGA contributions totaled approximately 3.14 million Naira ($20,947 USD), a 43% decrease from 2011. Also, state-level contributions were only provided in 7 of the 9 states and totaled approximately 45,000 Naira ($300 USD), an 87% decrease from 2011. There were no LGA nor state level contributions from Nasarawa or Plateau States, where TCC has its greatest number of programmatic activities. Government monetary contributions described here do not include the core salary costs of the Ministry of Health (MOH) personnel working in the program.

The Integrated Programs in Nigeria: The Carter Center-assisted program in Nigeria pioneered the concept of integrated mass treatment for RB, LF and schistosomiasis in which the logistics of a mass drug administration (MDA) program are shared across several programs. The program began in 1999 with integrated RB and urinary schistosomiasis interventions, expanding to include LF MDA in 2000, trachoma in 2001, and malaria in 2003 (data from the trachoma and malaria programs are not shown in this report). Background information on RB, LF and urinary schistosomiasis is provided in Annex 6. The central platform of the integrated program is an infrastructure and logistical system to deliver annual community-based mass Mectizan® and albendazole treatment for LF to all at risk in the two-state area. The effort has demonstrated a dramatic and effective intervention coverage scale-up of state wide interventions for schistosomiasis (in 2008), trachoma (in 2010), and malaria (in 2010). The LF treatment combination also is highly effective against several soil transmitted helminths (STH). The Gates Foundation grant ("Proof of Concept for Integrated Health Intervention in Nigeria") demonstrated that integration results in broader services, lower costs, and higher efficiency among disease programs that use similar strategies.

Lymphatic Filariasis: The goal of the LF program in Plateau and Nasarawa states is to demonstrate that LF transmission can be interrupted with annual combination MDA consisting of Mectizan® and albendazole, with health education in a highly endemic area of tropical Africa. The history of the effort was published by Richards et al. (2011). Briefly, LF was widespread in Plateau and Nasarawa states, and mass treatment and health education was required in all cities and villages in the 30 LGAs. MDA started in 2000 and achieved scale in 2003 (Figure 24). In 2008, a survey for LF prevalence in the 30 LGAs comprising the 2 state area showed that 10 LGAs had achieved the elimination threshold (based on LF antigenemia prevalence) (King et al. 2012). Five of those LGAs were onchocerciasis endemic, and treatment for this condition continued; in the other five LGAs MDA for LF was halted. In 2012, using the newly released WHO Treatment Assessment Survey (TAS), TCC and its MOH partners conducted LF antigenemia testing in children ages 6-7 years in a four 'Evaluation Units' (EU) using school-based cluster surveys drawn from the remaining 20 LGAs in Plateau and Nasarawa. A total of 7,131 children were tested in 173 schools: approximately 43 schools per EU; only 24 children were positive (8, 3, 10 and 3 in EUs1-4 respectively). These results were all below the required threshold of 20 positives per EU to 'pass.'

Based on the TAS results, the Federal Ministry of Health has declared that LF transmission has been interrupted in Plateau and Nasarawa states and that 2012 was the last year for LF MDA. In 2012, 3,147,903 persons in the 2 states received health education and their last mass treatment for LF (Figures 22 and 24), accomplishing 91% of the treatment goal of 3,453,353. At the end of 2012, 1,235,412 albendazole tablets remained in stock.

Fighting Malaria and Lymphatic Filariasis with LLIN: In Nigeria, LF is transmitted by *Anopheles* mosquitoes, the same mosquito that transmits malaria. LLINs are one of the most important prevention tools for malaria and are also believed to be useful as an adjunct to MDA in the LF elimination program. Between 2009 and 2012, all Carter Center-assisted states have received LLIN, donated through the Global Fund, with the aim of providing every household with two nets. These distributions totaled around 9.6 million LLIN, providing blanket coverage in all nine states. The Carter Center assisted in LLIN distribution in varying degrees in all nine states where it works.

In Plateau and Nasarawa, rates of LF infected mosquitoes have been determined by dissection since the launching of the program (Richards 2011). By the end of 2011, the year after LLINs had been distributed, the number of infected mosquitoes fell to 0% for the first time ever. It is very likely that the presence of these LLINs was synergistic with MDA and helped to interrupt LF transmission completely. Similar results have been seen in the Southeast as the key measurement outcome of the BMGF funded study "*Loa loa* Paralyzes LF MDA in Central Africa: Integration of LF and Malaria Programs Can Resurrect a Continental Initiative"; the results of this study are in press (Richards et al., *American Journal of Tropical Medicine and Hygiene* 2013)

The Carter Center cosponsored a national meeting for malaria and LF in Abuja (March 27-28, 2012) together with the FMOH (Frontispiece Figure L). The purpose of the

meeting was to explore the opportunities for co-implemented programs to address both malaria and LF, focusing on areas of programmatic synergy. The event was presided over by former head of state General Dr. Yakubu Gowon, who opened the meeting with the Permanent Secretary of Health, Mrs. Fatima Bamidele, and the Director Public Health, Dr. Mansur Kabir. Over 200 people attended, including Federal and State Ministry personnel, NGDOs, partner organizations, donor agencies, and the mass media. Participants included Mrs. Franca Olijimu (International NGDO Chair), distinguished Professors (A. Abiose, E Braide, O Kale, and O Akogun), and representatives from the BMGF Neglected Infectious Diseases Group (Drs. Julie Jacobson and Lance Gordon). TCC staff presented findings from research supported by the BMGF which showed that LLINs distributed for malaria control can also stop LF transmission, with or without mass drug administration (MDA). The Director of Public Health, Dr. Kabir noted "it is urgent to work together to rid Nigeria of these two diseases." At the close of the meeting, participants recognized that the strategic plans for both malaria and LF called for integration but did not specify what collaborative activities may exist. A key recommendation was to future articulate policies and actions related to LF and malaria integration. The TCC LF and malaria programs have worked with the FMOH and other partners on committees to further this work throughout 2012.

Schistosomiasis Control:

The Carter Center has been a pioneer in integrated control of NTDs. In 2007, a pilot program was started to show that integrated delivery of praziquantel (for schistosomiasis) co-administered with ivermectin and albendazole (for RB and LF) was both feasible and safe. By 2009, this process, now called Triple Drug Administration (TDA), accounted for 86% of all praziquantel treatments in Nigeria (Figure 25). TCC assists in schistosomiasis control in four states (Plateau, Nasarawa. Edo and Delta). In all areas we have integrated schistosomiasis control with the existing river blindness platform, with praziquantel combined with Mectizan®. In 2012, The Carter Center continued to enjoy support for schistosomiasis work from the Izumi Foundation.

In Plateau and Nasarawa states, where treatment is provided for both intestinal and urinary schistosomiasis, treatment was offered to all school-aged children. In Edo and Delta states, where only urinary schistosomiasis is currently being targeted, adults and children were treated in communities with urinary schistosomiasis prevalence greater than 50%, and school children alone were targeted where prevalence exceeded 10%, in accordance to WHO guidelines.

In 2012, The Carter Center assisted 1,172,859 praziquantel treatments The majority of the praziquantel used was donated through the World Health Organization (WHO) by Merck KGaA (E-Merck), Germany. However, due to a shortage of praziquantel in Plateau and Nasarawa only 49.5% coverage was achieved (900,229 treatments-Figure 22). A total of 272,630 treatments were given in Edo and Delta, accomplishing 90% of the annual treatment objective (ATO). A large project to map all seven TCC assisted states in the southeast for urinary and intestinal schistosomiasis, soil transmitted helminths, trachoma, and *Loa loa* was planned to be carried out with USAID/RTI/ENVISION support in 2013.

2013 RECOMMENDATIONS FOR CARTER CENTER NIGERIA

All States

With support of ENVISION/USAID, conduct integrated mapping for schisto, STH, trachoma, and *L. loa* in all LGAs currently assisted by TCC that have not yet been mapped. Work with state and local ministries of health to identify areas in need of MDA or improved coverage.

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

Continue to advocate for use of the Jos Lab as a national resource for monitoring and evaluation of NTDs.

Work towards a target of a minimum 1 CDD to 100 population ratio and 1 community supervisor to 5 CDDs where community-wide MDA is taking place.

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

Track government and Carter Center funding figures in 2013, including any additional funds provided through APOC.

Coordinate with national programs to ensure that the application for 2013 Mectizan® and albendazole is submitted no later than August of the year before the drug is needed. Work with federal agencies to facilitate appropriate documentation and clearance for all medications. Albendazole applications require an annual report to be submitted by the national program and approved by the WHO regional office. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year.

Changes in UTG denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and MDP should be advised accordingly. Changes in numbers of treatments to be administered (numerators), and frequency of administration (once versus twice per year) require discussion and approval by the MOH/NOTF, MDP and TCC HQ.

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

Lymphatic Filariasis/Malaria:

Publish the two LLIN LF entomology studies (Plateau/Nasarawa and Imo/Ebonyi) as soon as possible.

Work with the TCC malaria program and with General Gowon to help garner more political support for the scaling up and linkage, when it makes programmatic sense, between interventions against lymphatic filariasis and malaria, especially LLIN use, care and resupply.

Stop LF MDA in Plateau and Nasarawa. Publicize the results and establish health education messages about why treatments have ended, where appropriate. Enhanced use of CDDs for the malaria program and schistosomiasis treatments of school aged children (see schistosomiasis below).

Consider evaluating the LF recrudescence status in the LGAs where MDA was halted in 2009 and that were not assessed during the 2012 TAS: Keffi, Keana, Jos North, and Langtang South.

Onchocerciasis:

Work with federal and state ministries of health in defining and implementing standards for elimination of RB.

Analyze onchocerciasis entomology and serology assessment studies and determine policy for stopping treatment in Plateau and Nasarawa. Consider conducting additional stop MDA surveys (dependent on evolving APOC/WHO guidelines) if necessary. Publish results as soon as possible.

Augment onchocerciasis activities in the seven states assisted in the southeast. Determine in LGAs under treatment where twice-per-year treatment might be needed. Determine and map the limits of onchocerciasis in all hypoendemic LGAs. Map *Loa loa* in untreated LGAs using the RAPLOA <20% threshold (as required for being safe for Mectizan® MDA) to determine where Mectizan® MDA can be administered for hypoendemic onchocerciasis or for LF. Determine where onchocerciasis transmission is active through PCR testing of black fly vectors (deployment of new black fly traps) and OV16 surveys, starting in non *Loa*-endemic hypoendemic LGAs. Modify 2014 drug order accordingly for areas that require twice per year or new treatment activities.

Conduct surveys to assess treatment coverage modeled after trachoma coverage surveys conducted in 2012, especially in areas where results show poor impact. These surveys should have the capacity to indicate 95% confidence intervals.

Work with NOCP and state ministries of health (UNICEF if applicable) to address the Edo/Ondo cross-border transmission zone. Agree on mapping, monitoring, and treatment strategy for both states. Work with both teams to identify untreated communities in Edo while considering expanding treatment to twice per year. Consider

strategy to ensure that persons farming in one state and living in another state receive treatment (e.g. dual registries, proxy drug recipients, etc).

Schistosomiasis/STH:

Provide praziquantel to all school-age children in all LGAs of Plateau and Nasarawa States with particular attention to treating in communities that were untreated (i.e. those identified during 2011 and 2012 surveys). In LGAs where MDA for LF has stopped, PZQ treatment will be stand-alone community therapy in most LGAs. However, in four to five LGAs launch school-based (rather than community-based) treatment and determine challenges in switching to this distribution modality. Begin to design and collect cost data to determine cost implications of a transition from community-based to school-based SCH/STH treatments. Consider how the Sustainable Management Training Center's 'integrated' training process can be used to develop the MOH/Ministry of Education functional relationship needed for these transitions.

In all LGAs of Plateau and Nasarawa conduct STH surveys with support of ENVISION. Determine if albendazole needs to be added to PZQ schistosomiasis treatments in 2014. If not, the survey will provide the baseline for monitoring for potential STH recrudescence after halting of LF treatments.

Conduct a substudy of adults in these same areas to establish baseline post-LF/STH prevalence in an age group that will not be targeted for treatment of STH in future. Evaluate the new miniFlotec® system in these surveys.

Work to improve PZQ treatment coverage in Plateau and Nasarawa states. Conduct new PZQ coverage surveys based on the trachoma coverage survey model used in Plateau in 2012.

In the seven Southeastern states assisted by TCC, combine Mectizan® and praziquantel treatments where possible in areas where at least one year of stand-alone distribution for each drug already has occurred.

Conduct STH and SCH mapping surveys in all LGAs of the seven assisted southeast states, with support of ENVISION. Tailor surveys to need based on a review (in progress) of available data from previous surveys. In some states, trachoma and *Loa loa* surveys will also be conducted. Once mapping is completed, funding may be made available from USAID/RTI/ENVISION to launch a major scale-up of NTD MDA in some of these states in late 2013 and/or 2014. Such scale-up will use the community-based treatment model for STH/SCH where LF or onchocerciasis community-based treatment is also indicated.

Treatment and Distribution Objectives for Plateau and Nasarawa States 2013:
Mectizan® UTG: 1,867,504 persons
Praziquantel ATO: 1,884,691 children

Training Objective for RB and Schistosomiasis (SH) for Plateau and Nasarawa States 2013:

River Blindness:

CDDs:	**6,479**
Community supervisors:	**804**
Health workers:	**933**

Malaria/schistosomiasis:

CDDs:	**8,093**
Community supervisors:	**1,149**
Health workers	**1,093**
Teachers	**1,800**

Treatment Objectives for Southeast States 2013:

Mectizan® UTG:	**4,852,366 persons**
Praziquantel ATO (Delta and Edo States):	**416,609 persons**

Training Objective for RB and SH for Southeast States, 2013:

River Blindness:

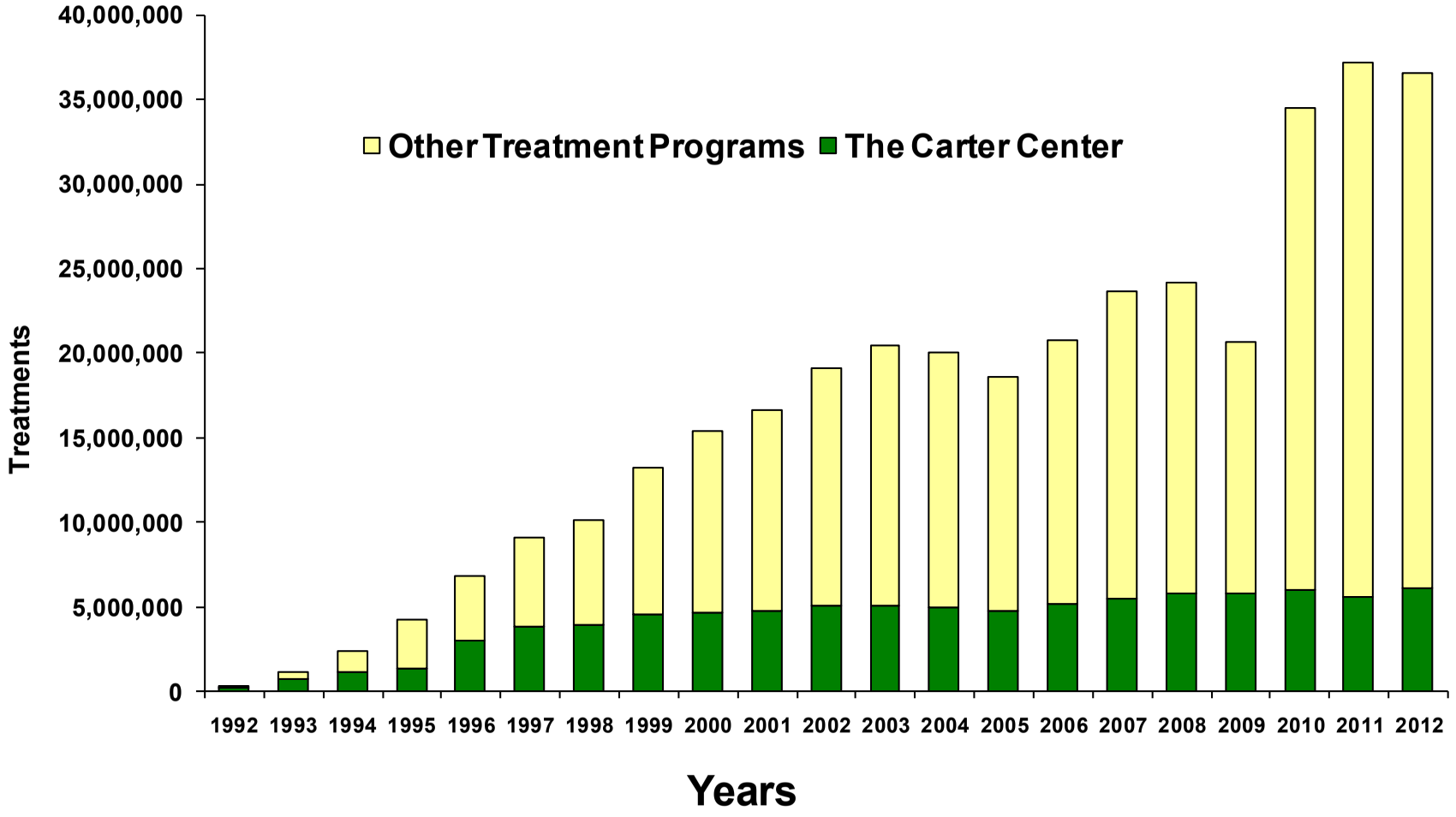
CDDs:	**65,993**
Community supervisors:	**15,949**

Schistosomiasis:

CDDs:	**6,500**
Community supervisors:	**2,700**

Figure 19

Nigeria: Carter Center-Assisted Treatments and Total Mectizan® Treatments Provided 1992-2012*



* Treatments from 1992-1995 were assisted by RBF. The 2012 national figure is provisional.

Figure 20

Nigeria: Carter Center-Assisted States

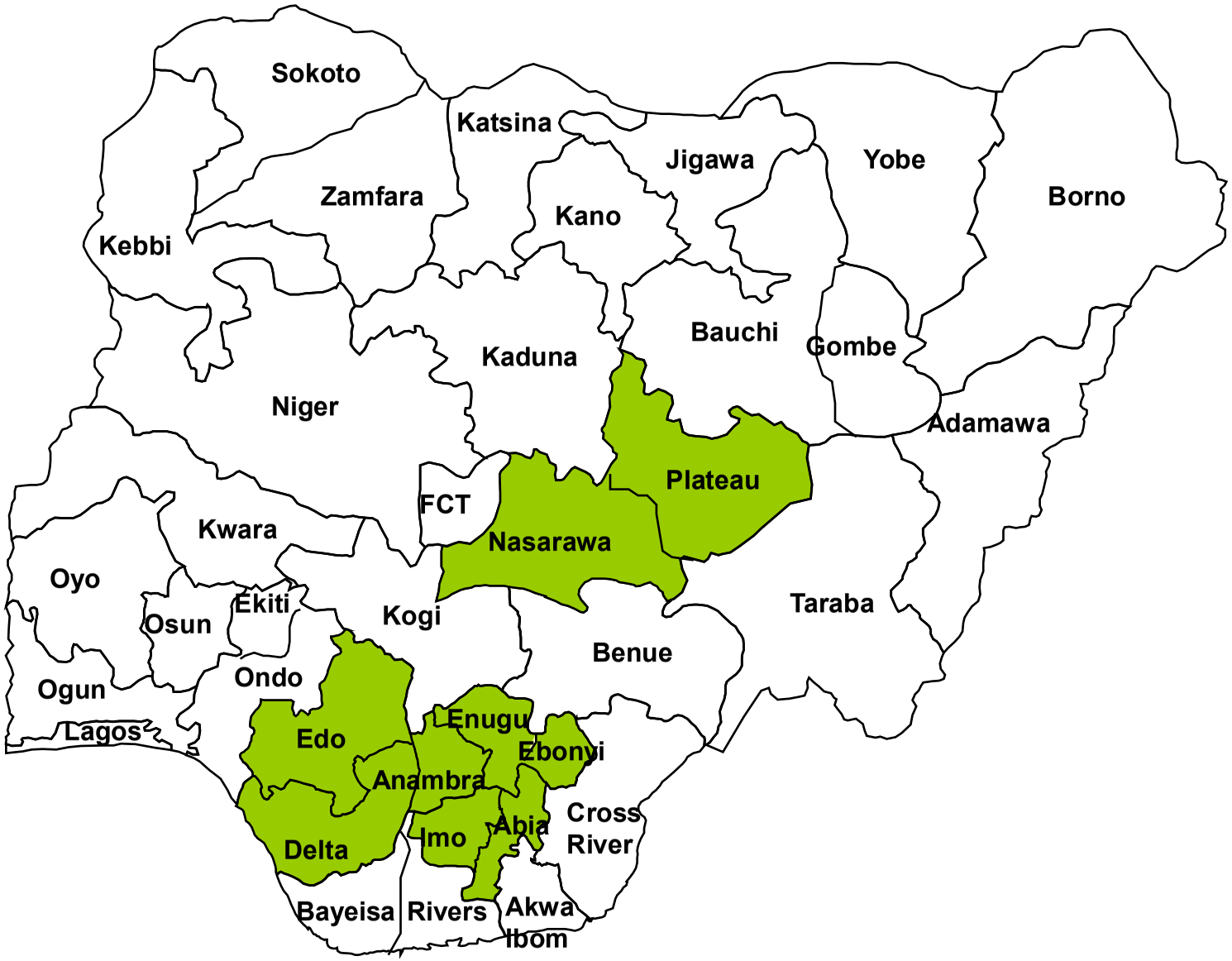


Figure 21

Nigeria: Carter Center-Assisted Areas
2012 River Blindness Mass Treatments*

Name of State	No. of LGAs	Popn treated cumulative	Ultimate TX Goal (UTG)	% UTG treated	Total Popn	% of total popn treated	Active villages cumulative	Active villages UTG/ATO	Active villages % for UTG
ENUGU	17	840,370	815,152	103%	1,018,940	82%	1,373	1,373	100%
ANAMBRA	16	604,544	604,054	100%	755,068	80%	1,062	1,062	100%
EBONYI	10	484,579	507,813	95%	634,767	76%	951	973	98%
EDO	12	1,190,878	1,167,751	102%	1,364,851	87%	824	824	100%
DELTA	9	510,247	511,362	100%	639,203	80%	470	470	100%
IMO	18	720,108	723,635	100%	904,544	80%	1,940	1,853	105%
ABIA	12	422,196	422,573	100%	528,217	80%	684	684	100%
PLATEAU	5	372,109	376,621	99%	470,775	79%	294	296	99%
NASARAWA	7	911,400	916,557	99%	1,143,196	80%	587	589	100%
TOTAL	**106**	**6,056,431**	**6,045,518**	**100%**	**7,459,561**	**81%**	**8,185**	**8,124**	**101%**

Active Treatments

* 45,757 passive treatments were also reported.

Figure 22

Nigeria: 2012 Lymphatic Filariasis and Schistosomiasis Treatments

Lymphatic Filariasis Treatments

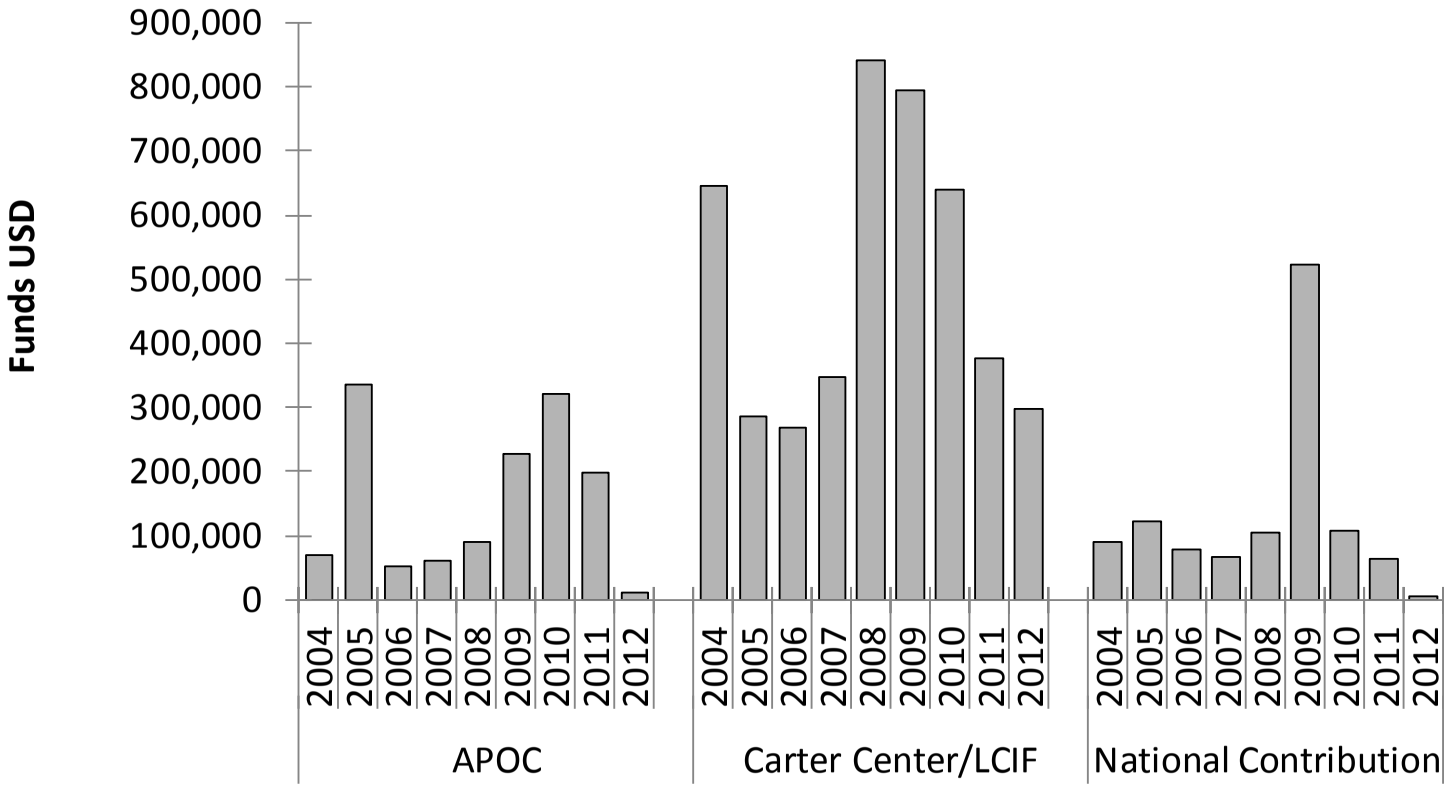
Name of State	No. of Local Gov't Areas (LGAs)	Popn treated cumulative	Ultimate TX Goal (UTG)	% UTG treated	Total Popn	% of total popn treated	Cumulative Villages Treated	Villages UTG
Plateau	14	1,451,211	1,743,408	83%	2,179,260	67%	1,914	2,328
Nasarawa	11	1,696,692	1,709,945	99%	2,134,930	80%	899	975
Total	**25**	**3,147,903**	**3,453,353**	**91%**	**4,314,190**	**73%**	**2,813**	**3,303**

Schistosomiasis Treatments

State	No. of Local Gov't Areas (LGAs)	Popn treated cumulative	Annual Treatment Objective (ATO)/UTG	% ATO/UTG Treated	Cumulative Villages Treated	Villages UTG	Villages % of UTG
Edo	12	153,427	184,604	83%	117	117	100%
Delta	9	119,203	119,217	100%	89	89	100%
Plateau	17	464,531	1,035,951	45%	1,744	2,577	68%
Nasarawa	13	435,698	782,300	56%	950	1,061	90%
Total	**51**	**1,172,859**	**2,122,072**	**55%**	**2,900**	**3,844**	**75%**

Figure 23

Financial Contribution by Individual Partners in US Dollars (2007-2012)



The APOC and government contributions are reported by our Carter Center country representatives based on their best possible determinations from information available in country through the National Onchocerciasis Task Force and other local sources. Capital equipment replacement provided by APOC and government salaries are not considered.

Figure 24

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

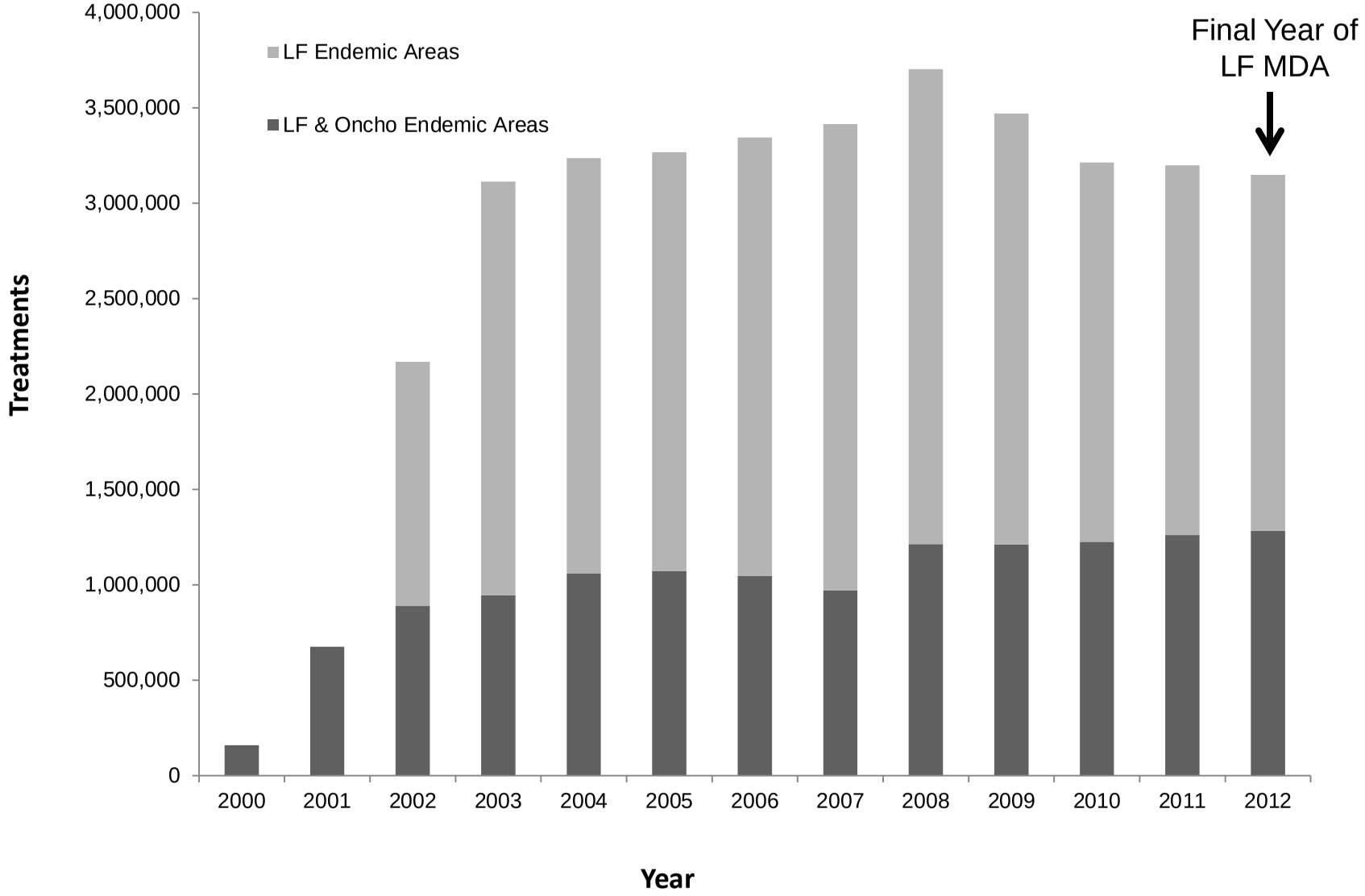
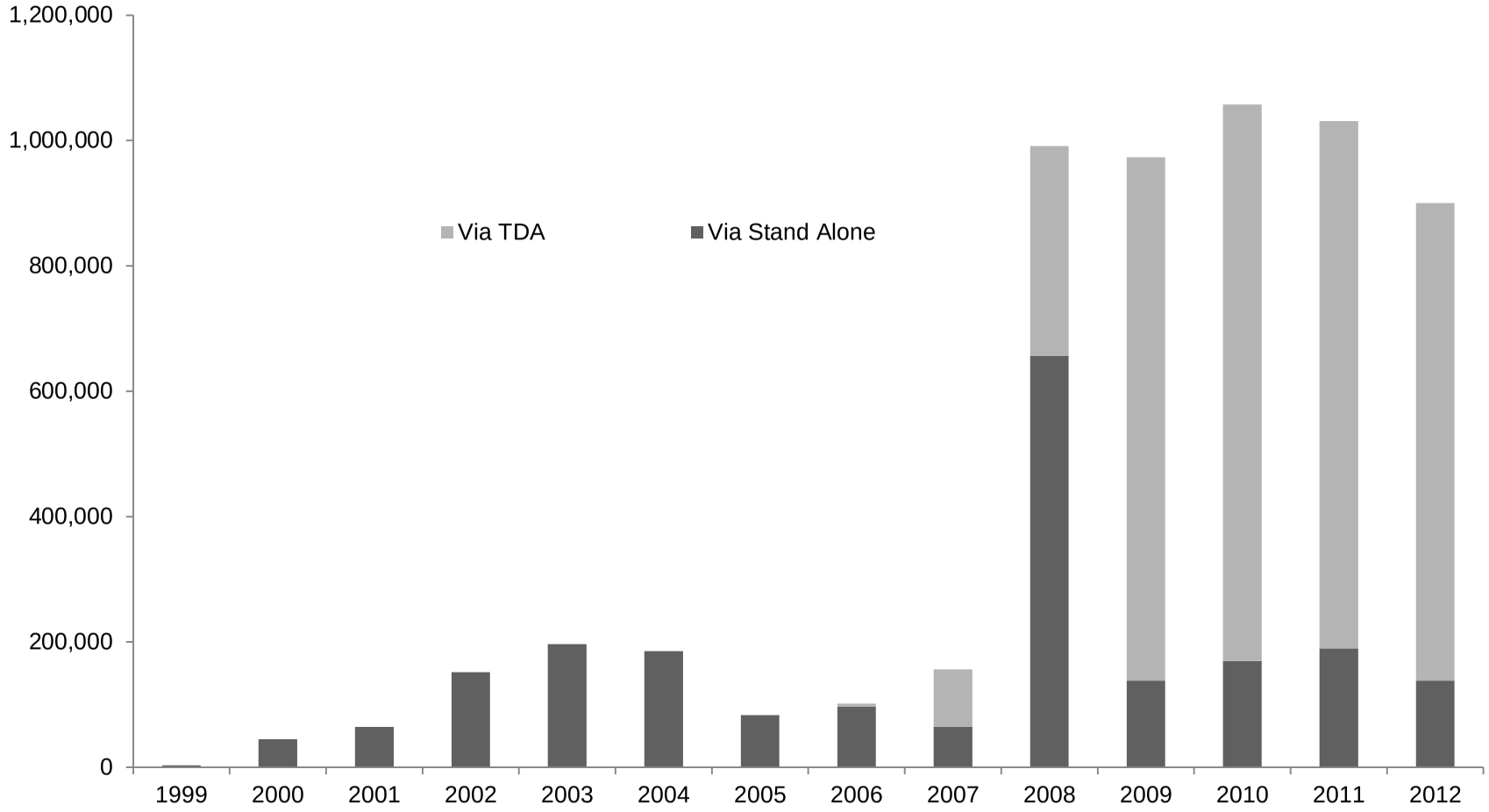


Figure 25

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



ETHIOPIA

Summary

In 2012 the Federal Ministry of Health (FMOH) of Ethiopia released a new master plan for NTDs that included a change in policy from RB control to RB elimination. As part of this policy change, in 2012 the Lions-RBP assisted the MOH to provide almost 4.9 million treatments; a 50% expansion over treatments assisted in 2011. The increase was due to the launching of treatment activities in new, previously unrecognized hyper and mesoendemic areas bordering old CDTI zones. Further expansion of treatments to include twice per year interventions as well as treatments in formerly untreated hypoendemic areas is planned, as well as establishment of a molecular laboratory for enhanced monitoring and surveillance. Almost 10 million treatments are proposed in this scale up effort for 2013, double the number provided in 2012.

The NTD National Master Plan now requires integration of interventions against NTDs, especially in the elimination of river blindness and LF. Based on this policy, and completion of LF mapping in TCC assisted RB treatment zones, LF treatments in TCC assisted zones in 2012 increased eight fold compared to 2011, reaching 711,701 (Frontispiece Figure I)**.**

Background: Ethiopia is the second most populous country in Africa with a population of approximately 83 million. Onchocerciasis was first reported in southwestern regions in 1939, while the northwestern part of the country was recognized to be endemic in the 1970s. The National Onchocerciasis Task Force (NOTF) was established in 2000, and the African Program for Onchocerciasis Control (APOC) began supporting Rapid Epidemiological Mapping of Onchocerciasis (REMO) in Ethiopia in 2001. This mapping identified and targeted 10 areas where the overall prevalence of onchocerciasis was estimated to be more than 40% (≥20% nodule rate) and thus eligible for APOC's community-directed treatment with ivermectin (CDTI) projects. The Carter Center, Lions Clubs International Foundation, and local Lions Clubs partnered with the FMOH and APOC in 8 of these 10 projects, beginning with Kaffa and Sheka zones in 2001. Since then, the River Blindness Program has expanded to include Bench-Maji, North Gondar, Illubabor, Jimma, Metekel and Gambella (Figure 26).

In 2012, The Lions Clubs International Foundation SightFirst provided renewed financial support to the Ethiopia effort. Members of Lions Clubs District 411-A play an important role in both The River Blindness and Trachoma Control Programs in the Lions-Carter Center SightFirst project areas of Ethiopia. Ethiopian Lions participate actively in the annual retreat of Carter Center Ethiopian staff, and The Carter Center's Country Representative in Ethiopia, Dr. Zerihun Tadesse, is a Lions Club member. The Honorable Dr. World Laureate Tebebe Y. Berhan attended the Program Review in Atlanta, representing the Lions Clubs of Ethiopia.

New Onchocerciasis Endemic Areas: In 2010-11, APOC supported new mapping activities in areas adjacent to Lions-Carter Center-assisted treatment areas. These adjacent areas were previously considered to be hypoendemic (nodule rates <20% and microfilaria rates <40%). Carter Center and FMOH staff worked with APOC consultants in these activities, which took place in 25 untreated woredas in Illubabor, Jimma and North Gondar zones. Eighteen of these woredas (72%) had nodule and/or mf rates that were above the hypoendemic threshold and were therefore in need of Mectizan® treatment. These 'expansion areas' have an estimated population of 1.7 million persons in need of treatment (Figure 26). Expansion areas were included in 2012 TCC assisted treatments activities, resulting in a 50% increase in treatments provided over 2011 (Figure 27). There may be other meso- and hyperendemic onchocerciasis areas in Ethiopia yet to be discovered.

Treatments: During 2012, 3,393,740 people were treated in old CDTI areas, while another 1,489,042 were treated in the new areas, adding to a total number treated of 4,882,782 people, in 24,278 of 24,367 targeted villages (Figure 28). The UTG treatment coverage reached 95%, and comprised 76% of all treatments given Ethiopia in 2012 (up from 68% in 2011).

Mectizan®: The national river blindness program received 14,587,000 tablets in 2012. Together with a balance of 248,768 tablets carried over from 2011, these were made available for distribution to Lions-Carter Center assisted areas. Through the course of the year, 13,519,042 tablets were distributed, with 42,044 (0.3%) damaged and none expired. The average number of tablets per person treated was 2.8. The balance at year's end was 1,324,682 tablets.

Training and Health Education: Training was provided to 71,621 community-directed distributors (CDDs) (Figure 29); this was a 74% increase over 2011 due to over 30,000 new CDDs in the new endemic areas. The ratio of CDDs per population changed from about 1:100 in 2011 to 1:85 in 2012. A total of 8,367 community supervisors were trained, overseeing an average of 9 CDDs each; an improvement from 13 CDDs per supervisor in 2011. These ratios have been improving annually. The percent of female CDDs showed substantial increase for the first time in recent years, from 11% in 2011 to 34% in 2012 (Figure 30). Community supervisors have had high levels of female participation, however, and 67% of the Community Supervisors trained in 2012 were female. This is due to the FMOH effort to engage the predominantly female Health Extension Workers in the CDTI supervisory program. Health education was provided in all 24,367 targeted communities in 2012.

Financial Contribution: Although CDTI is being implemented through government health care delivery structures, key funding comes from the Lions Clubs International Foundation and individual donors to The Carter Center. The five-year core funding from APOC ended for Lions-Carter Center assisted RB programs in 2009, although APOC funding increased temporarily in 2011 for mapping activities (discussed above). Government investment in the program has been generally improving (Figure 31).

Expenditures are expected to increase in 2013 as the new elimination effort gets underway.

Lymphatic Filariasis (LF): With GSK support, LF surveys were conducted in several zones in western Ethiopia in 2008, and found that LF was co-endemic with onchocerciasis in a number of areas currently assisted by TCC.

In 2009, GSK also supported The Carter Center to launch an FMOH endorsed LF elimination pilot program in Gambella Region, providing approximately 75,000 treatments annually. In 2012, with renewed support from GSK, the program was expanded to woredas in Bench Maji, Metekel, and North Gondar, increasing the UTG nearly 10 fold. In 2012, a total of 711,701 LF treatments were given for 96% of the UTG of 742,573 and an eight fold increase in LF treatments compared to 2011. It is anticipated that 2013 LF treatments will remain stable, with only modest increases..

Other Integration: The Carter Center's malaria program assistance operated at the grassroots level through CDDs in parts of Jimma and Illubabor zones (Oromia regional state), Bench Maji, Sheka, and Keffa zones (SNNPR regional state), Metekel zone (Beneshangul-Gumuz regional state), North Gondar zone (Amhara regional state) and part of Gambella Region. In North Gondar, the integrated program also delivers Carter Center assisted trachoma control activities. Malaria prevention activities are now included in integrated CDD training courses. CDDs are trained to provide health education messages related to the use and care of long-lasting insecticide-treated bed nets (LLINs) during their MDA activities.

2013 RECOMMENDATIONS FOR CARTER CENTER ETHIOPIA

Onchocerciasis

Launch twice per year treatments in newly identified meso-hyperendemic woredas. Consider twice per year treatment in all woredas of Kaffa, Sheka, and Bench Maji zones where mass treatment has been done for many years and transmission continues.

Continue mapping and delimiting other active onchocerciasis transmission zones including assessments in areas currently under treatment as well as in previously untreated hypoendemic areas.

Based on above assessments and national priorities for twice per year treatments in some areas, place the order for Mectizan® accordingly, with ample lead time, considering the logistical challenges of twice per year treatments.

Work with the FMOH, APOC and other partners to strengthen and revitalize the NOTF. Establish a national FMOH surveillance team that will build monitoring, evaluation, and surveillance capacity at zonal and woreda levels.

Establish a functional laboratory in the Ethiopian Health and Nutrition Research Institute (EHNRI), capable of performing OV16 antibody studies and PCR in black flies. Training and equipping the lab needs to be timed so that it is operational by fourth quarter of 2013. Training and other consultation with the University of South Florida lab is required in this process.

Coordinate with National Onchocerciasis Elimination Program (NOEP) to ensure that the application for Mectizan® and Albendazole for 2013 is submitted as early as possible and no later than August of the year before the drug is needed. Work with federal agencies to facilitate appropriate documentation and clearance for all medications. Albendazole applications require an annual report to be submitted by the NOEP and approved by the WHO Regional Office. Because drug requests are made well before treatment activities are done, treatment denominators will require adjustment during the treatment year.

Changes in UTG denominators varying by 5% or more should be noted in the monthly report, along with an explanation stating why the adjustment was made and if additional drug was needed. National program authorities and Mectizan Donation Program (MDP) should be advised accordingly. Changes in numbers of treatments to be administered (numerators), and frequency of administration (once versus twice per year) require discussion at Carter Center headquarters and approval by the MOH/NOTF and the MDP.

Undertake treatment coverage questionnaire surveys that provide 95% CIs.

Conduct the Carter Center's monitoring protocol annually to assess and validate coverage, health education, community involvement, and ownership. Expanded coverage surveys that provide 95% CIs will be needed.

Maintain a target of a minimum 1 CDD to 100 population ratio. Seek to increase training, supervision, involvement of kinship groups and gender balance among CDDs and community supervisors as appropriate. The current goal of 5 CDDs per supervisor cannot be reached as CDTI activity supervision is primarily by government employed extension health workers. Therefore, the program should begin to assess their effectiveness as the program moves towards semi-annual treatment.

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

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

Lymphatic Filariasis

Publish results of sentinel village work demonstrating LF infection (nocturnal microfilaremia) rates of up to 11% in areas treated for years with ivermectin for onchocerciasis (these results are of great international interest).

Map for LF in all newly identified RB expansion areas. Add albendazole to Mectizan® where RB and LF are co-endemic.

Treatment Objective for onchocerciasis for 2013:
Semiannual UTG(2): 8,181,932
Annual UTG: 1,928,388

Treatment Objective for lymphatic filariasis for 2013: 852,898

Training Objective for 2013:
CDDs: 81,204
Community supervisors: 10,206

Figure 26

Ethiopia: Lions-Carter Center-Assisted CDTI Projects

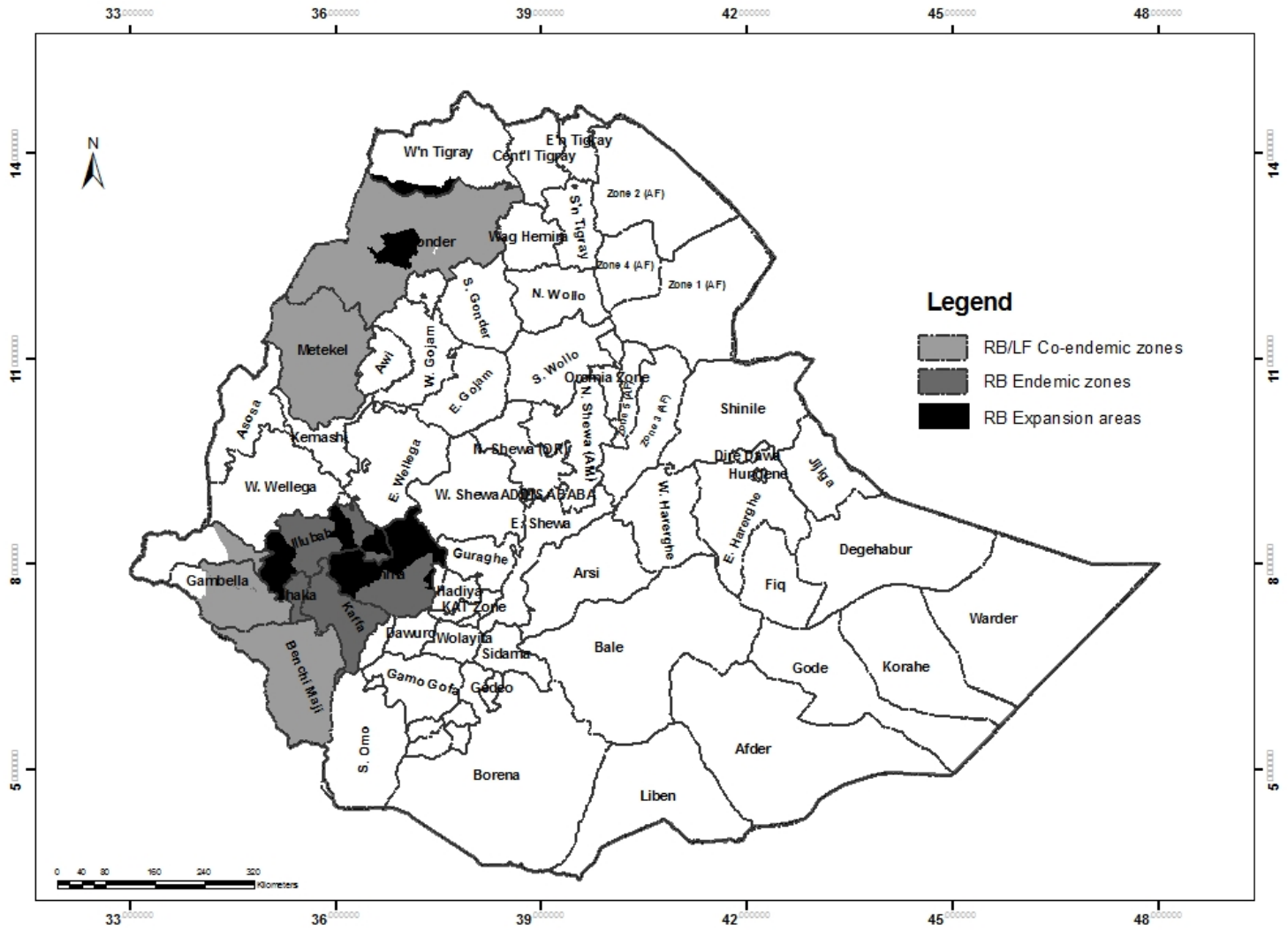


Figure 27

Ethiopia: Lions-Carter Center-Assisted Mectizan® Treatments as Percentage of Total Treatments Provided, 2001-2012

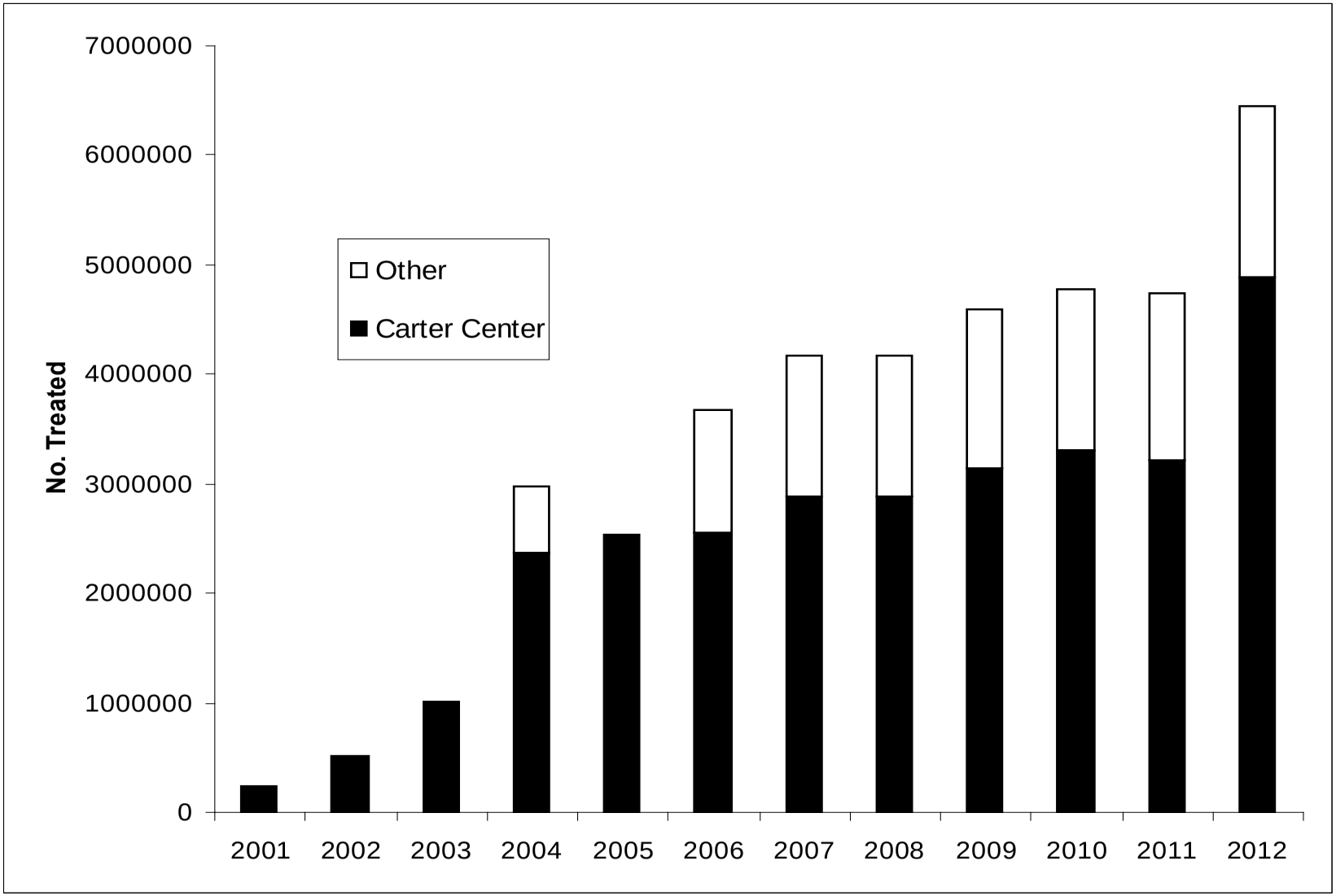


Figure 28

Ethiopia: Lions-Carter Center-Assisted Areas: 2012 River Blindness Treatments

Status by 2012	Project zone	Woredas	Total Popn for 2012	Ultimate TX Goal (UTG) for 2012	Popn treated cumulative for 2012	Total Popn TX % for 2012	Popn TX % of UTG 2012	Active villages treated 2012	Active villages cumulative for 2012	Active villages of UTG for 2012	% of active villages covered 2012
Old	Kaffa	11	1,031,105	866,128	822,589	80	95	2,650	2,651	2,651	100
Old	Sheka	5	218,821	183,810	178,983	82	97	642	642	642	100
Old	Bench Maji	10	725,509	609,428	553,741	76	91	1,341	1,354	1,354	99
Old	N. Gondar	5	311,546	261,699	258,625	83	99	763	763	763	100
New	N. Gondar	2	191,378	160,758	145,162	76	90	519	527	527	98
	Illubabor	12	755,247	634,407	629,092	83	99	3,980	3,980	3980	100
New	Illubabor	8	442,594	371,779	346,661	78	93	2,327	2,354	2,354	99
	Jimma	4	891,037	748,471	744,187	84	99	4,313	4,313	4313	100
New	Jimma	10	1,264,747	1,062,387	997,219	79	94	6,943	6,983	6,983	99
	Metekel	4	166,828	140,136	130,201	78	93	431	431	431	100
	Gambella	5	106,764	89,682	76,322	71	85	369	369	369	100
	TOTAL	**76**	**6,105,576**	**5,128,685**	**4,882,782**	**79.1**	**94.1**	**24,278**	**24,367**	**24,367**	**99.5**

Figure 29

Ethiopia: CDDs and Community Supervisors Trained (2004 - 2012)

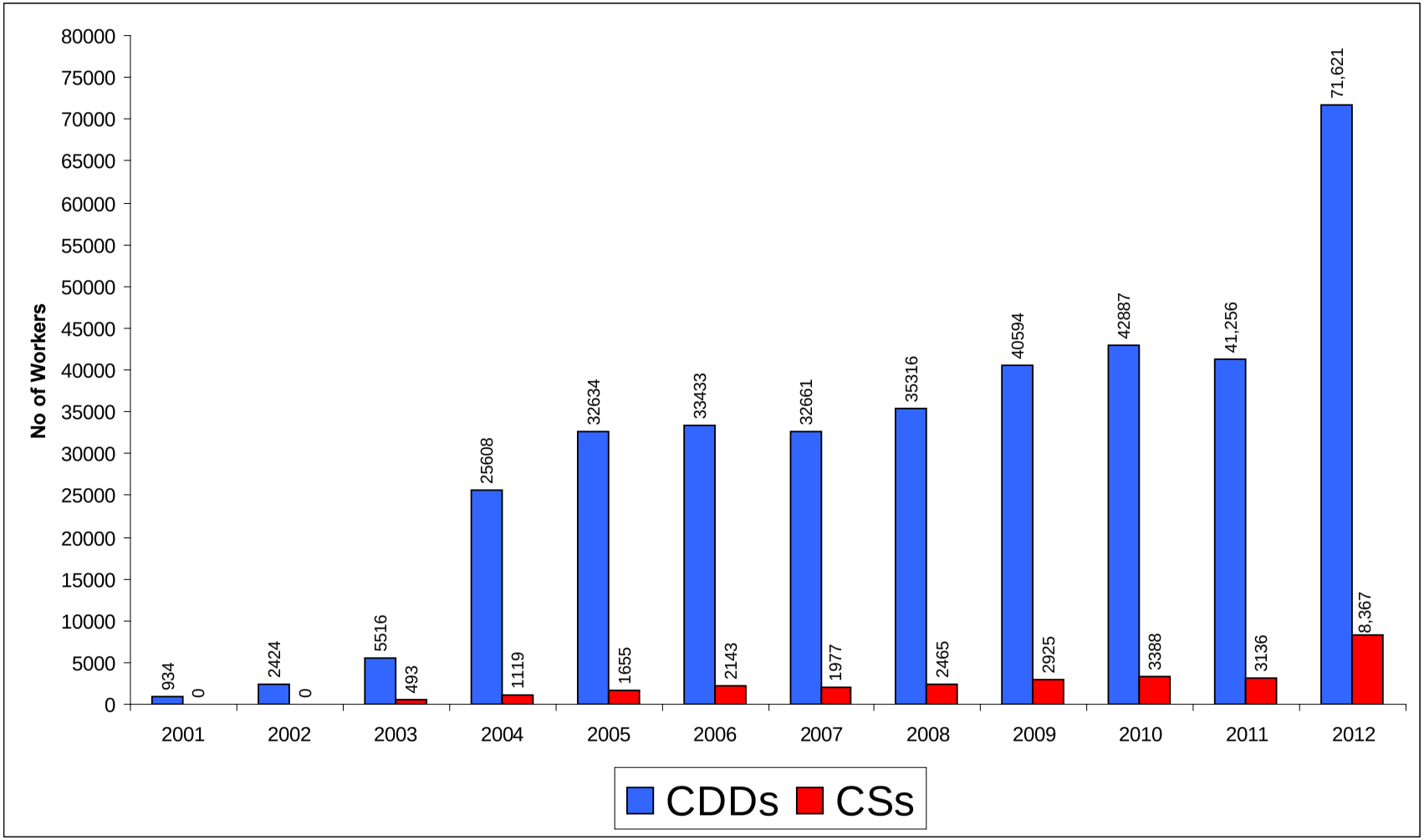


Figure 30

Ethiopia: Training of CDDs: 2001-2012 and percentage female

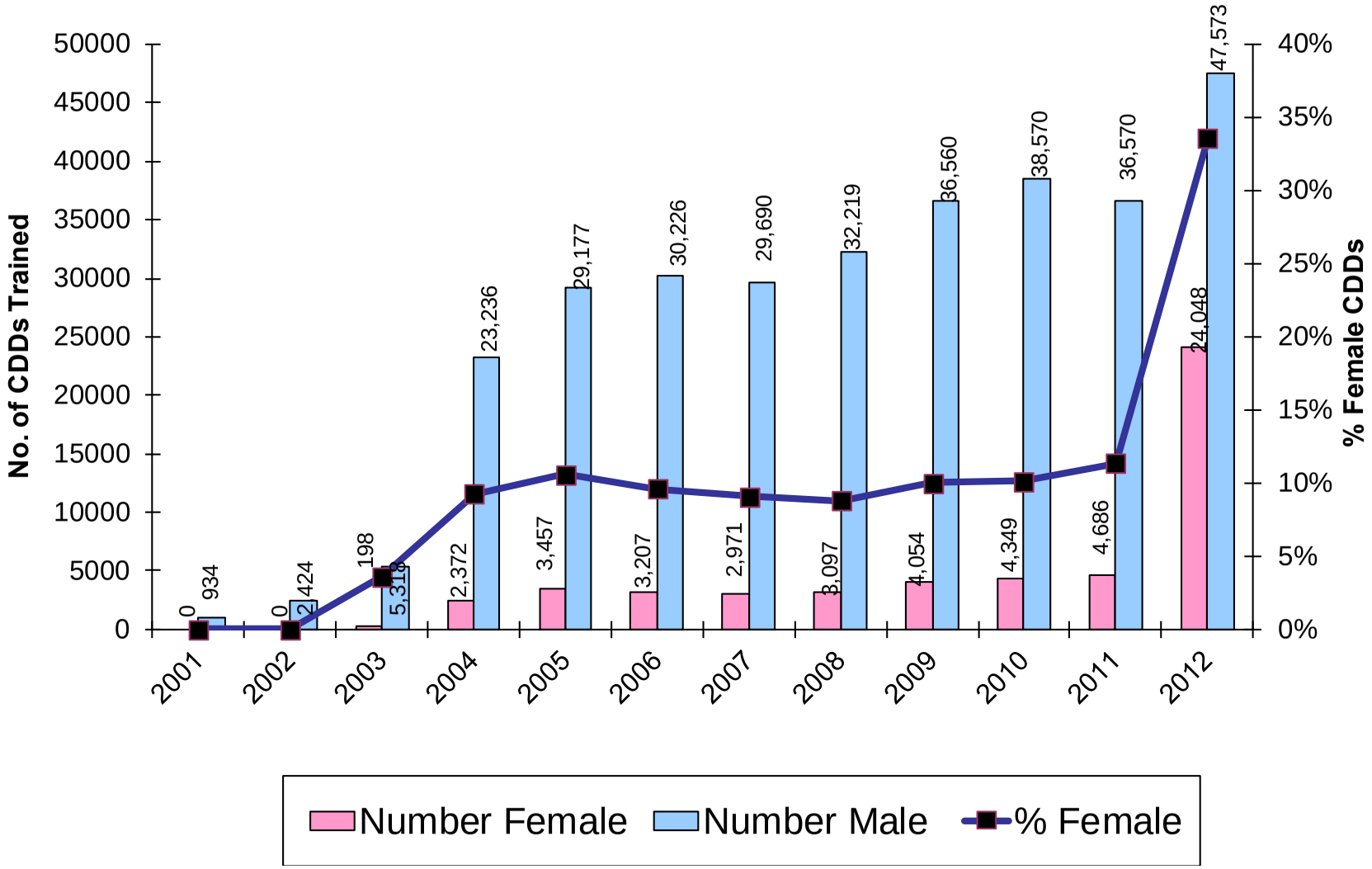
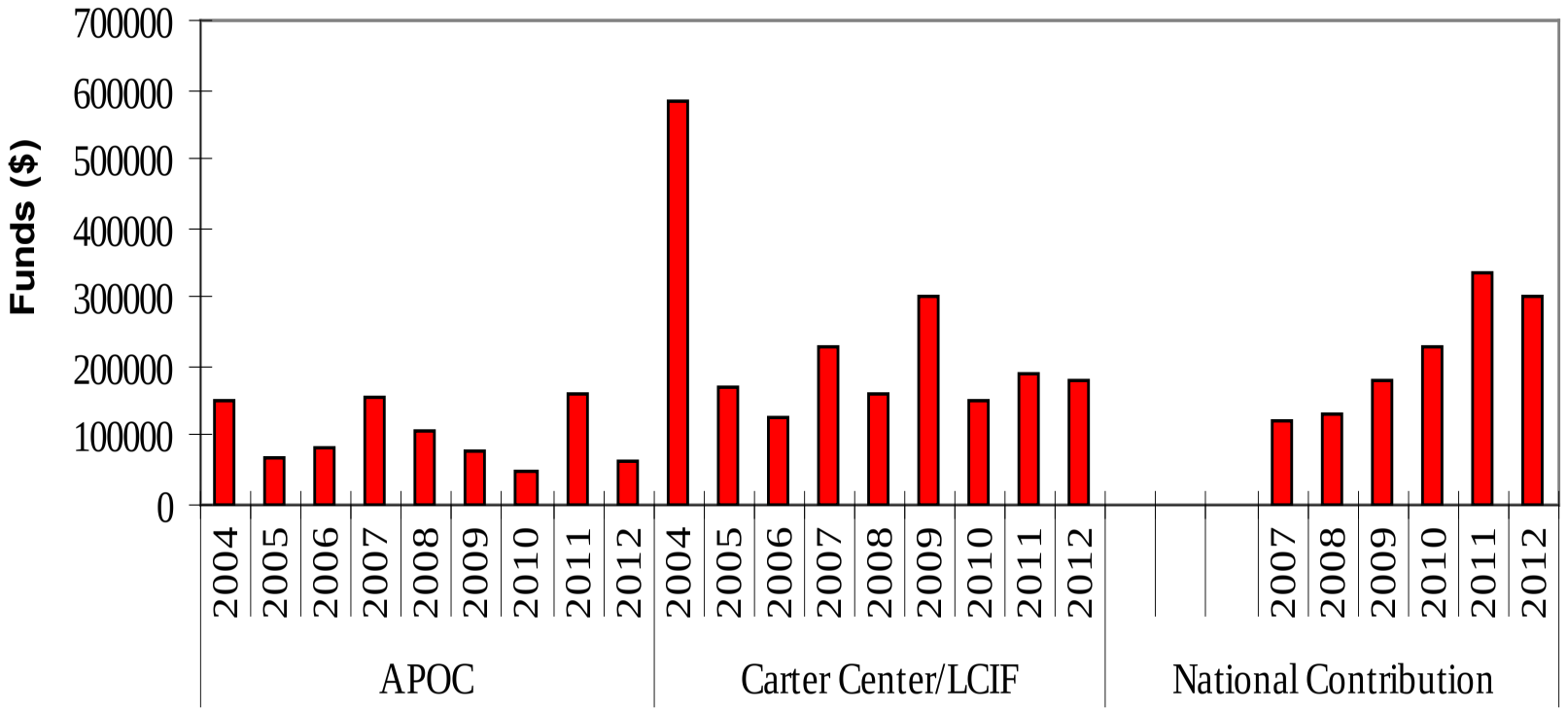


Figure 31

Ethiopia: Financial Contribution by different Partners 2001-2012



ACRONYMS

APOC	African Program for Onchocerciasis Control
arvs	at-risk villages (villages requiring community-wide active mass therapy)
ATO	Annual Treatment Objective
ATP	Annual Transmission Potential
BCC	Behavior Change Communication
BMGF	Bill & Melinda Gates Foundation
CBM	Christoffel Blindenmission
CDC	Centers for Disease Control and Prevention
CDD	Community Directed Distributors
CDHS	Community-Directed Health Supervisors
CDTI	Community-Directed Treatment with Ivermectin
CPA	Comprehensive Peace Agreement
CS	Community Supervisors
DDT	Dichlorodiphenyltrichloroethane
DEC	Diethylcarbamazine
DNA	Deoxyribonucleic Acid
DRC	Democratic Republic of the Congo
earp	eligible at-risk population
ELISA	enzyme-linked immunosorbent assay
FMOH	Federal Ministry of Health
GAELF	Global Alliance to Eliminate Lymphatic Filariasis
GOS	Government of Sudan
GOSS	Government of South Sudan
GSK	GlaxoSmithKline
HE	Health Education
HQ	Headquarters
IACO	InterAmerican Conference on Onchocerciasis
IEC	Information, Education, and Communication
IRB	Institutional Review Board
JAF	Joint Action Forum
KGaA	E-Merck
LCCSFI	Lions-Carter Center SightFirst Initiative
LCIF	Lions Clubs International Foundation
LF	Lymphatic Filariasis
LGA	local government areas
LLIN	Long Lasting Insecticidal (bed) Net
MDA	Mass Drug Administration
MDP	Mectizan® Donation Program
MEC	Mectizan® Expert Committee
Mectizan®	Ivermectin (Merck, product name)
MITOSATH	Mission to Save the Helpless
MOH	Ministry of Health
NGDO	Non-Governmental Development Organization
NOCP	National Onchocerciasis Control Program

NOTF	National Onchocerciasis Task Force
NTDs	Neglected Tropical Diseases
OCP	Onchocerciasis Control Program of West Africa
OEPA	Onchocerciasis Elimination Program for the Americas
OFR	Order of the Federal Republic
PAC	Preschool Age Children
PAHO	Pan American Health Organization
PCC	Program Coordinating Committee of OEPA
PCR	Polymerase Chain Reaction
PTS	Post-Treatment Surveillance
PZQ	Praziquantel
RB	River Blindness
RBEP	River Blindness Elimination Program
RBF	River Blindness Foundation
RBP	River Blindness Program of The Carter Center
REMO	Rapid Epidemiological Mapping of Onchocerciasis
RTI	Research Triangle Institute
SAC	School Age Children
SAE	Severe Adverse Events
SH	*Schistosomiasis haematobium* (urinary schistosomiasis)
SM	*Schistosomiasis mansoni*
STAG	Strategic and Technical Advisory Group
STH	Soil Transmitted Helminths
TAS	Treatment Assessment Survey
TCC	Technical Consultative Committee of APOC
TDA	Triple Drug Administration
TDR	Special Programme for Research and Training in Tropical Diseases
UNICEF	United Nations Children's Emergency Fund
UOEEAC	Ugandan Onchocerciasis Elimination Expert Advisory Committee
USAID	United States Agency for International Development
UTG	Ultimate Treatment Goal
WER	Weekly Epidemiolgical Record
WHO	World Health Organization

ANNEX 1: A History of the River Blindness Campaign at The Carter Center

Human onchocerciasis, caused by the parasite *Onchocerca volvulus*, is an infection characterized by chronic skin and eye lesions. Onchocerciasis is transmitted by small black flies of the genus *Simulium* that breed in rapidly flowing rivers and streams. Due to the high disease rates near rivers, onchocerciasis has been called "river blindness." The adult parasites develop in humans, and reside in non-painful nodules, measuring about one to two centimeters in diameter. These nodules have the consistency and dimensions of cooked lima beans and often can be easily felt under the skin. The parasites are thin male and female worms that measure up to 12 inches in length and have a lifespan of five to 15 years. Female worms, which are four to five times longer than males, release embryonic stage offspring called microfilariae that emerge from the nodules. The microfilariae swarm under the skin, causing itching and rashes and can enter the eyes, where they cause inflammation and ocular damage. The transmission cycle is propagated when microfilariae are picked up, metamorphose into infectious larvae and are transmitted to another person when the infectious black flies return to bite humans once more. The World Health Organization (WHO) estimates that approximately 123 million people live in endemic areas (and are therefore at risk of infection) in 38 endemic countries, 30 of which are in Africa. Approximately 770,000 persons are blinded or severely visually impaired as a result of the infection. Most of those infected (99 percent) are African. Annual mass treatment with the oral tablets of a medicine called ivermectin (Mectizan®), donated by Merck, prevents eye and skin disease by killing the microfilariae. Unfortunately, ivermectin is not curative, as it does not kill the adult *O. volvulus* (although it does reduce the worms' lifespan). Annual treatment does reduce transmission of the parasite by lowering the amount of microfilariae available to black flies. Twice-per-year treatment (e.g. every six months) is more certain to interrupt transmission of the disease if treatment coverage is high, as this keeps microfilariae levels (and, thus, fly infection rates) extremely low throughout the year. At times four times per year treatment is required (every three months) to push transmission below a critical threshold at which point worm populations cannot be sustained. Twice- or four-times-per-year mass drug administration (MDA) also increases the death rate of the adult worms so that MDA could theoretically be stopped after 6.5 years (with six monthly treatment) or 5 years (with quarterly treatment).

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

The Carter Center and its River Blindness Elimination Program: In 1987, Merck & Co., Inc. approached Dr. William Foege, then executive director of The Carter Center, for assistance in organizing the global distribution of Mectizan®. Shortly thereafter, in 1988, the Mectizan® Expert Committee (MEC) and the Mectizan Donation Program (MDP) were created and housed at the Atlanta-based Task Force for Child Survival and Development (now called the Task Force for Global Health), an independent partner of The Carter Center, with Dr. Foege as Chair. The global initiative has grown to one that now enables approximately 140 million treatments per year, and has cumulatively provided over one billion treatments valued at more than $4.2 billion U.S. dollars during the 25 years that it has been in existence. The donation is widely considered a model of public-private partnership that demonstrates how industry, international organizations, donors, national Ministries of Health (MOHs) and affected communities can successfully work together toward solving a major health problem. The MDP has spawned other public-private partnerships based on large drug donations and mass treatment programs to fight what are collectively known as the neglected tropical diseases (NTDs). Many of these programs are based at the Task Force for Global Health (www.taskforce.org).

In 1996, The Carter Center expanded its role within the coalition fighting river blindness by acquiring most of the operations of the River Blindness Foundation (RBF), a Houston- based organization founded in 1990 by John and Rebecca Moores. The River Blindness Program (RBP) was established at The Carter Center to assume the field activities of the RBF. The programs assumed in 1996 were active in parts of five African countries: Ethiopia, Nigeria, Cameroon, Sudan and Uganda, as well as the Onchocerciasis Elimination Program for the Americas (OEPA). OEPA has coordinated activities to completely eliminate transmission and RB infection in all six onchocerciasis-endemic countries in the Americas (Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela).

Shortly after assuming the field activities of the RBF in 1997, The Carter Center's RBP expanded to northern and southern Sudan (now Sudan and South Sudan) with support from the Lions Clubs International Foundation (LCIF), as part of the Carter Center's peace initiative and Guinea worm disease eradication efforts. In 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. Mectizan® treatments and health education (HE) began in 2001. The Comprehensive Peace Agreement (CPA) in Sudan, signed in January 2005, put an end to the decades-long civil war and created the Government of South Sudan (GOSS). The Lions-Carter Center RBP ceased its support of river blindness control activities in GOSS areas of the country shortly after the CPA was signed, when the African Program for Onchocerciasis Control (APOC) and CBM signed an agreement to support and establish five Community-Directed Treatment with Ivermectin (CDTI) projects in GOSS areas that overlapped areas historically assisted by RBP. In 2011 the Republic of South Sudan was formed after a referendum in the south overwhelmingly called for partition; North Sudan is now referred to as simply 'Sudan'. In 2011, RBP ceased its work in Cameroon.

Sudan, Uganda, Ethiopia and Nigeria launched elimination strategies in 2006, 2007, 2012 and 2013, respectively. All four countries formally invited The Carter Center to participate in their elimination efforts. In Sudan, the elimination strategy targets the Abu Hamad focus on the River Nile, using a twice-per-year treatment approach. In 2011, the Sudan Ministry of Health determined that transmission had been interrupted. In Uganda, the strategy is to phase in a countrywide flexible policy of elimination that includes not only twice-per-year treatment, but also vector elimination or targeted vector control where feasible through larviciding of breeding sites in fast-running rivers and streams. In Ethiopia and Nigeria, national programs are now phasing in treatment of hypoendemic areas and twice-per-year treatments. Nigeria is currently evaluating the ability to treat in areas that are coendemic for *Loa loa* (and thus where ivermectin may not be safe to distribute).

In 2012, The Carter Center's River Blindness Program obtained the Board of Trustees' approval to implement an 8-year plan to interrupt RB transmission everywhere we assist by 2020, in accord with the goals of the governments of the countries RBP assists. In early 2013, just prior to its Program Review, RBP was granted permission by the Board of Trustees to change its name to the River Blindness ***Elimination*** Program (RBEP) to reflect this paradigm shift everywhere The Carter Center assists. Programmatically, activities will be unchanged in the Americas and Uganda but enhanced in areas currently assisted in Nigeria and Ethiopia. The primary aim of the RBEP is to help Ministries of Health and residents of affected communities to establish and/or sustain optimal Mectizan® distribution and related HE activities, and to monitor the progress toward elimination of onchocerciasis.

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

Partnerships: The Carter Center works through partnerships, with our primary partners being the Ministries of Health (MOHs) and their national onchocerciasis programs. The Carter Center assists programs that are executed within and through the existing primary health care system, with the aim to strengthen those systems. The Carter Center and MOH staff work closely with district and frontline health workers and the afflicted rural communities. RBEP does not establish parallel systems to the MOH; RBEP provides financial and technical assistance, information, education, and communication (IEC), and behavior change communication (BCC). The primary principle is that the people themselves must be empowered to be full partners in the program and in the drug delivery process. As mentioned above, The Carter Center has had a long partnership with Lions Clubs and the Lions' Sight First Initiative, supported by the Lions Clubs International Foundation, in addition to long standing relationships with Merck and the Division of Parasitic Diseases and Malaria (DPDM) at the U.S.

Centers for Disease Control & Prevention (CDC). The Carter Center also works closely with the Task Force for Global Health, which houses the Mectizan Donation Program.

Partners in the African Programs: In Africa, the main Carter Center RBEP partners are the MOHs in host countries (Ethiopia, Nigeria, Sudan, and Uganda). The African Program for Onchocerciasis Control (APOC), which is executed by WHO and funded through a trust fund housed at The World Bank, is another important partner of The Carter Center (see Annex 7). APOC was launched in 1995 (with President Carter presiding), and aims to establish country-sustained river blindness treatment programs with a "community-directed" approach throughout highly endemic onchocerciasis areas in Africa. Carter Center disease control experts Dr. Donald Hopkins, Dr. Frank Richards, and Dr. Moses Katabarwa have all served on the Technical Consultative Committee of APOC. Dr. Richards also serves on the Strategic and Technical Advisory Group (STAG) to WHO's NTD Department and the Executive Group of the Global Alliance to Eliminate Lymphatic Filariasis (GAELF).

In 2011 APOC changed its focus from control to elimination in Africa. The Carter Center applauds and supports the APOC paradigm shift, having been long engaged in demonstrating the feasibility of onchocerciasis elimination in Africa. RBEP will continue to play a leadership role in demonstrating an approach to African onchocerciasis elimination that involves reorienting programs away from the control mode toward a more rigorous elimination mode that implies expanded, intensified, and flexible interventions against onchocerciasis, as well as better mapping, monitoring and evaluation. The RBEP mantra is "Elimination cannot be achieved by business as usual."

The Carter Center also works with other non-governmental development organizations (NGDOs) through an NGDO Coalition that includes, among others, CBM, Helen Keller International, Interchurch Medical Assistance, LCIF, the Mectizan Donation Program, Sightsavers, and the U.S. Committee for UNICEF. Dr. Frank Richards currently serves as Chair of this NGDO Coalition, which in 2013 renamed itself "the NGDO Coalition for Onchocerciasis Elimination," as a statement of solidarity with APOC).

Partners in the Americas Programs: The Carter Center provides the administrative framework for OEPA. Headquartered in Guatemala, OEPA is the technical and coordinating body of a multinational, multi-agency coalition working for the elimination of all onchocerciasis morbidity and transmission from the Americas by the year 2015. Through OEPA, The Carter Center partners with the national programs and MOHs of all six endemic countries of the Americas (Brazil, Colombia[2], 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. Dr. Ed Cupp stepped down as chair of the PCC in 2012, after years of invaluable service; Dr. Frank Richards was elected

[2] In 2013, Colombia received formal verification of river blindness elimination from the World Health Organization.

the new PCC chair in 2013. The Carter Center works with LCIF, PAHO, CDC, and several U.S. and Latin American universities. In 2003, The Carter Center's RBP received its first support from the Bill & Melinda Gates Foundation for OEPA through a matching grant mechanism that drew additional funding from LCIF, Merck, and more than 70 other donors. In 2012, OEPA began receiving major support from USAID.

Timeline of The Carter Center in River Blindness Elimination

- **1998:** Richards, with other TCC authors (Miri and Sauerbrey) writes about opportunities for RB elimination in a special edition of the Bulletin of WHO entitled Global Disease Elimination and Eradication as Public Health Strategies. He also writes about the history of the launching of the OEPA initiative (Bull PAHO).
- **2000:** OEPA needed a 'definition of success' endorsed by WHO; with a push from President Carter, WHO agreed to hold an important meeting to establish certification criteria for onchocerciasis elimination (WHO 2001). These guidelines remain a key milestone and are used by OEPA and the Uganda program. Richards, writing in *Lancet*, notes the importance of the LF program in advancing the RB elimination agenda.
- **2002:** Carter Center and WHO (with Gates' support) co-hosted a "Conference on RB Eradicability" that concluded RB can be eliminated in the Americas but not yet throughout Africa with current tools (ivermectin alone). The challenge of the parasite *Loa loa*, which occurs in some areas that have RB, was noted (ivermectin given to a person having *Loa loa* infection can result in severe nervous system reactions, including coma). (Dadzie 2003)
- **2003:** Richards coauthors a paper on mass treatment decision making in *Loa loa* areas where onchocerciasis occurs. (Addis 2003)
- **2005:** Paper published by Hopkins, Richards, and Katabarwa ("Whither Onchocerciasis Control in Africa?") challenges feasibility of indefinite RB control in Africa without continued external support. Calls for governments to do more to fund their RB programs, and calls for further research into RB elimination in Africa. (Hopkins 2005)
- **2006:** TCC agrees to assist North Sudan in elimination efforts in the Abu Hamad focus on the River Nile. (Higazi 2011, 2013)
- **2007:** TCC' ITFDE reviews RB eradicability and notes evidence that ivermectin alone may interrupt transmission in Africa, but that the challenge of *Loa loa* is not resolved. (WHO 2007). TCC/RBP agrees to assist Uganda in its new goal of national RB elimination.
- **2009:** A key WHO/TDR study by Diawara (2009) that was conducted in Senegal and Mali with Gates support (derived as an outcome of the 2001 Conference on Eradicability) proves RB elimination is possible with 17 years of ivermectin alone under some conditions in Africa. Gates, MDP, TCC and APOC all call for "Shrinking the Map" in Africa (WHO 2009). Rakers (TCC staff) reports that RB programs in Nigeria would collapse without external support, questioning the 'sustainability' theory.
- **2010:** TCC reports considerable success in RB elimination efforts in the Americas (series of *Weekly Epidemiological Record* articles) and parts of Africa. However, Katabarwa (TCC/RBP staff) notes a need to expand treatment into the so-called hypoendemic areas excluded in the APOC treatment targeting strategies. He also challenges the Diawara report by noting failures of once per year treatment with ivermectin alone for 17 years in TCC-assisted North Province, Cameroon; TCC calls for twice per year treatment in these areas (Katabarwa 2011). At an international conference TCC reports an analysis of the impact of annual ivermectin and albendazole (for lymphatic filariasis) on onchocerciasis transmission elimination in

many areas of Plateau and Nasarawa States of Nigeria.

- **2011:** TCC's International Task Force for Disease Eradication reviews the RB and LF elimination efforts in Africa, applauds the move by APOC from RB control to elimination, and calls for better coordination of RB, LF and malaria bed net distribution efforts (*Weekly Epidemiological Record* 2011). An expert committee (with Frank Richards TCC RBP Director, as a member), meeting under the auspices of the World Bank, recommends an elimination goal for ten African countries by 2020, including Nigeria, Uganda, and Ethiopia. In late 2012, the World Bank/APOC governing board recommends onchocerciasis elimination now be APOCs goal, and asks donors to extend the APOC program from 2015 to 2025.
- **2012:** Sudan announces interruption of transmission in Abu Hamad focus (Higazi 2013). TCC's River Blindness Program obtained Board of Trustees' approval for an 8-year plan to interrupt RB transmission everywhere we assist, by 2020. WHO sends verification team to Colombia to determine if the country has eliminated onchocerciasis.
- **2013:** The name of TCC's River Blindness Program was changed to The Carter Center's River Blindness Elimination Program (RBEP) to reflect the paradigm shift to focusing efforts on eliminating RB transmission everywhere we work. Colombia is the first country in the world verified by WHO to be free of onchocerciasis.

ANNEX 2: The Carter Center RBP Reporting Processes and Research Agenda

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

In much of Africa, a staged village sampling scheme called Rapid Epidemiological Mapping of Onchocerciasis (REMO) was executed with assistance from WHO to define endemic "zones" that should capture most or all villages having onchocercal nodule rates >20 percent in adults (which roughly corresponds to a microfilariae in skin prevalence >40 percent) for mass treatment. The mapping strategy is based on studies that have shown that most ocular and dermal morbidity from onchocerciasis occurs in villages where the nodule prevalence exceeds 20 percent. In the first stage of REMO, survey villages are selected based on a review of large-scale maps of areas that appear to be environmentally able to support black fly breeding and, therefore, transmission of *O. volvulus*. In the second stage, the survey villages are visited by field teams and a convenience sample of 30-50 adults are examined (by palpation) for characteristic onchocercal nodules. The mean nodule prevalence for each village sample is mapped (often using geographic information systems) and the map is used to define endemic zones called 'community directed treatment with ivermectin (CDTI) treatment zones'. These zones typically are defined by sample villages having nodule prevalence of >20 percent. All villages within the CDTI treatment zone are offered mass Mectizan® treatment annually. This approach is modified for areas where the parasite *Loa loa* exists. The approach of REMO excludes some areas from CDTI, where there may be onchocerciasis but nodules rates are under 20 percent (the so-called "hypoendemic areas"). As the policy shifts from control to elimination, the role of hypoendemic areas in *Onchocerca volvulus* transmission is being critically re-examined. The River Blindness Program (RBP) contributes to this area of investigation in our assisted areas (see Katabarwa, *Trop Med Int Health*. 2010; 15:645-52). Based on evidence we have collected, we firmly believe that transmission occurs in some hypoendemic areas and that they must therefore be promptly reassessed and if necessary treated with CDTI under the elimination approach.

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

lower for the Americas compared to Africa until recently when elimination in Africa became the focus.

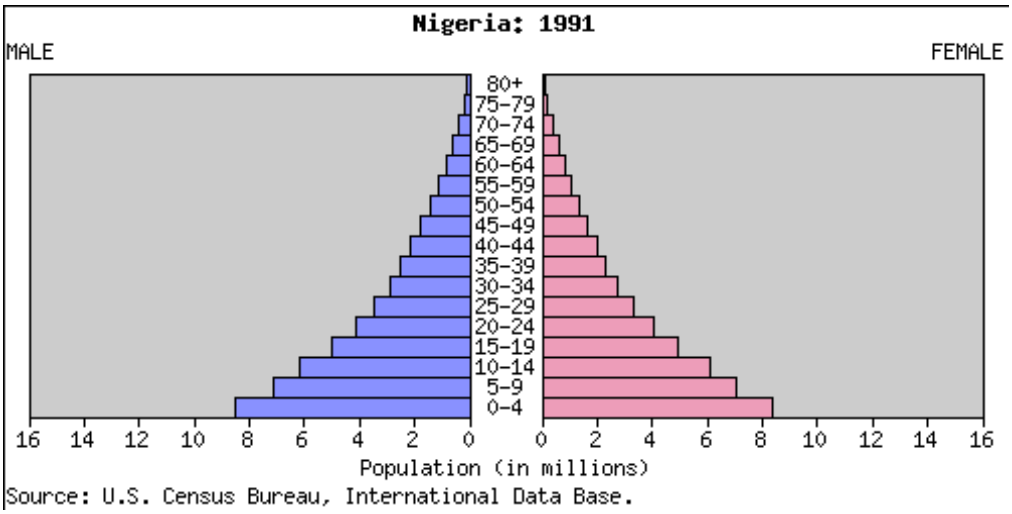
Data Reporting: The Carter Center program offices report monthly to The Carter Center headquarters in Atlanta. These reports include: 1) numbers of villages and persons treated during the previous month (reporting of treatments are updated quarterly for the Americas); 2) the status of the Mectizan® tablet supply; 3) training and health education activities; 4) epidemiological assessment, research, and program monitoring activities; and 5) administrative issues. Standardized tables and graphs are used across programs. The treatment data that are reported originate from village level records prepared during mass treatment activities carried out by village distributors and/or national Ministry of Health (MOH) personnel. The accuracy of these reports is routinely confirmed with random spot checks performed primarily by MOH personnel, supplemented by a standardized monitoring questionnaire administered by The Carter Center and MOH staff. 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 the Americas, the MOHs in the six countries report treatments quarterly to the OEPA office in Guatemala City, which then provides a combined regional report to The Carter Center and to the Program Coordination Committee (PCC), InterAmerican Conference on Onchocerciasis (IACO) and the Pan American Health Organization (PAHO)/World Health Organization (WHO) in its regular meetings; OEPA updates are provided in WHO's annual *Weekly Epidemiological Record (WER)* articles (See Annex 8). African MOHs report their annual results directly to WHO and APOC, which has recently begun publishing its results in the WER as well.

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

RBP Treatment Indices: Treatments are reported as numbers of persons and number of at-risk villages (arvs) treated for the month by district, focus, region, state or zone, depending on the geographical stratification of the country. Cumulative treatment figures for the year are compared to the Annual Treatment Objectives (ATOs) or Ultimate Treatment Goals (UTGs). The decision on whether to use ATOs or UTGs is based on projections of program capacity. Mature programs that sufficiently reach all targeted communities within their entire program area are said to be at "full geographic coverage," and use the UTG index as their coverage denominator (see below). UTG

figures typically increase by about five percent annually to account for normal population growth.

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



The UTG(2) and UTG(4) denominators are used by elimination programs where semiannual or quarterly treatments are delivered: the values are twice or four times the UTG, and represent treatments delivered, not persons treated. Full coverage in control programs is defined as 90 percent achievement of the UTG established for active mass treatment. Full coverage for elimination programs is 90 percent of the UTG(2) in African projects, or 85 percent of the UTG(2) or UTG(4) for OEPA. The differences in full coverage thresholds result from different recommendations by the African and

American expert steering committees. Passive treatments are Mectizan® treatments for onchocerciasis provided through health care units located in hypoendemic communities (where estimated onchocerciasis nodule prevalence is under 20 percent) in the control program strategy. As the program transitions to the elimination paradigm, hypoendemic villages will begin to receive mass treatment and the passive treatment strategy will be largely abandoned.

Annex 3: List of Program Review Participants

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ANNEX 5: Program Review Agenda

Seventeenth Annual River Blindness Program Review Agenda
Tuesday March 5 – Thursday March 7, 2013
The Carter Center, Atlanta, GA

Day 1: Tuesday March 5, 2013

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

Part 1: 2011 Treatment Activity Summary

9:45 – 10:15 10:15 – 10:30	Sudan presentation: Abu Hamad results, Gadarif update *Discussion*	Dr. Asam Zroug
10:30 –11:00 11:00 – 11:15	Ethiopia: Transition to onchocerciasis elimination and 2012 treatment activities *Discussion*	Dr. Zerihun Tadesse
11:15 – 11:45	*Coffee Break*	
11:45 –12:15 12:15 – 12:30	Ethiopia: Survey results and mapping, with treatment expansion plans in new endemic areas *Discussion*	Mr. Aseged Taye
12:30 – 2:00	*Lunch*	
2:00 – 2:30 2:30 – 2:45	Ethiopia: sustainability and integration *Discussion*	Dr. Zerihun Tadesse
2:45 – 3:15 3:15 – 3:30	Uganda: 2012 treatment activities *Discussion*	Ms. Peace Habomugisha
3:30 – 3:45	*Coffee Break*	
3:45 – 4:15 4:15 – 4:30	RTI ENVISION, principles, and overview and comments on Uganda and Nigeria Discussion	Dr. Eric Ottesen
4:30-5:00 5:00-5:15	Mectizan® and albendazole issues *Discussion*	Mectizan Donation Program
5:15	*Session Adjourned*	

Day 2: Wednesday March 6, 2013

8:00	*Shuttle pickup at hotel*	
8:30 – 9:00	*Continental breakfast*	
9:00 – 10:00 10:00 – 10:30	OEPA presentation: Overview, 2012 treatments, Post Treatment Surveillance (PTS), and Venezuela Brazil update *Discussion*	Dr. Mauricio Sauerbrey
10:30 – 11:00	*Coffee Break*	
11:00 – 11:30 11:30 – 12:00	Uganda: sustainability and integration *Discussion*	Ms. Peace Habomugisha
12:00 – 1:30	*Lunch*	
1:30 – 2:00 2:00 – 2:15	OEPA: Twice vs. four-times-per-year treatment: reporting, impact *Discussion*	Dr. Mauricio Sauerbrey
2:15 – 2:45 2:45 – 3:00	Moving from once to twice per year treatments in areas that still have transmission after 10 years of good coverage (Uganda, Nigeria, and Cameroon) *Discussion*	Dr. Moses Katabarwa
3:00 – 3:30	*Coffee Break*	
3:30 – 4:00 4:00 – 4:15	Uganda: Shrinking the onchocerciasis map (to include the role of the UOEEAC, the NCC, and Uganda Elimination Criteria) *Discussion*	Dr. Thomson Lakwo
4:15 – 4:45 4:45 – 5:00	Uganda: OV-16 analysis of laboratory work *Discussion*	Dr. Thomas Unnasch
5:00 – 5:10 5:10 – 5:20	Serological methods for evaluation of onchocerciasis programs *Discussion*	Dr. Vitaliano Cama
5:20 – 5:40 5:40 – 5:50	Lymphatic Filariasis Transmission & Elimination Dynamics *Discussion*	Prof. Edwin Michael
5:50	*Session Adjourned*	

Day 3: Thursday March 7, 2013

8:00	*Shuttle pickup at hotel*	
8:30 – 9:00	*Continental breakfast*	
9:00-9:15	Overview of the day: TCC assisted programs in Nigeria	Dr. Frank Richards
9:15 – 9:40 9:45 – 10:00	Nigeria: Plateau and Nasarawa States: Onchocerciasis, Lymphatic Filariasis, Schistosomiasis and Malaria treatment and bed net distribution activities *Discussion*	Dr. Abel Eigege
10:00 – 10:15 10:15 – 10:30	Nigeria: Mapping for LF & schisto: results of the integrated Transmission Assessment Survey and implications for MDA *Discussion*	Dr. Darin Evans
10:30 – 10:45	*Coffee Break and Group Photo*	
10:45 – 11:15 11:15 – 11:45	Nigeria: Sustainability and integration, with focus on Post LF monitoring, school based schisto treatments, and soil transmitted helminth monitoring when albendazole (for LF) stops (ENVISION) *Discussion (30 minutes)*	Dr. Abel Eigege
11:45 – 12:15 12:15 – 12:30	Nigeria: TCC-assisted Southeast States: Onchocerciasis and schistosomiasis treatment activities *Discussion*	Dr. Emmanuel Emukah
12:30 – 1:30	*Lunch*	
1:30 – 2:00 2:00 – 2:15	NTD line listing of Local Government Areas in the Southeast *Discussion*	Ms. Lindsay Rakers
2:15 – 2:45 2:45 – 3:00	Hypoendemic onchocerciasis evaluation *Discussion*	Dr. Frank Richards
3:00 – 3:15 3:15 – 3:30	New fly traps for onchocerciasis entomology *Discussion*	Dr. Tom Unnasch
3:30 – 3:45	*Coffee Break*	
3:45 – 4:15 4:15 – 4:30	STH, Schisto, and Trachoma mapping plans for the southeast states (ENVISION) *Discussion*	Dr. Emmanuel Miri
4:30 – 5:30	**Summary and closure of the Seventeenth Session**	Dr. Donald Hopkins Dr. Frank Richards
5:30	*2012 Carter Center River Blindness Program Review Adjourned*	

ANNEX 6: The Lymphatic Filariasis (LF) Elimination Program

Lymphatic filariasis in Africa is caused by *Wuchereria bancrofti*, a filarial worm that is transmitted in rural and urban areas by *Anopheline* and *Culex sp*. mosquitoes, respectively. The adult worms live in the lymphatic vessels and cause dysfunction, often leading to poor drainage of lymphatic fluid. Clinical consequences include collection of lymph that results in swelling of limbs and genital organs (lymphoedema and "elephantiasis"), and painful recurrent bacterial infections ('attacks' of acute adenolymphangitis). The female worms release microfilariae, which are tiny embryonic worms that circulate in blood at night, when the mosquito vectors bite. Microfilariae are picked up by mosquitoes, develop over several days into infectious larvae, and are then able to be transmitted to another person when the mosquitoes bite again. Microfilariae are killed by annual single-dose combination therapy, with either Mectizan® (donated by Merck) and albendazole (donated by GlaxoSmithKline), or diethylcarbamazine (DEC) and albendazole (in areas where there is no onchocerciasis and/or *Loa loa* infection). Annual mass drug administration (MDA) prevents mosquitoes from becoming 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). In 2013, the WHO issued a 'provisional strategy' for Loa loa areas that includes the dual approach of MDA monotherapy with albendazole, together with long lasting insecticidal (bed) nets (LLIN).

Nigerians suffer in disproportionate numbers from LF. Disease mapping of the country is nearly complete, and confirms that Nigeria is third globally behind India and Indonesia in the human suffering from this parasite. With 704 out of 774 LGAs of 36 States and the Federal Capital Territory mapped, 541 LGAs (77%) are endemic and an estimated 106 million Nigerians are at risk. The Carter Center, working with the Federal Ministry of Health (FMOH) of Nigeria and with the state and local government ministries in Plateau and Nasarawa states, has assisted in establishing an LF elimination program in Plateau and Nasarawa states. The effort is based on a strategy of health education (HE) and annual drug combination therapy with albendazole and Mectizan®. The manufacturers of the drugs have global donation programs for LF: GlaxoSmithKline (GSK) donates albendazole, and Merck donates Mectizan®. After years of high treatment coverage, LF has been eliminated in the two states, and they are now under post treatment surveillance for five years. Through a grant from the Bill & Melinda Gates Foundation, The Center also conducted field research on the use of LLINs alone to combat LF in Imo and Ebonyi states, which are areas where LF MDA is not currently possible due to the presence of *Loa loa*. Results show LLINs have had significant impact on mosquito infection (Richards et al., *American Journal of Tropical Medicine and Hygiene* 2013, in press). Thanks to the Global Fund Round 8, LLINs have now been mass distributed for malaria prevention, two per household, in the majority of Nigeria; this supplements HE and drug combination therapy as one more way to fight LF. The national programs are actively involved in The Carter Center-assisted program, and The Carter Center has assisted (in differing degrees) in the mass distribution of LLINs in all nine states where we work.

The LF program in Ethiopia was launched in 2008, starting with LF surveys for antigenemia conducted in several zones in western Ethiopia in areas where MDA for RB was ongoing (results reported in Shiferaw et al, Lymphatic filariasis in western Ethiopia with special emphasis on prevalence of *Wuchereria bancrofti* antigenaemia in and around onchocerciasis endemic areas. *Transactions Royal Society Tropical Medicine and Hygiene* 2011). With GSK support, The Carter Center assisted in the launching of a Ministry of Health LF elimination pilot program in 2009 that provided roughly 75,000 treatments annually. In 2012, the program expanded to provide 711,701 LF treatments. Additional mapping is required in Ethiopia. The Carter Center has assisted (in differing degrees) in the mass distribution of LLINs for malaria in several Regions of Ethiopia. These LLINs are undoubtedly impacting LF transmission.

ANNEX 7: The Schistosomiasis Control Program

Schistosomiasis is acquired from contact with infected fresh water. *Cercariae*, released from infected snails, penetrate the skin and develop into adult worms that reside in venules of the intestines (*Schistosoma mansoni*) or bladder (*S. hematobium*). Female worms lay thousands of eggs that exit the body in feces or urine. If the eggs gain access to fresh water, they hatch and release miracidae, which swim in search of certain types of snails that they penetrate and infect. In the snails, the miracidiae transform and multiply, releasing cercariae, thus continuing the lifecycle. Disease from schistosomiasis comes from the inflammation caused by the eggs deposited into human tissues by the female worms. These eggs cause inflammation, organ damage, bleeding, and anemia. School-aged children (ages five to 14) are the most heavily affected by schistosomiasis and act as the main disseminators of this infection through their urination and defecation in or near fresh water. MDA with the safe and effective oral medicine praziquantel can significantly reduce schistosomiasis morbidity. Praziquantel kills the adult worms and so prevents the eggs from accumulating in tissues. Until 2007, praziquantel was not routinely donated in large amounts to control programs by the pharmaceutical companies (as are Mectizan® and albendazole) and had to be purchased at approximately U.S. $0.20 per child treated. In April 2007, the pharmaceutical company Merck KGaA (E-Merck) announced a 200 million tablet, 10-year donation of praziquantel to the World Health Organization for schistosomiasis control. By 2011, the company's donation had grown to about 25 million tablets per year. In January 2012, Merck KGaA went further: it pledged to increase its praziquantel donation program tenfold, to 250 million tablets per year.

Nigerians suffer in disproportionate numbers from schistosomiasis; an estimated 20 million Nigerians (the highest for any country) need to be treated with praziquantel every one to three years. The Carter Center's Schistosomiasis Control Program currently operates only in Nigeria, in Plateau, Nasarawa, Delta and Edo states (See maps in Nigeria section). The strategy is similar to the RBP and LF programs: HE and mass annual treatments with safe and effective oral drugs, in this case praziquantel. Until 2007, praziquantel was not routinely donated to the program, although in past years, The Carter Center received limited gifts of praziquantel from pharmaceutical companies including: Bayer AG, Medochemie, Ltd., and most recently, Shin Poong Pharmaceutical Company, Ltd. The Carter Center has purchased the remainder with funds raised from other donors. WHO, in collaboration with Merck KGaA, has been donating praziquantel tablets to our Plateau and Nasarawa projects since 2008, with the intention to continue this donation annually for up to 10 years, depending on progress and the Center's ability to find funding for drug distribution. This major development removed the hurdle of the price of praziquantel (approximately U.S. $0.20 per treatment) for those two states, which restricted the growth of the schistosomiasis program in the past. The schistosomiasis program in Delta and Edo states operates and purchases praziquantel with a generous grant from the Izumi Foundation, and also receives some donated praziquantel from Merck KGaA.

The strategy in those two states is to treat all the estimated one million school aged children. Treatment in Plateau and Nasarawa addresses coendemic intestinal *Schistosomiasis mansoni* (SM), in addition to urinary schistosomiasis (*Schistosomiasis haematobium* or SH). The change in approach was decided upon after a Carter Center-supported study, in collaboration with Emory University School of Medicine, concluded that the costs of the village-by-village diagnosis of SH and SM would be greater than those of the presumptive treatment of the school-age children (SAC) in all villages. Until improved and less expensive rapid diagnostic methods for SM become available, the least costly approach to the overall problem of schistosomiasis in this part of Nigeria would therefore be widespread mass drug distributions, without screening for at-risk populations.

ANNEX 8: Monitoring Sustainability and Costs after Withdrawal of Core Funding by the African Program for Onchocerciasis Control (APOC)

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

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

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

The RBP has made it one of its basic monitoring tasks to collect and refine government and Carter Center funding figures, along with additional funds provided through APOC. Monitoring trends for increased funding is especially important to determine if countries

are filling the ”post-APOC” funding gap. The post-APOC gap is defined as budget shortfalls in key areas arising since the withdrawal of core APOC support for distribution activities. The RBP is monitoring Ultimate Treatment Goal (UTG) coverage by post-APOC treatment year as well, and has not observed a decline in treatments in the post-APOC period. However, when RBP has temporarily withdrawn its support, also, we have observed programmatic decline in either treatments (see Rakers et al, *Lancet* 2009) or in programmatic activities such as training, health education or treatment reporting. The ultimate goal for control programs is to see Mectizan® delivery handed over to the full fiscal responsibility of the national, state, and local governments. However, in the new elimination paradigm that is being embraced by APOC and its partners for Africa, the ultimate goal will be to safely stop administering Mectizan®; sustainability as an ultimate goal will no longer be required.

ANNEX 9: Publications Authored or Coauthored by RBP Personnel

Lakwo TL, Garms R, Rubaale T, et al. The disappearance of onchocerciasis from the Itwara focus, western Uganda after elimination of the vector Simulium neavei and 19 years of annual ivermectin treatments. *Acta Trop*. Jun 2013;126(3): 218-21. Epub 2013 Feb 28.

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King JD, Eigege A, Umaru J, et al. Evidence for stopping mass drug administration for lymphatic filariasis in some, but not all local government areas of Plateau and Nasarawa States, Nigeria. *Am J Trop Med Hyg.* Aug 2012; 87(2): 272-80.

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Cupp EW, Sauerbrey M, Richards F. Elimination of Human Onchocerciasis: History of Progress and Current Feasibility Using Ivermectin (Mectizan®) Monotherapy. *Acta Tropica.* 2010 (Supplement on NTDs).

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