

**SUMMARY**  
**2019 VIRTUAL PROGRAM REVIEW**  
**RIVER BLINDNESS E**

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*University of South Florida*

*USAID's Act to End NTDs | East  
Program, led by RTI International*

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APOC African Program for Onchocerciasis Control

OTS	Onchocerciasis Technical Subgroup/Subcommittee
PAHO	Pan American Health Organization
PCC	Program Coordinating Committee of OEPA
PCR	Polymerase Chain Reaction
PTS	Post-Treatment Surveillance
QGIS	Geographical Information System
RB	River Blindness
RBEP	River Blindness Elimination Program
REMO	Rapid Epidemiological Mapping of Onchocerciasis
RPRG	Regional Program Review Group
RSS	Republic of South Sudan
RTI	Research Triangle Institute
S&C	Slash and Clear
SCH	Schistosomiasis
SE/SS	South East/S8outh A0 11.04 91.68 494.88 TET S8S81 Tf 11.04 0 0 11.04 100.8 478

## **EXECUTIVE SUMMARY**

The 24<sup>th</sup> Annual Review Meeting of the Carter Center (TCC) River Blindness Elimination Program (RBEP), scheduled for March 11-13, 2020, in Atlanta, was canceled in the wake of the emerging 2019 novel coronavirus disease (COVID-19). The RBEP Atlanta staff held abbreviated virtual reviews between March 19 - 30, 2020, with each RBEP-assisted country's staff and, in some countries, Ministry of Health (MOH) officials, focusing on the 2019 achievements, challenges, operational research, and recommendations for 2020 activities.

The goal of the RBEP is to assist MOH in six countries<sup>1</sup> to eliminate river blindness (RB) transmission. The strategy for elimination in RBEP programs is mass drug administration (MDA) with ivermectin (Mectizan<sup>®</sup>, donated by Merck & Co., Inc., Kenilworth, N.J. USA), given twice-per-year, and in some cases, four-times-per-year. This strategy has been highly successful in the Americas, resulting in World Health Organization (WHO) estimates of 1.5 million people at risk of RB.



**2020 GENERAL RECOMMENDATIONS FOR  
CARTER CENTER RIVER BLINDNESS ELIMINATION PROGRAMS**



There should be special reports on MDA activities among refugees and internally displaced persons.

TCC/RBEP encourages Ministries of Health to submit drug applications to WHO and the Mectizan Donation Program (MDP) as early as possible; timely drugs are critical, particularly for twice-per-year treatment areas. Programs in Africa should actively pursue collaboration with Ministries of Health on application preparation, and target an April 30 submission, to receive drugs on time. Drug inventories submitted with applications can be interim but must be included. Assist the national programs with submissions. Keep TCC/RBEP Atlanta office informed on the process.

Seek to increase training, supervision, involvement of kinship groups, and gender balance among CDDs and community supervisors (CSs).

The Carter Center website should house key public domain documents from National Onchocerciasis Elimination Committees (NOECs) of Ethiopia, Nigeria, and Uganda. The

Based on the successful experience with virtual TCC Program Reviews in 2020 due to the COVID-19 outbreak, consider having virtual linkages in future TCC Program Reviews so that additional TCC international personnel might view some of the proceedings live or as recorded media.

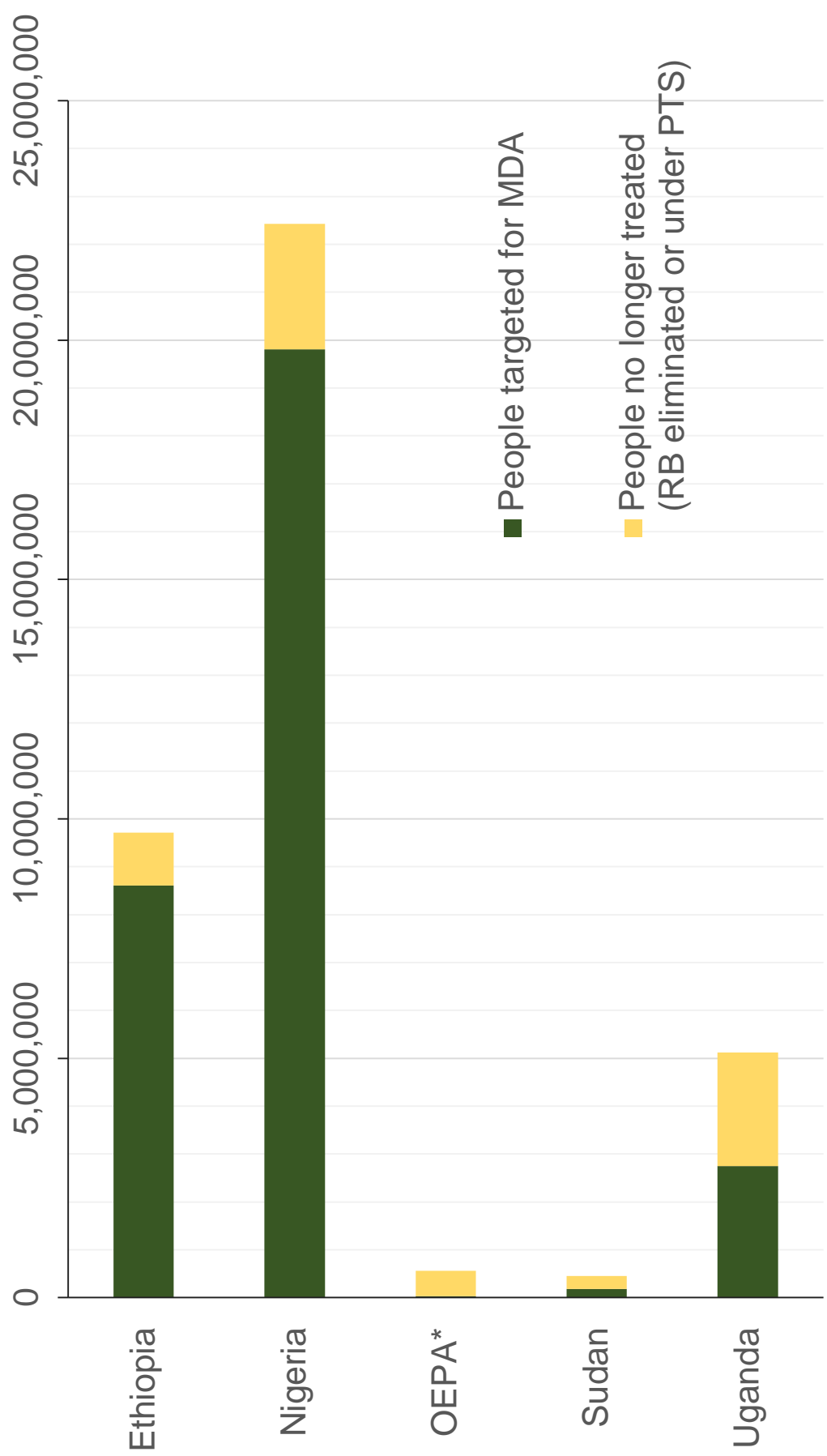
[(e )22r (al)]T J2020 Tccatm 5-19-20 5 (27) Tg 5004 (T) 40.004 Tcc 2024 00B 435) 27 (br) TC (e E) 1B 7) 37 Etc < / M 215 05 > # 156.5

# **Phases of the Elimination of Onchocerciasis (2016 WHO Guidelines\*)**

\*WHO (2016). Guidelines for stopping mass drug administration and verifying elimination of human onchocerciasis: criteria and procedures (document WHO/HTM/NTD/PCT/2016.1). Geneva, World Health Organization.  
<http://www.who.int/onchocerciasis/resources/9789241510011/en/>

Figure ES2

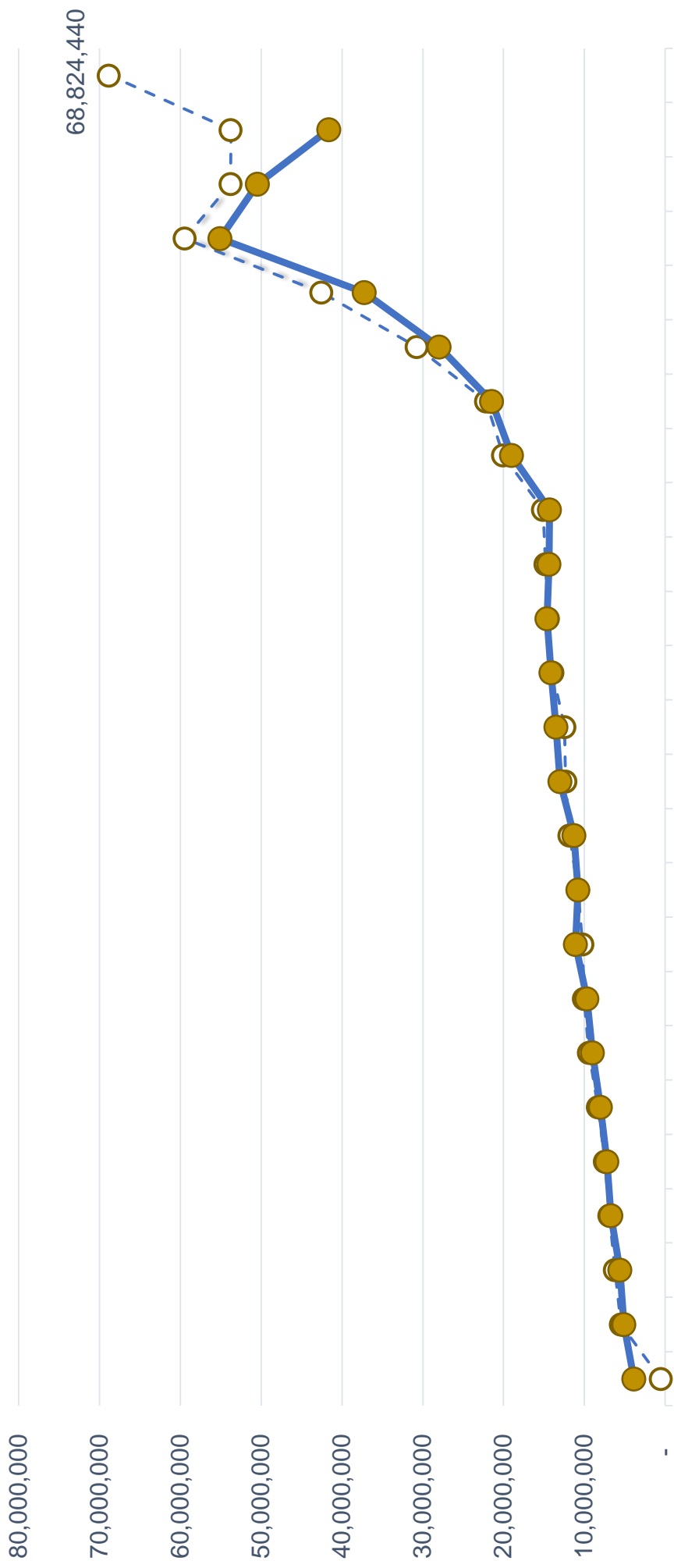
**Population Currently and Previously Targeted for Mectizan® Treatment  
6.9 million people in ten Carter Center-assisted countries no longer need  
treatment as a result of our river blindness elimination partnership**







# RBEP-Assisted Programs: Mectizan® Treatments and Targets 1996 – 2020



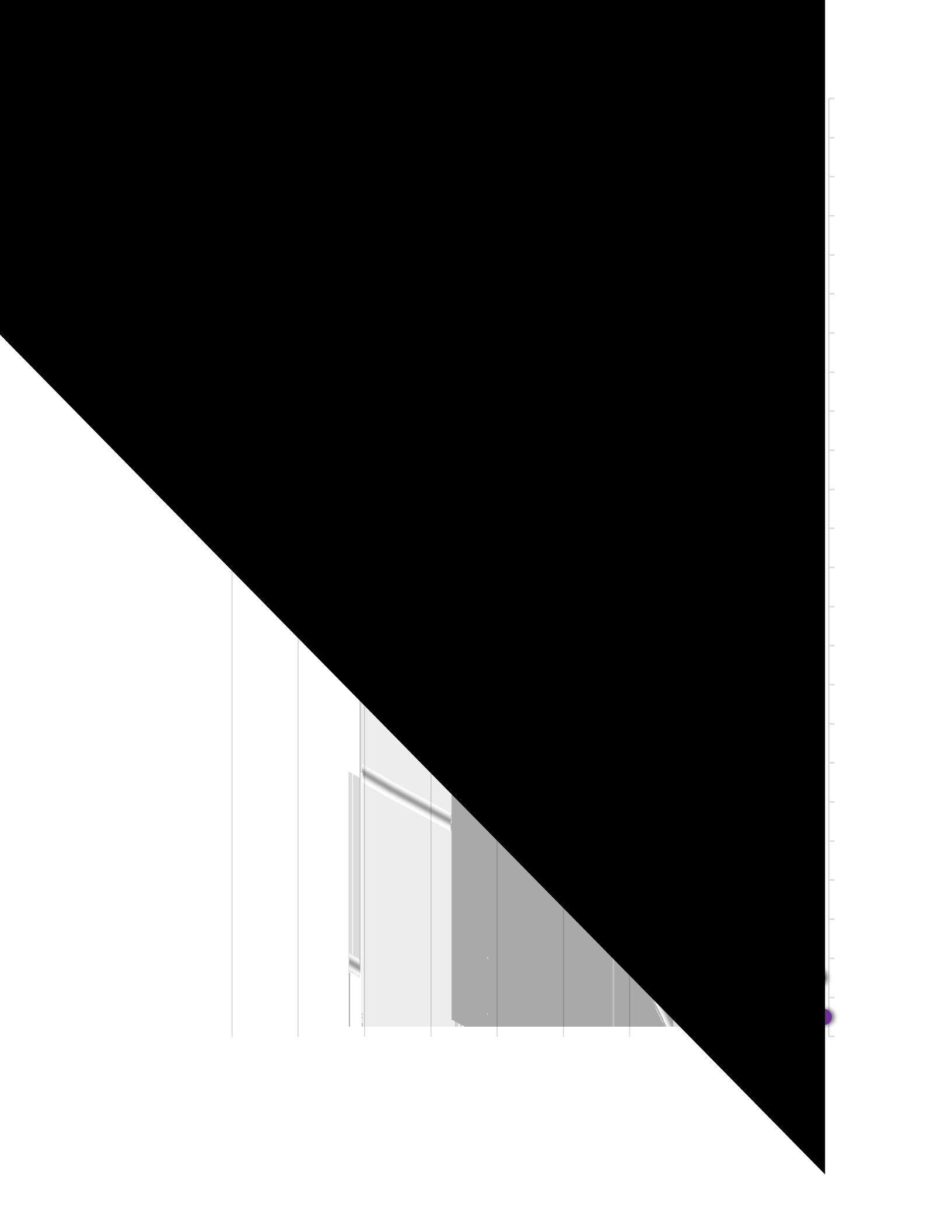
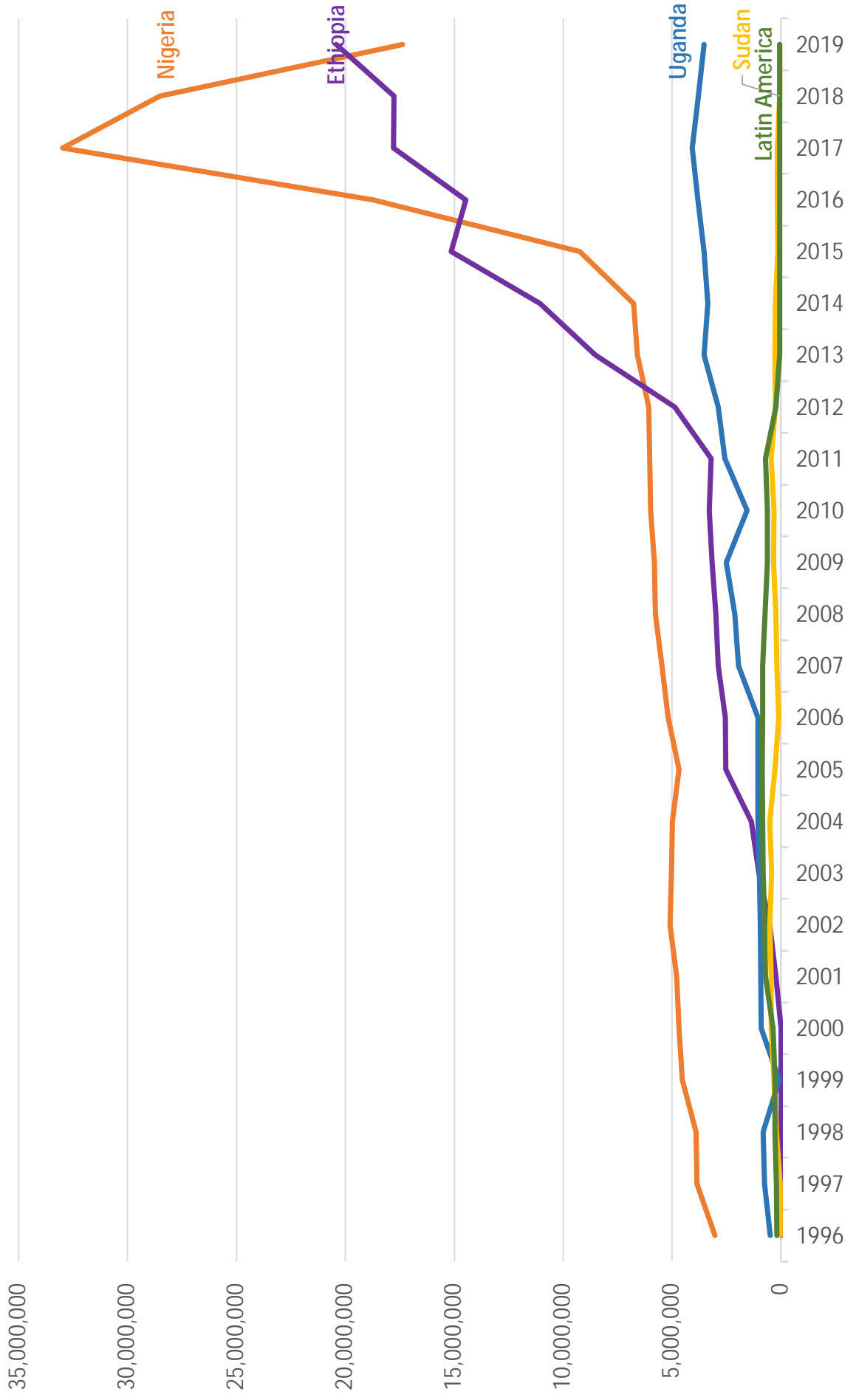




Figure ES7



# River Blindness Program: Reported Treatment Coverage (Eligible Population) by Project: UTG, UTG(2), or UTG(4) 2005 – 2019

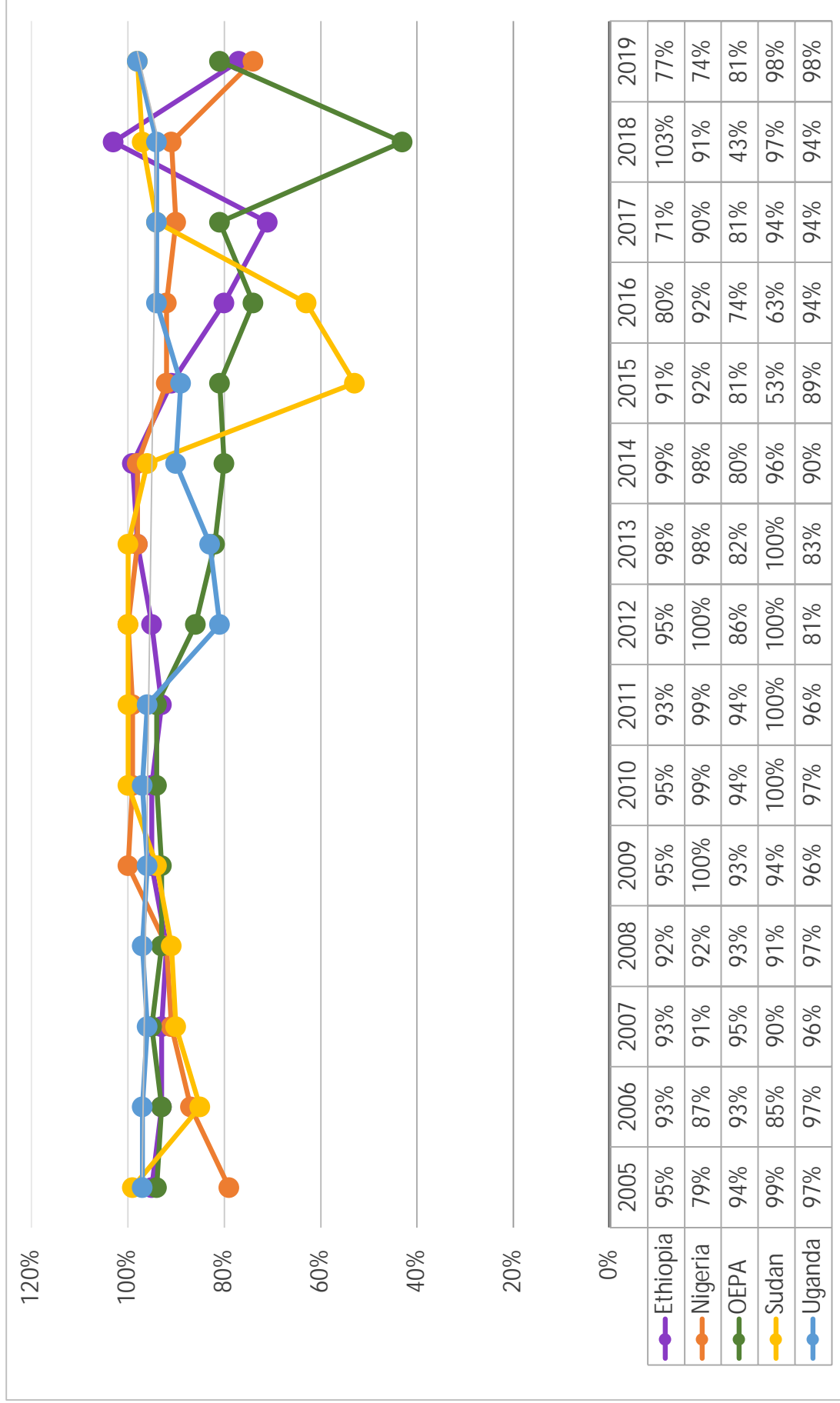
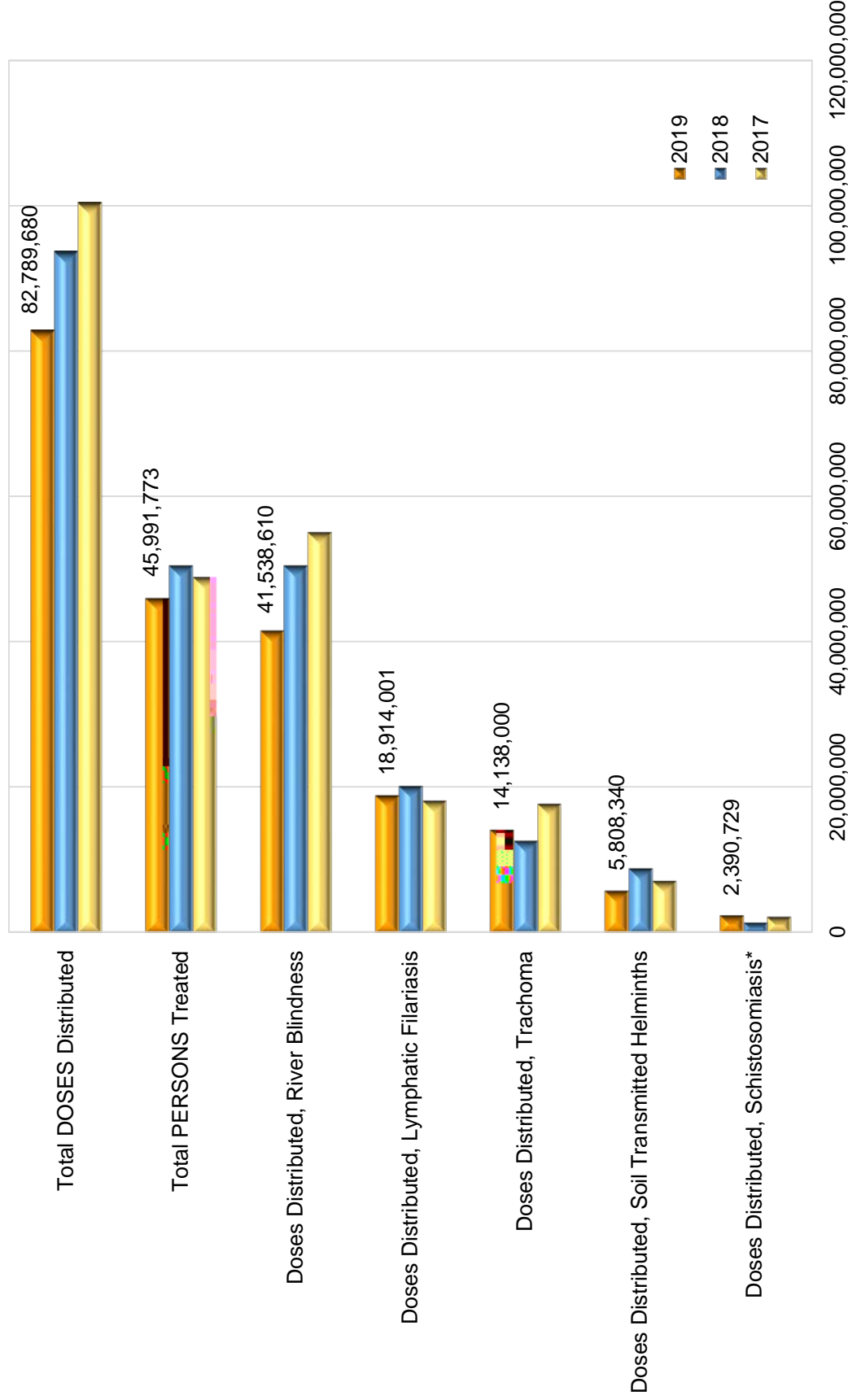


Figure ES9

# Carter Center-Supported Treatment Doses and Persons Treated for Neglected Tropical Diseases, 2017 – 2019



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 these treatments possible.

\* The decrease in treatment between 2018 and 2019 is attributable to a Mectizan delay in Ethiopia and Nigeria.

Figure ES10

# Community-Directed Distributors (CDDs) Trained 2004 – 2019 and 2020 Total Targets

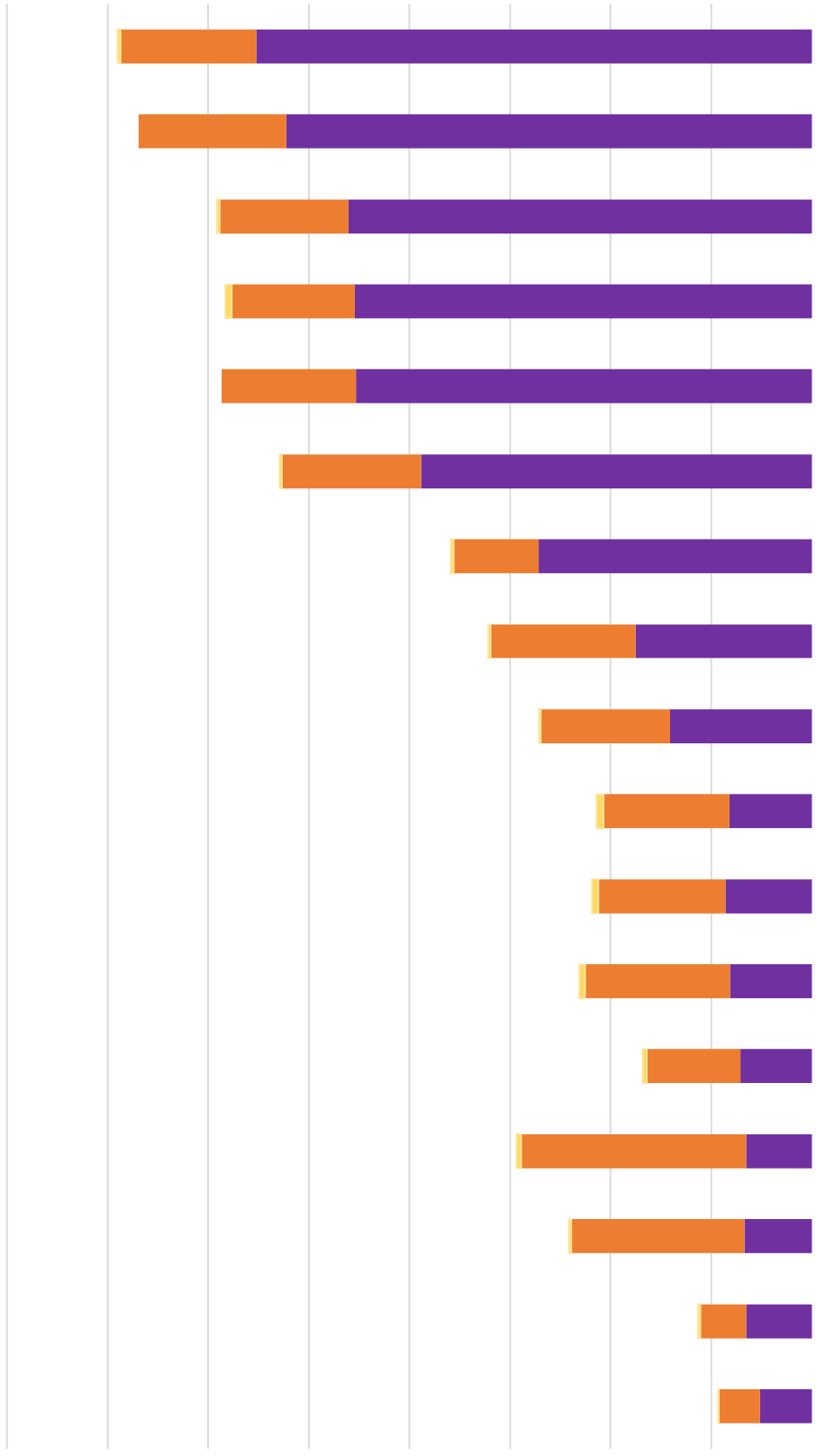
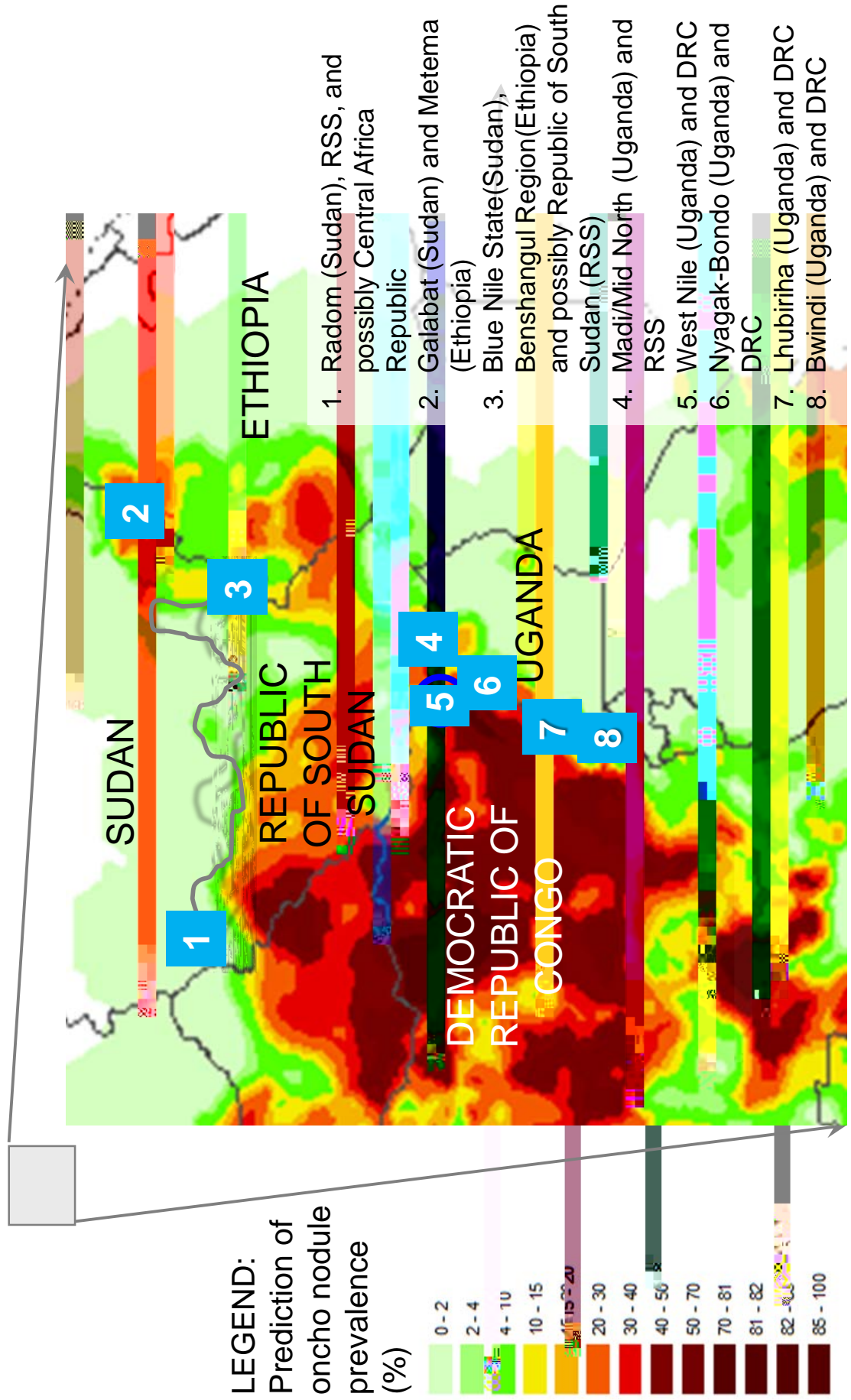


Figure ES11

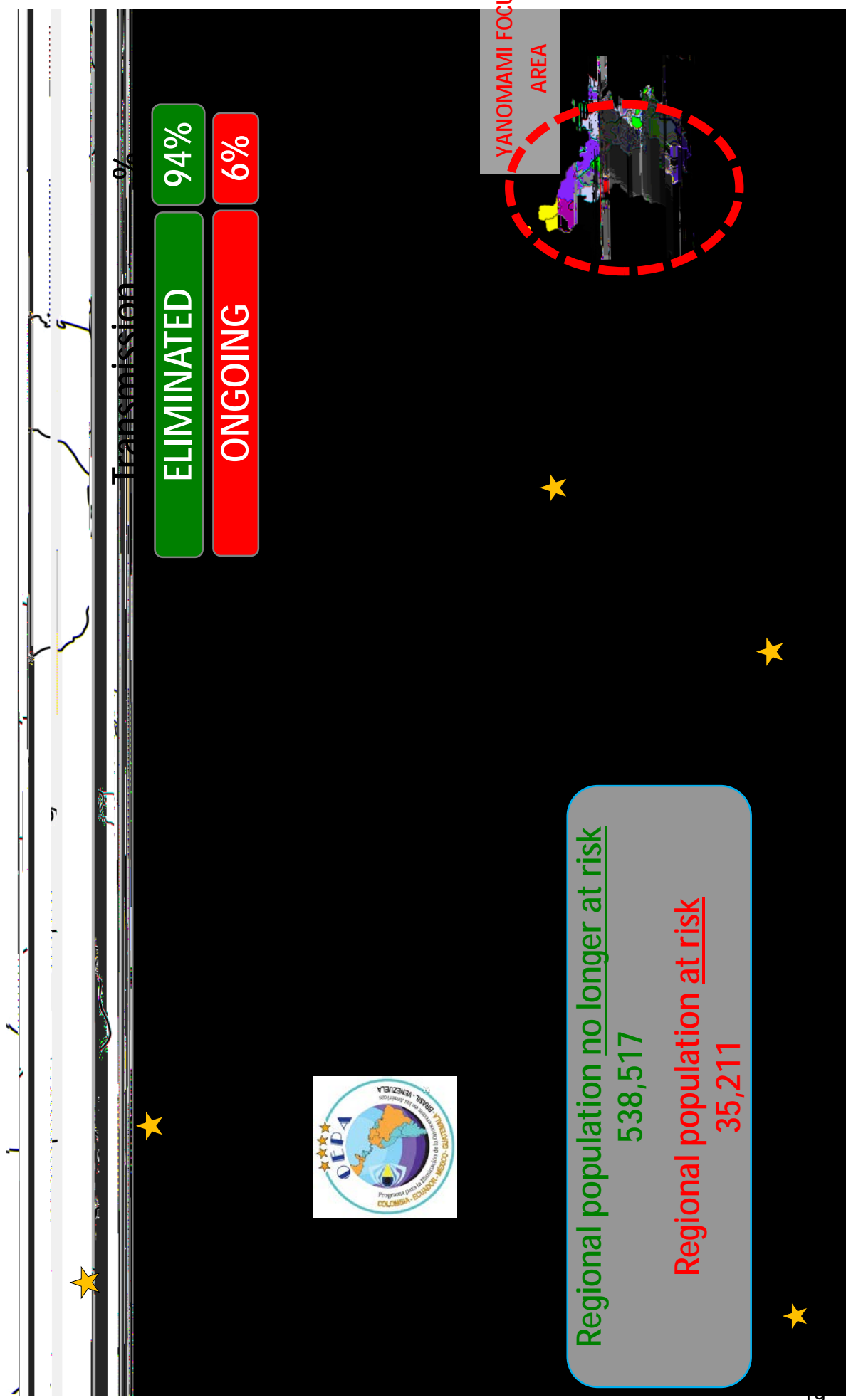
# Carter Center Assisted Special Intervention Zones in Ethiopia, Sudan, and Uganda



Map source: APOC

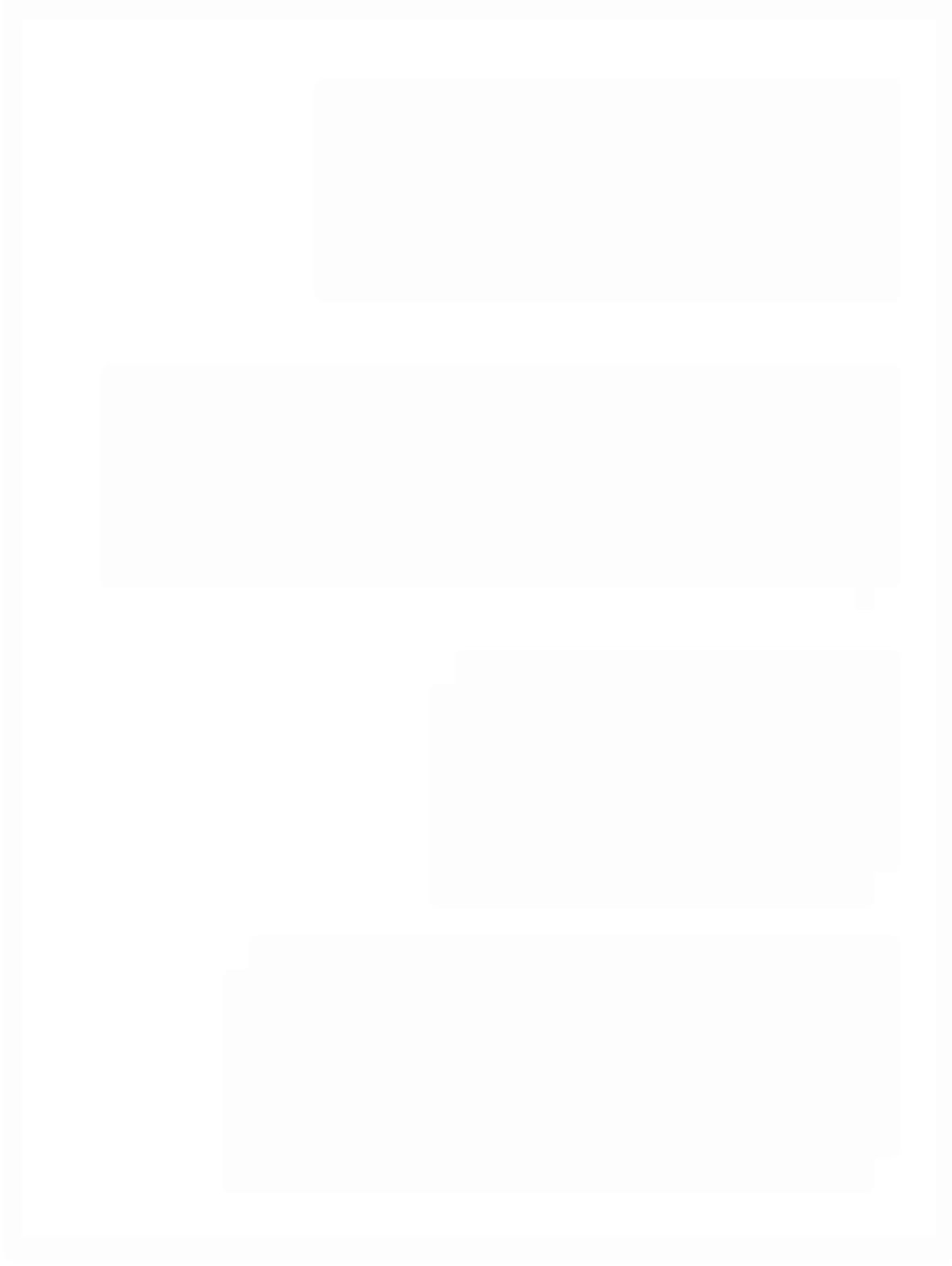
Figure ES12

# Geographic Distribution and Transmission Status of Onchocerciasis in the Americas in 2020





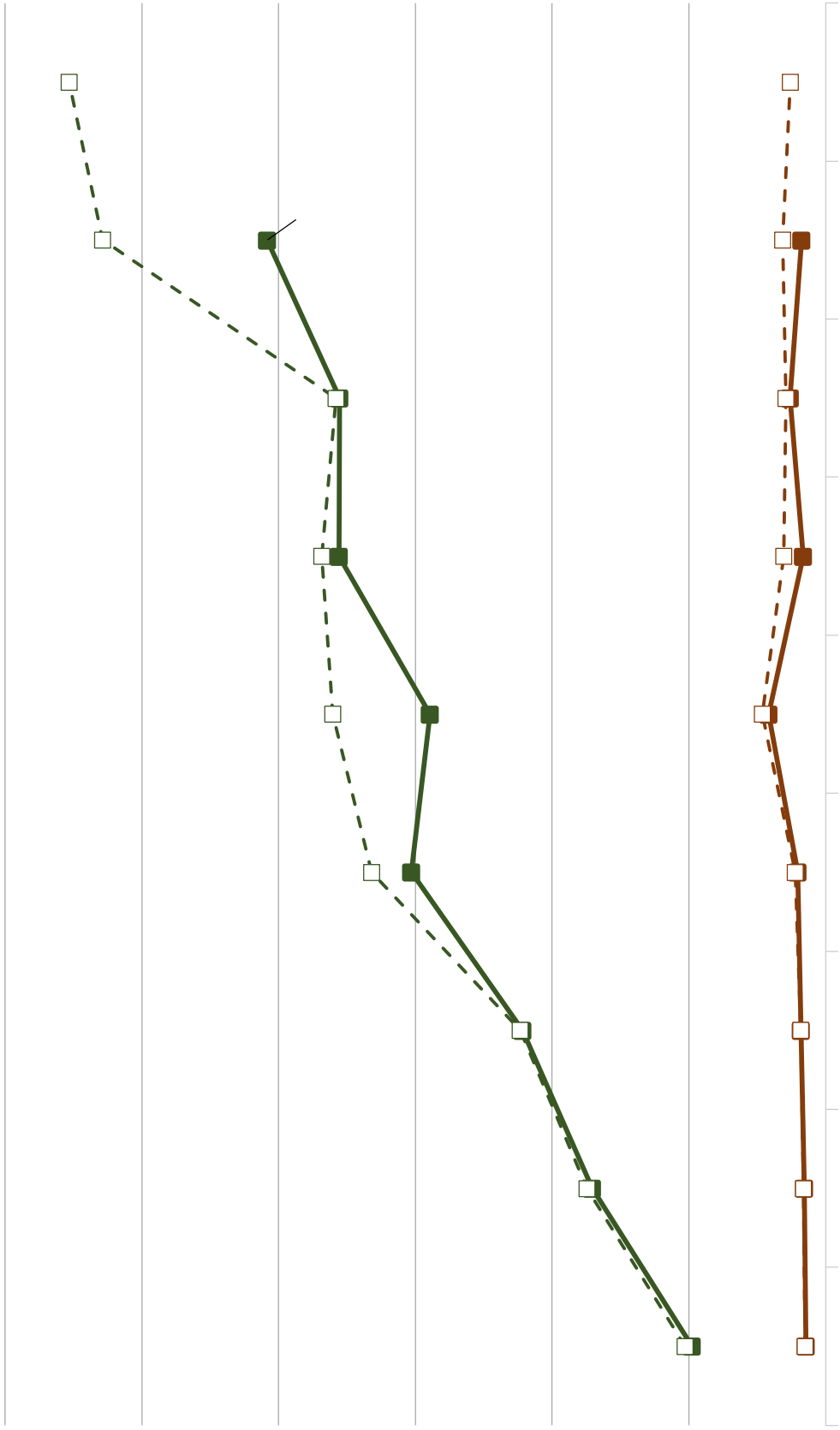
## OEPA, Regional







# Ethiopia: Carter Center Assisted River Blindness (RB) and Lymphatic Filariasis (LF) Treatments and Targets 2012 – 2020

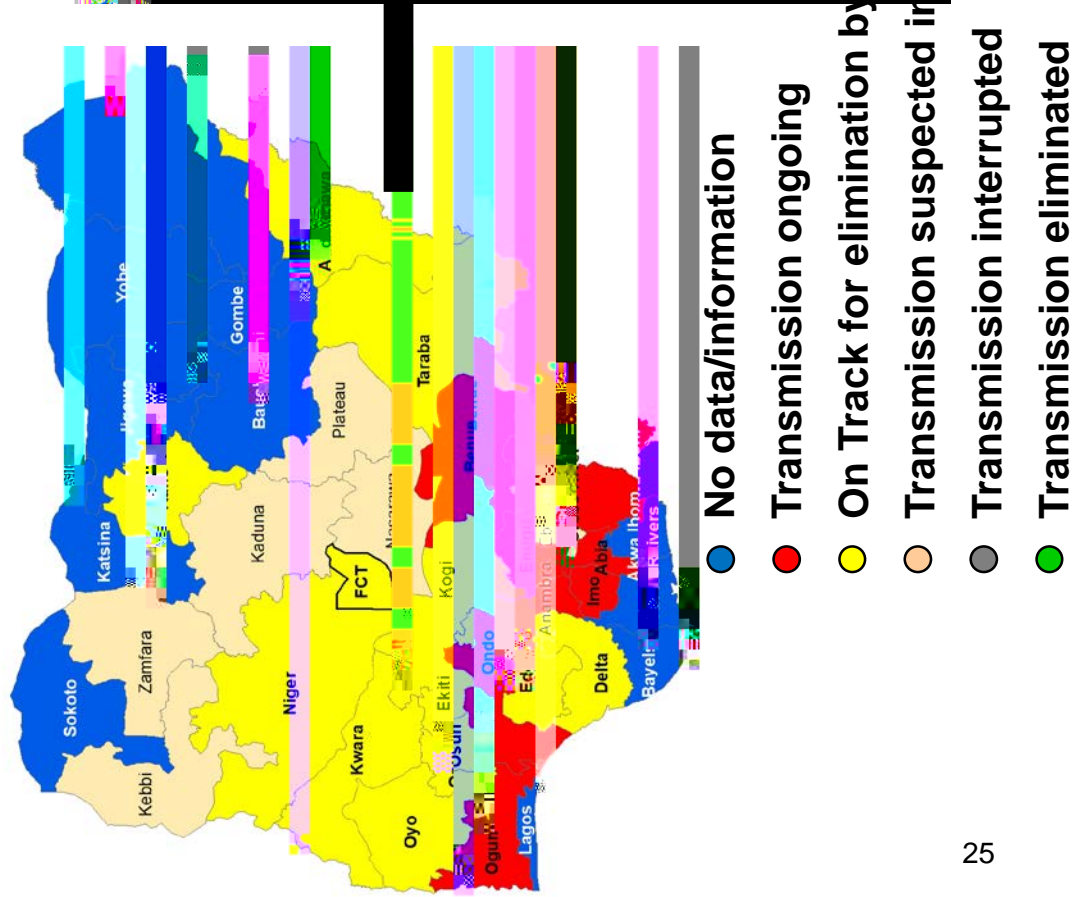


**Lymphatic Filariasis Elimination Progress by WoreFiS05 (a)5.8 (FiS57 (i)4**

Figure ES18

# Progress of Onchocerciasis Elimination in Nigeria

2016 2019



\*States changing status in 2019 are outlined in green highlight.

**Nigeria: Carter Center Assisted River Blindness (RB), Lymphatic**

Figure ES20

### Nigeria: Annual and Semiannual Mectizan® Treatments in RBEP-Assisted Areas\*

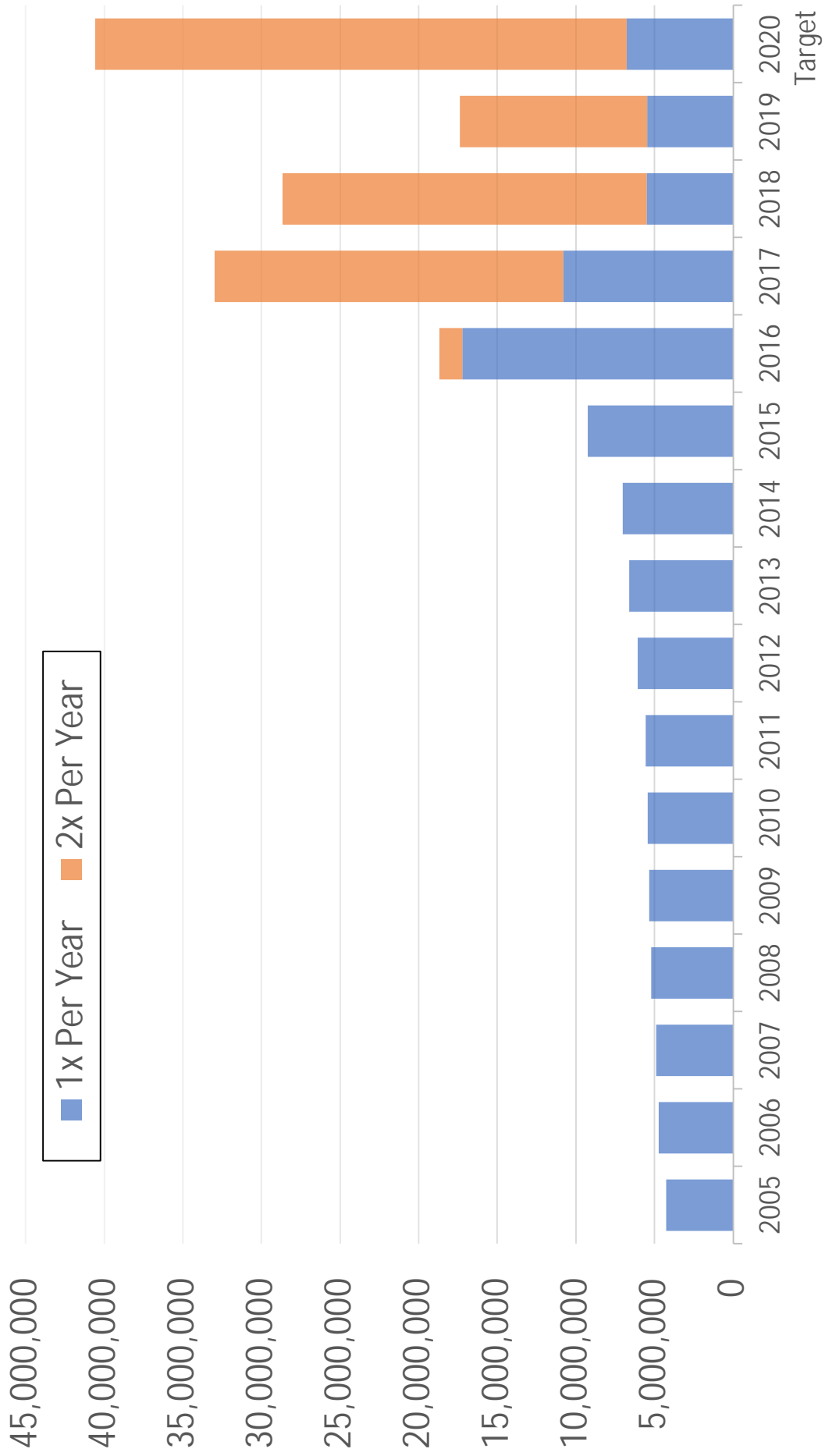
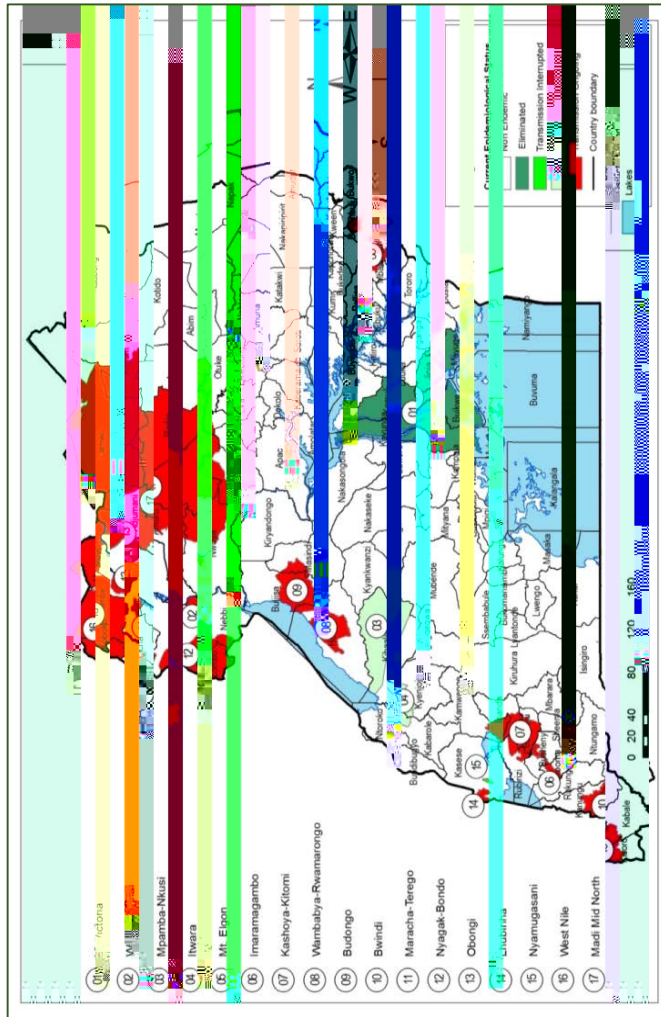


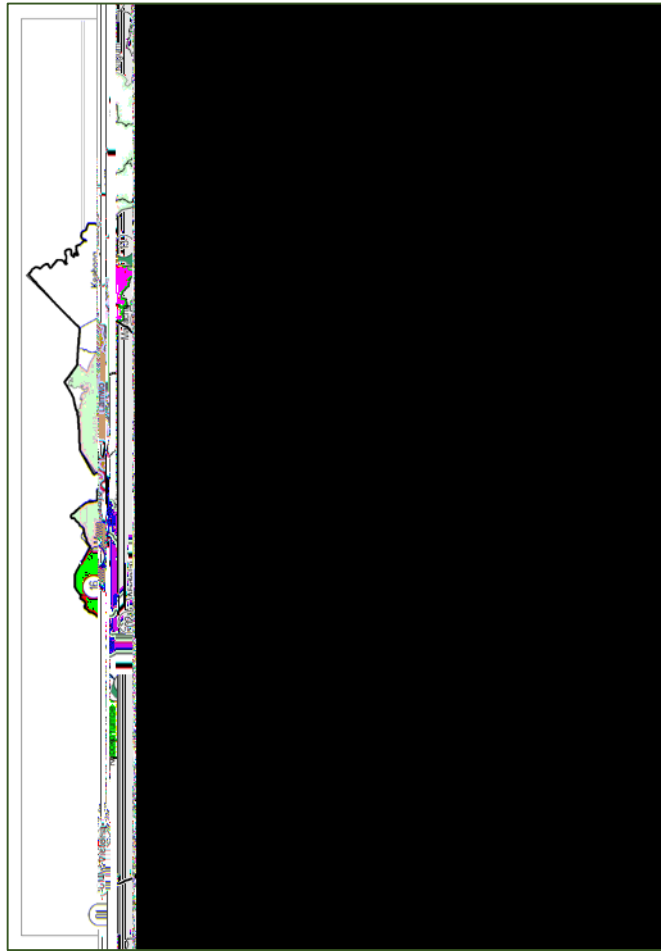
Figure ES21

# Uganda: Twelve Years of Progress in Eliminating Onchocerciasis Transmission

2007



2019



# Uganda Progress in Eliminating Onchocerciasis Transmission (Change



## THE AMERICAS

OEPA is a coalition led by The Carter Center that includes the ministries of health of the affected countries in the Americas, the Pan American Health Organization (PAHO)/WHO, and other partners. The OEPA initiative has stopped treatments in 94% of the population once endemic for the disease, and four countries have received WHO verification of elimination: Colombia (2013), Ecuador (2014), Mexico (2015), and Guatemala (2016). In 2017, PTS was completed in the Northeast Focus of Venezuela, once the third largest transmission zone of the region in terms of population. See Figure ES12 for a map of the region. The OEPA treatment history over almost two decades shows a scaling up of MDA treatments followed by a scaling down treatments as elimination was achieved in an increasing number of areas (Figure ES13).

OEPA is a coalition led by The Carter Center that includes the ministries of health of the affected countries in the Americas, the Pan American Health Organization/WHO, and other partners. The OEPA initiative has stopped treatments in 94% of the population once endemic for the river blindness, and four countries have received WHO verification of elimination (Figure ES14). The last active transmission zone is in the Amazon rainforest bordering Brazil and Venezuela, called the 'Yanomami Focus Area' (YFA) after the indigenous people residing there. The challenge with the YFA lies in the remoteness of its population, the lack of high-level coordination between Brazil and Venezuela, and especially the deteriorating political situation in Venezuela. In 2019, OEPA assisted Brazil and Venezuela in 54,700 Mectizan<sup>®</sup> treatments, representing 81% of the 2019 treatment target. Some of the Yanomami people from the endemic communities of both Brazil and Venezuela serve as Indigenous Health Agents (IHAs) and are proving vital to the program to provide health services in this challenging area. Despite the political, humanitarian and health crises of Venezuela, Venezuelan teams supported by The Carter Center were able to provide ivermectin MDA as well as vaccinations, malaria treatments, and other health services. Additionally, the program has conducted 20 rounds of successful high-coverage treatment in 61% of the communities of the YFA, which means that transmission in these communities is likely interrupted (Figure ES15). In 2019, the OEPA program received financial support from the United States Agency for International Development (USAID), Merck & Co., Inc., the Lions Clubs International Foundation, and the Carlos Slim Foundation.

The countries and TCC staff are trying to creatively surmount the problems of extreme isolation and difficult access to the Yanomami area. In Venezuela, the program is using satellite imagery to locate communities, rehabilitating or building airplane landing strips, and training Yanomami health workers to actively help provide ivermectin treatment as well as other health care. About 59,000 treatments are planned in the Yanomami Area in 2020.





**ETHIOPIA**

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## **NIGERIA**

Thanks to NTD funding from USAID's ENVISION project and Act to End NTDs | East program, both led by Research Triangle Institute (RTI) International, and funding from the IZUMI Foundation and other generous donors, the program assisted 43.6 million treatments for RB, LF, SCH, and STH.

The Carter Center currently assists river blindness and LF treatments in seven southern states in Nigeria (Figure ES18); Plateau and Nasarawa states in central Nigeria stopped MDA for LF and RB in 2013 and 2018, respectively. Unfortunately, Nigeria's RBEP only assisted in 17,371,267 Mectizan treatments for river blindness in 2019 (Figure ES19), a 39% decrease from 2018 and only about 74% of the target, due to ivermectin importation delays that precluded the first round of the twice-per-year treatment regimen (Figure ES20). However, the national elimination program continues to make progress, as Delta and Ebonyi states changed status to "transmission suspected interrupted" and two Sight Savers-assisted states (Kebbi and Zamfara) changed status to "transmission interrupted" per the Nigeria Onchocerciasis Elimination Committee (Figure ES18). Our Nigeria LF program assisted 18,046,756 treatments in 2019 reaching 85% of the target. The 2020 targets for RB and LF are 41 and 21 million, respectively (Figure ES19). The NTD programs in Nigeria were supported in large part by the USAID's ENVISION project and Act to End NTDS | East program, both led by RTI International.

The Carter Center assisted in 2,390,729 praziquantel treatments for schistosomiasis in the nine states in Nigeria in 2019. The SCH program follows WHO guidelines that target some areas only every other year or every three years, and 2019 was a high-target year with a 69% increase from 2018. However, our programs reached less than half (46%) of our target for 2019 due to importation delays that affected praziquantel supply. Praziquantel is donated to The Carter Center through the WHO by Merck KGaA, Germany. The Izumi Foundation also supported this program in 2019. Our target in 2020 is 6 million praziquantel treatments (Figure ES19).

Treatments in 2019 for STH were 5,808,340, representing 61% of the 2019 treatment target. The 2020 target is 11 million treatments. The medicines used for STH treatment are donated by GSK (albendazole) or Johnson & Johnson (mebendazole).

### **2020 RECOMMENDATIONS FOR THE CARTER CENTER RBEP, NIGERIA**

#### ***Overarching for the three programs:***

Rolling surveys should be smaller in scale and budget than those promoted by WHO. Coverage evaluations of any kind should inform programmatic decisions, so they should be directed to areas where there is concern about the quality of MDA or where an epidemiological study is planned.

Whenever possible, add LF and/or RB sentinel villages to the sample in any population-based survey activities being conducted (in these SVs' states or local government areas [LGAs]). This would help us to conduct serial monitoring of SVs.

national 1:250 limit. Increase the number of CDDs as budgets allow, working to reach the target ratio of at least 1 CDD:250 people, 1 CS:5 CDDs and 1 CS per village. When calculating population served per CDD, remove urban populations from the equation since these are typically served directly by health workers.

Complete the analysis of the pilot CDD attrition study (based on Kaplan-Meier survival

indicates MDA can cease, conduct Health Education to prepare the populations for an end of MDA, and advise the state MOH that TCC support for SCH and STH will soon cease (see below).



### **Schistosomiasis (SCH) and Soil Transmitted Helminthiasis (STH):**

Due to an anticipated reduction in funding of SCH/STH work by USAID in future years, The Carter Center is beginning a process to incrementally transition ownership of SCH/STH to the federal, state and local governments. In LGAs where RB or LF community-wide MDA is ongoing, integrate the STH/SCH treatments into the RB or LF platform, co-administering drugs. Where the RB or LF community-wide platform is being lost due to stop-MDA determinations, the SCH/STH programs should be mainstreamed into a school-based program such that national funds will transition over a short time period to fully support the program. We should monitor this process carefully for evidence of decreasing MDA coverage in the school-aged target population.

Publish in a peer-reviewed journal the results of the SCH/STH impact assessment in Plateau and Nasarawa that includes intensity of infection determinations.

<b>2020 Nigeria River Blindness Treatment Targets</b>		
Annual (UTG)	Semiannual (UTG2)	Total
6,779,049	33,796,685	<b>40,575,734</b>

<b>2020 Nigeria Lymphatic Filariasis</b>	
Annual (UTG)	
	<b>21,144,172</b>

<b>2020 Nigeria Schistosomiasis</b>	
Annual (UTG)	
	<b>5,583,186</b>

<b>2020 Nigeria Soil-Transmitted Helminths</b>		
Annual (UTG)	Semiannual (UTG2)	Total
7,276,782	3,832,977	<b>11,109,759</b>

<b>2020 Training Objectives</b>			
CDDs	CSs	HWs	Teachers

## **SUDAN**

During 2019, 70,300 treatments were provided in Sudan, 45,000

assessments give a good account of human infection rates. Entomological surveys will be important given the reports of few breeding sites having been identified.

<b>2020 Sudan Treatment Targets</b>	
Semiannual (UTG2)	403,750

<b>2020 Training Objectives</b>		
CDDs	CSs	HWs
1,360	86	40

UGANDA



## ANNEX 1: BACKGROUND

Human onchocerciasis, an infection caused by the parasitic worm *Onchocerca volvulus*, causes eye lesions that can progress to visual loss or complete blindness. In addition to severe eye disease, onchocerciasis causes papular or hypopigmented skin lesions and intense itching. The parasite is transmitted by certain species of *Simulium* black flies, with the most common vector being *Simulium damnosum* sensu lato (sl). *Simulium* species black flies breed in rapidly flowing rivers and streams, thus leading to the common name for the disease, “river blindness”.

In humans, the adult worms cluster in subcutaneous fibrous onchocercomas (commonly referred to as ‘nodules’) that are often visible and/or palpable. In these nodules, fertilized females release first-stage larvae (microfilariae [mf]) that migrate in the sub dermis and eye, causing immune reactions that result in the major morbidities associated with the infection. Some mf are picked up when the vector flies take a blood meal. In the flies, the mf eventually develop into the third stage larvae (L3) that are infectious to humans on subsequent blood meals. In the humans, the larvae then develop into adult worms and so continues the life cycle. There are no known environmental or epidemiologically important animal reservoirs of *O. volvulus*.

The World Health Organization (WHO) estimates that 20.9 million people are infected and 1.15 million had vision loss. Approximately 205 million people live in endemic areas worldwide and are therefore at risk of infection; more than 99% of those at risk live in sub-Saharan Africa. Onchocerciasis also exists in Latin America. Periodic mass drug administration (MDA) with oral Mectizan® (ivermectin, donated by Merck) tablets 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, the efficiency of the vector, and the extent of the infected population, the vector, and MDA distribution programs. An WHO update on the global onchocerciasis initiative was provided in the Weekly Epidemiological Record (WER) in



## **ANNEX 1: BACKGROUND** - *continued*

in every kinship/neighborhood zone in the community; 2) sustained treatment coverage of at least 90% of treatment-eligible persons; 3) increasing involvement of women as CDDs; and 4) the presence of at least two community-selected supervisors in every community.

The CDDs and community supervisors are often also highly engaged in other community-based health interventions, such as water provision and sanitation, malaria control, immunization, and integrated neglected tropical disease (NTD) control efforts.



## ANNEX 2: A Timeline of the River Blindness Campaign at The Carter Center

- **2019:** Problems with the importation of Mectizan into Nigeria in 2019 resulted in an inability of RBEP-assisted programs to provide twice-per-year MDA for onchocerciasis; all RBEP-assisted Nigeria programs provided a single round of treatments. Just over 600,000 treatments were halted in Uganda after successful stop MDA assessments were conducted. The large Madi-Mid North focus bordering the Republic of South Sudan was reclassified as 'transmission suspected interrupted.' Cross-border activities between Uganda and the Democratic Republic of Congo (DRC) were halted however, because of the DRC Ebola outbreak. Onchocerciasis Elimination Mapping in Ethiopia provided data that led the national committee to recommend treatments be launched in several new areas of the country. The lymphatic filariasis (LF) elimination program in Ethiopia stopped about 117,000 treatments after successful Transmission Assessment Surveys (TAS). The OEPA program held the 29th InterAmerican Conference on Onchocerciasis (IACO) in Brasilia, with the theme "Brazil approaching the elimination of onchocerciasis." The conference praised the Indigenous Health Agents (IHAs) involved in both the Brazil and Venezuela elimination programs. In 2019, RBEP authors published papers on vegetation clearance (slash and clear) as a non-chemical based vector control in Uganda, the role of OEPA as a model for Africa RB elimination programs, MDA coverage surveys in Uganda and Cameroon, and use of doxycycline treatment as an endgame strategy in the Americas. ( T)11.3913.6 (i7d )- ahudarl 70658 0 Td



**ANNEX 2: A Timeline of the River Blindness Campaign at The Carter Center -**  
*continued*

*loa* infection can result in severe nervous system reactions, including coma. The conference calls for further study in Africa and for implementers to 'go for transmission elimination' in Africa where feasible (Dadzie 2003). The Gates Foundation, in part as a result of the findings of the conference, shortly thereafter provide major grants to TCC in support the OEPA program and TDR to study using Mectizan<sup>®</sup> alone to eliminate onchocerciasis transmission in Mali and Senegal.

- **2000:** OEPA needs a 'definition of success' endorsed by WHO; with a push from President Carter to WHO DG H Gro Brundland, WHO agrees to hold an important meeting to establish certification criteria for onchocerciasis elimination (WHO 2001), which had great utility for programs in the Americas and Uganda. Richards, writing in *The Lancet*, notes the importance of the LF program in advancing the RB elimination agenda and challenges the African program to move toward onchocerciasis transmission elimination in a model similar to that in the Americas.
-

### **ANNEX 3: The Carter Center RBEP Reporting Processes**

***Treatment areas:*** An epidemiological mapping exercise is a prerequisite to identifying at-risk villages (ARVs) for mass Mectizan<sup>®</sup> treatment programs. The assessment techniques used in the

**ANNEX 3: The Carter Center RBEP Reporting Processes - *continued***

microscopy to identify *O. volvulus* microfilaria in skin. Villages in which one or more persons are positive (sample preval

**ANNEX B: The Care Centre RBEP Reporting Process - continued**

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### **ANNEX 3: The Carter Center RBEP Reporting Processes - *continued***

for OEPA. The differences in full coverage thresholds result from varying recommendations by the African and American expert committees.

In post-treatment scenarios, passive treatments with Mectizan are provided when patients present themselves in clinics within towns of endemic districts, or where large sections of the population are highly mobile and are often from non-endemic areas.

## ANNEX 4: The Lymphatic Filariasis (LF) Elimination Program

Lymphatic Filariasis (LF) in Africa is caused by *Wuchereria bancrofti*, a filarial worm that is transmitted in rural and urban areas by *Anopheles* and *Culex sp.* mosquitoes, respectively. The adult worms live in the lymphatic vessels and cause vessel dysfunction, often leading to poor drainage of lymphatic fluid. Clinical consequences include a collection of lymph (lymphatic fluid) that results in swelling of limbs and genital organs (lymphoedema, "elephantiasis" and hydrocele), 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 infective larvae, and are then able to be transmitted to another person when the mosquitoes bite again. Microfilariae are killed by annual single-dose combination therapy, with either Mectizan® (donated by Merck & Co., Inc.) and albendazole (donated by GSK/The Task Force for Global Health), or diethylcarbamazine (DEC, donated by Eisai Co., Ltd.) 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 World Health Organization (WHO) issued a 'provisional strategy' for *Loa loa* areas that includes the dual approach of albendazole monotherapy via MDA twice per year, together with long-lasting insecticidal (bed) nets (LLIN). Because of River Blindness Elimination Program (RBEP)-sponsored research, as of 2017, Nigeria has been excluded from this *Loa loa* policy and combination MDA with Mectizan®/albendazole can be used there (see below).

Nigerians suffer in disproportionate numbers from LF. Disease mapping of the country confirms that Nigeria is second globally (behind India) in human suffering from this parasite. With 761 out of 774 LGAs of 36 States and the Federal Capital Territory mapped, 572 LGAs (75%) are endemic and over 130 million Nigerians are at risk.

***Elimination of LF as a Public Health Problem in Plateau and Nasarawa States:*** In Plateau and Nasarawa States, The Carter Center, working with the Federal Ministry of Health (FMOH) of Nigeria and with state and local government ministries, assisted in establishing an LF elimination program. The effort is based on a strategy of two pillars: 1) annual MDA combination therapy consisting of albendazole and Mectizan® to interrupt transmission of LF and 2) Morbidity Management and Disability Prevention (MMDP) programs for those suffering from lymphoedema, elephantiasis, hydrocele and adenolymphangitis. GSK and Merck donations in Nigeria allow pillar 1 MDA activities, which were the focus of the early years of the program. After denenen.







**ANNEX 5: The Schistosomiasis/Soil-Transmitted Helminthiasis Control Program -**  
*continued*

Transmission is unlikely to be interrupted by this paradigm of MDA targeted at school-aged children because: 1) transmission occurs in all age groups; 2) praziquantel does not kill the migrating schistosomula forms, thus single dose treatment in children in highly endemic areas is unlikely to be curative; and 3) until open defecation and urination (or reduction of release of raw sewage into fresh water) are halted through construction and use of sanitation systems, MDA will

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## **ANNEX 5: The Schistosomiasis/Soil-**

## **ANNEX 6: Publications by Year Authored or Coauthored by RBEP Personnel**

*Publications for the current reporting year are shown in bold.*

**Smith ME, Bilal S, Lakwo TL, Habomugisha P, Tukahebwa E, Byamukama E, Katarwa MN, Richards FO, Cupp EW, Unnasch TR, Michael E. Accelerating river blindness elimination by supplementing MDA with a vegetation "slash and clear" vector control strategy: a data-driven modeling analysis. Sci Rep. 2019 Oct 24;9(1):15274. doi: 10.1038/s.946r038/ep.,**

## **Publications by Year Authored or Coauthored by RBEP Personnel - *continued***

Anonymous. Progress towards eliminating onchocerciasis in the WHO Region of the Americas: advances in mapping the Yanomami focus area. *Wkly Epidemiol Rec.* 2018. 93, 541–552.

Emukah E, Rakers L, Kahansim B, Miri E, Nwoke BEB, Griswold E, Saka Y, Anagbogu I, Davies E, Ityonzughul C, D'Ambrosio M, Bakalar M, Fletcher DA, Nutman T, Kamgno J, and Richards FO. In southern Nigeria *Loa loa* blood microfilaria density is very low even in areas with high prevalence of Loiasis: Results of a Survey Using the New LoaScope Technology. *Am J Trop Med Hyg.* 2018; 9: 116 - 123

Elhassan E, Zhang Y, Bush S, Molyneux D, Kollmann MKH, Sodahlon Y, Richards F. The role of the NGDO Coordination Group for the Elimination of Onchocerciasis. *Int Health.* 2018; 10(suppl\_1):i97-i101. doi: 10.1093/inthealth/ihx050.

Griswold E, Unnasch T, Eberhard M, Nwoke BEB, Morales Z, Muheki Tukahebwa E, Kebede B,

**Publications by Year Authored or Coauthored by RBEP Personnel - *continued***

Obindo J, Abdulmalik J, Nwefoh E, Agbir M, Nwoga C, Armiya'u A,



## Publications by Year Authored or Coauthored by RBEP Personnel - *continued*

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