Summary Proceedings

Twenty-Third Annual
Trachoma Control Program Review

"Resilience in the Face of Historic Global Challenges"

THE
CARTER CENTER

Waging Peace. Fighting Disease. Building Hope.

Atlanta, Georgia

March 7-8, 2022

Acknowledgments

The Carter Center's Trachoma Control Program would like to acknowledge the support of numerous partners and donors who have made the 2021 activities reviewed in this document possible:

Abbott

Alwaleed Philanthropies

Bill & Melinda Gates Foundation

Robert and Joan Blackman Family Foundation

Children's Investment Fund Foundation

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The William H. Donner Foundation, Inc.

The END Fund

The Francis I. Proctor Foundation at the University of California at San Francisco

William R. Hoch Family Foundation

International Trachoma Initiative

IZUMI Foundation

Frank S. and Julia M. Ladner Family Foundation

Lions Clubs International Foundation

Lions Clubs of Ethiopia

Lions Clubs of Mali

Lions Clubs of Niger

Manaaki Foundation

Margaret A. Cargill Philanthropies

Noor Dubai Foundation

Orbis International

Pfizer Inc.

Qatar Foundation

Rock Paper Scissors Foundation

John and Kathleen Schreiber

SoapBox Soaps

The Task Force for Global Health/ Coalition for Operational Research on Neglected Tropical Diseases

University of North Carolina – Chapel Hill

U.S. Centers for Disease Control and Prevention

World Innovation Summit for Health

YKK Corporation of America

And to many others who may not be listed, our sincere gratitude.

Acknowledging Resilience in the Face of Historic Global Challenges

The Carter Center's Trachoma Control Program celebrated another year of achievements despite the many challenges brought forth by the coronavirus disease 2019 (COVID-19) global pandemic. Through the power of partnership, compassion, and resilience, we assisted in providing life-altering surgeries, mass drug administration (MDA), and community health education across the Amhara region of Ethiopia, Mali, Niger, South Sudan, and Sudan. The Carter Center is proud to assist, in partnership with the ministries of health, the most mature and long-standing trachoma programs worldwide. These programs have historically been the largest of their kind, contributing to some of the most outstanding global SAFE (Surgery, Antibiotics, Facial cleanliness, and Environmental improvement) outputs annually and cumulatively. In the World Health Organization (WHO) Weekly Epidemiological Record, published 6 August 2021, global 2020 data showed the Carter Center's Trachoma Control Program assisted in approximately 32% of the worldwide output of MDA and 20% of all trachomatous trichiasis (TT) surgeries performed. The Carter Center Trachoma Control Program assisted countries have historically assisted in serving about 25% of the population in need of SAFE interventions.

The Program has demonstrated great *Resilience in the Face of Historic Global Challenges*, particularly those brought on by the COVID-19 pandemic and increased insecurity across all Carter Center-assisted countries. Leaning on longstanding partnerships, stepping forth with compassion and purpose, and adapting to ever-changing circumstances, the Program was still able to accomplish much in the effort to eliminate trachoma as a public health problem. In partnership with communities and ministries of health in Mali, Niger, and Sudan since 1999 and with Ethiopia and South Sudan since 2001, the Carter Center's Trachoma Control Program has provided TT surgeries to 868,936 persons and assisted in the distribution of more than 222 million doses of antibiotics—over 15,259,000 doses of which were distributed just in the 2021 calendar year (with a significant portion of these counted towards the 2020 programmatic year). The Center's partnerships have also contributed to health education programs and activities in more than 107,000 communities and the construction of nearly 3.7 million latrines. Additionally, the Carter Center's Trachoma Control Program has deep and rich relationships and partnerships with academia and other partners to conduct and assist in operational research towards policy change and programmatic improvements. These partnerships and outcomes reflect the tremendous cumulative and collective success of the Carter Center-assisted countries, their continued resilience in the midst of immense challenges, and their determination to eliminate trachoma as a public health problem.

The Carter Center's work and the achievements of the partnerships would not be possible year after year without the critical support and committed advocacy of additional partners, such as the generosity and enthusiasm of donors, including Pfizer Inc., Conrad N. Hilton Foundation, Lions Clubs International Foundation and Lions Clubs of Ethiopia, Mali, and Niger, Noor Dubai Foundation, Alwaleed Philanthropies, The OPEC Fund for International Development, Abbott, Manaaki Foundation, Crown Agents/ASCEND, Bill & Melinda Gates Foundation, Margaret A. Cargill Philanthropies, The END Fund, John and Kathleen Schreiber, The William H. Donner Foundation, Inc., IZUMI Foundation, Sightsavers, and many others. Moreover, we would also like to acknowledge and thank our crucial and dedicated academic partners who continue to support academic research and laboratory work to advance the Center's mission to control the world's leading cause of infectious blindness.

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Acronyms

ARHB	Amhara Regional Health Bureau
ARRET	Azithromycin Reduction to Reach Elimination of Trachoma
ASCEND	Accelerating the Sustainable Control and Elimination of Neglected Tropical Diseases
AVENIR	Azithromycine Pour la Vie Des Enfants au Niger – Implémentation et Recherche (Azithromycin For the Lives of Children in Niger – Implementation and Research)
CDC	U.S. Centers for Disease Control and Prevention
CI	Confidence Interval
CIFF	Children's Investment Fund Foundation
COVID-19	Coronavirus Disease 2019
Ct	*Chlamydia trachomatis*
DBS	Dried blood spot
DHIS2	District Health Information Software 2
ETAG	Ethiopia Trachoma Advisory Group
ETAS	Enhancing the A in SAFE
F&E	Facial Cleanliness (F), and Environmental Improvement (E) of the SAFE Strategy
FMOH	Federal Ministry of Health
GET2020	WHO Alliance for the Global Elimination of Trachoma by 2020
ICTC	International Coalition for Trachoma Control
IDP	Internally Displaced People
IECW	Integrated Eye Care Workers
ITI	International Trachoma Initiative
IU	Implementation Unit
MDA	Mass Drug Administration
MFTA	More Frequent Than Annual
MOH	Ministry of Health
NGO	Non-Governmental Organization
NTD	Neglected Tropical Diseases
OR	Odds Ratio
PNLC	Programme National de Lutte contre la Cecité (National Blindness Prevention Program)
PNSO	Programme National de Santé Oculaire (National Eye Health Program)
POC	Protection of Civilian
SAFE	Surgery (S), Antibiotics (A), Facial Cleanliness (F), and Environmental Improvement (E)
SBCC	Social and Behavior Change Communication
SCR	Seroconversion Rates
SPET	Surveillance Post-Endemique du Trachome (Trachoma Post-Endemic Surveillance)
SOP	Standard Operations Procedure
STP	School Trachoma Program
SWIFT	Sanitation, Water, and Instruction in Face-Washing for Trachoma
TEC	Trachoma Expert Committee

TEO	Tetracycline Eye Ointment
TFGH	The Task Force for Global Health
TIS	Trachoma Impact Surveys
TSS	Trachoma Surveillance Surveys
TF	Trachomatous Inflammation-Follicular
TI	Trachomatous Inflammation-Intense
TT	Trachomatous Trichiasis
UCSF	University of California -San Francisco
UNICEF	United Nations Children's Fund (formerly United Nations Children's Education Fund)
USAID	U.S. Agency for International Development
WASH	Water, Sanitation, and Hygiene
WHA	World Health Assembly
WHO	World Health Organization
WUHA	WASH Upgrades for Health in Amhara

Executive Summary

The 23rd Annual Trachoma Control Program Review was held virtually March 7-8, 2022, due to the COVID-19 pandemic. To celebrate the partnership and resilience through this trying period worldwide, the theme of this year's review was "Resilience in the Face of Historic Global Challenges." Attending this year's review were representatives from the Ministries of Health and Carter Center offices in the five countries where the Center currently assists in the elimination of trachoma as a public health problem: Ethiopia, Mali, Niger, South Sudan, and Sudan. Partners and donors in attendance included representatives from CBM, Children's Investment Fund Foundation (CIFF), Emory University, The END Fund, FHI360, Helen Keller International, the Leona M. and Harry B. Helmsley Charitable Trust, International Coalition for Trachoma Control (ICTC), International Trachoma Initiative (ITI), Lions Clubs International Foundation, London School of Hygiene and Tropical Medicine, Manaaki Foundation, OPEC Fund for International Development, Orbis International, Pfizer Inc., The Francis I. Proctor Foundation at the University of California at San Francisco (UCSF), RTI International, Sightsavers, The Task Force for Global Health (TFGH), U.S. Agency for International Development (USAID), U.S. Centers for Disease Control and Prevention (CDC), and the WHO.

In keeping tradition with past program reviews, the 2022 program review provided an opportunity to assess the status of each national program and discuss the progress toward meeting the elimination of trachoma as a public health problem. Despite the ongoing COVID-19 pandemic and political, economic, and security challenges, the Carter Center-assisted programs were highly productive. In calendar year 2021, a total of 14,440 TT surgeries were conducted, 63.5% of which were provided to women; more than 15,259,000 doses of antibiotics were distributed (with a significant portion of these counted towards the 2020 programmatic year); more than 14,000 latrines were constructed; and health education towards facial cleanliness and environmental improvement (F&E) interventions continued in communities and schools, when possible.

The Amhara region in Ethiopia was able to conduct 25 prevalence surveys in calendar year 2021 and distribute more than 14.9 million doses of Pfizer-donated Zithromax® in 117 districts. The 14.9 million doses will be counted towards program year 2020, as the Amhara Program continues to "catch up" from the effects of COVID-19. The Mali National Program is finalizing the WHO validation dossier, as surveys in just two districts remain to demonstrate elimination of trachoma as a public health problem is nationwide. The Niger National Program follows closely behind, with just under 4,350 estimated TT cases remaining at the end of 2021, and only 12 out of 72 districts are left to demonstrate the elimination of trachoma as a public health problem objectives are met. In addition, data collection was completed for the SPET (surveillance post-endemique du trachome—trachoma post-endemic surveillance) study in Niger to examine the risk of recrudescence. The South Sudan National Program reached monumental achievements in distributing more MDA and conducting more trachoma surveys in 2021 than any other year in its programmatic history. The South Sudan National Program was even able to reach one state that has not been reached with MDA and TT surgeries in over a decade. In Sudan, three districts demonstrated achievement of the elimination of trachoma as a public health problem thresholds in final surveillance surveys.

The two-day review focused on achievements and reaching these with resilience in the face of historic challenges. The Carter Center Chief Executive Officer, Mrs. Paige Alexander, opened the program

review by welcoming participants and highlighting some 2021 accomplishments of the Center's Health Programs. This was followed by another commendation and goodwill recognition from Dr. Tedros Adhanom Ghebreyesus, Director-General of the WHO, who highlighted the new WHO neglected tropical diseases (NTD) roadmap: "Ending the Neglect to Attain the Sustainable Development Goals: A Road Map for Neglected Tropical Diseases 2021–2030."

In her opening remarks, Ms. Kelly Callahan, the Carter Center's Trachoma Control Program Director, brought forth the central thread of this year's program review. Ms. Callahan's presentation illuminated the meaning of resilience through multiple illustrations of the Program's astounding progress and achievements toward eliminating trachoma as a public health problem, even as the pandemic and insecurity persisted. Among the challenges faced this year were the losses of three instrumental leaders in public health: Dr. Paul Farmer, Dr. Mwelecele Ntuli Malecela, and Dr. Nabil Aziz Mikhail. Under the inspiration of these leaders and the evident progress toward elimination, Ms. Callahan encouraged the Program to continue building hope through exercising compassion, acceptance of failure, flexibility, and focus. The presentation concluded with a quote by President Carter, "We must adjust to changing times and still hold to unchanging principles." The year 2021 was indeed a time of substantial change and staggering challenges, and the Center—in hand with its partners—will continue holding to its guiding tenets of resilience, building hope, and eliminating trachoma as a public health problem. Ms. Callahan emphasized The Carter Center remains proud and honored to assist the ministries of health on the road toward trachoma elimination and will continue to support this crucial work in the years to come.

Throughout the program review, country-specific presentations were interspersed with multiple illustrations of how The Carter Center and partners remain resolute in mitigating challenges and achieving the elimination of trachoma as a public health problem. Mr. Phong Le, Data Analyst of the Carter Center's Trachoma Control Program, presented an investigation of the factors associated with unfavorable trachoma surveillance survey (TSS) results after elimination. Ms. Kristen Renneker, Senior Data Analyst of ITI at the TFGH, and Dr. Jeremiah Ngondi, Senior NTD Advisor of RTI International, presented a global data analysis on the magnitude of the remaining trachoma problem (including persistence and recrudescence – see Appendix IV). Dr. Scott Nash, Epidemiologist of the Carter Center's Trachoma Control Program, presented an innovative approach being used in Amhara, Ethiopia, called 'Wait & Watch' which could impact MDA programming and lead to immense cost savings across programs. Dr. Paul Emerson, Director of ITI, provided an update on the global status of the Zithromax® donation program with a special focus on recent Trachoma Expert Committee (TEC) recommendations based on a WHO Informal Consultation meeting (Appendix IV).

Mr. Tim Jesudason, a consultant of Partners in Global Health Ltd., presented some preliminary findings from an MDA costing study being conducted in South Sudan. Dr. Angelia Sanders, Chair of the ICTC and Associate Director of the Carter Center's Trachoma Control Program, presented an update on the activities being conducted by ICTC. Dr. Sanders' update was followed by Ms. Julie Jenson, Director, Corporate Affairs, Pfizer, Inc., who provided an update on Pfizer's ongoing commitment to the trachoma elimination program worldwide. A special session was presented on serology with numerous experts providing important insight for the global program: Dr. Diana Martin, Research Biologist of the CDC, provided a high-level summary and rationale for the use of serology for trachoma surveillance; Ms. Zeinab Abdalla, Senior Program Officer for the Carter Center's

Trachoma Control Program in Sudan, and Ms. Katie Lynn, Graduate Assistant for the Carter Center's Trachoma Control Program, discussed ongoing analyses of various trachoma indicators in North Darfur, Sudan, and Amhara, Ethiopia; Dr. Benjamin Arnold, Associate Professor of Francis I. Proctor Foundation, and Dr. Christine Tedijanto, Post-doctoral Scholar of UCSF, provided further insights into using seroprevalence data to better understand disease dynamics in endemic countries. Dr. Solomon Aragie, Researcher for UCSF, and Dr. Jeremy Keenan, Director of International Programs of Francis I. Proctor Foundation, presented a research update on the SWIFT (Sanitation, Water, and Instruction in Face-Washing for Trachoma) study focused on the impact of water, sanitation, and hygiene (WASH) on trachoma in Amhara, Ethiopia.

Finally, Dr. Kashef Ijaz, Vice President of Health Programs for The Carter Center, closed the meeting with a summary of the two-day meeting and the success exemplified through incredible determination of individual programs and the power of partnership. This year's program review demonstrated that through collaboration, compassion, and resilience, there can be incredible success, despite historic global challenges. Dr. Ijaz emphasized that together we are stronger and we are more resilient in order to build hope and fight disease to meet our collective goals. Dr. Ijaz echoed the remarks made by Ms. Callahan and also emphasized that The Carter Center remains proud of our partnerships in the elimination of trachoma as a global public health problem.

SAFE in Ethiopia

Presented by Mr. Fikre Seife, National NTD Program Coordinator, Ministry of Health (MOH) – Ethiopia

Background

Ethiopia has the highest burden of trachoma in the world with about 72 million people at risk of trachoma, which constitutes nearly 50% of the global burden. The National Survey on Blindness, Low Vision, and Trachoma conducted in 2006 revealed that 2.8 million people in Ethiopia had low vision and 1.2 million people were blind. It was estimated that 87% of blindness was from avoidable diseases. The survey revealed that active trachoma was endemic in virtually all country regions, with more than 1.3 million people living with TT. As of December 2020, 798 woredas (districts) were endemic for trachoma, with about 342,800 people experiencing TT; the mean prevalence of active trachoma reduced from 26.6% at baseline to 13.3%; and the prevalence of TT among people ages 15 years and above decreased from 4% to 0.85%. From 2015 to 2020, 202 woredas stopped MDA for trachoma after achieving the WHO elimination threshold of less than 5% trachomatous inflammation-follicular (TF) among children ages 1–9 years, and since the Fast Track Initiative was launched in 2015 which aimed to clear the TT backlog across Ethiopia, 115 districts achieved the TT elimination threshold with 648,924 TT cases managed.

Ethiopia has shown great dedication to addressing the country's trachoma burden, among other NTDs. The Ethiopia NTD Master Plan was launched in 2013, subsequently updated in 2016, and most recently revised in 2020, with an increased focus on the integration of WASH and NTD programming through the promotion of sector coordination, capacity building, and improving WASH-NTD strategies and tools. The National Program continues to be dedicated to eliminating trachoma as a public health problem by 2030.

Surgery (S)

From 2015 to 2020 (since the Fast Track Initiative began), in a huge effort to reduce TT levels, the National Program operated 648,924 TT cases. As of December 2020, an estimated 342,800 TT cases remain, and 716 districts in Ethiopia have yet to reach the threshold for the elimination of TT as a public health problem (prevalence of TT <0.2%, unknown to the health system, in individuals 15 years and above). To bring this backlog down further, in 2021, 45,411 cases were operated, more than double the surgeries administered in 2020. In order to enhance strength and capacity to address remaining TT cases, the National Program has implemented a number of training efforts in 2021; 383 integrated eyecare workers (IECW) were trained, 369 were certified, along with 1,387 individuals trained as case finders, and 74 Supervisory and Quality Audit trainings were conducted in three regions (Sidama 30, SNNPR 26, and Oromia 18). Similar training efforts will continue in 2022. The National Program's TT elimination efforts have been additionally bolstered by integration of TT screening with MDA. Furthermore, the monitoring of TT kits and consumables through periodic inventory checks has helped address gaps and mobilize supplies to the regions and zones, as needed.

Antibiotic Therapy (A)

The TF prevalence in Ethiopia is continuing to decrease and is approaching the 5% threshold for elimination of trachoma as a health problem in many districts. Baseline estimates showed that 352 districts had a TF prevalence of ≥30% (hyperendemic) and 154 districts were below the 5% elimination threshold. As of 2021, only 165 districts had a TF prevalence of ≥30% and 422 were found to be below the 5% elimination threshold. From 2015 to 2020, the mean national estimated TF prevalence dropped from 26.6% to 13.3%. These trends are in no small part due to the antibiotic administration efforts of the National Program. The number of antibiotic doses distributed in Ethiopia has greatly increased over time; since 2010, 406 million doses have been distributed. The National Program has shown great resilience and adaptability in the face of the COVID-19 pandemic, evidenced by a 350% increase in Zithromax® distribution between 2020 and 2021. The most recent impact surveys reveal that, since baseline surveys were conducted, a total of 187 districts are no longer hyperendemic, and 268 districts have fallen below the 5% TF prevalence threshold, no longer requiring MDA. Nationally, TF prevalence has been reduced from 22.4% at baseline to 12.6% in 2021.

Facial Cleanliness (F) & Environmental Improvement (E)

With the successes of mass antibiotic treatment, the F & E strategies remain paramount. The National Program is engaged in promoting facial cleanliness and latrine construction and use through social and behavior change communication (SBCC) strategies. Advocacy and collaboration for access to a safe water supply, sanitation, and hygiene are at the forefront of efforts as well.

Programmatic Challenges

The National Program has had to work through immense challenges in order to attain such high accomplishments. These challenges include:

- Security concerns which disrupted the provision of TT surgery in parts of Amhara, Afar, and Oromia regions. The Tigray region is completely inaccessible due to the conflict.
- The COVID-19 pandemic led to remote monitoring and supportive supervision. This resulted in limited information on actual MDA and TT surgery implementation.
- Low TT surgical uptake, including a high level of refusals in some areas.
- Persistent trachoma/slow progression towards elimination threshold, as evidenced by an average "pass rate" of ~26% at trachoma impact surveys (TIS) from 2010–2020.
- High rate of recrudescence (TF ≥10%) after TSS.
- Inadequate access of households to safe water supply (56%) has challenged the acceleration of elimination efforts.
- Limited use of the DHIS2 (District Health Information Software 2) platform for reporting and program management.

Programmatic Initiatives in 2021

In 2021, text message groups were developed at the MOH, regional, and zonal levels to exchange information and provide timely feedback. This contributed to boosting field staff morale, peer influence, and technical and administrative backup for better MDA and TT surgery results. The

modality of TT screening was integrated into MDA to improve case finding in remote areas and minimize missed opportunities for TT detection, referral, and treatment. There was TT program data synthesis and review of technical groups to objectively illustrate progress, trends, and lessons to enhance performance strategies. This enabled the National Program to identify key constraints and enablers in determining the progression towards achieving elimination targets. The Ethiopia Trachoma Advisory Group (ETAG) was also established in order to provide scientific-technical guidance to the National Program. The ETAG has helped identify alternative strategies for progression towards elimination targets and will continue to provide guidance in 2022 and beyond.

Trachoma elimination targets to be attained by 2030

In order to achieve the national target of elimination of trachoma as a public health problem in 75% of endemic districts by 2025 and throughout the country by 2030, the National Program is pursuing several objectives. The National Program plans to provide high-quality TT management to 342,800 individuals with TT, maintain post-operative TT below 10% at 3–6-month follow-up, and ensure that all 798 endemic districts have access to TT surgical services. The National Program aims to achieve at least 80% therapeutic coverage with antibiotic MDA in all 567 endemic districts and ensure MDA safety, with no severe adverse events. The National Program anticipates strengthening F & E strategies in all endemic districts by scaling up the woreda WASH-NTD implementation toolkit to 798 endemic districts. To assess the impact of all of these efforts, the National Program plans to conduct impact surveys in 567 districts.

Future Programmatic Initiatives

To address the challenges and reach the targets above, the National Program has several key initiatives planned. Biannual MDA will be applied to persistent and recrudescent districts where appropriate, in coordination with the regional health bureaus. Additional child MDA will be implemented in selected pilot districts (across three regions: Amhara, Oromia, and SNNPR). Based on this pilot implementation, the national protocol will be revised to scale up MDA to children in additional persistent districts. The National Program also plans to strengthen F & E interventions, including implementing SBCC and encouraging community engagement. In all these initiatives, through operational research, the National Program aims to promote evidence-based decision-making in its work.

Ethiopia – TF Prevalence: Children 1–9 years

2015

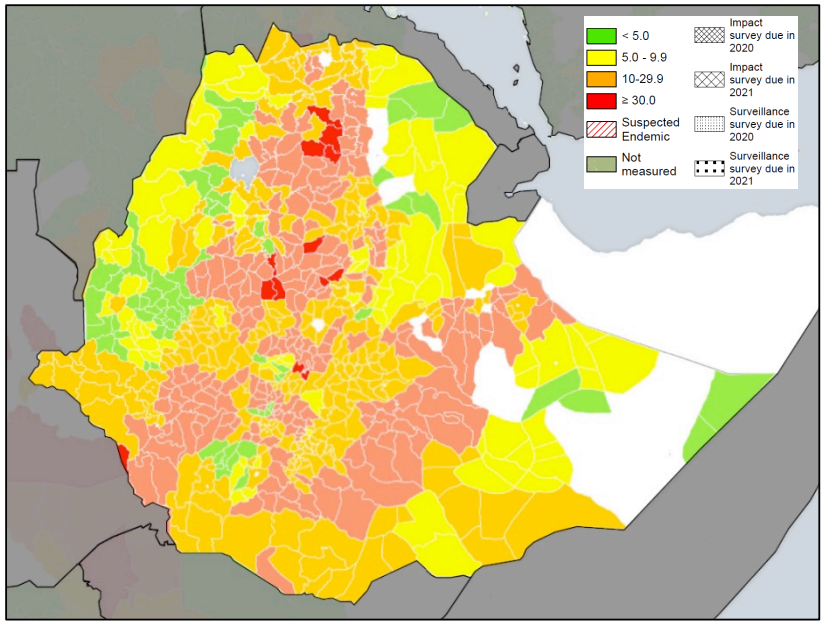


Figure 1 – Estimated prevalence of TF in 2015: 26.6%

2020

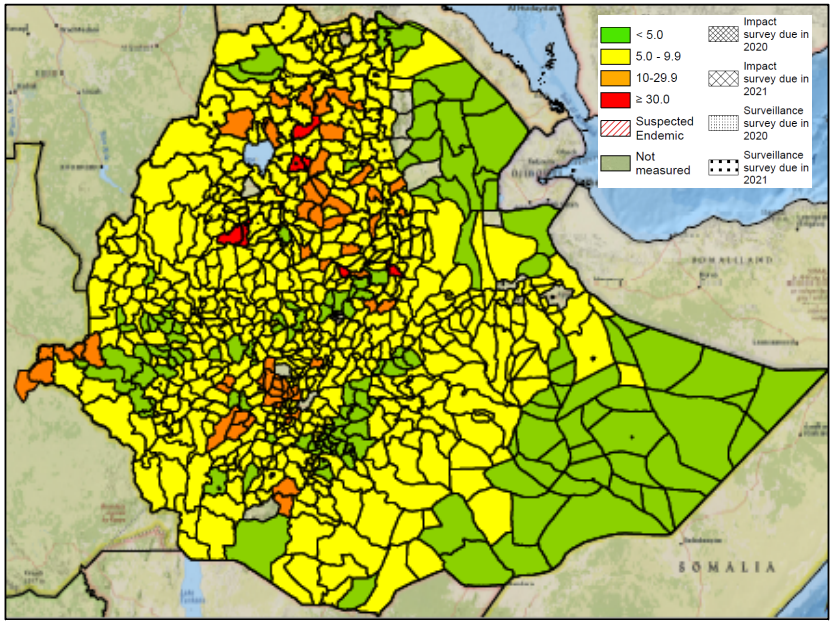


Figure 2 – Estimated prevalence of TF in 2020: 13.3%

Ethiopia – TT Prevalence: Adults ≥ 15 years

2015

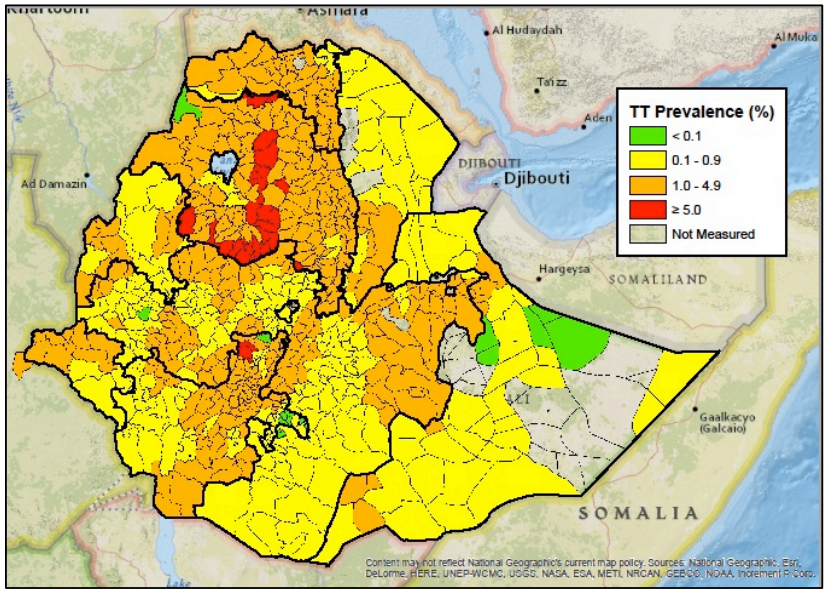


Figure 3 – Estimated prevalence of TT in 2015: 4%

2020

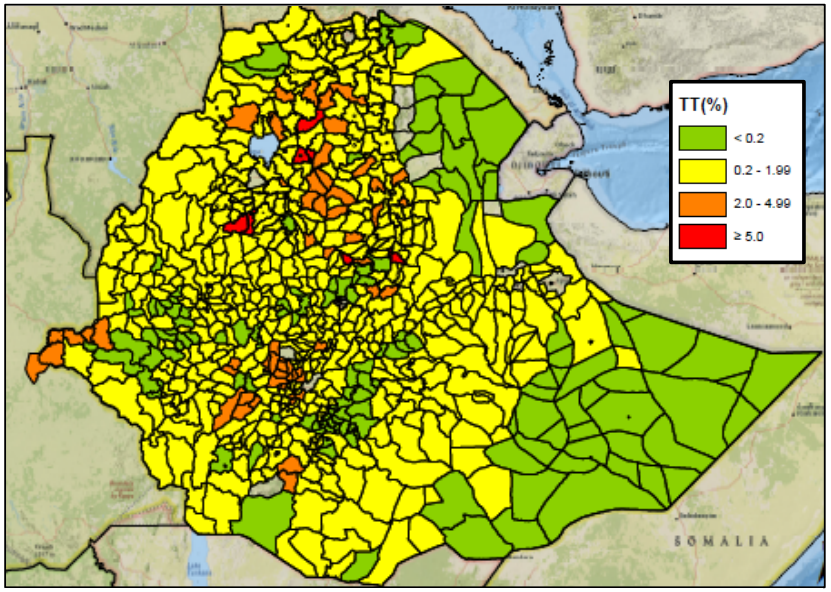


Figure 4 – Estimated prevalence of TT in 2020: 0.82%

SAFE in Amhara, Ethiopia

Presented by Mr. Abdulkerim Mengistu, Deputy Head, Amhara Regional Health Bureau (ARHB)

Background

Since 2001, the ARHB has been working with The Carter Center to implement the full SAFE strategy in Ethiopia's Amhara region, completing more than 726,000 surgeries and distributing more than 200 million doses of antibiotics. A trachoma baseline prevalence survey at the zonal level was conducted in 2007 in the region to quantify the prevalence of active trachoma and TT; based on the results, all zones in the Amhara region were eligible for the full SAFE strategy and an estimated 643,904 people required surgery to correct TT.

Due to the Program's tremendous efforts, by December 2021, 49 out of 166 health districts in the Amhara region reached the elimination threshold for TF, making them exempt from MDA. Despite a pause in programming due to the COVID-19 pandemic and insecurity in and around the region, MDA activities resumed in calendar year 2021, covering 117 districts and reaching more than 14.9 million people with antibiotic. The Program also completed 11,180 surgeries and trained 47 new and 39 existing TT surgeons to ensure the quality of surgery provision. In an effort to limit the risk of COVID-19 transmission, the Program continued implementing the standard operating procedures (SOPs) for surveys, MDA, and TT case-finding and surgeries that were developed in 2020 in response to the pandemic. In 2022 and beyond, the Program remains focused on eliminating trachoma as a public health problem by reviving SAFE programming, utilizing enhanced MDA, updating the School Trachoma Program (STP) curriculum, and expanding water provision in select schools in trachoma hyperendemic areas.

Table 1. Program Achievements in 2021

Indicator	Goal	Amhara Region (Carter Center-Assisted)	
		Target	Achieved
# of persons operated	150,441	30,532	11,180
# of women operated			7,181
# of surgeons trained		28	47*
# of surgeons retrained		88	39
# of doses of Zithromax® distributed during MDA	15,310,025	15,310,025	14,571,088**
# of doses of tetracycline eye ointment (TEO) distributed during MDA	325,026	312,449	348,604**
# of villages with health education		3,447	3,447
% improved latrine coverage		50%	38%

** Surgeon training done in collaboration with CIFF's Operation Sight Program through the MOH*

*** MDA was conducted in calendar year 2021 but applied to program year 2020*

Surgery (S)

In 2021, 11,180 people in the Amhara region received Carter Center-assisted TT surgery; and of those operated, 7,181 (64%) were women. Since the beginning of the program in 2001, 726,439 TT surgeries have been conducted in Amhara. The baseline surveys completed in 2007 showed an estimated backlog of more than 640,000 TT cases to operate to reach the elimination target. As of the end of 2021, it is estimated that 141,978 individuals require TT surgical services to reach the threshold for the elimination of TT as a public health problem. Due to the ongoing impacts of the COVID-19 pandemic and insecurity in Amhara, limited surgeries were completed in 2021. Still, coverage was able to increase relative to 2020. Additionally, in collaboration with CIFF's Operation Sight Program through the MOH, the Program was able to support the training of 47 new TT surgeons, IECW, and the retraining of 39 existing IECW who will continue the work to clear the TT backlog in Amhara.

Antibiotic Therapy (A)

In calendar year 2021, the Program completed 25 surveys and distributed over 14.5 million antibiotic doses of Zithromax®, along with 348,604 doses of tetracycline eye ointment (TEO), all in just a five-month period. Because of the delays due to COVID-19 and insecurity in Amhara and the surrounding areas of Tigray, no MDA occurred in calendar year 2020. Activities resumed in early 2021 in all 117 endemic districts; all MDA was conducted in February and May 2021 and was attributed to Program Year 2020. As determined by the TEC of the ITI, delayed MDA carried out before June 2021 can be counted toward the previous Program Year. Given this provision, The Carter Center and ARHB will conduct MDA in early 2022 to count toward the 2021 Program Year as they try to make up for the valuable time lost. The Program plans to be back on cycle next year.

All 2021 Program MDA and survey efforts were carried out with updated SOPs to mitigate COVID-19. The Program distributed antibiotics in a house-to-house modality—rather than from fixed points—and ensured that health extension workers and community volunteers had proper PPE.

Even with these immense and continual challenges, by the end of 2021, 49 of the 166 health districts in the Amhara region—containing an estimated population of 4.9 million—have achieved the elimination target for TF and no longer require MDA. This number includes 37 districts that remained below the elimination threshold after their TSS. This significant achievement shows great progress throughout the region compared to just six years prior, when only nine districts were below 5% TF.

Moving forward, the Program aims to conduct surveys in 57 districts in 2022 to determine MDA eligibility; of these surveys, 54 will be TIS and three will be TSS. The Carter Center and the ARHB are planning a May 2022 pilot for enhanced MDA in two districts and may scale up this strategy in the future.

Facial Cleanliness (F) & Environmental Improvement (E)

The Program focused immense efforts on health education, with ongoing health education in 3,447 villages and STP implemented in more than 8,700 schools in Amhara. Given the continued success of STP, the ARHB, Amhara Board of Education, and The Carter Center are developing a pre-school curriculum for children ages 4–6 in 2021, to pilot in 2022, and expand to the region in 2023.

In an effort to enhance the impact of STP, the Program has also focused on improving water access in select schools. In collaboration with the Amhara Water Bureau, the Program began a water provision pilot in 2021, enlisting 12 schools from three hyperendemic districts. Each of the schools will receive a water point (hand-dug well, shallow well, or line extension) and will form a water committee that will manage the water point maintenance. In 2022, a monitoring and evaluation tool will be implemented for this project, assessing the sustainability of the water points. The next phase of the project will commence, expanding to additional schools found in trachoma hyperendemic areas in conjunction with the implementation of the STP.

Programmatic Challenges & Successes

The year of 2021 saw ongoing challenges related to the COVID-19 pandemic, including increased activity cost due to mitigation strategies (e.g., personal protective equipment, changes in MDA modality, limiting vehicle capacity), lower surgery output, and delays causing programs to get "off cycle". However, these were not the only challenges in 2021—Amhara and the surrounding regions experienced the impact of insecurity, causing additional delays in programming, tremendous damage to health facilities and schools, looting of supplies and materials, displacement of health workers, and population displacement. This greatly impacted the Program and will continue to do so, in particular in East Amhara where the greatest damage from the conflict occurred. Still, the Program was remarkably able to complete the 25 delayed West Amhara surveys followed by MDA to more than 14.9 million people in calendar year 2021.

Additionally, the Program continued to look for opportunities to improve programming. This included working to determine whether districts that return above the 5% TF threshold after surveillance survey truly are recrudescent. In two districts, the Program implemented the Wait and Watch approach; after 2019 TSS results showed that the district-level prevalence was above 5%, and the Program waited and re-surveyed in 2021 (delayed from 2020) instead of restarting MDA. In this new survey, both districts were found below the elimination threshold, thus no longer requiring additional MDA and providing a future potential strategy for districts with a similar experience. In 2022, the Wait and Watch approach will be expanded to three districts and complimented by collection of *Chlamydia trachomatis* (*Ct*) infection data from the districts.

Program Plans for 2022

Surgery (S)

- Operate 38,981 TT cases
- Train 24 new IECW (surgeons)
- Retrain 108 IECW

Antibiotic Therapy (A)

- Distribute 16,838,165 doses of Zithromax®
- Distribute 343,636 doses of TEO

Facial Cleanliness (F) & *Environmental Improvement (E)*

- Conduct health education in 3,447 villages

- Achieve 50% latrine coverage
- Implement and supervise the STP in primary schools

Surveys

- Conduct 54 TIS and three TSS

Amhara, Ethiopia – TF Prevalence: Children 1–9 years

2015

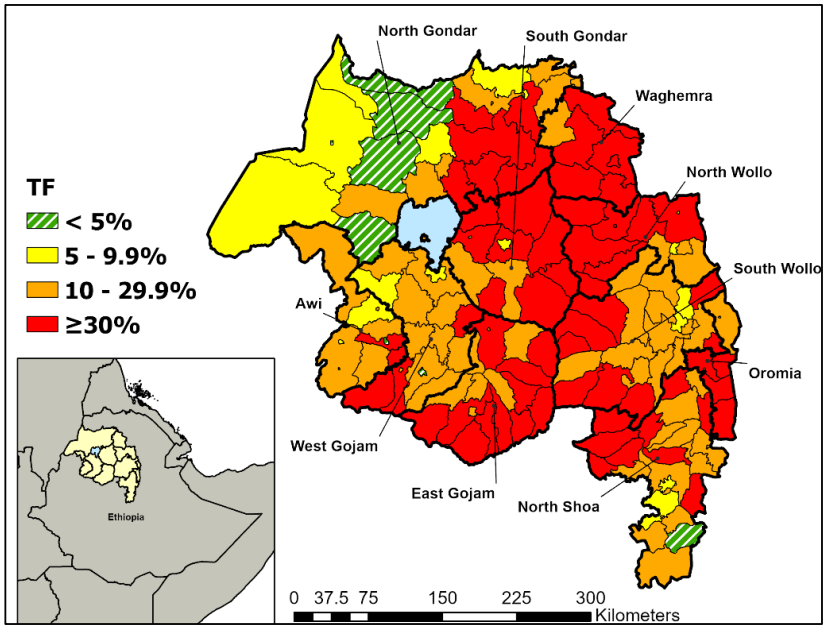


Figure 1 – Estimated prevalence of TF in 2015

2021

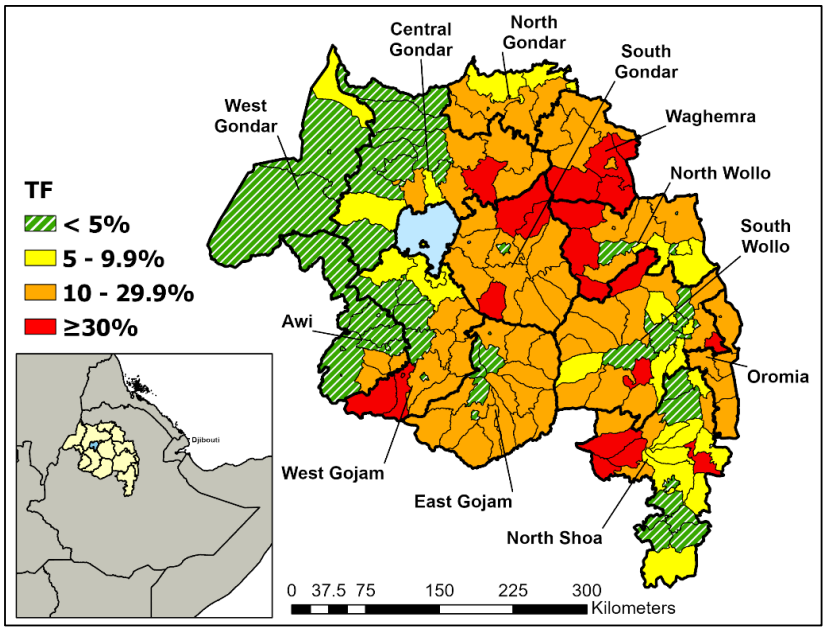


Figure 2 – Estimated prevalence of TF in 2021

Amhara, Ethiopia – TT Prevalence: Adults ≥ 15 years

2015

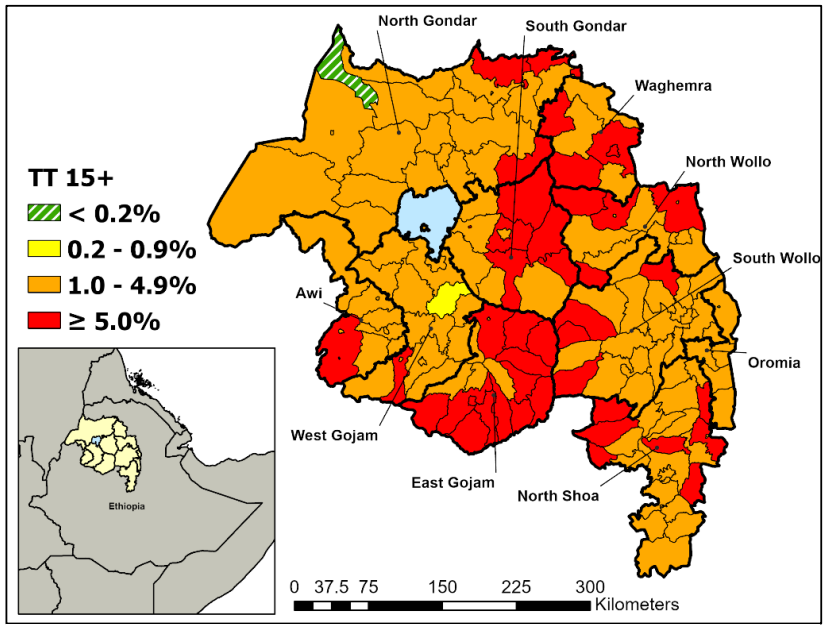


Figure 3 – Estimated prevalence of TT in 2015

2021

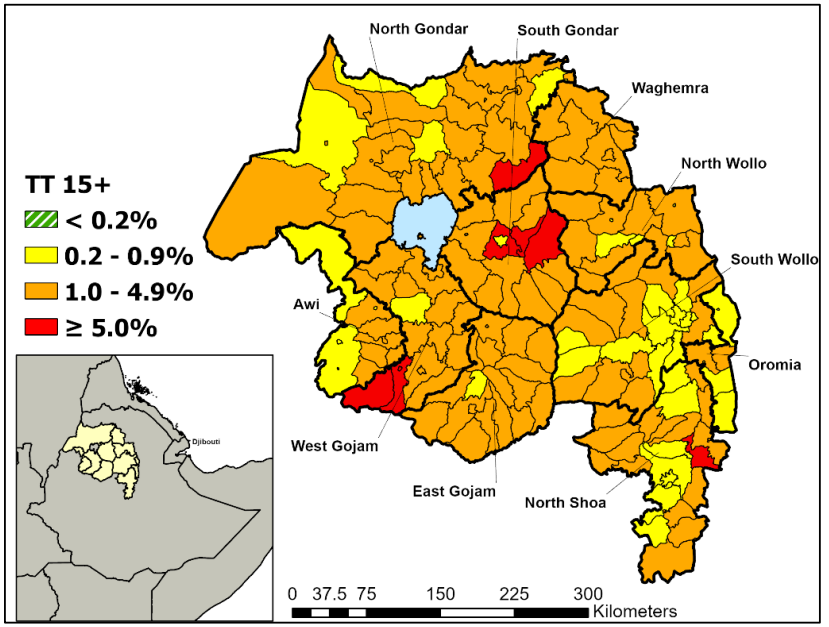


Figure 4 – Estimated prevalence of TT in 2021

Amhara, Ethiopia – MDA and Survey Plans 2022

MDA Plans

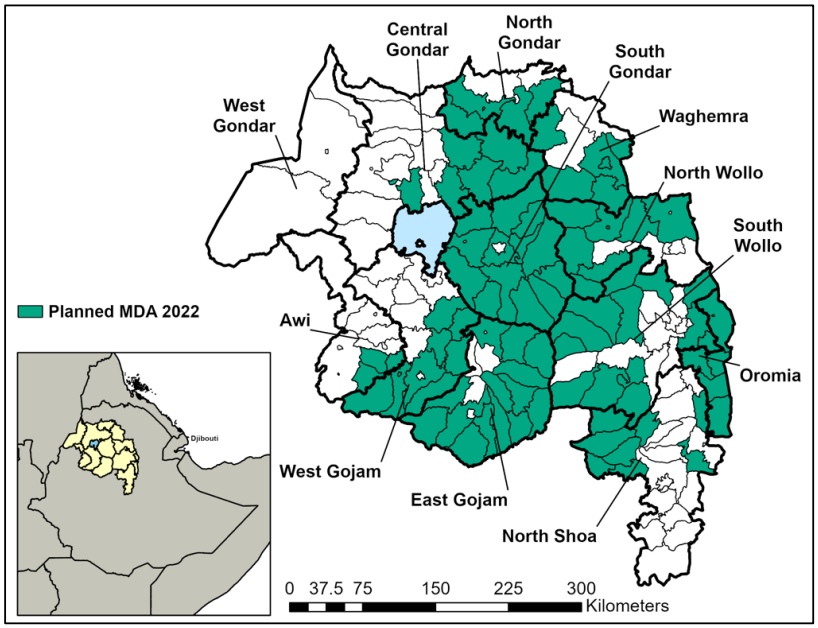


Figure 5 – The map for 2022 planned MDA activities include MDA originally planned for 2021 but was delayed due to COVID-19 and insecurity. Because of the program year definition, the Program is still trying to catch up from delays, which will continue for the next 1-2 years.

Survey Plans

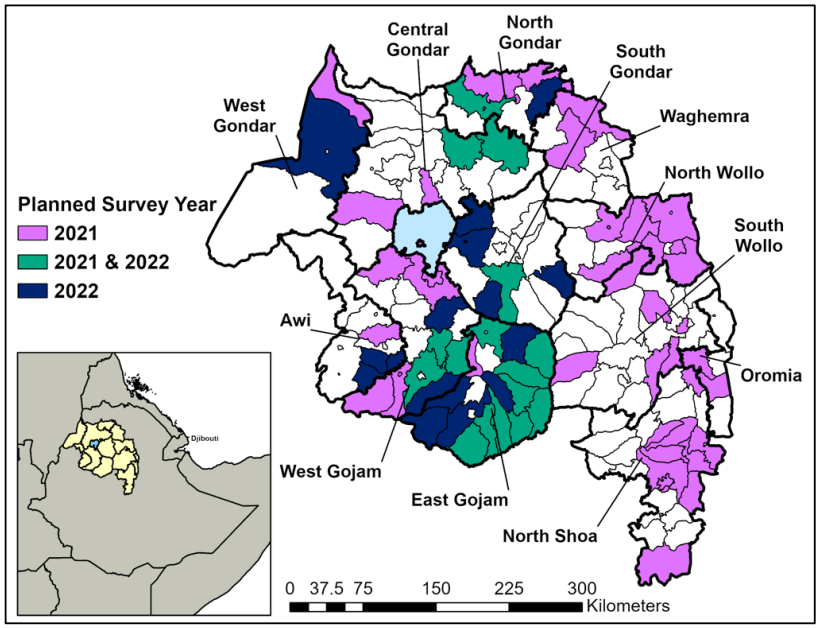


Figure 6 – The map for 2022 planned survey activities include surveys originally planned for 2021 and surveys originally planned for 2022. If required and timing permits, two surveys will be conducted in calendar year 2022 in West Amhara to catch up from the delays resulting from COVID-19 and insecurity. To create the projections, it was assumed that districts would decrease by one prevalence category at each survey round.

Reaching the Last Mile of Elimination, Despite Insecurity

Presented by Professor Lamine Traoré, National Coordinator, Programme National de Santé Oculaire (PNSO), MOH – Mali

Background

The PNSO established the National Trachoma Control Program in 1999, following prevalence surveys conducted in 1996-1997 which identified trachoma as a major public health issue. This included an estimated 85,000 persons with TT that required surgery. Since then, to eliminate trachoma as a public health problem, the Mali Trachoma Control Program has been implementing MDA, surgery for TT (including complete *ratissage*, or house-to-house case finding, to address the final cases), latrine construction, training of masons, and health education through radio and the support of community health workers. The Carter Center has been supporting the Mali Trachoma Control Program since its inception. The National Program has had massive, hard-earned success in progress toward elimination of trachoma as a public health problem. By the end of 2016, all districts in Mali had reached the 5% TF elimination threshold for children ages 1–9 years, and no further MDA has been required. Mali now must only achieve the 0.2% threshold in individuals 15 years or above for the elimination of TT as a public health problem, and only two districts remain, Douentza and Koro, to achieve this goal. The National Program has made tremendous progress since 1999, in the face of increasing insecurity, and hopes to submit the elimination dossier at the end of September 2022.

Table 1. Program Achievements, 1999-2021

Indicator	National Program	Carter Center-Assisted
# of persons operated	**90,002**	**31,247***
# of women operated	**54,042**	**18,681****
# of surgeons trained	**179**	**30**
# of surgeons retrained	**105**	**20**
# of doses of Zithromax® distributed during MDA	**29,126,964**	**698,083**
# of doses of TEO distributed during MDA	**582,539**	**120,795**
# of villages with health education	**7,576**	**3,959**
# of household latrines built	**155,686**	**117,086**
# masons trained		**7,775**

*Support began in 2008.
**The Carter Center started reporting on the number of women operated in 2012.

Implementation and Achievements in Spite of Insecurity

Insecurity and violence have impacted the Program's efforts for much of its existence. Conflict in Mali began increasing in 2012, was exacerbated in 2016, and reached its peak in 2021. The violence is rather concentrated in the southeastern border shared with Burkina Faso and Niger, and in the central region

of Mopti in particular; as a result, Program activities have been especially difficult to carry out in these areas.

Despite these severe challenges, the Program has shown great adaptability and resilience. To implement in insecure areas, the Program has received regular security reports from directors of community health centers, rented vehicles locally for all travel within villages to decrease the risk of theft, collaborated with local actors (e.g. women's groups and religious leaders) at the district level to sensitize them to the activities and the individuals who would be visiting the communities, communicated with receptive armed groups in preparation for and implementation of activities, and adapted the programming to either summon the populations of health areas to the main regional health center or carry out activities in villages, depending on security and community access.

The Program's efforts yielded tremendous results during the years of conflict and in spite of threatening insecurity. A total of 66 surveys were administered from 2013 to 2021, including TIS and TSS. In the same time period, 35 *ratissage* outreach events were conducted by five teams, and 4,616 TT cases were operated. These *ratissage* outreach events and the *ratissage* data will be utilized by nine districts to demonstrate achievement of the elimination of TT as a public health problem in the elimination dossier, rather than prevalence data.

Activities Remaining in 2022 to Demonstrate Elimination

As Mali prepares to submit the elimination dossier by the end of September 2022, the PNSO is preparing the final activities required for submission, including the final two surveys in Douentza and Koro to demonstrate achievement of the TT elimination threshold. After conducting targeted *ratissage* in 2021 to address some remaining TT cases in Douentza and Koro, surveys are planned in March 2022 in Koro and May in Douentza, security pending. The Program will then submit the dossier for WHO validation of the elimination of trachoma as a public health problem by the end of September 2022. With elimination in sight, the Program plans to complete the remaining transition activities in Mali. Significant progress has already been made on the transition activities that remain (Table 2). The dossier has been drafted with initial feedback and revisions provided by the dossier development committee. Trachoma data have been included in the DHIS2 for ongoing surveillance activities. Refresher training has been conducted for TT surgeons in two regions.

Table 2. 2021 Transition Planning Meeting Update

Activities	Status Update
Designation of **referral clinics/hospitals** for incident cases and of **referral surgeons**.	The district referral health center takes care of incident TT cases.
Availability of **surgeons** (ophthalmologists or senior technicians).	Current availability: 179 surgeons 52 of which are in Sikasso, Segou and Mopti.
Availability of qualified **nurses** (for diagnosis and referral).	To be completed (400 in Mopti and Sikasso).
Refresher training for existing surgeons and nurses.	74 surgeons left to be retrained (See Table 1. 179 - 105 = 74).
Plan for **continuing education needs** (due to limited surgical output).	Continuous training is planned every two years for the ophthalmic medical assistants in charge of the district Ophthalmology Units.

Immediate need for **consumables**.	Estimated 250 kits (number of incident cases to be operated on).
Plan for future material and **budgetary** needs.	98 TT boxes, 98 magnifying helmets.
Data collection and communication of **needs and capacity** for TT surgery.	Working with partners to integrate data in the DHIS2 application, small adjustments and training needed.
Opportunities for **collaboration** (e.g., trachoma prevention messages in WASH materials or combining cataract and TT surgery outreach).	Actions are under ongoing implementation. Several meetings with WASH group. Cataract surgeons sometimes operate on TT cases.

What remains includes retraining 52 surgeons in Mopti, Segou, and Sikasso; training 400 nurses in TT diagnosis and referral; updating radio messages for health education; providing surgical consumables and replacing surgical instruments to address incident cases of TT; and coordination with WASH groups to assess coverage, gaps, and opportunities for collaboration in prevention messaging.

With these finite steps ahead, after the elimination of trachoma as a public health problem is validated for Mali, transition to post-elimination activities can move smoothly. The Program's experiences from the challenges of reaching elimination in insecure zones—particularly those surrounding adaptability and collaboration—can be taken as lessons-learned for many future elimination efforts.

Mali – TF Prevalence: Children 1–9 years

1996

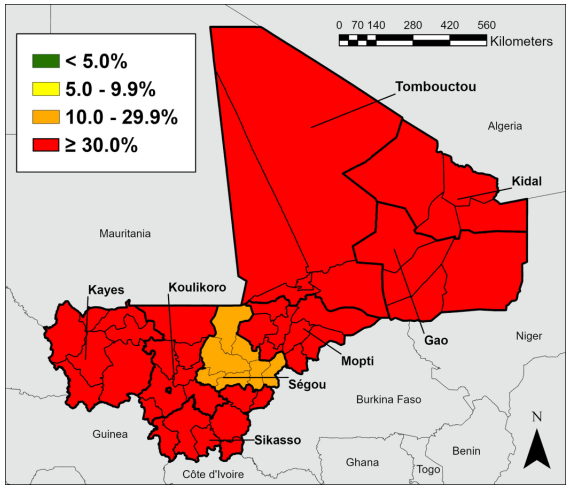


Figure 1 – Estimated prevalence of TF in 1996

2009

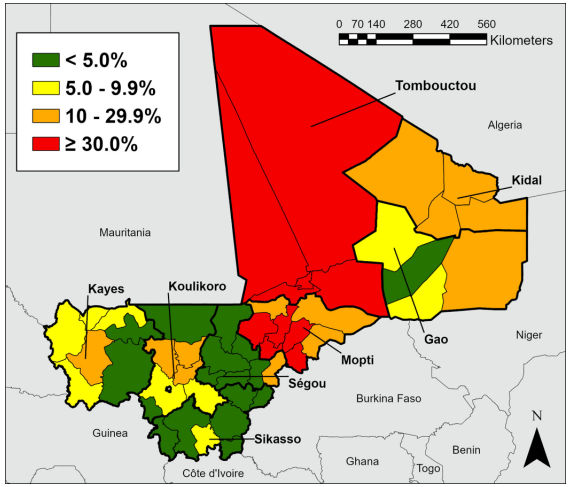


Figure 2 – Estimated prevalence of TF in 2009

2021

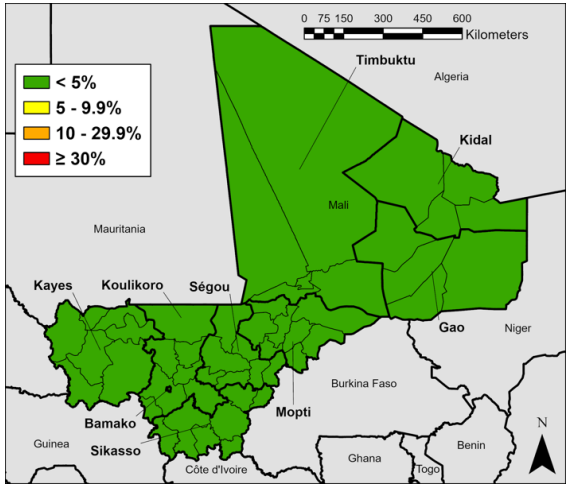


Figure 3 – Estimated prevalence of TF in 2021

Mali – TT Prevalence: Adults ≥ 15 years

1996

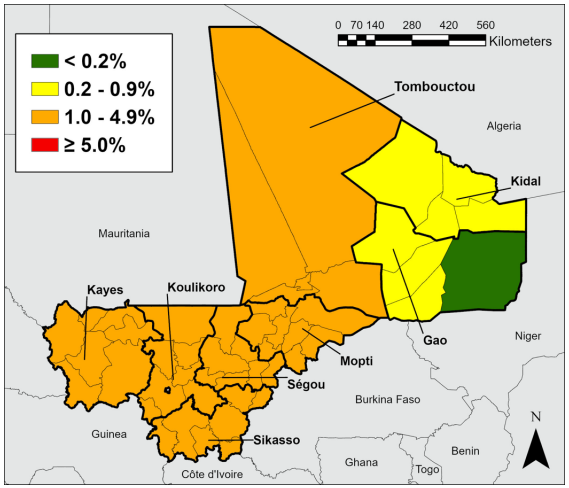


Figure 4 – Estimated prevalence of TT in 1996

2009

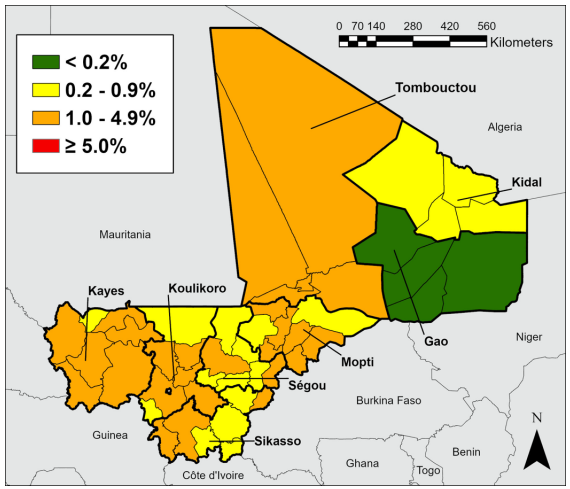


Figure 5 – Estimated prevalence of TT in 2009

2021

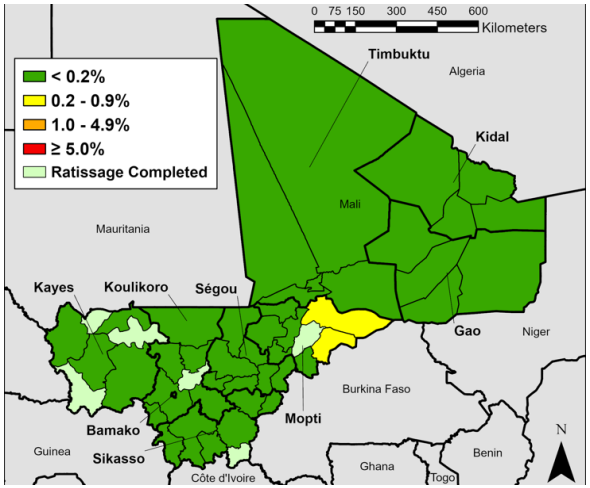


Figure 6 – Estimated prevalence of TT in 2021

Mali – Activities Remaining in 2022 to Achieve Elimination

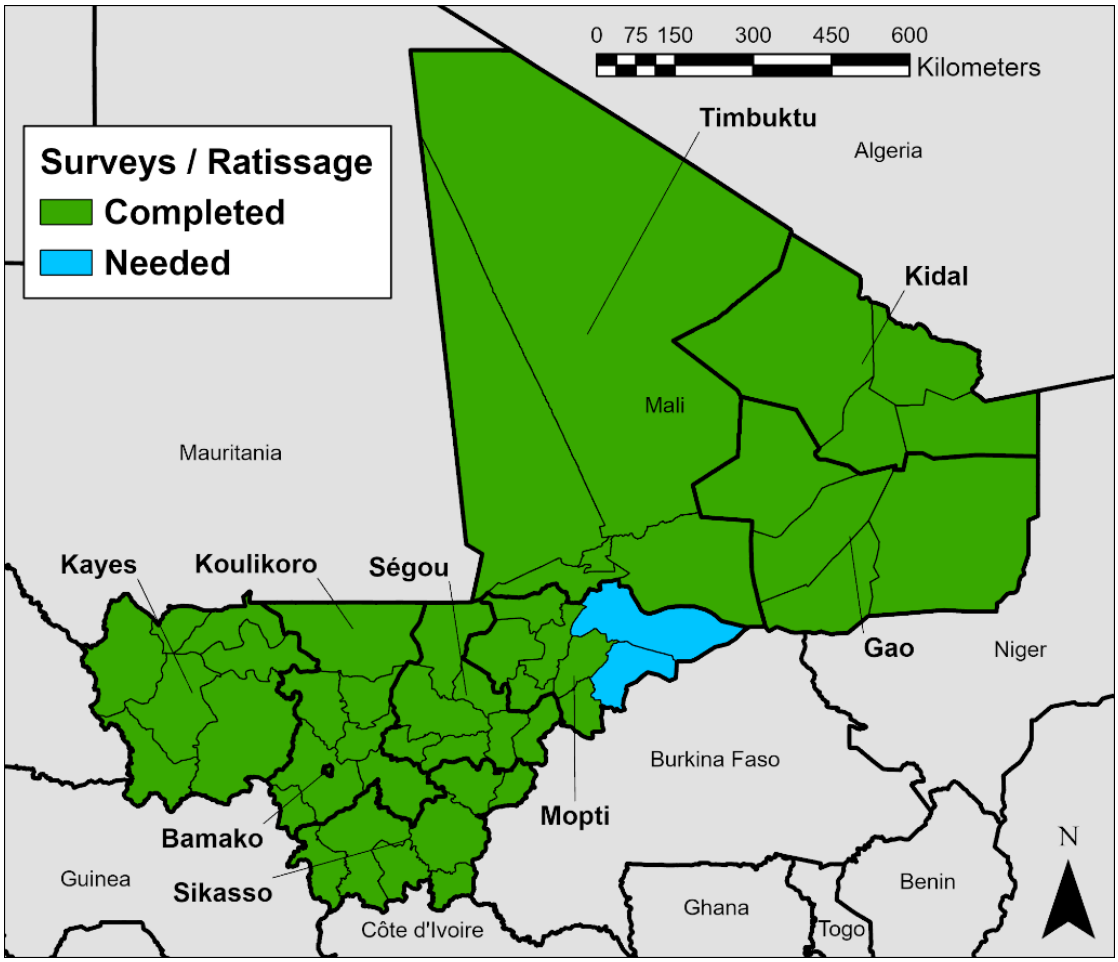


Figure 7 – Two districts remain to complete ratissage and/or surveys to demonstrate achievement of the TT elimination threshold: Douentza and Koro (Mopti region).

SAFE in Niger

Presented by Dr. Kadri Boubacar, Coordinator, PNSO, MOH – Niger

Background

The PNSO, formerly the Programme National de Lutte contre la Cecité (National Blindness Prevention Program – PNLC), was established in 1987; national surveys at the time showed a prevalence of blindness of 2.2%, with 25% of the blindness due to trachoma. Regional baseline surveys conducted from 1997 to 1999 found that 44% of children ages 1–9 years had active trachoma, and 1.7% of women over 15 years of age had TT. In 1999, the PNSO formed the National Trachoma Task Force and began district-level prevalence surveys in 2001. Currently of the 62 health districts that are or were ever endemic (of the total 72 districts in the country), 12 districts (or select evaluation units within a district) remain above the 5% elimination threshold for TF, with eight achieving elimination in 2021. The Program has targeted 2025 to eliminate trachoma as a public health problem in Niger.

Table 1. Program Achievements in 2021

Indicator	National		Carter Center-Assisted	
	Target	Achieved	Target	Achieved
# of persons operated	8,000	6,031	3,000	2,815
# of women operated		3,812		1,669
# of surgeons trained	45	26	20	10
# of doses of Zithromax® distributed during MDA	1,537,342	1,468,285	N/A	N/A[1]
# of doses of TEO distributed during MDA	100,000	100,000	100,000	100,000[2]
# of villages with health education	550	550	550	550
# of household latrines built	20,000	14,077	10,000	14,077*

**And 20 school block latrines.*

Surgery (S)

Since 2000, 156,525 TT surgeries have been conducted in Niger; The Carter Center has supported a total of 87,717 TT surgeries since partnering with the National Program in 2009. According to recent data, 36 of the 62 endemic health districts in Niger have achieved the TT elimination threshold of <0.2% TT in individuals 15 years or above, and thus 26 health districts, or select evaluation units within a district, are still above the 0.2% threshold, requiring further outreach. In 2021, great improvements were observed from the previous year, with 6,031 people receiving TT surgery, 75% of the annual target of 8,000. The Carter Center very nearly reached its goal of supporting 3,000 TT surgeries by assisting to complete 2,815 surgeries; nationally, a total of 26 new TT surgeons were

[1] The Carter Center does not currently assist MDA implementation in Niger.

[2] The Carter Center does assist in purchasing tetracycline for MDA but does not participate in distribution activities.

trained. By the end of 2021, an estimated 4,342 persons still require surgery, and the National Program plans to implement a series of *ratissage* and survey strategies to demonstrate achievement of elimination thresholds.

Antibiotic Therapy (A)

As of 2021, 50 out of the 72 districts in Niger have achieved the elimination target of less than 5% TF in children 1–9 years, joining 10 districts that were never endemic. This leaves just 12 districts to demonstrate achievement of the less than 5% TF elimination threshold. Of the 50 districts below the 5% threshold, 36 have undergone TSS. Of the 12 districts that have not achieved TF elimination, five have completed MDA and will soon complete TIS, while seven will undergo MDA in 2022. In 2021, 1,468,285 doses of Zithromax® were distributed, with the support of Helen Keller International and Act to End NTDs West, along with 100,000 doses of TEO provided by The Carter Center. The distribution of 1,491,738 Zithromax® doses and 50,000 TEO doses are planned for 2022, covering the seven eligible districts. Niger expects to achieve elimination of trachoma as a public health problem in 2025 when the final two TSS are conducted.

Facial Cleanliness (F) & Environmental Improvement (E)

In 2021, health education activities were conducted in 550 villages across Niger—all with Carter Center assistance—to support the efforts to prevent trachoma transmission in communities. The Carter Center also funded the construction of 14,077 latrines, in addition to 10 school latrine blocks.

Programmatic Challenges and Successes

COVID-19 remained chief among the Program's challenges causing delays and increased resource consumption in 2021. Over the years, persistent (districts that have not achieved the 5% threshold despite years of MDA and multiple TIS rounds) and recrudescent (districts that have fallen below the 5% threshold at TIS and return above 5% at TSS) districts have challenged Niger, as well as insecurity and inaccessibility. Four planned surveys could not be conducted in 2021 because of insecurity in three districts, while the last survey was postponed to 2022 to combine it with other programmatic efforts for efficiency. Additionally, as Niger nears the elimination threshold for TT, the remaining cases will be more difficult to locate and thus more cost-intensive for both human and financial resources. Despite these challenges, the Program has seen successes with better MDA coverage in 2021 as compared to previous years, reaching 10 health districts and completing 20 evaluation unit surveys. Additionally, much progress has been made in the way of operational research—detailed in the section below.

Operational Research

In 2021, the ARRET (Azithromycin Reduction to Reach Elimination of Trachoma) study protocol was validated, and the first phase was completed. The AVENIR (Azithromycine Pour la Vie Des Enfants au Niger - Implémentation et Recherche) study is in the execution phase in the Dosso region and in the extension phase in the Tahoua region. The SPET study was just conducted in collaboration with The Carter Center in Baragoua, Ilela, and Malbaza districts of Tahoua region. The objective is to assess the risk of trachoma disease recrudescence and to determine potential strategies to detect recrudescence years after surveillance surveys are completed. As of January 2022, data collection is complete in all three districts, including TF grading, photos of the conjunctiva, dried blood spot (DBS)

collection, and eye swab samples. DBS were sent to the CDC for serological testing. Next steps for the SPET study include sending the eye swabs to the lab in Amhara, Ethiopia, or to the University of Alabama, U.S.A., and further data analysis.

Program Plans for 2022

In 2022, the Program plans to conduct *ratissage* where appropriate to eliminate the backlog of TT, as well as collect data for the dossier, and to conduct MDA in seven districts followed by surveys. The Program also plans to continue the ARRET and AVENIR studies. As the elimination target is set for 2025, the Program is taking steps to plan transition activities and begin developing the elimination dossier.

Surgery (S)

- Operate 4,000 TT cases, 2,000 with Carter Center assistance
- Train 10 TT surgeons

Antibiotic Therapy (A)

- Distribute 1,491,738 doses of Zithromax®
- Distribute 50,000 doses of TEO; all provided by The Carter Center

Facial Cleanliness (F) & *Environmental Improvement (E)*

- Conduct health education in 550 villages, all with Carter Center assistance
- Construct 20,000 latrines, 10,000 with Carter Center assistance

Surveys

- Conduct seven prevalence surveys

Operational Research

- Continue implementation of ARRET and AVENIR studies

Niger – TF and TT Prevalence 2021

TF Prevalence: Children 1–9 years

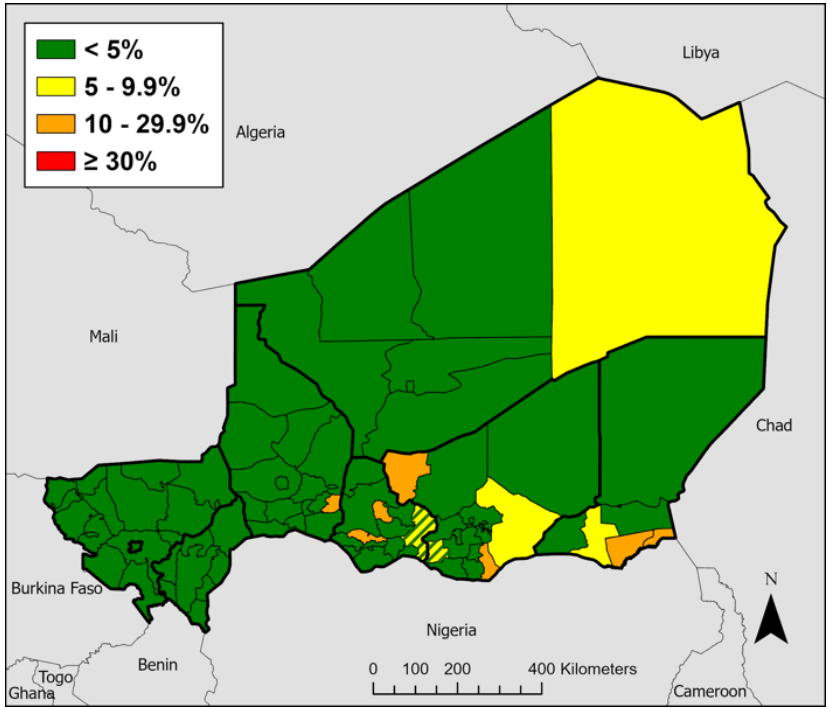


Figure 1 – Estimated prevalence of TF in 2021

TT Prevalence: Adults ≥ 15 years

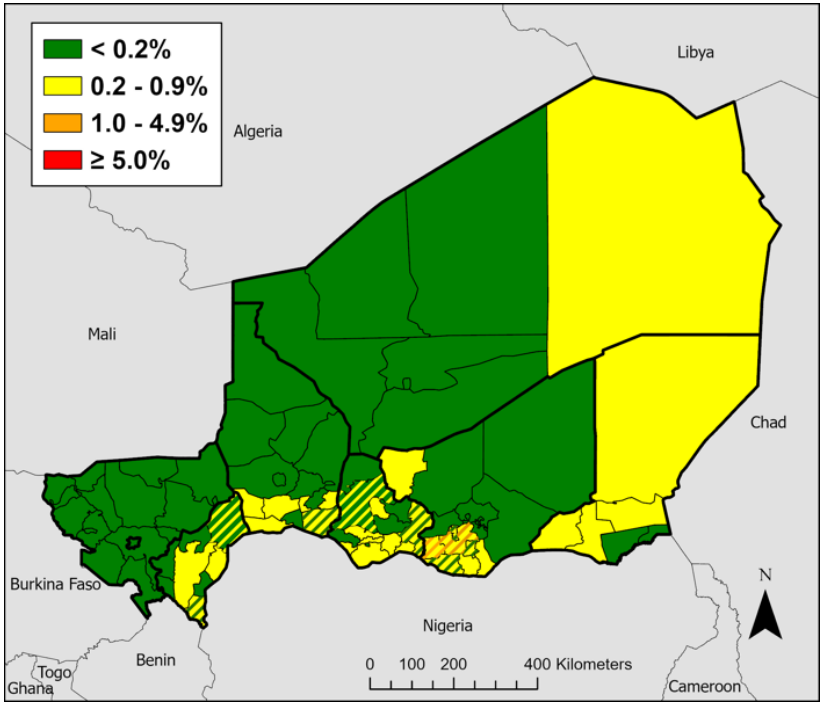


Figure 2 – Estimated prevalence of TT in 2021

SAFE in South Sudan

Presented by Mr. Makoy Samuel, Director for Guinea Worm Eradication Program and Preventive Chemotherapy – Neglected Tropical Diseases, MOH, South Sudan

Background

In South Sudan, baseline prevalence surveys have shown TF prevalence as high as 80% among children ages 1–9 years old and TT prevalence as high as 15.1% among adults 15 years and older. Over half of the country has not received baseline surveys, so the true magnitude of trachoma in South Sudan is unknown. The Program is making significant strides to reduce unknowns, with 2021 scheduled with the highest number of trachoma surveys conducted in one year in South Sudan's programmatic history. Additionally, more people were treated with antibiotics in 2021 than any other year in the Program's history. This success is partially attributed to the fact that Unity state received MDA and TT eye surgery treatments for the first time in over a decade.

Table 1. Program Achievements in 2021

Indicator	National		Carter Center-Assisted	
	Target	Achieved	Target	Achieved
# of persons operated	6,000	924	900	169
# of women operated		769		151
# of surgeons trained/retrained	5	10	-	-
# of doses of Zithromax® distributed during MDA	2,132,344	656,758	400,000	298,234
# of doses of TEO distributed during MDA	127,940	87,230	24,000	21,461
# of villages with health education	10,661	6,031	2,000	2,831
# of household latrines built	80	0	-	-

Surgery (S)

Since 2001, the National Program has provided a total of 22,693 TT surgeries across South Sudan. A total of 924 surgeries were conducted in 2021, 169 of which were assisted by The Carter Center. Of the surgeries undertaken, 83% were provided to women. Performing TT surgeries was difficult due to the COVID-19 pandemic. While adapted protocols were developed, surgery was considered a high-risk activity in terms of COVID-19 transmission, especially considering the close physical contact between surgeon and patient. To enhance the capacity of the Program for surgeries, 10 TT surgeons were trained in 2021.

Antibiotic Therapy (A)

Of the annual MDA target for 2021, the Program reached 743,988 people with azithromycin or TEO across 13 South Sudan counties—four in Eastern Equatoria state (Kapoeta East, Kapoeta South, Budi, and Lopa-Lafon) supported by The Carter Center, and nine in Unity state supported by CBM. Protection of civilian (POC) and internally displaced people (IDP) camps were included as part of MDA in Unity state.

In Eastern Equatoria, many of the cattle camps moved long distances; this movement necessitated long travel times (2–3 days) for distributors, leading to an increased number of porters and teams, thus incurring more costs. In 2022, the Program team will be identifying strategies to increase MDA coverage among pastoralists. In Koch, Leer, and Mayendit counties of Unity state, heavy rains posed considerable challenges to transportation as many locations were inaccessible due to flooding. As a result, there was low coverage in those counties. Nonetheless, despite these accessibility challenges amidst the burden of the ongoing COVID-19 pandemic, in 2021, the South Sudan Program achieved the highest number of trachoma surveys and the most azithromycin treatments ever in a single year. Additional positive outcomes are that TIS showed that TF decreased by 81% and 74% in Kapoeta South and Kapoeta East, respectively.

MDA was planned for multiple counties in Jonglei state in 2021; however, the abrupt ending of ASCEND (Accelerating the Sustainable Control and Elimination of Neglected Tropical Diseases) funding in April 2021 prevented the MDAs from occurring. In 2022, 30 surveys are planned for Jonglei, Unity, Upper Nile, and Eastern Equatoria State, covering highly endemic counties, as well as many of those counties previously un-surveyed. To accompany this aim, the Program has a target of 1,340,410 doses of Zithromax® and 164,164 doses of TEO to distribute in 2022.

Facial Cleanliness (F) & Environmental Improvement (E)

The National Program provided health education activities in 6,031 villages in 2021, assisted by The Carter Center in reaching 2,831 of these villages. Health education efforts—critical to the F&E components of the SAFE strategy—are conducted continuously throughout surgery and MDA campaigns. Drug distributors, TT case finders, supervisors, county authorities, and local chiefs are all trained to use the trachoma flipchart.

Unfortunately, the target for latrine building was not met in 2021. The Program has continued to face challenges due to incomplete integration with WASH partners. The National Program recognizes that a concerted effort needs to be made to reinforce the E aspect of the SAFE strategy, including the renewed inclusion of WASH partners in NTD-Trachoma activities. The F&E components are the root of a sustainable path towards the elimination of trachoma as a public health problem in South Sudan.

Programmatic Challenges & Mitigation Efforts

To mitigate the spread of COVID-19, the Program has continued to implement the SOPs developed in 2020 for MDA and surgery campaigns, alongside continuous health education. The methods incorporated into these programmatic efforts include house-to-house MDA, ensuring social distancing, and requiring the use of PPE and hand sanitizer.

There were several other obstacles affecting activities this year. Extensive flooding in the Greater Upper Nile Region impacted planned surveys and MDA, causing low coverage. Because of this, the Program hopes to conduct MDA campaigns and TT surgery campaigns during drier months in the future. There was also an abrupt end to ASCEND funding. This financial cut—in combination with the high cost of conducting surveys while the majority of the country remains unmapped—necessitates that the MOH and partners advocate for financial support in order to map the rest of the country.

Program Plans for 2022

Surgery (S)

- Operate 1,500 TT patients, 500 with Carter Center assistance
- Train 12 TT surgeons

Antibiotic Therapy (A)

- Distribute 1,320,410 doses of Zithromax®, 316,828 doses with Carter Center assistance
- Distribute 164,164 doses of TEO, 23,568 doses with Carter Center assistance

Facial Cleanliness (F) & *Environmental Improvement (E)*

- Conduct health education in 3,276 villages, 2,916 with Carter Center assistance
- Construct 80 latrines

Surveys

- Conduct 30 surveys

Operational Research

- Enhancing the A in SAFE (ETAS) study in Kapoeta North

South Sudan – TF Prevalence: Children 1–9 years

Baseline, 1999–2020

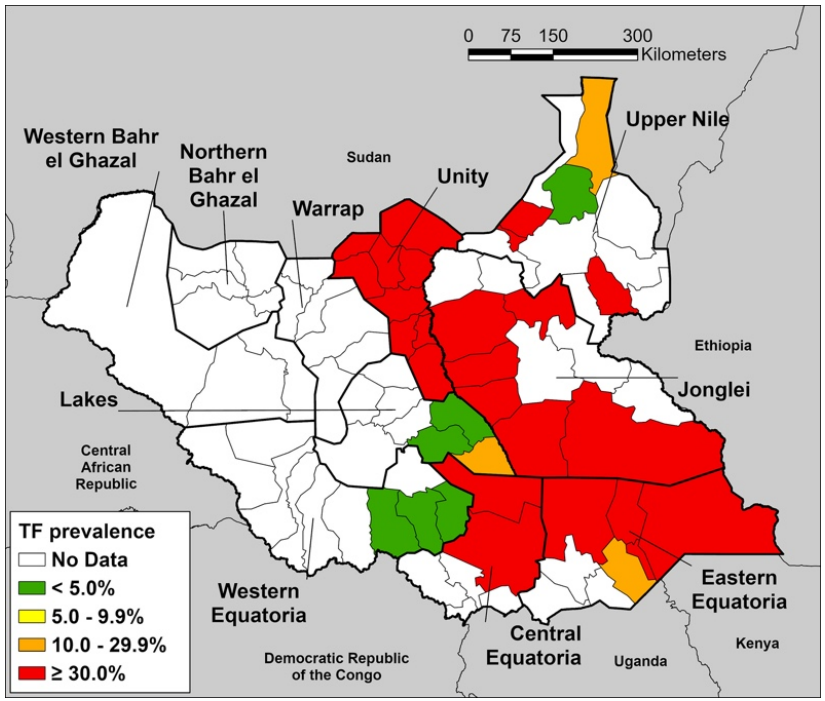


Figure 1 – Estimated TF baseline prevalence 1999–2020

2021

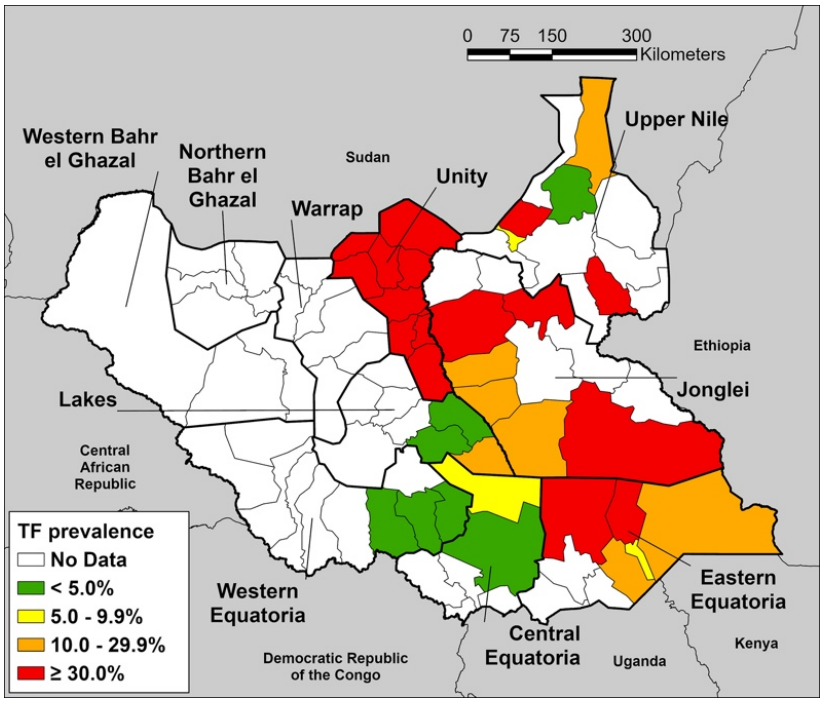


Figure 2 – Estimated prevalence of TF in 2021

South Sudan – TT Prevalence: Adults ≥ 15 years

Baseline, 1999–2020

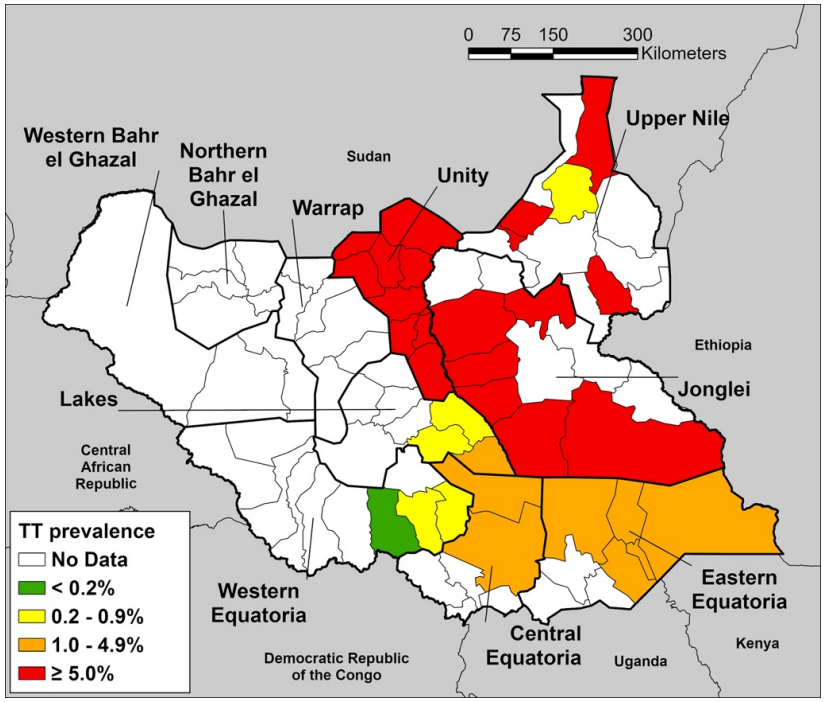


Figure 3 – Estimated TT baseline prevalence 1999–2020

2021

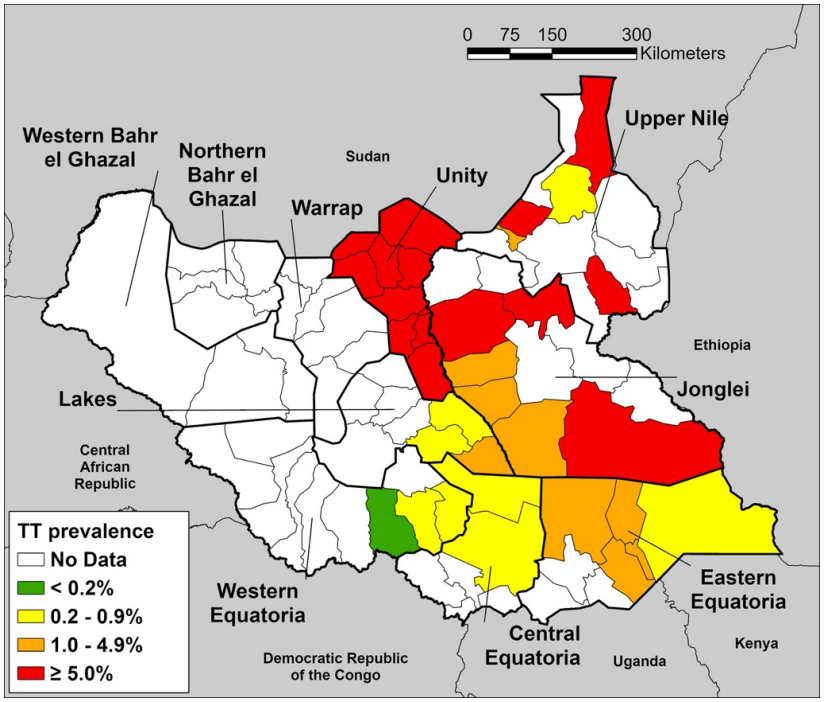


Figure 4 – Estimated prevalence of TT in 2021

South Sudan –Prevalence Surveys

Conducted in 2021

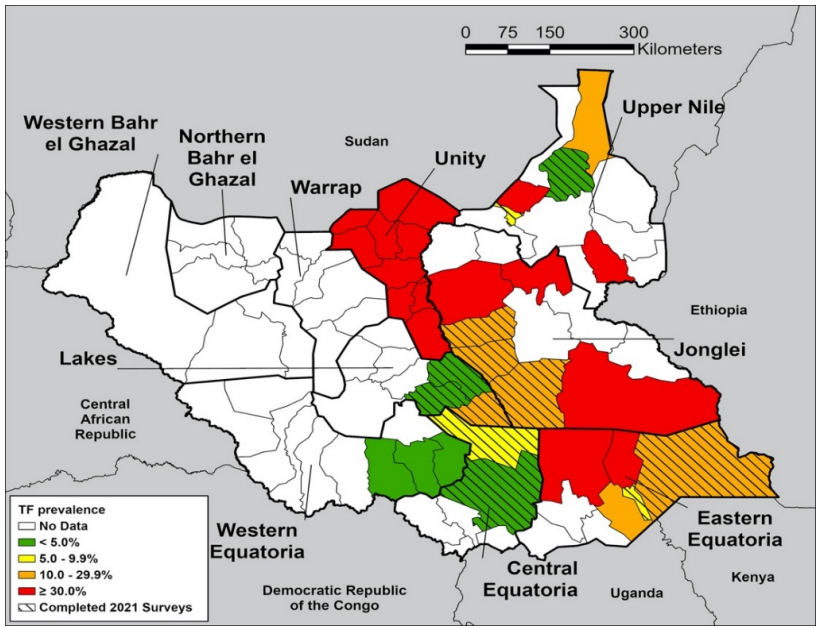


Figure 5 – Prevalence surveys conducted in 2021

Planned in 2022

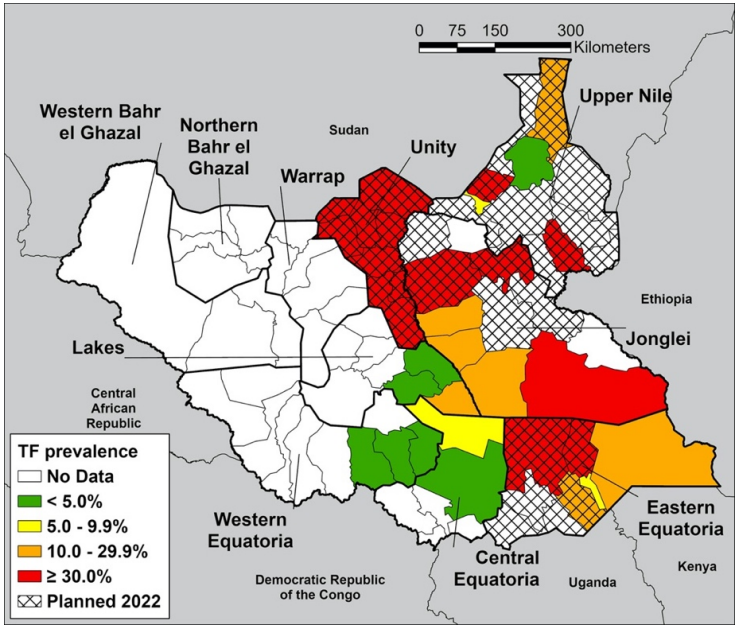


Figure 6 – Prevalence surveys planned in 2022

SAFE in Sudan

Presented by Dr. Balgesa Elshafie, National Coordinator, Trachoma Control Program, Federal Ministry of Health (FMOH), Sudan

Special Acknowledgment

Rest in peace, Dr. Nabil. We are forever grateful for your leadership, heroism, commitment, kindness, and oh so affable spirit. You will never be forgotten!

Background

The elimination of trachoma as a public health problem has long been a goal for the FMOH, evidenced by previous allocation of government funds to support the Trachoma Control Program. There is a historically strong coordination mechanism between the government and The Carter Center.

National baseline prevalence mapping was conducted between 2006 and 2019, though 11 localities in Darfur remain to be mapped. The FMOH implements the S (surgery), A (antibiotics), and F (facial cleanliness) elements of the SAFE strategy, with the support of The Carter Center. The E (environmental improvement) interventions are implemented by various federal and state ministries and are supported by the United Nations Children's Fund (UNICEF) and other organizations. Though E activities are not directly funded by The Carter Center, the Center supports ongoing health education activities. Via the SAFE strategy, the current elimination target for Sudan is 2025.

Table 1. Program Achievements in 2021

Indicator	National		Carter Center-Assisted	
	Target	Achieved	Target	Achieved
# of persons operated	5,400	428	2,100	144
# of women operated		203		88
# of surgeons trained/retrained	30	31	-	-
# of doses of Zithromax® distributed during MDA	541,495	122,141	201,376	-
# of doses of TEO distributed during MDA	10,830	-	4,110	-
# of villages with health education	432	136	83	54
# of household latrines built	-	-	-	-

Surgery (S)

In 2021, the Program provided 428 TT surgeries, reaching 7.9% of its annual target. The Carter Center assisted 144 (34%) of these surgeries. Of the 428 operated, 203 (48.6%) individuals were women. Thirty-one TT surgeons were trained by the National Program. Additionally, The Carter Center met with various Gazira State MOH officials to plan a surgery campaign in early 2022. The Carter Center

supported the Ministry in boosting TT surgery activities in several eye hospitals, including Al-Managil (Gazira), Abdelfadeel Almaz (Khartoum), and Gedarif State Eye Hospital.

A TT case finder activity was conducted in Port Sudan locality, in Red Sea state. Of the 14,450 people screened, only 20 people (0.001%) were confirmed with TT, and 16 of these persons received TT surgery. The extremely low number of people found with TT highlights the high cost and human resource investment to prove that TT is below the elimination threshold.

Antibiotic Therapy (A)

In 2021, a total of 122,141 doses of antibiotic (Pfizer-donated Zithromax® and TEO) were distributed by the National Program. Due to challenges discussed previously, only 22.6% of the annual targeted treatments were distributed.

Additional achievements in 2021 include four TSS and one TIS were conducted.

Facial Cleanliness (F) & Environmental Improvement (E)

During MDA and TT surgical campaigns of 2021, the Program dedicated resources to health education and promotion of trachoma prevention. The Program was able to reach 432 villages with health education this year—83 with the assistance of The Carter Center. Posters, pamphlets, and stickers were distributed, and local dialects were used in the announcement of activities by mobile teams.

Programmatic Challenges

Due to COVID-19, the implementation of activities during 2021 continued to be delayed. Many of these activities will now be targeted for 2022. In addition to the pandemic, the Program was also impacted by logistical, economic, security, and political challenges, which included significant cost increases due to inflation, a shortage of TEO locally, high turnover of FMOH staff, and Zithromax® bottles received with end-of-month expiration date markings (that caused challenges with community acceptance).

TT elimination efforts experienced hindrances stemming from high surgery refusal rates, low surgery output during surgical campaigns, delayed activity approvals due to FMOH concerns, and outdated TT prevalence data. Additionally, the internal movement of tribes, departures of South Sudanese from refugee camps to return home, travel of TT patients to other states for treatments, and under-reporting to the NTD program of TT surgeries conducted in state and locality hospitals have also contributed to low surgical numbers reported by the Program.

Despite these challenges, the Program was able to show that in 2021 three Sudan localities maintained the TF elimination target following their surveillance survey. In order to sustain progress and improve outcomes in 2022, the Program plans to 1) review the TT backlog and explore ways to better determine possible patients; 2) continue coordination between the Trachoma Control Program and the Sudan Public Health Training Initiative in the practical training of TT surgery in order to increase the uptake and to clear the backlog by introducing TT surgery in academic institutions and in-services training; and 3) increase community awareness and improve environmental sanitation through expanding different health education approaches in endemic states.

Program Plans for 2022

Surgery (S)

- Operate 7,400 TT patients, 2,100 with Carter Center assistance
- Train 30 TT surgeons

Antibiotic Therapy (A)

- Distribute 994,019 doses of azithromycin, all doses with Carter Center assistance
- Distribute 20,286 doses of TEO, all doses with Carter Center assistance

Facial Cleanliness (F) & *Environmental Improvement (E)*

- Conduct health education in 490 villages, all with Carter Center assistance

Surveys

- Conduct eight TIS, three TSS, and 11 baseline surveys

Sudan – TF Prevalence: Children 1–9 years

Baseline, 1999–2020

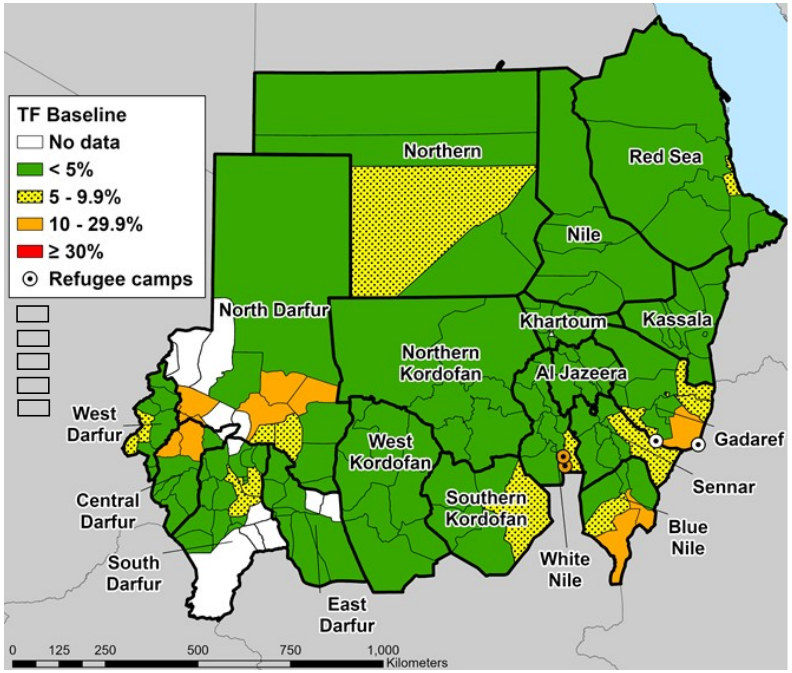


Figure 1 – Estimated TF baseline prevalence 1999–2020

2021

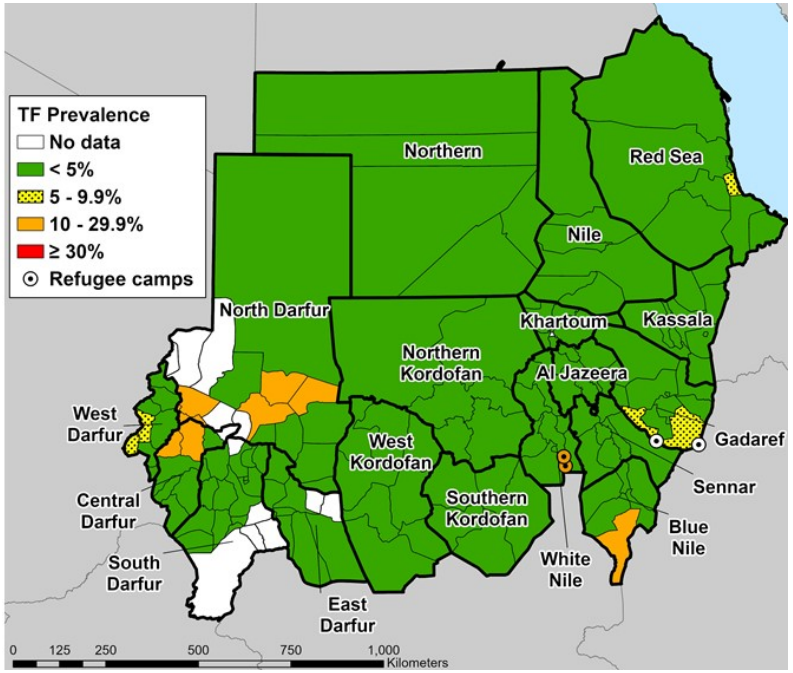


Figure 2 – Estimated prevalence of TF in 2021

Sudan – TT Prevalence: Adults ≥ 15 years

Baseline, 1999–2020

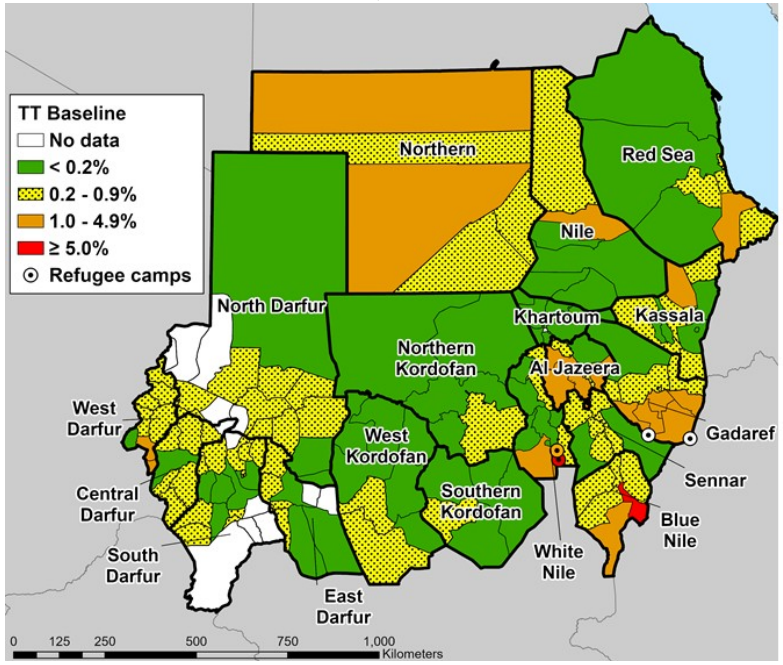


Figure 3 – Estimated TT baseline prevalence 1999–2020

2021

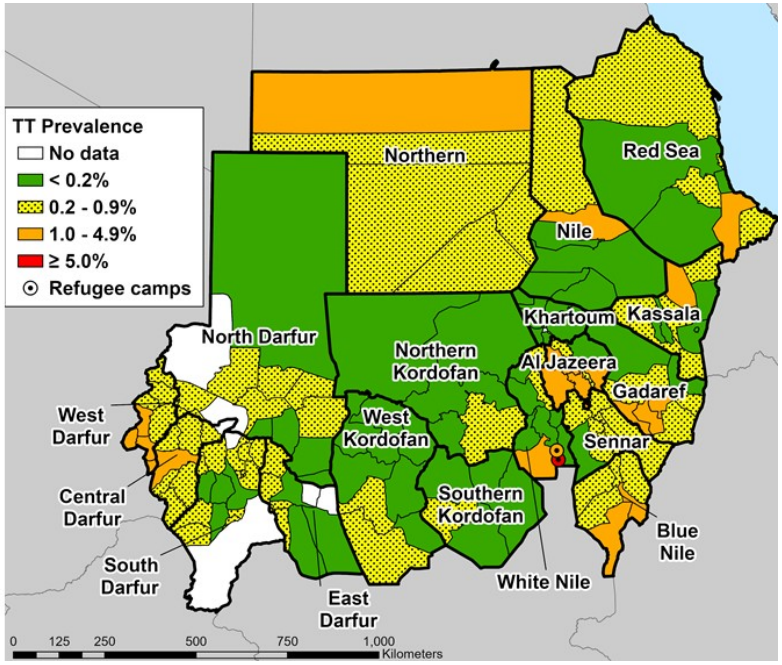


Figure 4 – Estimated prevalence of TT in 2021

Sudan – 2022 Planned MDA and Surveys

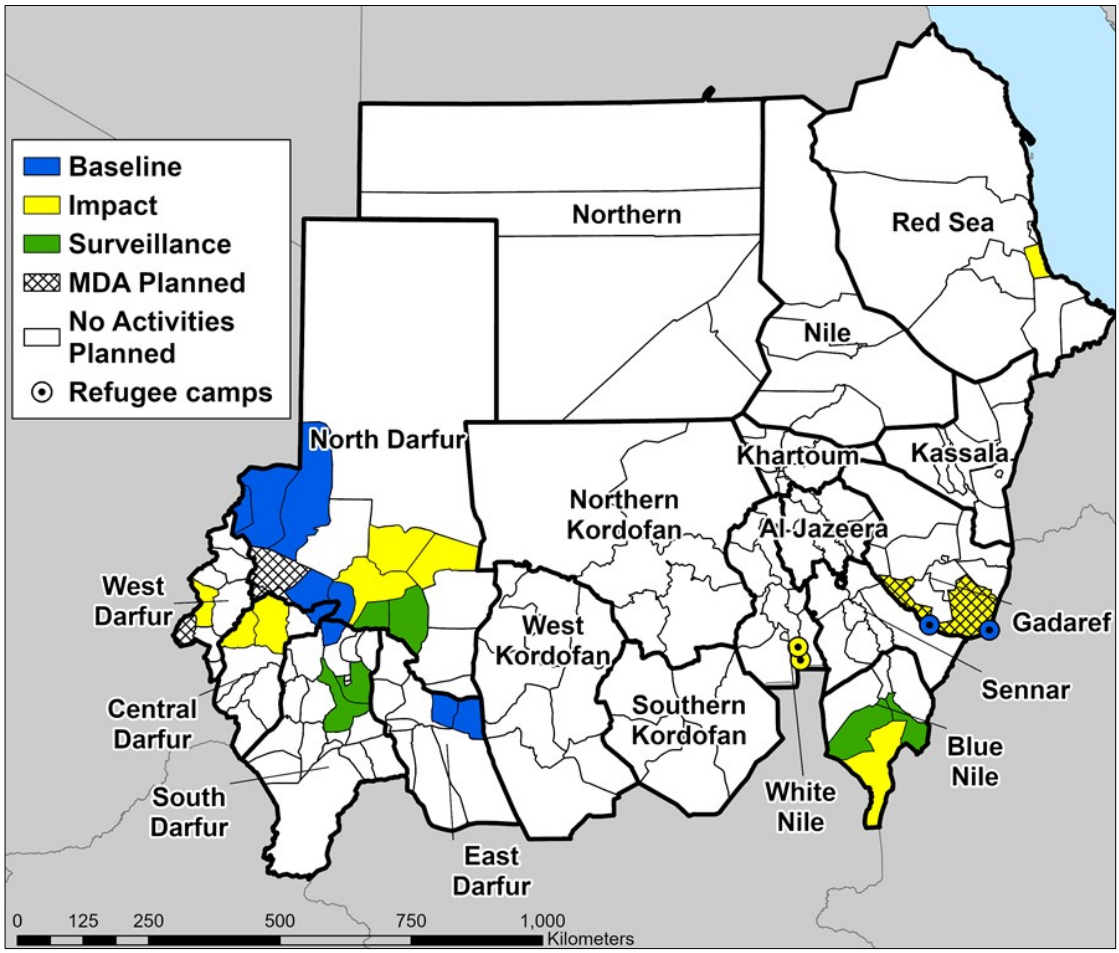


Figure 5 – Planned 2022 MDA and surveys

Table 1. Summary of National Data from Trachoma Control Programs (Carter Center-Assisted Countries)						
National Data as Reported for 2021						
	Ethiopia	**Mali**	**Niger**	**South Sudan**	**Sudan**	**Total**
Surgery						
Surgeries	45,411	308	6,031	924	428	**53,102**
2021 Target	85,500	N/R	8,000	6,000	5,400	**104,900**
Percent Coverage	53.1%	N/R	75.4%	15.4%	7.9%	**50.6%**
Antibiotics						
Doses	45,362,250	N/A	1,568,285	743,998	122,141	**47,796,674**
2021 Target	46,539,424	N/A	1,637,342	2,260,284	552,325	**50,989,375**
Percent Coverage	97.5%	N/A	95.8%	32.9%	22.1%	**93.7%**
Facial Cleanliness and Health Education						
Villages with Health Education	N/R	N/R	550	6,031	136	**6,717**
2021 Target	N/R	N/R	550	10,661	432	**11,643**
Percent Coverage	N/R	N/R	100.0%	56.6%	31.5%	**57.7%**
Environmental Improvements						
Latrines	N/R	N/R	14,077	0	N/A	**14,077**
2021 Target	N/R	N/R	20,000	80	N/A	**20,080**
Percent Coverage	N/R	N/R	70.4%	0.0%	N/A	**70.1%**
N/A=Not Applicable						
N/R=Not Reported						
Totals only include countries and districts where data are available.						

Table 2. National Trachoma Control Program Annual Targets 2022 (Carter Center-Assisted Countries)						
Targets[§] as Reported, March 2022						
	Ethiopia	**Mali**	**Niger**	**South Sudan**	**Sudan**	**Total****
Surgery						
Persons to operate for TT	N/R	N/A	4,000	1,500	7,400	**12,900**
Antibiotics						
Doses of azithromycin to distribute during MDA†	N/R	N/A	1,491,738	1,320,410	994,019	**3,806,167**
Doses of TEO to distribute during MDA	N/R	N/A	50,000	164,164	20,286	**234,450**
Facial cleanliness						
Villages to reach through health education	N/R	N/A	550	3,276	490	**4,316**
Environmental improvement						
Household latrines to construct	N/R	N/A	20,000	80	N/A	**20,080**
N/A=Not Applicable						
N/R=Not Reported						
[§]All targets are subject to change.						
†Antibiotic targets do not reflect ITI-approved allocations of Zithromax®						
**Totals only include countries where data are available.						

Table 3. Carter Center-Assisted Implementation of SAFE (Carter Center-assisted output)						
Summary of Interventions per Country, January - December 2021						
Indicators	**Ethiopia-Amhara***	**Mali**	**Niger**	**South Sudan**	**Sudan**	**Total**
Surgery						
Persons operated for TT	11,180	132	2,815	169	144	**14,440**
2021 Target	30,532	N/R	3,000	900	2,100	**36,532**
Percentage	36.6%	N/R	93.8%	18.8%	6.9%	**39.5%**
Antibiotics						
Doses distributed	14,919,692	N/A	100,000	319,695	0	**15,339,387**
2021 Target	15,310,025	N/A	100,000	400,000	201,376	**16,011,401**
Percentage	97.5%	N/A	100.0%	79.9%	0.0%	**95.8%**
Facial cleanliness and health education						
Villages with ongoing health education	3,447	N/R	550	2,831	54	**6,882**
2021 Target	3,447	N/R	550	2,000	83	**6,080**
Percent Coverage	100.0%	N/R	100.0%	141.6%	65.1%	**113.2%**
Environmental improvement						
Household latrines constructed	N/R	N/R	14,077	N/A	N/A	**14,077**
2021 Target	N/R	N/R	10,000	N/A	N/A	**10,000**
Percentage	N/R	N/R	140.8%	N/A	N/A	**140.8%**
*Amhara reports latrine ownership, not latrines constructed; data not included in Total.						
N/A=Not Applicable						
N/R=Not Reported						

Table 4. Carter Center-Assisted Implementation of SAFE						
Cumulative Interventions per Country, 1999-2021						
Indicators	**Ethiopia-Amhara**	**Mali**	**Niger**	**South Sudan**	**Sudan**	**Total**
Persons operated for TT	726,439	31,247	87,671	10,956	12,340	**868,653**
Antibiotic doses distributed (MDA)	201,661,901	818,878	4,331,365	4,581,451	8,215,138	**219,608,733**
Villages with ongoing health education	3,447	3,959	550	2,831	54	**10,841**
Household latrines constructed	3,336,513	117,086	179,147	646	N/A	**3,633,392**
N/A=Not Applicable						

Figure 1. Persons Operated for TT, Carter Center-Assisted Countries

Data as presented for January - December 2021

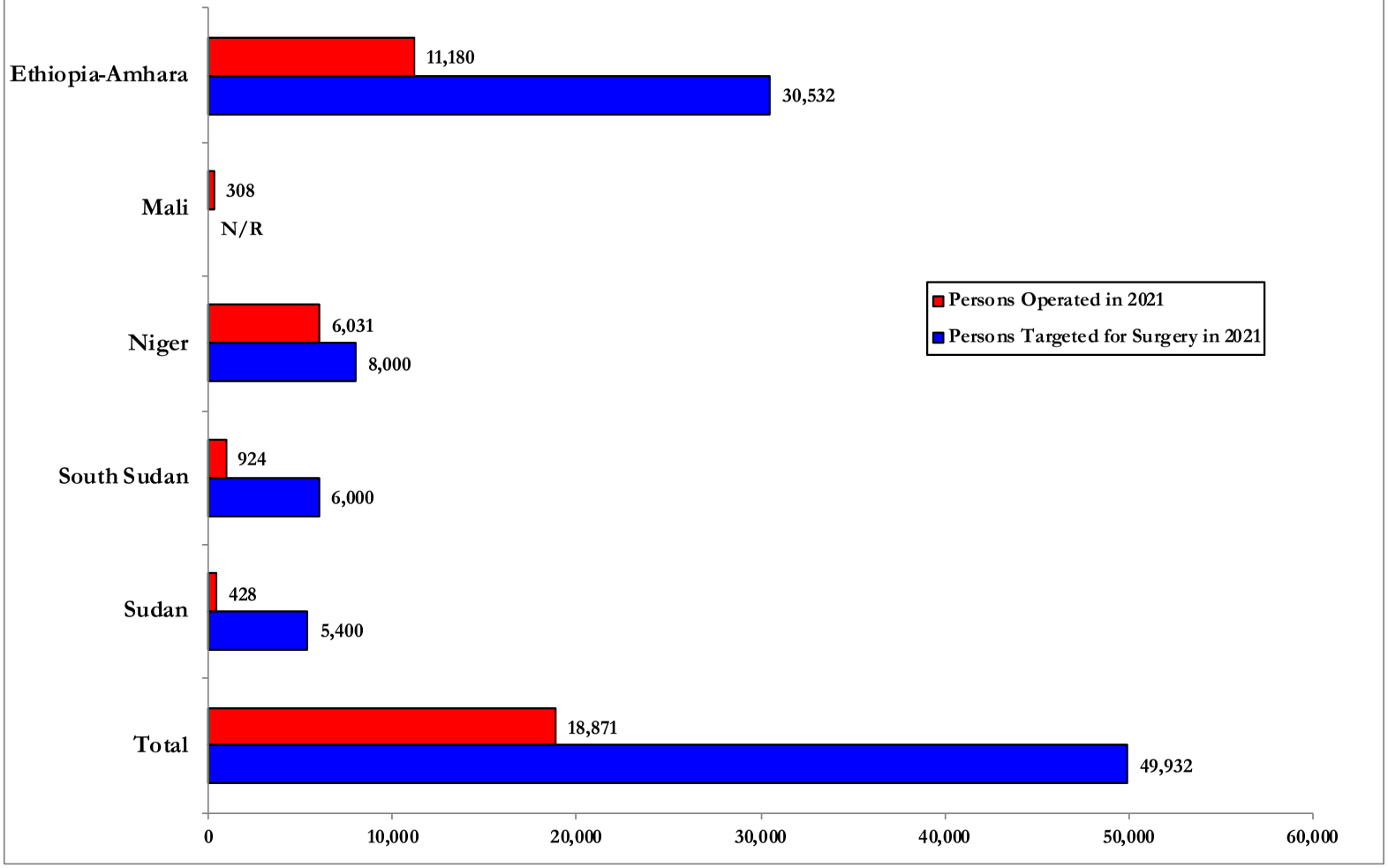


Figure 2. Antibiotic Distribution, Carter Center-Assisted Countries

Data as presented for January - December 2021

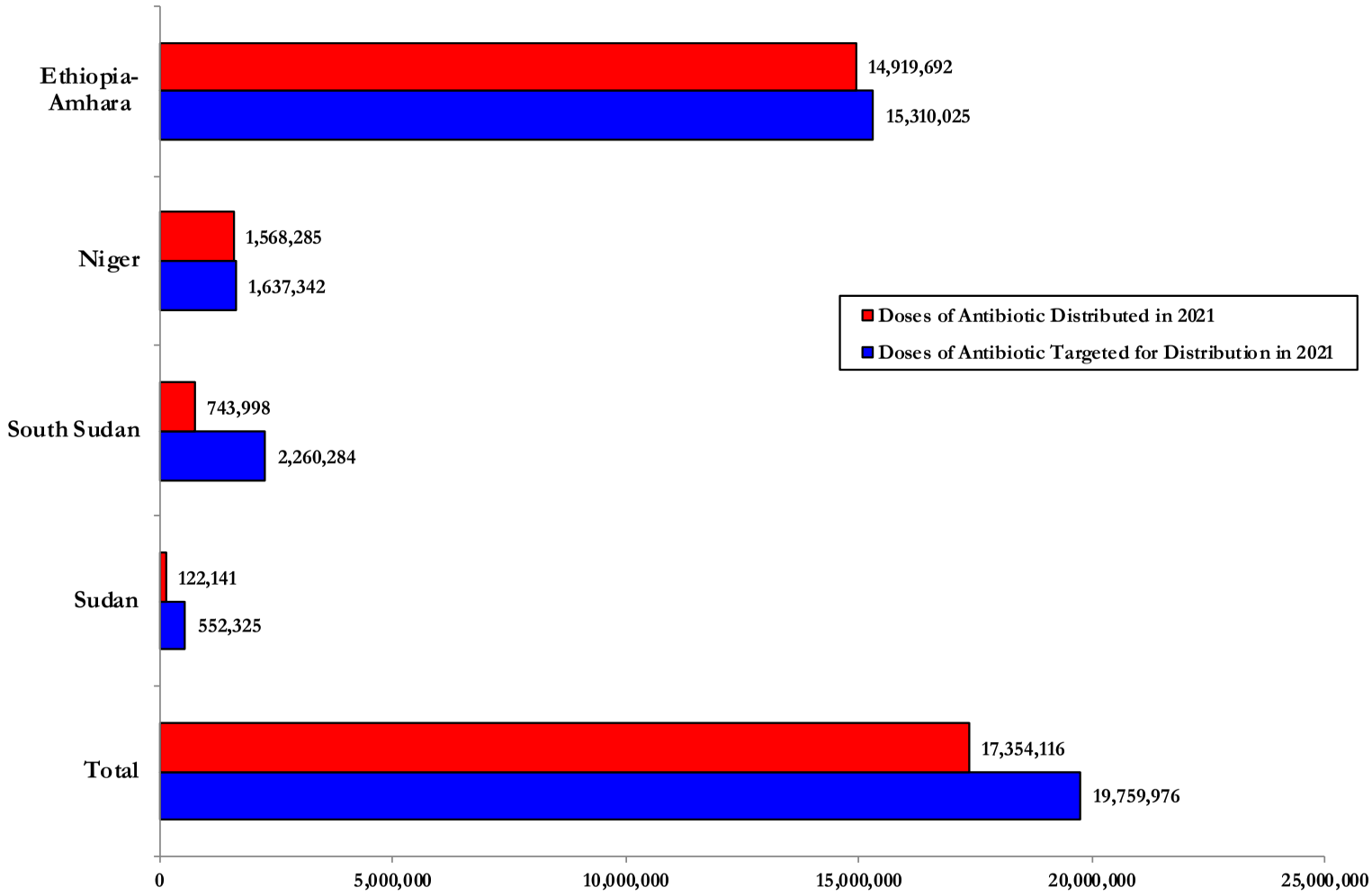
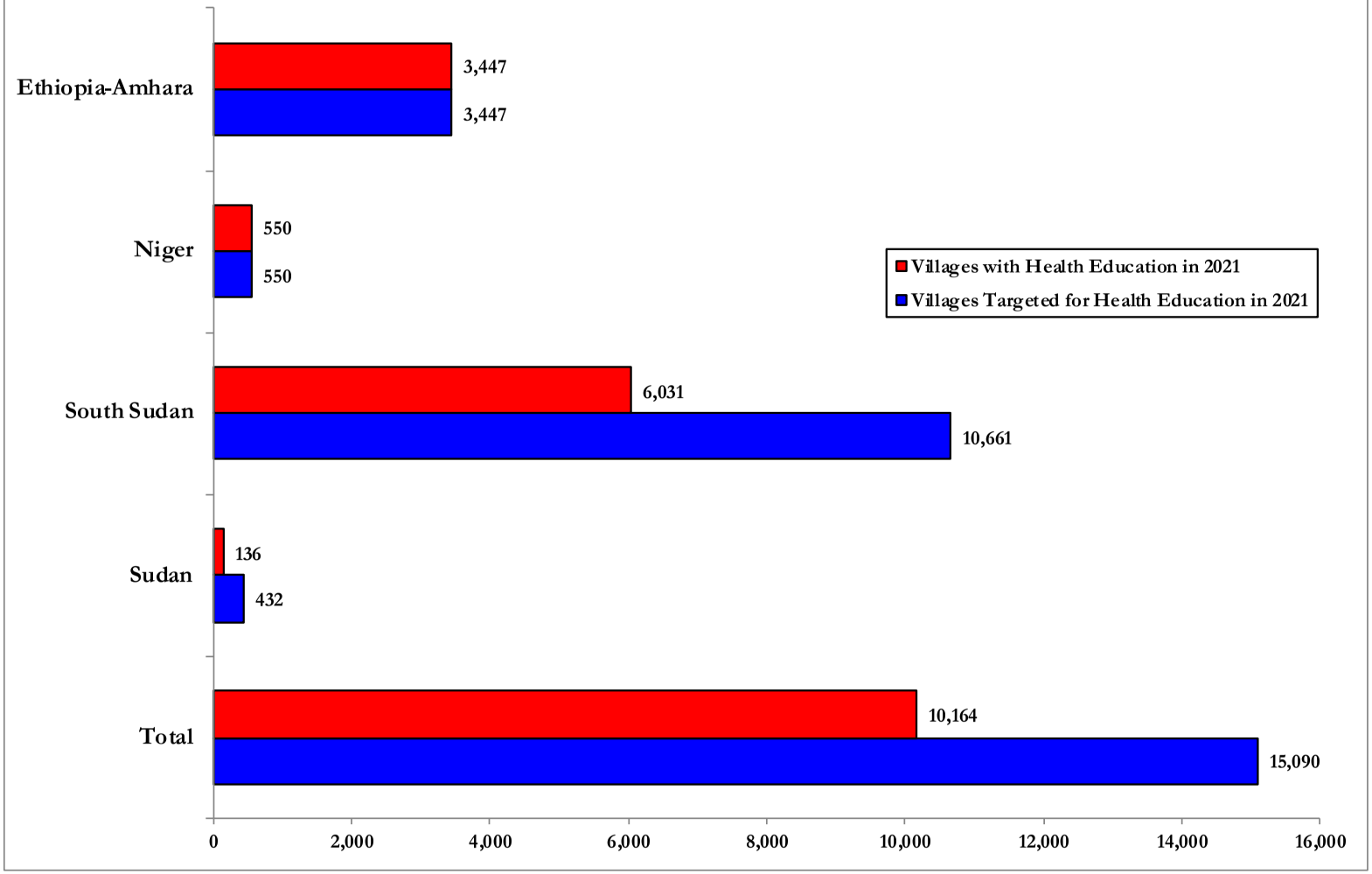


Figure 3. Health Education, Carter Center-Assisted Countries

Data as presented for January - December 2021



Factors Associated with Unfavorable TSS Results after Elimination

Presented by Mr. Phong Le, Data Analyst, Trachoma Control Program, The Carter Center

There is a high prevalence of trachoma in the Amhara region of Ethiopia. When districts reach less than 5% TF and undergo a TSS, many TSS return unfavorable results. We are defining an unfavorable TSS as having returned with a prevalence of TF above 5%. When an unfavorable TSS occurs, MDA is restarted. This causes long delays in programmatic work in Ethiopia. Because of this, the Trachoma Control Program of The Carter Center sought to better understand the current situation.

The objective of our study was to learn what contributes to a TSS returning unfavorable results. Specifically, we would like to better understand how indicators such as the historical burden of trachoma, historical levels of ocular *Ct* infection, MDA indicators, and WASH indicators contribute to an unfavorable TSS result.

Surveys were conducted using conventional survey designs using Tropical Data, a data collection standardization tool. These TSS were conducted between 2015 and 2021. Many of the indicators previously mentioned were built into the design of these surveys and collected during their administration. MDA coverage was measured using programmatic records.

In total, 51 districts reached less than 5% TF prevalence and administered a TSS. Of those 51 districts, 17 (33%) returned with a TSS that indicated TF had gone above 5% (unfavorable). The majority, 15 of the 17 (88%) unfavorable TSS, returned a TF prevalence of 5–10%. Moreover, the majority, nine of the 17, (53%) returned a TF prevalence of 5–6%. In other words, the majority of unfavorable TSS returned less than 1% over the TF threshold.

It is suggestive that districts with higher levels of historical TF have (odds ratio [OR]: 1.89, confidence interval [CI]: 0.97 - 4.07) higher odds of unfavorable TSS. Higher levels of historical trachomatous inflammation-intense (TI) (OR: 2.46, CI: 1.11 - 6.52) and *Ct* (OR: 2.88, CI: 1.05 - 9.93) were significantly associated with a higher odds of unfavorable TSS. In terms of MDA coverage, a larger number of surveys (OR: 2.33, CI: 1.14 - 5.27) and previous rounds of MDA (OR: 1.76, CI: 1.21 - 2.85) were significantly associated with a higher odds of an unfavorable TSS. This aligns with previous findings regarding historical trachoma indicators since more rounds of surveys and MDA indicate a higher initial (baseline) burden of trachoma.

A variety of WASH indicators were also considered. OR were calculated to measure the association of unfavorable TSS while being in the bottom tertial of a WASH metric (lowest level of access to WASH) compared to being in the top tertial (highest level of access to WASH). Indicators including the percentage of children with clean faces (OR: 6.22, CI: 1.20 - 48.21) and access to a water source within 30 minutes (OR: 4.15, CI: 0.93 - 23.07) demonstrated that being in the bottom tertial of either of these metrics compared to the top tertial resulted in a statistically significant increased odds of unfavorable TSS.

In conclusion, having 33% of TSS returning unfavorable results extends programmatic intervention dramatically. These extensions are resource intensive. Measures need to be implemented to alleviate and better understand this occurrence. Most unfavorable TSS fell within 1% of the elimination threshold suggesting that restarting MDA may not be warranted. Further, in terms of understanding

contributors of unfavorable TSS, current WASH outcomes and historic trachoma burden are the most suggestive in understanding why this occurs.

We recommend referencing the solutions from the recent WHO Informal Consultation meeting, held in December 2021. This Consultation resulted in surveillance flexibility for districts with TSS within 1–5% of the elimination threshold. This suggests a "wait and watch" approach may be utilized and could improve efficiencies and save limited resources for use in other areas. In the future, utilizing data on the historical burden of trachoma as well as current WASH conditions may help programs predict the success of sustaining trachoma elimination as a public problem once interventions cease. As more TSS are performed in additional districts, models should be updated to inform the Program of potential correlates of unfavorable TSS. Clean face, a potential marker of community sanitation/cleanliness, appeared to be an important correlate at the district level and should be considered if possible. High *Ct* infection and TI measured during the first TIS were strong indicators of unfavorable TSS and should be strongly considered for future study.

Magnitude of the Problem: Global Data Analysis
Barriers to Elimination

Presentation 1: Definitions of Persistent and Recrudescent Trachoma
Presented by Ms. Kristen Renneker, Senior Data Analyst, ITI

The purpose of this presentation was to present the magnitude of the problem of persistence and recrudescence. From the WHO Informal Consultation meeting held in Decatur, Georgia, in December 2021, two categories of implementation units (IUs) emerged. Persistent IUs are defined as those with at least two TIS at which the TF_{1-9} prevalence is ≥ 5%, without ever having had a TF_{1-9} prevalence <5%. Recrudescent IUs are defined as those with at least one TSS at which TF_{1-9} prevalence is ≥ 5%. An analysis of global data in the Alliance for Get 2020 Database shows that there are a total of 176 IUs that meet the definition of Persistence, in 10 countries (Table 1).

In Ethiopia, 18% of IUs with a TF_{1-9} ever ≥ 5% meet the criteria of Persistence. 82% of all IUs that meet the criteria of Persistence are in Ethiopia.

For recrudescence, there are a total of 88 IUs in 12 countries that meet the definition of recrudescence (Table 2).

Table 1 – Numbers of Implementation Units (IUs) meeting the definition of Persistence

Country	IUs ever endemic	Persistent (current TF ≥ 5%)
Ethiopia	795	145
Kenya	33	5
Mozambique	71	6
Niger	98	9
Nigeria	127	1
South Sudan	27	1
Sudan	29	1
Tanzania	77	4
Uganda	57	1
Zambia	45	3
SUM	**2,144**	**176 (8%)**

Table 2 – Numbers of Implementation Units (IUs) meeting the definition of Recrudescence

Country	TSS1 ever done	TSS1 TF≥5%, TF still ≥5%
Cameroon	22	2
Chad	25	2
Eritrea	11	1
Ethiopia	103	49
Kenya	13	5
Mozambique	37	6
Niger	63	3
Solomon Islands	9	9
Sudan	10	2
Tanzania	70	4
Uganda	56	4
Zambia	7	1
Grand Total	**426***	**88**

** Total for countries presented. The total for all countries is 774 TSS1 ever done.*

Presentation 2: When and Why do Districts Have TIS/TSS Results of TF ≥5%?
Presented by Dr. Jeremiah Ngondi, Senior NTD Advisor RTI International

The December 2021 WHO Informal Consultation meeting on end-game challenges for trachoma elimination defined parameters for classifying districts with persistent and recrudescent trachoma. While majority of IUs implementing SAFE attained elimination of TF with one or two cycles of MDA, there are a growing number of IUs that do not respond to the routine programmatic efforts and will therefore take much longer than average to attain and sustain elimination of TF, unless modified strategies are considered.

Analysis of patterns of progression of IUs across the baseline, TIS, and TSS suggests that while most districts attain TF elimination within a few MDA cycles, majority of IUs with higher baseline TF take much more rounds of MDA implementation to attain elimination. In addition, there is a sub-set of IUs that appear to be caught in a vicious cycle of MDA-TIS-MDA with some remaining just above 5% TF prevalence for several TIS waves.

Analysis of previous number of MDA rounds implemented comparing IUs that have attained TF<5% vs. those that have remained above 5% TF shows that across the WHO TF categories, the median number of MDA rounds for IUs with TF<5% was consistent with the current recommended number of MDA rounds; however, a good number still required many more rounds of MDA. For the IUs that have not attained TF<5%, the median number of rounds was slightly higher than the recommended suggesting that they will require substantially more MDA rounds to achieve the elimination threshold.

Preliminary logistic regression analysis of risk factors associated with TF≥ 5% at first TIS, persistent TF and recrudescent TF suggest that independent risk factors associated with increased odds of TF≥ 5% were higher baseline TF prevalence, lower access to water sources and lower access to sanitation facilities. In addition, for the persistent and recrudescent TF IUs, the TF prevalence in the immediate previous survey was also an independent predictor. Further analysis of the global datasets is needed to provide more comprehensive risk factor analysis and to provide evidence for program improvements.

The presentation made the case that persistent TF and recrudescent TF are growing end-game challenges with far reaching programmatic implications. While the current SAFE efforts have made a huge impact, there were challenges in some settings thus there was need for programs to shift focus from trachoma control to trachoma elimination. While baseline TF prevalence was a major predictor for persistent TF and recrudescent TF in some contexts, there were complex population factors that drove persistent TF and recrudescent TF, for example nomadic pastoralist communities.

Tackling persistent TF and recrudescent TF was an important priority to get countries back on track towards 2030 targets. Increasing MDA pressure through "gear shifting" whereby the number of MDA rounds was increased in IUs with persistent TF and recrudescent TF (for example doing 3 rounds of MDA instead of 1 round in IUs with TF=5-9.9%) could be a good first start to address the challenges.

Wait and Watch: A Potential Trachoma Surveillance Strategy from Amhara, Ethiopia

Presented by Dr. Scott Nash, Epidemiologist, Trachoma Control Program, The Carter Center

Background

Recrudescence of trachoma after the elimination as a public health problem threshold has been reached is a serious concern for the global control program. Currently, many district-level surveillance surveys are resulting in a TF prevalence among children ages 1–9 years above the elimination threshold (≥5%). Once a district returns to TF ≥5%, a program restarts costly MDA campaigns and TSS. In Amhara, most TSS which result in a TF prevalence ≥5% have a prevalence close to 5%, making it difficult to determine whether the result is due to true recrudescence or to statistical variability.[1] More data are needed to better understand the epidemiology of trachoma in districts which have TF ≥5% at TSS. The aim of the Wait and Watch study was to monitor recrudescence within Amhara by not restarting MDA in two districts with a TF prevalence ≥5% at the TSS. The districts would instead be resurveyed one year later using traditional and alternative trachoma indicators, such as measures of infection and serology, to better inform whether true recrudescence has occurred and if the districts should be re-enrolled in MDA.

Methods

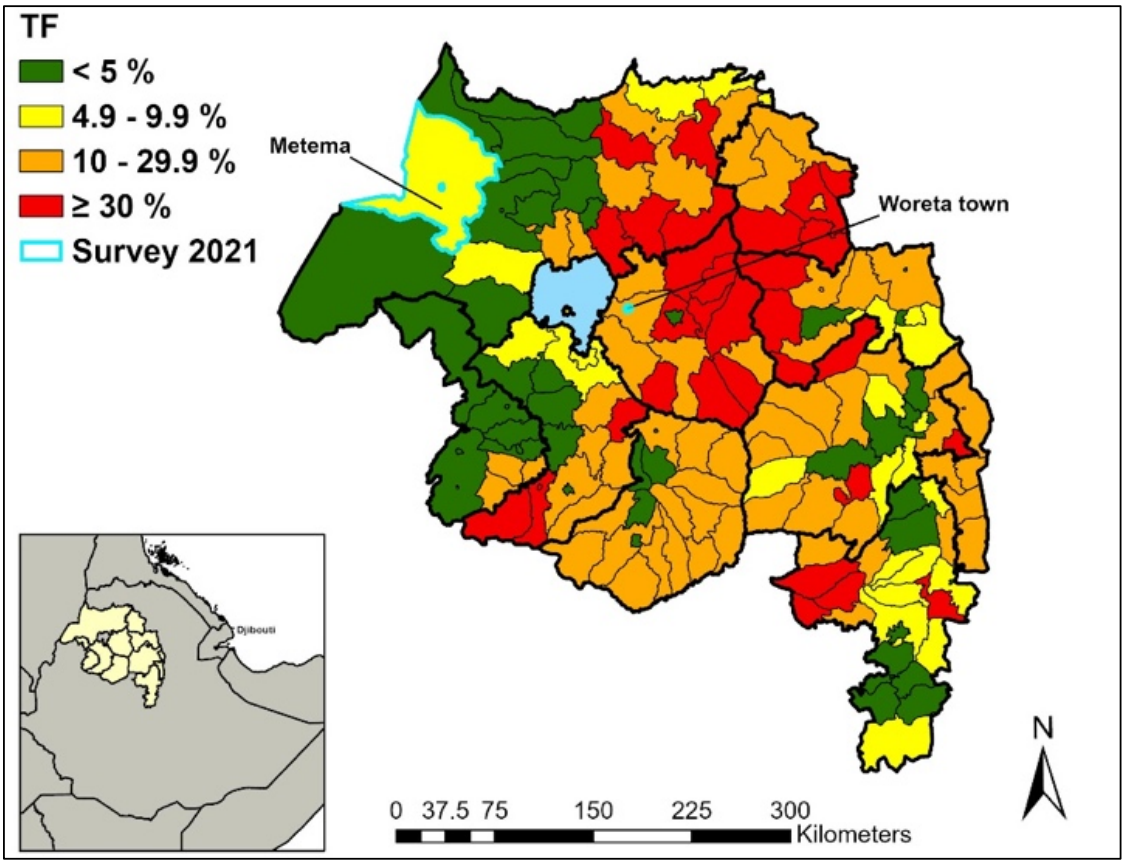
All surveys were multi-stage cluster surveys whereby certified graders assessed the clinical signs of trachoma including TF. For the post-surveillance surveys conducted in 2021, children ages 1–9 years also provided a DBS, and children 1–5 years provided an ocular swab. Ocular swabs will be assayed using Abbott Realtime PCR, and DBS will be assayed using a multiplex bead assay for the trachoma antigens Pgp3 and CT694. Data from DBS will become available later in 2022.

Results

The two districts enrolled in the Wait and Watch study were Metema in West Gojjam zone and Woreta town in South Gondar zone (Figure 1). Metema and Woreta town were first surveyed to measure impact of A, F, and E interventions in 2013 and 2011, respectively (Figure 2). In 2017 both Metema and Woreta town districts reached the TF 5% threshold for the first time. During the 2019 TSS, both Metema (5.2%) and Woreta town (5.1%) had a TF prevalence just greater than the threshold. No MDA occurred in these districts during the 2020 MDA in Amhara.

[1] Sata E, Nute AW, Astale T, Gessese D, Ayele Z, Zerihun M, Chernet A, Melak B, Jensen KA, Haile M, Zeru T, Beyen M, Dawed AA, Seife F, Tadesse Z, Callahan EK, Ngondi J, Nash SD. Twelve-Year Longitudinal Trends in Trachoma Prevalence among Children Aged 1-9 years in Amhara, Ethiopia, 2007-2019. Am J Trop Med Hyg. 2021 Jan 18:tpmd201365.

Figure 1. Location of Watch and Wait Districts and TF prevalence as of 2020, Amhara, Ethiopia



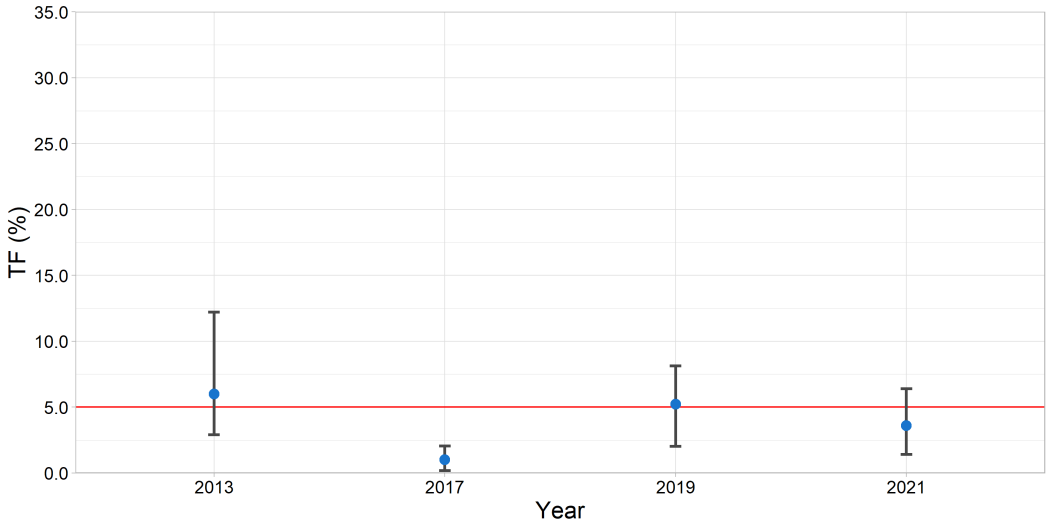
In February 2021, 16 months since the TSS, post-surveillance surveys were conducted in these two districts. Survey teams sampled 30 clusters of approximately 30 households in each district and examined 934 children ages 1–9 years in Metema and 636 children in the same age group in Woreta town. At this post-surveillance survey, the TF prevalence in Metema and Woreta town was 3.6% (95% CI:1.4-6.4) and 2.5% (95%CI:0.8-4.5), respectively. No infection was detected in Metema district, while the prevalence of infection among children ages 1–5 years was 1.2% in Woreta town.

Discussion

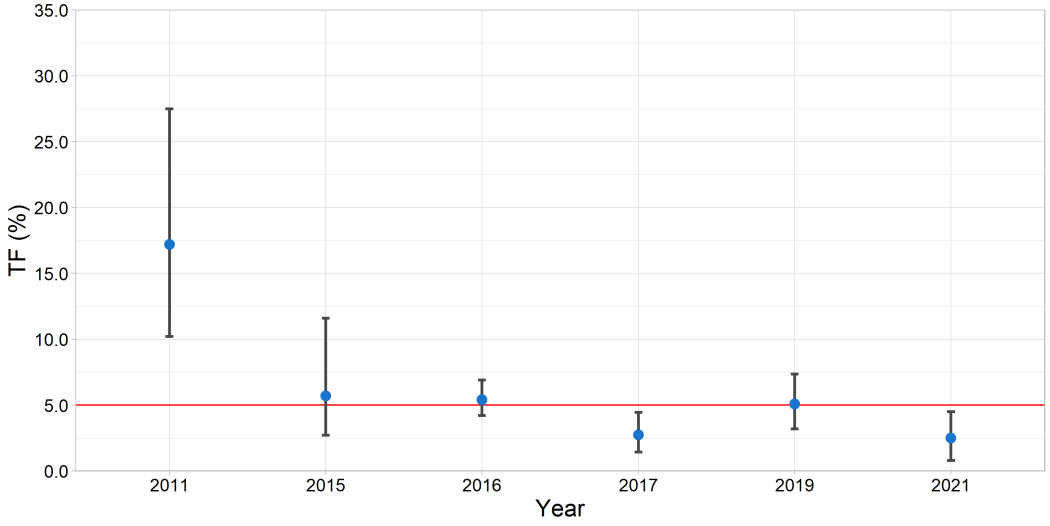
Based on these results of the Wait and Watch study, the Program should not restart MDA in either Metema or Woreta town since the districts remained below the threshold without additional antibiotic intervention. Further, the Program should consider the Wait and Watch approach for other districts above the elimination threshold at TSS. The Program should also consider a second post-surveillance survey after a period of 2–3 years in Metema and Woreta town as operational research to ensure the sustainability of these results. Lastly, cost projections should be done to better quantify the resources saved by avoiding restarting MDAs and TSS after these additional MDAs in settings where Wait and Watch methodology could be employed.

Figure 2. TF prevalence over time in a) Metema district and b) Woreta town district

a)



b)



The Cost of MDA for Trachoma in the Republic of South Sudan

Presented by Mr. Tim Jesudason, Health Economics and Communications Consultant, Partners in Global Health Ltd.

Background: Achieving the elimination of trachoma as a public health problem will require evidence-based economic analyses across settings, including those that are most difficult and expensive to reach. However, published literature regarding the cost of MDA in hard-to-reach settings is limited. The only published study for MDA in the Republic of South Sudan was conducted in 2011 and estimated the average economic cost per person treated to be USD 1.53. This is considerably more expensive than USD 0.50 per person treated, an estimate frequently quoted to advocate for NTD control.

Our study estimates the cost of implementing MDA in two countries in Eastern Equatoria in 2020: Kapoeta East and Kapoeta North. We estimate two primary outcomes: the total cost for implementation and the cost per person treated. The two settings show significant variation in their populations and geographical accessibility, making the comparison a relevant one to demonstrate how costs change across settings. It is a timely study, as South Sudan expects a significant scale-up of MDA in coming years.

Methods: We conducted a bottom-up micro-costing analysis. We used a payer perspective, identifying the quantity and costs of all required resources incurred by The Carter Center to implement MDA in these settings. We estimated both financial and economic costs.

We included capital costs and recurrent costs. Capital costs, those only incurred once with a value of USD 100 or more, were annualized based on a 3% discount rate and estimates of the useful life of the item. Recurrent costs were disaggregated from The Carter Center budget and assigned to the cost data categories, including central administration, training, community sensitization, drug transportation, drug administration, and supervision.

Personnel costs included both financial costs of participation in the intervention (such as per diems), as well as the relevant share of that person's salary that covers their working time as part of the intervention. Commodities included azithromycin, which is donated, as well as TEO, which is purchased by The Carter Center.

In our sensitivity analysis, we removed staff salary costs from our financial costs to show the additional cost to The Carter Center to implement the programs. We also changed the length of the drug distribution to account for delays due to bad weather or other factors. Lastly, as the cost per treatment is not constant and the coverage rate in the counties has uncertainty, we estimated a range of unit costs by coverage rate. In the base case, we used the best point estimate of the coverage rate. We also assessed the cost per person treated at 60, 70, 80, 90, and 100% coverage.

This study utilized the Global Health Cost Consortium Reference Case and its Principles and Methods Checklist to ensure the quality and comparability of results.

Preliminary results: In our base case analysis at 97% population coverage, we calculated the total cost of MDA in Kapoeta East to be USD 228,000, equating to USD 1.47 per person treated for financial costs – the costs incurred by The Carter Center. When economic costs were accounted for, the total cost increased to over USD 284,000, or USD 1.82 per person treated. In Kapoeta North, the

base case analysis included 79% population coverage, which we calculated would cost a total of USD 97,000, equating to USD 2.27 per person treated. When economic costs were accounted for, the total cost increased to over USD 119,000, or USD 2.79 per person treated.

In both counties, central administration accounted for the majority of expenditure, as we would expect, with staff salaries included, as well as other capital items, including vehicles owned by the Kapoeta Hub. The proportion of central administration was 75% in Kapoeta East and 81% in Kapoeta North. The second largest cost category was implementation, which accounted for 19% of expenditure in Kapoeta East and 10% of expenditure in Kapoeta North. This is likely due to the more time-consuming nature of hard-to-reach communities.

Discussion: The preliminary results of our study demonstrate that there is no fixed cost that can be used to describe the cost per person treated for trachoma. Although many within the NTD community have used the value of USD .50 cents per person treated, this cost varies greatly across settings, including across counties within trachoma-endemic countries. To estimate the costs to achieve the elimination of trachoma as a public health problem, it will be important that we add this important nuance when discussing the costs of trachoma elimination, particularly in hard-to-reach settings.

Although the cost of implementation in South Sudan is likely higher than in other settings, the total costs and cost per person treated identified in our study are consistent with the 2011 costing analysis in South Sudan, which concluded that it costs USD 1.53 per person treated. Adjusted to current dollars, this would be approximately USD 2.95 today. Our study demonstrates the significant economies of scale that are present in MDA programs.

International Coalition for Trachoma Control (ICTC) Update

Presented by Dr. Angelia Sanders, Associate Director, Trachoma Control Program, The Carter Center and Chair, ICTC

The ICTC is a multi-stakeholder membership of over 50 non-governmental, donor, private sector, and academic organizations working together to support the WHO Alliance for the Global Elimination of Trachoma by 2020 (GET2020). ICTC serves as a forum for collaboration, shared learning, and joint programming.

Although 44 countries are known to require interventions for trachoma, significant progress has been made, including a 92% reduction in people at risk since 2002, and 12 countries being validated by WHO for eliminating trachoma as a public health problem. Most recently, in February 2022, Saudi Arabia was validated by WHO for achieving the elimination of trachoma as a public health problem.

While we may not have reached our original 2020 goal of global elimination, the new WHO NTD road map assesses the challenges and barriers to achieving our shared global ambition and sets out an updated course of action. ICTC remains committed to supporting the WHO Alliance for the Global Elimination of Trachoma and is fully aligned with the new road map.

In particular, ICTC recognizes the 1) need for multi-sectoral engagement – including WASH, disability, and education sectors; 2) extending the health and development narrative beyond our own specific disease focus to consider common issues of sustainability and health system strengthening; 3) research continues to be a key strength of the global trachoma program, though gaps in our knowledge still persist; and 4) ensuring that we leave no one behind, which requires a focus on equity, cross border issues, and insecure states.

In 2022, ICTC will publish its Strategic Plan, which will guide the coalition through to 2030. The Strategic Plan was developed through an ICTC Strategy Task Team made up of members and observers, and engagement from the consultancy firm Direct Impact Group. This process included a member-wide survey as well as direct interviews with ICTC members, observers, and representatives from 12 health ministries. The interview process revealed positive perceptions about the progress of national-level trachoma programs in reaching the goal of eliminating trachoma as a public health problem. ICTC was viewed as a helpful mechanism toward those ends and it was commonly suggested that ICTC continue to advocate for and mobilize resources at the international and domestic levels. It was also suggested that ICTC continue to share and produce preferred practices to support implementation of the WHO-endorsed SAFE strategy.

It is well established that NTDs are diseases of neglected and underserved populations. With this rationale, ICTC created a task team on Special Populations, which aims to develop the evidence base to support ICTC member organizations and national counterparts to incorporate populations that may not have full access to trachoma interventions. Special populations, for the purposes of the ICTC, refers to populations that are at risk of not being able to access or receive the full complement of trachoma services. This can be due to various factors, including social, ethnic, cultural, religious, and/or geographical reasons, or due to disabilities. These populations have been referred to as "statistically invisible" as disease prevalence among these populations is often obscured by the dominant population in population-based surveys.

The first step the task team has taken is to develop an inventory tool to allow ICTC to identify the various "special populations" within trachoma endemic countries to understand the scope of the problem. Where possible information is collected at the district level. This tool has been tested in Colombia and Sudan and is currently being piloted in Mozambique. Once the tool is finalized, the task team will prioritize the next countries to which the tool will be sent. As information becomes available, the task team will also seek examples of where and how special populations have been factored in program implementation. Using this data, case studies and preferred practices will be drafted to articulate a clear narrative and rationale for supporting the special population groups within the global trachoma program and to assist with conducting advocacy and identifying opportunities for research.

Through its communications initiatives, ICTC continues to support members and observers to align around a common set of language to advocate for trachoma. This includes the development of infographics and datasheets, highlighting key epidemiological data from the GET2020 database, published in the WHO Weekly Epidemiological Record. ICTC also continues to foster collaboration through its quarterly updates, which provide ICTC members and observers with a global overview of partnership initiatives, progress, and challenges towards our shared goals.

Serological Tools for Trachoma Surveillance

Presented by Dr. Diana Martin, Research Biologist, CDC

Diana Martin presented the rationale and high-level summary of serology for trachoma surveillance. The 2021-2030 NTD Road Map indicates a gap in post-validation surveillance tools for trachoma and suggests that tests for infection or exposure to ocular *Ct* would be valuable to fill that gap. The presentation highlighted that antibodies represent the host response to *Ct* infection similarly to how TF represents the host response to infection. The working hypothesis for serological surveillance of trachoma is that (1) prevalence of antibodies in children can provide information on historical exposure and therefore transmission intensity and (2) seroprevalence integrated with age likely represents cumulative infections in a community. These hypotheses are founded not just on the nature of antibodies but on trachoma morbidity: the best estimates are that >100 lifetime infections are needed to develop trichiasis and potentially blindness. Serological testing also has other potential advantages to TF grading. First, the reliability of TF grading decreases with lower prevalence, and training graders becomes more expensive and challenging. Next, blood collection is generally accepted by communities due to their familiarity with this from malaria, HIV, and other programs that use blood collection. Finally, there is potential to integrate trachoma post-validation surveillance with other programs if blood is used as the sample type. The identification of antigens to be used as targets for serological tests for trachoma was described, with the antigens Pgp3 and CT694 being selected based on sensitivity, specificity, and scalability for programs. Data from pre- and post-MDA communities in Nepal illustrated how seroprevalence integrated with age (i.e., age seroprevalence) can be used to estimate transmission, and that this can be done using any of the 3 serological tests developed (multiplex bead assay, ELISA, and lateral flow assay). The partnerships between CDC, The Carter Center, WHO, and >20 MOHs were highlighted to show how this program has advanced in the just 10 years of work.

Serological Results in North Darfur, South Sudan & Amhara, Ethiopia

Presentation 1: Results of a Serological Survey for Ocular Ct in North Darfur, Sudan
Presented by Zeinab Abdalla, Senior Program Officer, The Carter Center

After years of programmatic inaccessibility to the Darfur region, in 2019-2020 the Sudan FMOH Trachoma Control Program conducted population-based trachoma surveys in three localities (districts) in North Darfur state, Sudan. The goals of the baseline surveys were to determine the current prevalence of TF among children ages 1–9 years and to further use serological markers to understand the historical trachoma burden within this MDA-naïve area. Multi-stage cluster random sampling was used to select 30 villages (clusters), with 25 households per locality. In addition to the collection of trachoma clinical data by trained and certified graders, trained nurses collected DBS samples from individuals of all ages within the selected households. DBS were assayed on a multiplex bead array for antibody responses to the *Ct* antigen Pgp3. Across the three localities, 8,325 individuals ages 1–99 years in 2,189 households were examined for trachoma clinical signs, and 8,324 DBS were collected, including 3,674 DBS samples from children ages 1–9 years. The prevalence of TF among children 1–9 years was endemic (>10%) in two localities (El Seraif and Saraf Omrah) and below the elimination as a public health problem threshold (<5%) in the third (Kotom). The Pgp3 seroprevalence among children ages 1–9 years was 35.9% in El Seraif, 32.2% in Saraf Omrah, and 13.8% in Kotom. Within this age group, by age nine years seroprevalence reached as high as 48% and 59% in Sarah Omrah and El Seraif, respectively, and reached 29% in Kotom. Across the whole age range sampled, the seroprevalence was 40.4% in El Seraif, 41.9% in Saraf Omrah, and 36.8% in Kotom. Starting at age 20–29 years, the age specific seroprevalence was ≥40% among all age groups in all localities. Serological data collected within these trachoma surveys has demonstrated that all three localities have had a long history of exposure to *Ct*.

Presentation 2: Serological Responses Within Trachoma Persistent Districts: Amhara, Ethiopia, 2019
Presented by Ms. Katie Lynn, Graduate Assistant, Trachoma Control Program, The Carter Center

The WHO recommends implementation of the SAFE strategy for a minimum of 5 years in districts where TF prevalence is ≥ 30% among children ages 1–9 years.[1] The Trachoma Control Program in Amhara, Ethiopia, has been at scale with the SAFE strategy in the region since 2010.[2] Some districts in the region have yet to reach the <5% TF elimination as a public health problem threshold despite >10 years of SAFE intervention.

In August 2019 population-based TIS were conducted in four districts, Ebinat, Debay Tilatgin, Goncha, and Machakel to assess towards trachoma elimination. All four districts are considered persistent for trachoma, as they all have received >10 of SAFE interventions without reaching elimination thresholds. As part of those surveys, certified graders screened 3,065 children ages 1–9 years for the clinical signs of trachoma using the WHO simplified grading system. Public health personnel collected conjunctival swabs from all children ages 1–9 years to test for the presence of active *Ct* infection and DBS from individuals of all ages to determine serologic responses to the *Ct* antigens Pgp3 and CT694. Conjunctival swabs were assayed via quantitative polymerase chain reaction at the Amhara Public Health Institute and DBS were assessed by multiplex bead assay at the CDC in Atlanta, GA, USA. Seroconversion rates (SCR) were estimated using a generalized linear model with robust standard errors to estimate the force of ocular *Ct* infection.

Preliminary results of this investigation suggested that Ebinat remained hyperendemic with 42.5% TF prevalence among children ages 1–9 years, 7.1% infection prevalence among children ages 1–5 years, and an SCR (Pgp3) of approximately 10.8 seroconversions per 100 children per year. In Goncha, TF prevalence was 17.9%, with 1.7% infection prevalence, and an SCR (Pgp3) of 3.9 seroconversions per 100 children per year. In Debay Tilatgin TF prevalence was 10.8%, with 1.6% infection prevalence, and an SCR (Pgp3) of 3.4 seroconversions per 100 children per year. Similar to the other three districts, TF prevalence in Machakel remained above the elimination target with 10.7% TF prevalence, and no infections were observed. The SCR (Pgp3) for Machakel was 1.1 seroconversions per 100 children per year.

Trachoma indicators demonstrated clear differences in the intensity of trachoma prevalence between these four districts that have been slow to reach the <5% TF elimination threshold. Generally, SCRs among children tracked well with TF endemicity. Coupled with traditional clinical signs trachoma indicators, serologic markers may be useful in elucidating trachoma endemicity over time. Alternative indicators of ocular *Ct* transmission demonstrate that Ebinat remains a hyperendemic trachoma district. Persistently hyperendemic districts may require enhancements to the SAFE strategy with intensified MDA and WASH interventions to reach elimination goals by 2030.

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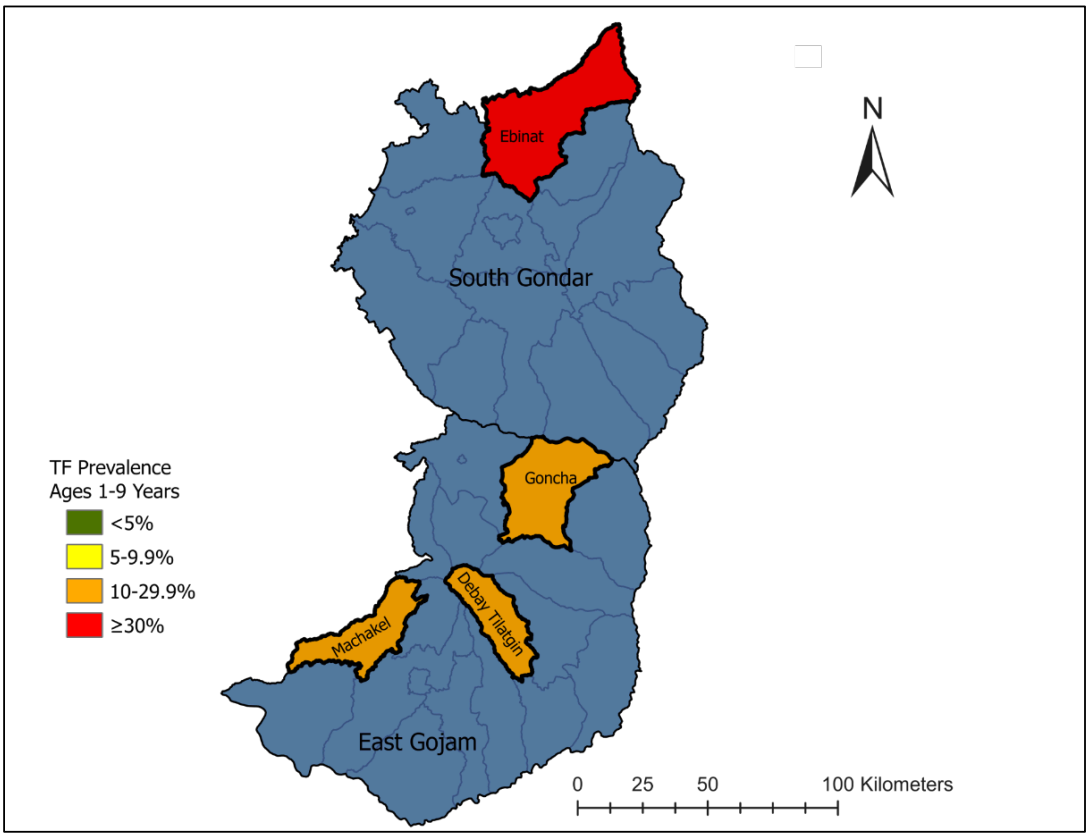
[1] Nash, S.D.; Stewart, A.E.; Zerihun, M.; Sata, E.; Gessese, D.; Melak, B.; Endeshaw, T.; Chanyalew, M.; Chernet, A.; Bayissasse, B. Ocular Chlamydia trachomatis infection under the surgery, antibiotics, facial cleanliness, and environmental improvement strategy in Amhara, Ethiopia, 2011–2015. Clinical Infectious Diseases 2018, 67, 1840-1846.

[2] Sata, E.; Nute, A.W.; Astale, T.; Gessese, D.; Ayele, Z.; Zerihun, M.; Chernet, A.; Melak, B.; Jensen, K.A.; Haile, M. Twelve-year longitudinal trends in trachoma prevalence among children aged 1–9 years in Amhara, Ethiopia, 2007–2019. The American journal of tropical medicine and hygiene 2021, 104, 1278.


Ebinat
South Gondar
Goncha
Debay Tilatgin
Machakel
East Gojam
N
TF Prevalence
Ages 1-9 Years
<5%
5-9.9%
10-29.9%
≥30%
0
25
50
100 Kilometers

Seroepidemiology of Trachoma for the Elimination Endgame

Presented by Dr. Benjamin Arnold, Associate Professor, Francis I. Proctor Foundation, UCSF and Dr. Christine Tedijanto, Post-Doctoral Scholar, Francis I. Proctor Foundation, UCSF

Antibody responses hold promise as sensitive, objective markers to monitor progress toward trachoma elimination, but programs currently lack a framework to translate antibody data into actionable information. Dr. Arnold presented an overview of how population-level summaries of antibody responses in young children have been used to assess disease transmission for other infectious pathogens. In particular, age-dependent seroprevalence curves are consistently flatter in areas where transmission is lower. Dr. Arnold then described how the UCSF team is currently working on an NIH-funded study (funding period 2021–2026) to advance epidemiologic methods for trachoma serology in which they plan to collate measurements from at least 19 studies including over 100,000 blood samples collected between 2010 and 2024. The team at UCSF is collaborating with scientists at The Carter Center, CDC, TFGH, WHO, and MOHs from several countries around the world that are contributing data to support the research. The first aim of this study is to chart trachoma's path toward elimination through population-level antibody response and to harmonize methods to measure changes in transmission, and the second aim is to determine if geospatial statistical models can improve serologic survey design and enable finer-scale targeting of control programs.

Towards the first aim, Dr. Tedijanto presented results that evaluated approaches for serological monitoring of population-level transmission and benchmarked serologic summaries against other trachoma indicators. We collated IgG responses to *Ct* antigen Pgp3, ocular infections detected by PCR, and clinical signs among 31,568 children ages 1–9 years from nine studies, including population-based prevalence surveys and randomized controlled trials in Ethiopia, Malawi, Morocco, Niger, and Tanzania. We hypothesized that (1) age-seroprevalence curves for trachoma would consistently flatten as populations neared elimination and (2) simple serologic summaries (e.g., seroprevalence) would represent population-level transmission as effectively as more complex measures (e.g., SCR). Median cluster seroprevalence varied widely, ranging from 0 to 54% (corresponding to SCRs of 0 to 0.14 per person-year). Age-seroprevalence curves rose steeply in populations with high levels of infection and active trachoma such as Amhara, Ethiopia, reaching 54% seropositivity by age nine years (corresponding to SCR of 0.14, 95% CI: 0.13-0.15). Across a gradient of declining transmission, age-seroprevalence curves became less steep, and populations with flat curves (SCR <0.01) were associated with low levels of infection (estimated prevalence 0%). Seroprevalence and modeled SCR aligned similarly with infections across all settings. The data support the hypotheses that age-seroprevalence curves become flat as prevalence decreases and that simple seroprevalence measures reflect transmission similarly to more complex analyses, such as those that account for sero-reversion. The results of analyses to date demonstrate that population summaries of Pgp3 antibody responses in young children could contribute to robust monitoring tools for trachoma programs as we approach the elimination endgame.

During the session's discussion, there was some concern that the results of the analyses and recommendations might come late to inform the 2030 endgame, underscoring the need to move quickly in this work. There was also interest in analyses of populations with longitudinal measurements

to document changes over time in the same location and in populations before- and after MDA to help better understanding of how MDA could influence the interpretation of antibody response.

Next steps in this work include evaluating the importance of contextual factors such as recent MDA, identifying potential serologic thresholds for elimination, determining whether sub-district level targeting might be feasible, and continuing to collate additional study data. Studies with corresponding PCR measurements, longitudinal measurements from the same clusters, geo-located measurements, and evidence of recrudescence are of particular interest.

Sanitation, Water, and Instruction in Face-Washing for Trachoma (SWIFT) Research Update

Presented by Dr. Solomon Aragie, Researcher, UCSF and
Dr. Jeremy Keenan, Director of International Programs, Francis I. Proctor Foundation, UCSF

Introduction

WHO promotes the SAFE strategy for the elimination of trachoma as a public health programme, which promotes surgery for trichiasis (i.e., the S component), antibiotics to clear the ocular strains of chlamydia that cause trachoma (the A component), facial cleanliness to prevent transmission of secretions (the F component), and environmental improvements to provide water for washing and sanitation facilities (the E component). However, little evidence is available from randomized trials to support the efficacy of interventions targeting the F and E components of the strategy. We aimed to determine whether an integrated WASH intervention prevents the transmission of trachoma.

Objective: The primary outcome was the cluster-level prevalence of ocular chlamydia, measured annually using conjunctival swabs in a random sample of children ages 0–5 years from each cluster at 12, 24-, and 36-month timepoints.

Methods: The WASH Upgrades for Health in Amhara (WUHA) was a two-arm, parallel-group, cluster-randomized trial in 40 rural communities in Wag Hemra Zone (Amhara Region, Ethiopia) that had been treated with seven years of annual MDA. The randomization unit was the school catchment area. All households within a 1·5 km radius of a potential water point within the catchment area (as determined by the investigators) were eligible for inclusion. Clusters were randomly assigned (at a 1:1 ratio) to receive a WASH intervention either immediately (intervention) or delayed until the conclusion of the trial (control), in the absence of concurrent antibiotic distributions. Between Nov 9, 2015, and March 5, 2019, 40 of 44 clusters assessed for eligibility were enrolled and randomly allocated to the trial groups (20 clusters each, with 7636 people from 1751 households in the intervention group and 9821 people from 2211 households in the control group at baseline). Given the nature of the intervention, participants and field workers could not be masked, but laboratory personnel were masked to treatment allocation. The WASH intervention consisted of both hygiene infrastructure improvements (namely, construction of a community water point) and hygiene promotion by government, school, and community leaders, which were implemented at the household, school, and community levels. Hygiene promotion focused on two simple messages: to use soap and water to wash your or your child's face and to always use a latrine for defecation. Analyses were done in an intention-to-treat manner. This trial is ongoing and is registered at ClinicalTrials.gov, NCT02754583.

Findings: We assessed intervention fidelity through annual household surveys. Findings over the three years, more wash stations, soap and latrines were seen at households in the intervention clusters than the control clusters: risk difference 47 percentage points (95% CI: 41–53) for wash stations, 18 percentage points (95% CI: 12–24) for soap and 12 percentage points (95% CI: 5–19) for latrines. A greater proportion of people in intervention clusters reported washing their faces with soap (e.g., risk difference 21 percentage points; 95% CI: 15–27 for 0–5 year-old children) and using a latrine (e.g., risk difference 9 percentage points; 95% CI: 2–15 for 6–9 year-old children). Differences between the intervention and control arms were not statistically significant for many indicators until the program had been implemented for at least a year; they did not decline during later study visits. At baseline,

ocular chlamydia prevalence among children ages 0–5 years was 11% (95% CI 6 to 16) in the WASH group and 11% (5 to 18) in the control group. At month 36, ocular chlamydia prevalence had increased in both groups, to 32% (24 to 41) in the WASH group and 31% (21 to 41) in the control group (risk difference across three annual monitoring visits, after adjustment for prevalence at baseline: 3·7 percentage points; 95% CI –4·9 to 12·4; p=0·40). No adverse events were reported in either group.

Conclusion: The community- and school-based intervention was associated with improved hygiene access and behaviors, although changes in behavior were slow and required several years of the intervention. An integrated WASH intervention addressing the F and E components of the SAFE strategy did not prevent an increase in prevalence of ocular chlamydia following the cessation of antibiotics in an area with hyperendemic trachoma. Continued antibiotic distributions will probably be important in areas with persistent trachoma.

On-going study activities: The impact of WASH in the presence of annual MDA is currently being studied in a follow-up trial of the 40 study clusters (WUHA II). The aim is to determine the benefit of WASH for trachoma control when used in conjunction with MDA. WUHA II allows us to leverage our existing WUHA I intervention and study infrastructure to assess whether elimination will occur only by combining antibiotics, facial cleanliness, and environmental improvements.

2022 Trachoma Control Program Review Recommendations

General Recommendations:

1. Supported by the flexible guidelines from the WHO informal meeting in December 2021, Programs should consider, if financially and logistically feasible, utilizing More Frequent Than Annual (MFTA) MDA in areas with persistent or recrudescent TF - (e.g., one round for 5-9.9% TF could become three rounds).
2. Programs should continue to be data driven and utilize data on clinical trachoma; WASH; and alternative indicators over time to help identify which districts should be prioritized for MFTA.
3. As appropriate, Programs should investigate associations between infection, clinical markers, and serology to better understand trachoma transmission in persistent districts and to continue assessing whether there are suitable alternative indicators to TF to establish achievement of elimination threshold.

Country-Specific Recommendations:

Ethiopia

1. The National Trachoma Program should consider piloting and assessing the integration of TT case finding into house-to-house MDA. The assessment should consider cost effectiveness, suspected cases versus confirmed cases, and coverage. The National Trachoma Program should consider ensuring this is organized in a way to cover 100% of households in the targeted district(s).
2. The National Trachoma Program should consider piloting MFTA MDA in a few districts to assess feasibility, timeliness, coverage, cost effectiveness, impact on infection, and serological markers. The National Trachoma Program should consider scaling MFTA MDA after the pilots are completed and assessed, where appropriate and agreed upon with relevant regional authorities.
3. The *Wait and Watch* approach utilized in the Amhara Region should be assessed and considered by the National Trachoma Program for expansion in the Amhara Region, as well as other regions in Ethiopia, to ultimately reduce survey costs over time.
4. The National Trachoma Program should review the availability of IECW to ensure enough trained personnel are available to meet the TT needs, particularly in the areas that require the most work.
5. Operational research focusing on improving program performance are vital for program improvement. The MOH should advocate for swift ethical processes with the appropriate national institutions.

Amhara Regional State, Ethiopia

1. The Amhara Regional Trachoma Program should utilize the MFTA MDA pilot planned for two districts in Amhara to inform a feasible scale-up to other districts in the region,

considering human and financial resources required, while also focusing on monitoring and evaluation processes.

2. The Amhara Regional Trachoma Program should share a report of results from the school water provision pilot activities in Amhara, Ethiopia. This report should be shared and perhaps even published, with a focus on sustainability.

3. The Amhara Regional Trachoma Program should consider concentrating the school water provision activities in hyperendemic areas and targeting 100% geographic coverage to maximize and assess impact on trachoma.

4. The Amhara Regional Trachoma Program should ensure TT case finding is implemented and completed with 100% geographic coverage to "finish" each targeted district; specific data should be collected to document these activities, so the information may be utilized as evidence in the elimination dossier that TT thresholds have been met.

5. Operational research focusing on improving program performance are vital for program improvement. The Amhara Regional Health Bureau and Amhara Public Health Institute should consider swift ethical approval process for operational research.

Mali

The National Trachoma Program has made tremendous progress in the face of insecurity and should continue that resilience and determination to complete the remaining transition activities, as stipulated by their timeline, in advance of the proposed September 2022 submission of the elimination dossier.

Niger

1. As the National Trachoma Program nears the elimination of trachoma as a public health problem, they should begin collating the necessary data and historical program information required for inclusion in the elimination dossier. The National Trachoma Program should begin to involve various stakeholders now who have years of experience with the Program to benefit from their tremendous knowledge of this decades long program.

2. The National Trachoma Program should ensure TT case finding is implemented and completed systematically, targeting 100% geographic coverage, to "finish" each targeted area; detailed case finding data should be collected to document these activities, so they can be utilized in the elimination dossier as evidence for the targeted areas that TT thresholds have been met.

South Sudan

1. The National Trachoma Program should consider advocating for closer collaboration between the NTD and WASH sectors.

2. The National Trachoma Program should consider working with the Ministry of Education to incorporate facial cleanliness messaging into other WASH related school-based education materials.

3. The National Trachoma Program should identify opportunities to work closely with eye care providers at the county, state, and national levels and ensure those providers share data related to TT surgeries with the National Trachoma Program.

4. The National Trachoma Program should consider exploring opportunities to conduct MFTA MDAs, if such MDAs are financially and logistically feasible.

Sudan

1. The National Trachoma Program should explore how TT data from previous prevalence surveys could be used to calculate more precise TT estimates. This might include using geostatistical or mathematical modeling approaches.

2. The National Trachoma Program should continue to work towards collaboration with the Academy of Health Sciences to increase TT surgery uptake.

3. The National Trachoma Program should undertake a TT case finding costing analysis to determine the cost of proving that TT is below elimination thresholds in localities that were non-endemic at baseline but had greater than 0.2% TT in individuals 15 years and above.

4. The National Trachoma Program should consider establishing a regional office in Darfur to enhance the effective implementation of the full SAFE strategy in the region.

Trachoma: The Disease

Trachoma, the world's leading cause of infectious blindness, is caused by repeated infections of the conjunctiva (the lining of the eye and eyelid) by the bacterium *Ct*. As of August 2021, the WHO estimates that 1.9 million people, the majority of whom are women, are blind due to trachoma, and another 136.9 million people are at risk of blindness or severe visual impairment due to trachoma in 44 countries[1]. The early stage of the disease is called *inflammatory trachoma* and is most common among children. Inflammatory trachoma can present as either the formation of whitish follicles, on the conjunctiva under the upper lid or around the cornea, or as an intense painful or uncomfortable inflammation with thickening of the conjunctiva. Women are repeatedly exposed to inflammatory trachoma in their role as primary caretakers of children. It is therefore not surprising to find that women develop chronic trachoma twice as often as men. Trachoma is transmitted through discharge from the eyes and nose of infected individuals: (i) by contact with hands, towels, and clothing or (ii) by flies, which are attracted to ocular and nasal discharge. As individuals are repeatedly infected with *Ct*, subsequent scarring of the conjunctiva deforms the eyelid margin, resulting in eyelashes turning inward and rubbing against the cornea. This condition, called *trichiasis*, causes disabling pain, physically abrades the cornea, and can lead to corneal opacity and blindness if not corrected.

In 1987, eye care experts and the WHO developed a simplified trachoma grading scale, which facilitated and standardized the diagnosis and identification of all stages of trachoma. In 1997, the WHO established the GET2020 Alliance, which brought international non-governmental development organizations, donors, and researchers together to work collectively in controlling trachoma. The World Health Assembly (WHA) adopted resolution WHA51.11 in 1998, targeting the global elimination of trachoma as a public health problem. In addition, with support from the Edna McConnell Clark Foundation and WHO, the SAFE strategy was created to control trachoma through community-based interventions. In 2004, ICTC, a coalition of non-governmental organizations (NGOs), donors, academic institutions, and other partners, was created to support the GET2020 Alliance and to advocate for the implementation of the SAFE strategy. The SAFE strategy stands for: Surgery to correct TT, the advanced, blinding stage of the disease; Antibiotics to clear *Ct* infection; and Facial cleanliness as well as Environmental improvement to reduce transmission.

Another important development was the finding that the oral antibiotic, azithromycin, taken once or twice annually, is as effective in preventing chronic trachoma as six weeks of daily treatment with TEO, the previously recommended therapy. Pfizer Inc., manufacturer of Zithromax®, maintains a commitment to supporting the GET2020 Alliance goal of eliminating trachoma as a public health problem by the year 2025. Since the beginning of the donation in 1998, more than 980 million doses of Zithromax® have been donated by Pfizer Inc. and managed by ITI. The existence of the donation program has served to invigorate national trachoma programs and reinforce global support for the elimination of trachoma. In 2016, WHO published the dossier template for the validation of the elimination of trachoma as a public health problem. Since 2017, 13 countries fulfilled the criteria to be validated by WHO to have eliminated trachoma as a public health problem. In 2018, the global trachoma community celebrated three 20th anniversary milestones: The Carter Center began its

[1] The Weekly Epidemiological Record published on 6 August 2021.

pioneering work in 1998; WHA 51.11 called for the elimination of blinding trachoma; and Pfizer Inc. created ITI to lead the drug donation program.

TT and TF Thresholds for Disease Elimination

The achievement of the ***elimination of trachoma as a public health problem*** is defined by the WHO through two proxy indicators:

1) a prevalence of TT "unknown to the health system" of <0.2% in adults ages ≥15 years (approximately one case per 1,000 total population); and

2) a prevalence of TF in children ages 1–9 years of <5% in each (formerly) endemic district.

Through WHA resolution 51.11, trachoma can be eliminated as a public health problem through the implementation of the WHO-endorsed SAFE strategy. The strategy consists of Surgery, Antibiotic distribution at community level, Facial Cleanliness, and Environmental improvement. The surgery, or S component, should be offered to any individual with TT that is diagnosed to benefit from the surgical treatment. The surgery component also includes case finding activities, which are recommended when prevalence of TT is ≥ 0.2% among individuals who are ≥15 years old. The A, F, and E components of the strategy are recommended for areas in which TF prevalence is ≥5% in children of ages 1–9.

To meet the criteria mentioned above, population-based prevalence surveys, amongst other activities, must be conducted in districts (enumeration units) suspected of being endemic at baseline and then at specified intervals after the start of interventions. Below are the success indicators and procedures often used to determine whether a district or region has achieved thresholds for the elimination of trachoma as a public health problem:

TIS: Must be conducted at least six months after final planned MDA. If the TF prevalence threshold has been met, the district enters a two-year hold period (no MDA required).

TT activities: If TF prevalence threshold is met, but not TT threshold, then the program must conduct case searching and management activities.

TSS: At the conclusion of the two-year hold period, after the final impact survey, a surveillance survey is undertaken. If TT and TF thresholds are met, then the district is considered as "transitioned" and no longer warrants interventions. If thresholds are not met, then the district is re-enrolled in TT activities and MDA as appropriate.

More Frequent than Annual (MFTA) MDA

Presented by Dr. Paul Emerson, Director of ITI

A WHO informal consultation was hosted by the ITI December 7-9, 2021, during which there was agreement on defining districts that would benefit from enhanced MDA or a modified approach, and what may be included in a modified approach. In response, the ITI and the TEC have and will continue to invite countries and partners to request additional Zithromax® for 2022 and for 2023 applications in areas that fit the criteria of "persistent" or "recrudescent" trachoma.

These categories defined as:

1. Districts with **persistent trachoma**, where there have been two or more TIS in which the prevalence of TF_{1-9} has never been below 5% (and the current TF_{1-9} remains ≥5%).
2. Districts with **recrudescent trachoma**, where the result of at least one TSS has come back ≥5% TF_{1-9} (and the current prevalence is ≥5%).

Programs may choose to modify trachoma program implementation using donated Zithromax® in districts classified as persistent or recrudescent in 2022 and 2023 in the following ways:

MDA Strategies:

1. **Increased frequency of MDA**. Programs can conduct MFTA MDA. The additional treatment rounds can be targeted (for example, to children only) or provided to the whole community. The timing is flexible (e.g., biannual MDA can be conducted on months 0 and 1, months 0 and 4, months 0 and 6, or whatever makes programmatic sense). Likewise, three rounds could be conducted in any timing combination that works for the program. The sum of the MFTA MDAs conducted in a year are considered one round (e.g., a district with TF_{1-9} 10-29% conducting biannual MDA for three years would complete six total treatments in three annual rounds before a TIS is required). *It is important that the implementation plan leaves no one behind, anticipates high coverage MDA, and is paired with strong F&E.*
2. **Increased number of MDA rounds**. For example, a program may choose to implement 2–3 years of AFE in a district with TF_{1-9} 5–9% before conducting their next TIS.

Monitoring Strategies:

1. **Enhanced investigation**. Programs are encouraged to conduct enhanced investigations to better understand factors contributing to persistence so that interventions can be tailored to the problem. This may include a deep dive into existing data on coverage, infection distribution, WASH gaps, etc. Geostatistical analyses may prove helpful.
2. **Program enhancement**. Programs would put in place measures and strategies based on the enhanced investigation to ensure quality and consistent coverage that reaches all populations and subgroups (e.g., migratory populations).
3. **Collection of age-stratified infection and serological data** to better assess whether TF is really indicating ongoing disease above threshold. Further work is required to guide the collection and use of these data in programs.

4. **Adapted TIS.** Geostatistical or adaptive survey designs could be used for program surveys, taking into account available information and providing a reliable and quick indication that TF is above threshold, and better assess TF in special populations. These adapted surveys may also include the collection of serological and infection data (thresholds will need to be established). Further work is required to define survey design.

5. **Adapted evaluation unit.** The evaluation unit could be adapted to take into account migratory populations, ensuring the whole group is included (even across country borders).

Remain in surveillance ("wait and watch"). Programs could continue F&E without MDA for a period of time, expecting that the TF_{1-9} will regress to <5%, especially if surrounding districts have a prevalence of TF_{1-9} <5%. This strategy would be most appropriate for recrudescent districts (those with a prevalence of TF_{1-9} ≥5% at TSS).

Resilience in the Face of Historic Global Challenges

The Twenty-Third Annual Trachoma Control Program Review
The Carter Center
March 7 - 8, 2022

Monday, March 7		
07:00 – 07:10 *10 mins*	Meeting Management & Chairperson Welcome	Ms. Debbie Jackson-Cole & Ms. Kim Jensen (Chair) Project Manager & Associate Director, Trachoma Control Program MYT & The Carter Center
07:10 – 07:15 *05 mins*	Welcome & Opening Remarks	Ms. Paige Alexander Chief Executive Officer The Carter Center
07:15 – 07:20 *05 mins*	World Health Organization Message	Dr. Tedros Adhanom Ghebreyesus Director-General World Health Organization
07:20 – 07:40 *20 mins*	Trachoma Control Program Overview	Ms. Kelly Callahan Director, Trachoma Control Program The Carter Center
07:40 – 08:10 *30 mins*	Ethiopia SAFE Update	Mr. Fikre Seife National NTD Program Coordinator Ministry of Health – Ethiopia
08:10 – 08:40 *30 mins*	Amhara SAFE Update	Mr. Abdulkerim Mengistu Deputy Head Amhara Regional Health Bureau – Ethiopia
08:40 – 08:55	Break	
08:55 – 09:15 *20 mins*	Mali – Getting to the End of the Road	Professor Lamine Traoré National Coordinator, National Eye Health Program Ministry of Health – Mali
09:15 – 09:45 *30 mins*	Niger SAFE Update	Dr. Kadri Boubacar Deputy Coordinator, National Eye Health Program Ministry of Health – Niger
09:45 – 10:45 *70 mins*	**Rapid Fire & Discussion: Special Focus on Problem Areas**	
09:45 – 09:55 *10 mins*	Factors associated with unfavorable trachoma SS results after elimination	Mr. Phong Le Data Analyst The Carter Center
09:55 – 10:15 *20 mins*	Magnitude of the Problem: Global Data Analysis Barriers to Elimination	Ms. Kristen Renneker & Dr. Jeremiah Ngondi Senior Data Analyst & Senior NTD Advisor International Trachoma Initiative & RTI International
10:15 – 10:25 *10 mins*	Wait & Watch Amhara, Ethiopia	Dr. Scott Nash Epidemiologist The Carter Center
10:25 – 10:40 *15 mins*	International Trachoma Initiative Updates: Special Focus Trachoma Expert Committee Recommendations	Dr. Paul Emerson Director, International Trachoma Initiative & Interim Director, Children Without Worms Task Force for Global Health
10:40 – 10:55 *15 mins*	**Discussion/Q&A**	
10:55 – 11:00 *05 mins*	Meeting Wrap-Up	Ms. Kim Jensen Associate Director, Trachoma Control Program The Carter Center

Resilience in the Face of Historic Global Challenges

The Twenty-Third Annual Trachoma Control Program Review
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March 7 - 8, 2022

Tuesday, March 8		
07:00 – 07:10 *10 mins*	Meeting Management & Chairperson Welcome	Ms. Debbie Jackson-Cole & Dr. Angelia Sanders (Chair) Project Manager & Associate Director, Trachoma Control Program & Chair MYT, The Carter Center & International Coalition for Trachoma Control
07:10 – 07:40 *30 mins*	Sudan SAFE Update	Dr. Balgesa Elshafie National Coordinator for Trachoma Control Program Federal Ministry of Health – Sudan
07:40 – 08:10 *30 mins*	South Sudan SAFE Update	Mr. Makoy Logora Director for Guinea Worm Eradication and Director Preventive Chemotherapy – Neglected Tropical Diseases Ministry of Health – South Sudan
08:10 – 08:25 *15 mins*	South Sudan MDA Costing Study	Mr. Tim Jesudason Health Economics and Communications Consultant Partners in Global Health Ltd.
08:25 – 08:40 *15 mins*	International Coalition for Trachoma Control Update	Dr. Angelia Sanders Associate Director, Trachoma Control Program & Chair The Carter Center & International Coalition for Trachoma Control
08:40 – 08:45 *5 mins*	Pfizer Update	Ms. Julie Jenson Director, Corporate Responsibility Pfizer Inc.
08:45 – 09:00	Break	
09:00 – 10:00 *60 mins*	**Rapid Fire & Discussion: Special Focus on Serology**	
09:00 – 09:10 *10 mins*	Serological Tools for Trachoma Surveillance	Dr. Diana Martin Research Biologist Centers for Disease Control and Prevention
09:10 – 09:25 *15 mins*	Serological Results in North Darfur, South Sudan & Amhara, Ethiopia	Ms. Zeinab Abdalla & Ms. Katie Lynn Senior Program Officer & Graduate Assistant The Carter Center
09:25 – 09:35 *10 mins*	Seroepidemiology of Trachoma for the Elimination Endgame	Dr. Benjamin Arnold & Dr. Christine Tedijanto Associate Professor & Post-Doctoral Scholar Proctor Foundation, UCSF
09:35 – 10:00 *25 mins*	**Discussion/Q&A**	
10:00 – 10:20 *20 mins*	Sanitation, Water, and Instruction in Face-Washing for Trachoma (SWIFT) Research Update	Dr. Solomon Aragie & Dr. Jeremy Keenan Researcher, University of California San Francisco & Director of International Program The Carter Center & Proctor Foundation
10:20 – 10:30 *10 mins*	Closing Remarks	Dr. Kashef Ijaz Vice-President, Health Programs The Carter Center
10:30 – 10:45 *15 mins*	Any Outstanding Q&A and Meeting Wrap-Up	Dr. Angelia Sanders Associate Director, Trachoma Control Program & Chair The Carter Center & International Coalition for Trachoma Control