SUMMARY PROCEEDINGS

THIRTEENTH ANNUAL TRACHOMA CONTROL PROGRAM REVIEW

SHAPING PROGRAMS TO FIT THE NEED: THE RELEVANCE OF PREVALENCE

THE
CARTER CENTER

Waging Peace. Fighting Disease. Building Hope.

Atlanta, Georgia
February 27-29, 2012

Supported by:
Conrad N. Hilton Foundation
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The Thirteenth Annual Trachoma Control Program Review

The Carter Center
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And to many others, our sincere gratitude.

ACRONYMS

AMREF	African Medical and Research Foundation
BLTR	Bilamellar Tarsal Rotation
CBM	Christoffel Blindenmission
CDC	U.S. Centers for Disease Control and Prevention
CDD	Community Drug Distribution or Distributor
CLTS	Community Led Total Sanitation
CMA	Christian Medical Association
CNHF	Conrad N. Hilton Foundation
CPA	Comprehensive Peace Agreement
DHS	Demographic Health Survey
DNA	Deoxyribonucleic Acid
FMOH	Federal Ministry of Health
GET2020	Alliance for the Global Elimination of Blinding Trachoma by 2020
GPS	Global Positioning System
GSM	Global Scientific Meeting
HEW	Health Extension Worker
HKI	Helen Keller International
IECW	Integrated Eye Care Worker
ITI	International Trachoma Initiative
KAP	Knowledge, Attitudes, and Practices
KCCO	Kilimanjaro Centre for Community Ophthalmology
LCIF	Lions Clubs International Foundation
LGA	Local Government Areas (specific to Nigeria)
MalTra	Malaria and Trachoma Weeks
MDA	Mass Drug Administration
MIS	Malaria Indicator Survey
MOH	Ministry of Health
NAAT	Nucleic Acid Amplification
NGO	Non-governmental Organization
NTD	Neglected Tropical Disease
OCCGE	Organisation de Coordination Communautaire de Lutte des Grandes Endémies
OLS	Operation Lifeline Sudan
PCR	Polymerase Chain Reaction
POS	Pediatric Oral Suspension
PNLC(C)	Programme National de Lutte contre la Cecité
PRET	Partnership for the Rapid Elimination of Trachoma
RHB	Regional Health Bureau (specific to Ethiopia)
RNA	Ribonucleic Acid
RTI	Research Triangle Institute International
SAFE	Surgery, Antibiotics, Facial Cleanliness & Environmental Improvement
Sanplat	Modified Mozambique Sanitation Platforms
STH	Soil-transmitted helminth
TCC	The Carter Center
TEO	Tetracycline Eye Ointment
TF	Trachomatous inflammation-Follicular
TI	Trachomatous inflammation-Intense
TMA	Transcription-Mediated Amplification
TT	Trachomatous Trichiasis
UIG/UTG	Ultimate Intervention/Treatment Goal
UNICEF	United Nations Children's Education Fund
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

Shaping Programs to Fit the Need: The Relevance of Prevalence

The Thirteenth Annual Program Review of trachoma control programs was held at The Carter Center, February 27 – 29, 2012. In addition to the six Carter Center-assisted programs (Ethiopia, Mali, Sudan, South Sudan, Niger, and Nigeria), we were joined by our donors and partners from the World Health Organization, U.S. Centers for Disease Control and Prevention, Emory University, International Trachoma Initiative (ITI), Helen Keller International (HKI), Fred Hollows Foundation, CBM, London School of Hygiene and Tropical Medicine, Kilimanjaro Centre for Community Ophthalmology, University of California San Francisco, the Task Force for Global Health, Sightsavers, Lions Clubs International Foundation, and the Conrad N. Hilton Foundation.

As in previous years, the objective of the program review was to provide inspiration, instruction and motivation to all those involved in delivering the SAFE strategy for trachoma control. This is accomplished by reviewing the status of the national trachoma control programs, identifying challenges encountered in planning and implementation, discussing solutions and shared experience, and by promoting the sharing and standardization of information.

Country trachoma control programs currently exhibit a range of progress in implementation, from those still struggling with mapping to those that have reached the elimination targets and are implementing surveillance before applying for certification. All country programs can learn from the experience their peers have had on their journey towards the elimination targets. This document summarizes presentations given at the review, including: the Sightsavers-supported Trachoma Fast-track Initiative which aims to provide access to the SAFE strategy in many new districts; impact assessments in Ethiopia, Mali, and Niger; and managing the end game of active trachoma in The Gambia and Mali. In addition, special sessions were held on improvements in surgery provision; the actual vs. reported dosage of azithromycin received by program participants; the effect of sanitation for trachoma control on intestinal parasites; and an evaluation of the use of radio broadcasts for mass media.

The World Health Organization presented a report on the global progress in trachoma control; the ITI presented the new online Global Trachoma Atlas. For The Carter Center, Dr. Donald Hopkins gave an overview of the progress in the Guinea Worm Eradication Program and commented on global progress in trachoma control.

With less than 10 years before the target date for elimination, one Carter Center-assisted country, Ghana, has reached the elimination targets for active trachoma, and has now reached the target for surgery provision. Mali, Sudan, Niger and Amhara Regional State in Ethiopia appear to be on track to achieve elimination by the target date of 2015 whilst the rest of Ethiopia, Nigeria and South Sudan need additional assistance if the targets are to be met. Overall, Carter Center-assisted program output was very strong with over 52,000 surgeries, over 19 million doses of antibiotic, nearly 8,000 villages receiving routine health education, over 300,000 household latrines reported as constructed, and 15 scientific papers published utilizing Carter Center supported data. In all, the programs touched the lives of approaching 40 million people at risk of trachoma.

Mali Trachoma Control Program

Presented by Dr. Sanoussi Bamani, National Coordinator, National Blindness Prevention Program, Mali

Background

From 1960 to 1978, a large national effort was made to address trachoma through the mass distribution of tetracycline via efforts of the Organisation de Coordination Communautaire de Lutte des Grandes Endémies (OCCGE). *Projet Yelen* (Project Sight) operated between 1978 and 1986 with the goal of providing ophthalmological care throughout the country via training and placement of ophthalmologists.

The National Blindness Prevention Program (PNLC) was started in 1994. The Mali Trachoma Control Program began in 1999, following mapping of trachoma distribution supported by a consortium of partners including The Carter Center. Surveys conducted in 1996-1997 identified trachoma as a public health problem with TF prevalence of 35% among children less than ten years of age and a TT prevalence of 2.5% among women 15 years of age and older. The Carter Center also supported a Knowledge, Attitudes and Practices (KAP) survey and the development of health education materials in 1998.

The full SAFE strategy was implemented country-wide in 2008. To date, the PNLC is coordinating the full SAFE strategy in 13 of the 22 endemic districts, 10 of which have a prevalence of greater than 10% TF in children ages 1-9 years. Of Mali's 53 total districts, 46 have more than 1 known trichiasis case per 1,000 population (the TT elimination target); one district has reached its elimination target; and six districts have not been mapped at the district level due to insecurity.

Timeline of Events

1994: National Blindness Prevention Program launched
1996-1997: National baseline prevalence survey
1999: Mali Trachoma Control Program launched
2000: Distribution of Pfizer Inc-donated Zithromax® begins
2006: Launching of USAID Neglected Tropical Disease Program
2008: The Carter Center and Helen Keller International expand support to implement full SAFE strategy
2015: Target date for elimination of blinding trachoma in Mali

Program Achievements in 2011

Table 1. Program Achievements in 2011

Indicator	National Program Targets	National Program Output	Carter Center Targets	Carter Center Output
Persons operated on for trichiasis	7,900	8,510	6,000	5,393
Doses of azithromycin distributed	2,033,326	960,000	N/A	N/A
Doses of tetracycline eye ointment distributed	40,667	20,356	N/A	28,899*
Villages reached through health education	5,000	2,490	2,595	2,490
Household latrines constructed	15,000	11,093	12,000	11,093

***The Carter Center covers the cost of purchase of tetracycline eye ointment, but not the cost of distribution.*

Surgery

Forty-six districts in Mali have a TT prevalence higher than the WHO elimination threshold of 1 known trichiasis case per 1,000 population. As of the end of 2011, an estimated 35,780 trichiasis cases need to operated to reach the ultimate intervention goal in these districts. Thirty-eight districts have active

surgeons. The PNLC has prioritized the certification of surgeons using an unofficial French translation of the WHO manual "Final Assessment of Trichiasis Surgeons." Five surgeons were trained with Carter Center support and eight trichiasis surgeons were certified in 2011.

A total of 8,510 trichiasis surgeries were conducted in 2011 (108% of the targeted 7,900 surgeries) with The Carter Center supporting 5,393 of these surgeries. Surgeries were conducted by individual surgeons on motorcycles ("moto sorties"); surgeons traveling from Bamako by car and joined by surgeons from rural posts ("auto sorties"); and through static facility-based service.

The Carter Center partnered with the Kilimanjaro Center for Community Ophthalmology and Helen Keller International, with funding from the Conrad N. Hilton Foundation, to assess the status of the trichiasis surgical services in Mali. The study included surveys with operated patients, unoperated patients, surgeons, and discussions with health workers and villagers. The surgeon survey found that surgeons conduct an average of 15 trichiasis surgeries per year. Higher productivity was associated with surgeons who have a greater number of surgical kits and with greater number of years since training. An external ophthalmologist found a need to increase supervision of trichiasis surgeons and improve sterility measures. The majority of trichiasis patients reported satisfaction with the surgical outcome (91.6%) and had recommended surgery to someone else (89.5%). Epilation was the most common method of managing trichiasis pre-surgery. Interventions based on these results will be implemented in 2012.

Table 2. Interviews with Operated Patients, n=194

Variable		n	%
Mean age (SD)	63.3 (11.9)		
Female		119	63.6
Operated ≥ 3 years ago		84	44.4
Epilated prior to surgery		111	57.2
Satisfied with surgical outcome		175	91.6
Recommended surgery to others		171	89.5
Presence of post-operative trichiasis		51	26.4

The majority of trichiasis cases who had never received surgery were female (64.8%), had lived with trichiasis more than three years (62%) and were successfully epilating (69.4%). Thirty-six felt pain in any eye and half felt pain.

Table 3. Interviews with Unoperated Trichiasis Cases, n=72

Variable		n	%
Mean age (SD)	60.7 (14.3)		
Female		46	64.8
Lived with trichiasis ≥3 years		44	62.0
Successfully epilating (0 lashes in affected eye or eyes)		50	69.4
Presents with major trichiasis (5+ lashes in one or both eyes)		26	36.1
Feels pain in either or both eyes		36	50.0
Aware that condition will progress unless operated		21	29.2
Most common reasons for not getting operated			
Unaware of time/place		19	27.5
Afraid		13	18.8
No money for transport/fare		13	18.8

The PNLC has a plan to clear the backlog by 2015 that calls for 10,000 TT operations each in 2012 and 2013, 8,000 operations in 2014, and 6,000 operations in 2015. To achieve this, 6,000 village health

extension workers (*relais*) will be trained in 2012 to identify and mobilize TT patients. This method saves time for the surgical team, increases the effect of social mobilization around the issues of TT, and reduces the number of refusals. An assessment of the *relais*' ability to detect TT cases showed a concordance of 28% between the ophthalmologists and the *relais*. The PNLC also plans to increase supervision and reduce refusals through village mobilization, train 30 new surgeons, and certify 45 surgeons in 2012.

Antibiotic Therapy
Antibiotics in Mali are distributed by the Ministry of Health (MOH) with support from the USAID NTD initiative through Helen Keller International. Ten districts in Mali are eligible for mass drug administration (MDA) and all are currently receiving MDA. In addition, three districts are receiving sub-district drug distributions. In Mali, approximately 960,000 people received azithromycin in 2011. The program plans to distribute 894,437 doses of azithromycin and tetracycline during 2012, 100% of the eligible population.

The PNLC has created a post-endemic site surveillance system to detect whether TF returns after it has been controlled. The system uses two villages per health area to assess prevalence. If TF is found to be ≥10% in one village the health area is treated. If the village prevalence is 5%≥TF>10% then the village is treated. If TF <5%, then only those who have signs of active trachoma (TF and/or TI) will be treated.

Facial Cleanliness
In 2011, 2,490 villages targeted for health education were reached. Women's groups were trained to support facial cleanliness through health education and soap-making. In addition, the PNLC, with support from The Carter Center and Helen Keller International, promotes radio broadcasts disseminating information on the SAFE strategy and surgical campaigns. In 2011, the PNLC supported the diffusion of 7,200 messages broadcast over the radio.

Environmental Improvement
The PNLC built 11,093 latrines in 2011 out of a targeted 15,000 and plans to construct 10,000 latrines in 2012 in the districts where the prevalence of TF ≥ 10% as in Koulikoro, Banamba, Kolokani, Bafoulabé, and Tominian. *Relais*, masons, and women's groups all are trained to support environmental improvement.

Targets for 2012

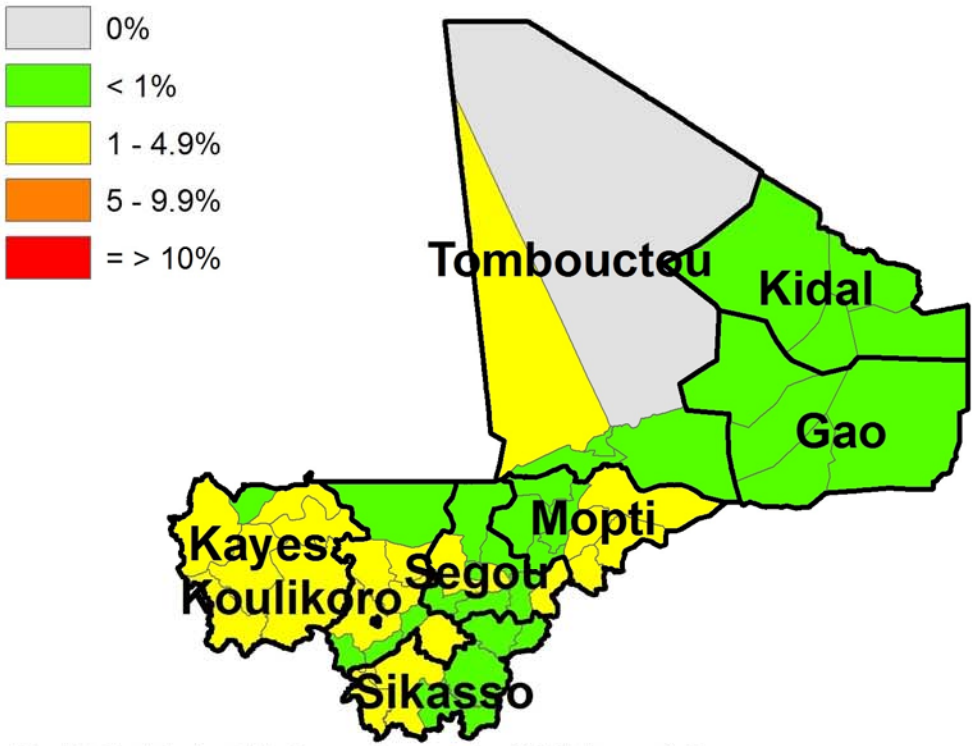
Surgery (S)
- Operate 10,000 trichiasis patients, 6,000 with Carter Center support
- Train 30 surgeons, 15 with Carter Center support

Antibiotic Therapy (A)
- Distribute 876,899 doses of azithromycin
- Distribute 17,538 doses of tetracycline eye ointment, 15,000 purchased with Carter Center support

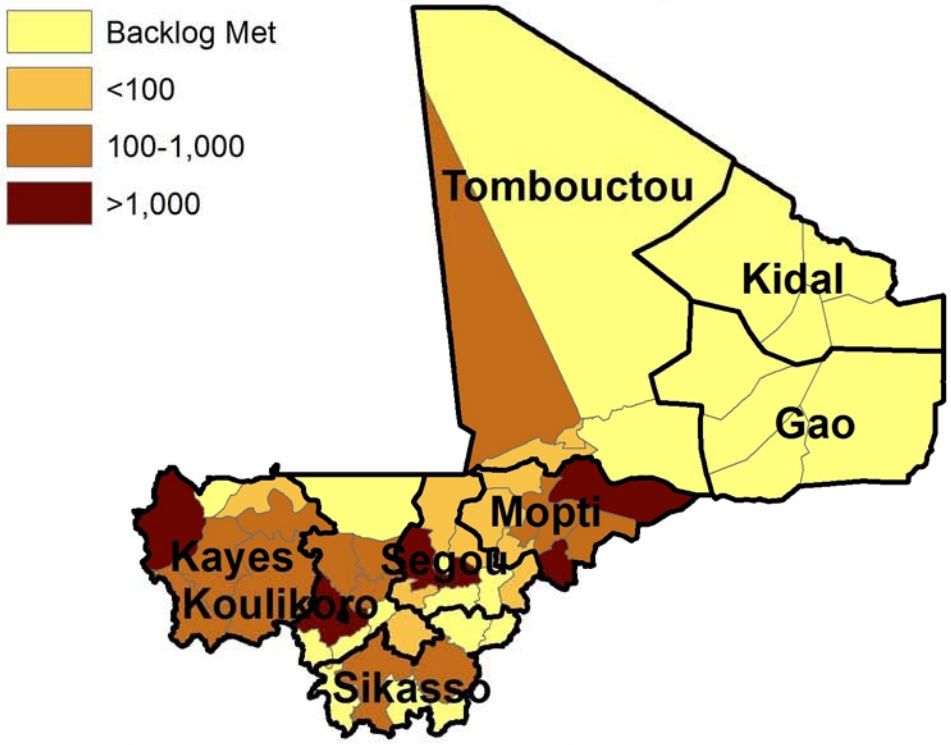
Facial Cleanliness
- Conduct health education in 2,490 villages, 250 villages with Carter Center support

Environmental Improvement (E)
- Construct 10,000 household latrines, 7,000 with Carter Center support

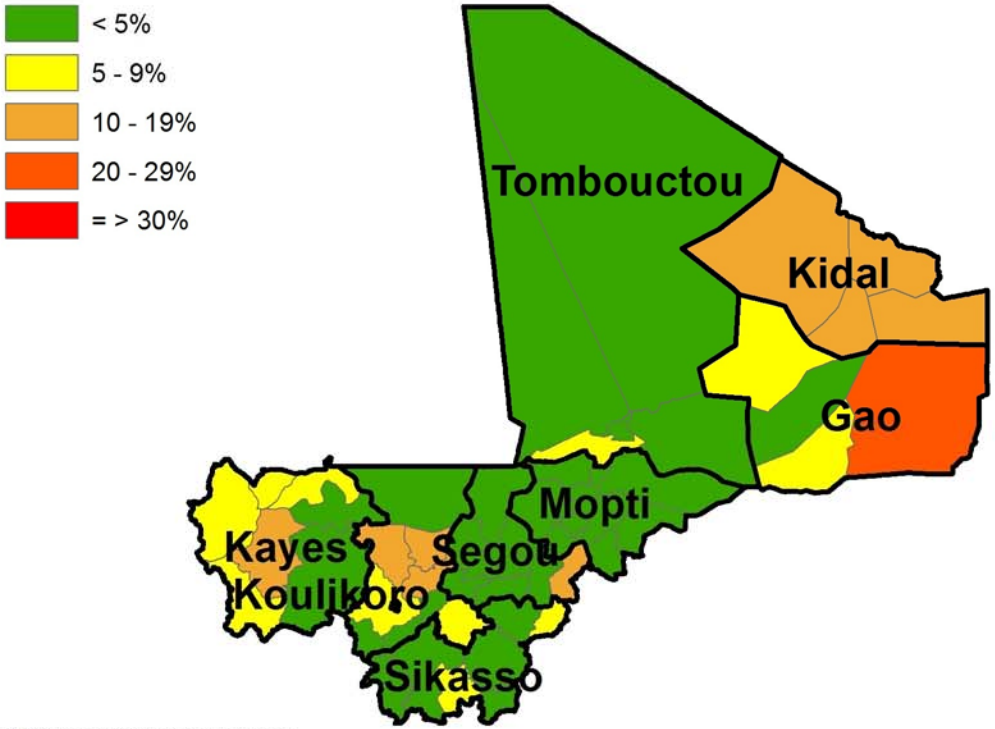
Mali TT Prevalence in Adults



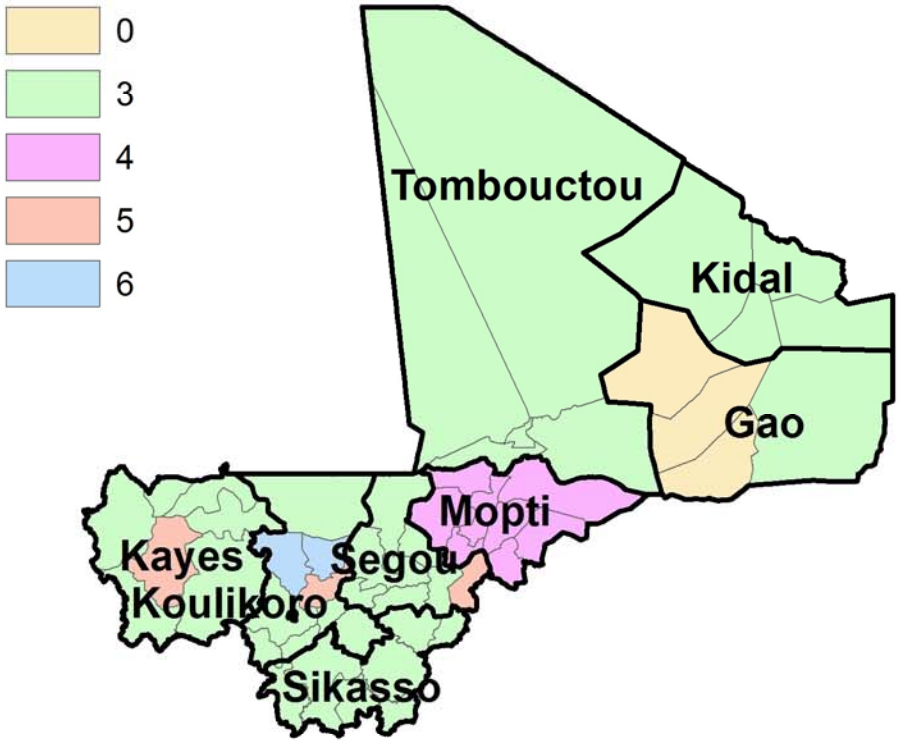
Mali Districts Remainder Against the Backlog



Mali Districts TF Prevalence in Children 1-9



Mali Districts Number of Rounds of MDA

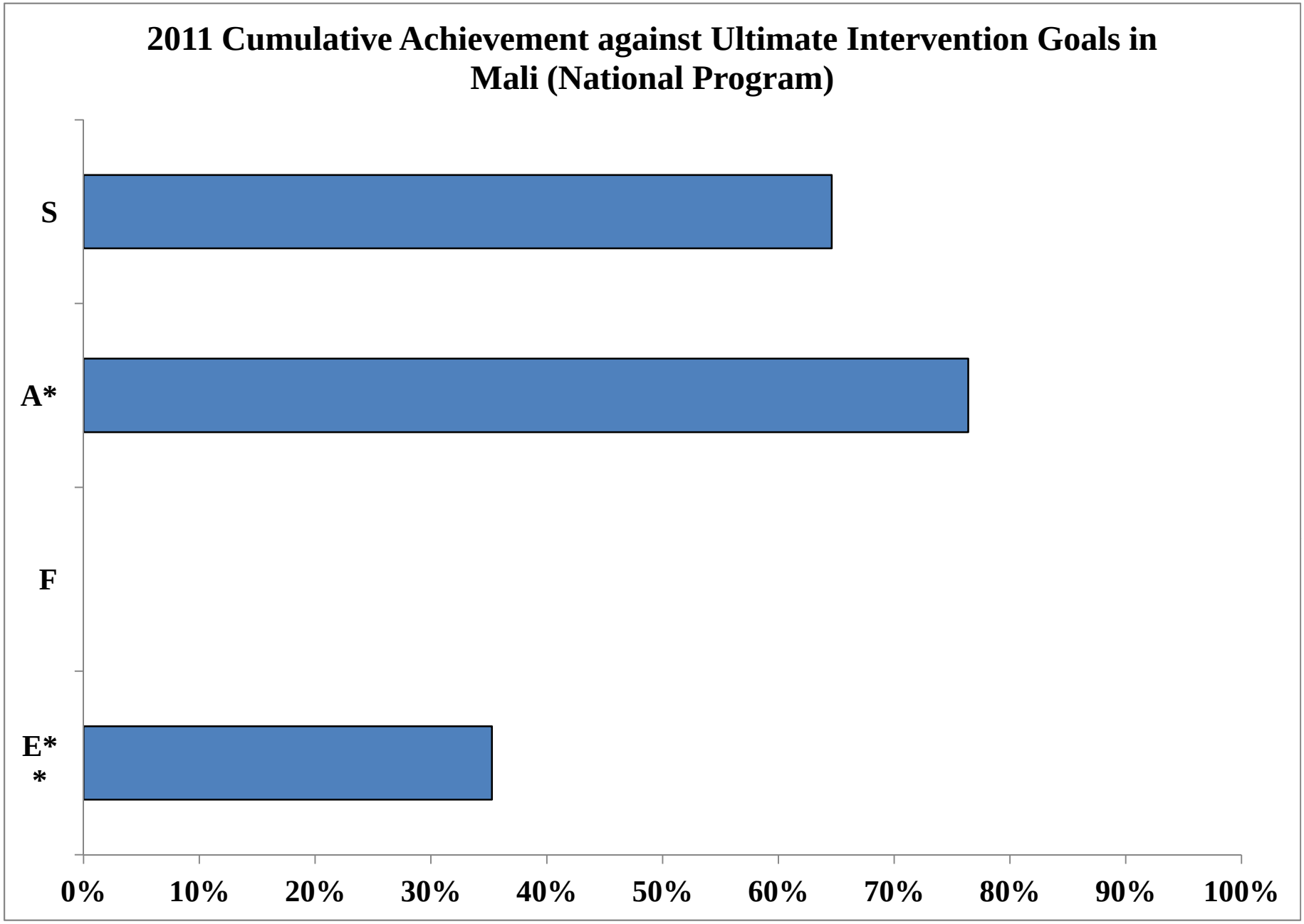


All data are current as of December 2011.

Mali

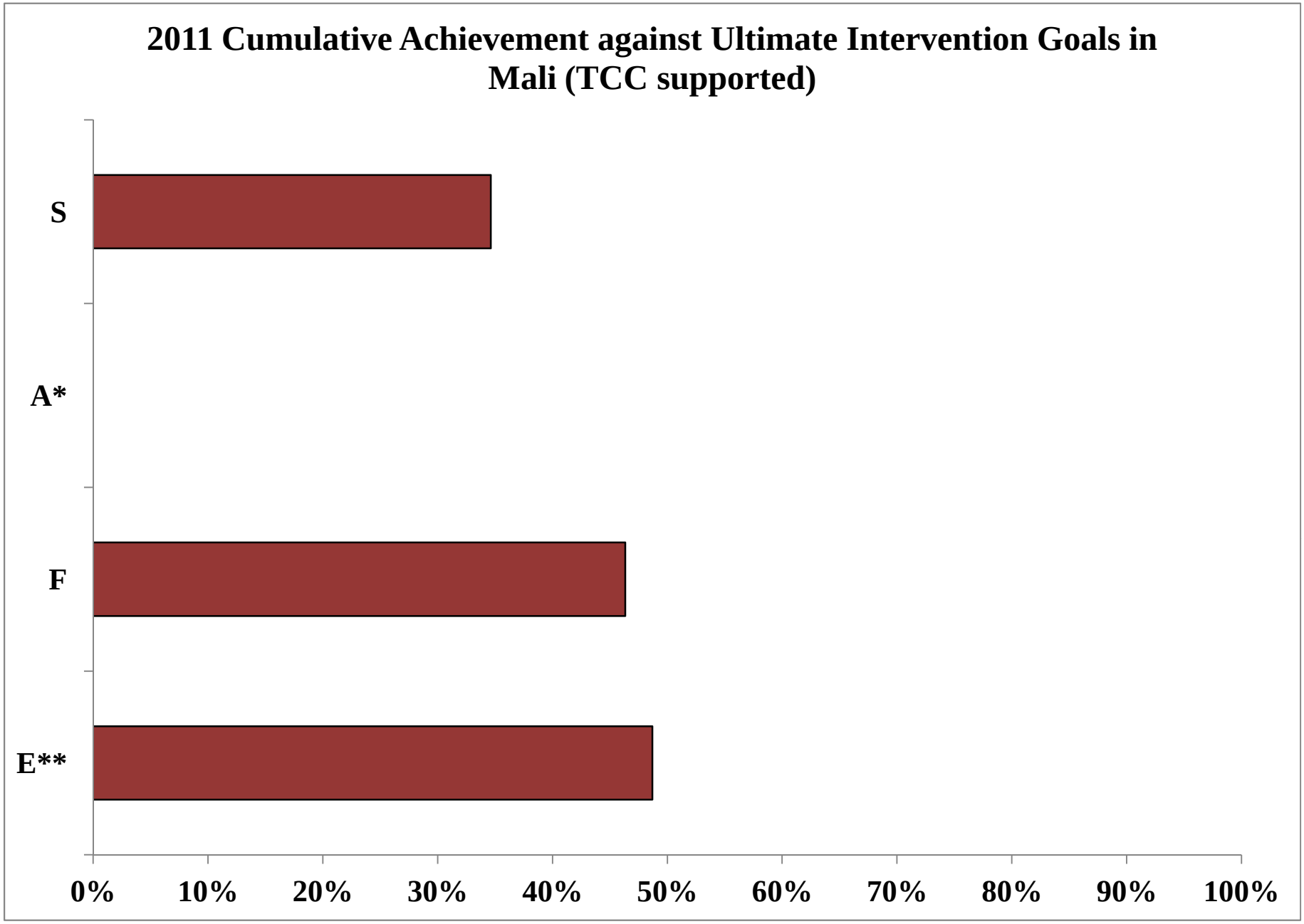
Intervention	National Achievements	UIG	Percentage of UIG Achieved by National Program
Surgery	61,988	95,953	65%
Antibiotic Distribution	960,000	1,256,438	76%
Facial Cleanliness (Villages)	N/R	N/R	N/A
Environmental Change (Latrines)	111,249	315,464	35%

Intervention	TCC-Supported Achievements	UIG	Percentage of UIG Achieved with TCC Support
Surgery	17,988	51,953	35%
Antibiotic Distribution	N/A	N/A	N/A
Facial Cleanliness (Villages)	N/R	N/R	N/A
Environmental Change (Latrines)	83,239	170,924	49%



*The ATO denominator is based on the population where TF>10%.

**Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).



*The Carter Center does not support the distribution of antibiotics in Mali.

**Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).

Niger Trachoma Control Program

Presented by Dr. Kadri Boubacar, Assistant Coordinator, Prevention of Blindness Program, Niger

Background

The National Prevention of Blindness Program (PNLCC) was established in 1987 following national surveys showing a prevalence of blindness of 2.2%, one-quarter of which was due to trachoma. Baseline surveys conducted in 1997-1999 found that 44% of children ages 1-9 had active trachoma and 1.7% of women over 15 had trichiasis. These surveys assisted in the prioritization of trachoma control activities in Diffa, Maradi, and Zinder regions based on their high prevalence of active trachoma. In 2002, the full SAFE strategy was implemented throughout Zinder.

In 1999, the PNLCC formed the National Trachoma Task Force and tasked it with writing a national strategic plan and supporting the elimination of blinding trachoma in Niger. The task force included members from the Ministries of Health, Water, Education, and Social Development; the World Health Organization (WHO); The Carter Center; local Lions Clubs; Helen Keller International; CBM; the Niger Association for the Blind; and the African Muslim Agency.

Increased donor and partner support allowed the expansion of activities to implement the full SAFE strategy nationwide in 2008. The Carter Center, Helen Keller International, the John P. Hussman Foundation, the Conrad N. Hilton Foundation, and the Lions Clubs International Foundation currently support the implementation of the full SAFE strategy in the 19 remaining endemic districts in Niger.

Niger currently has a population of 16,274,738 living in 42 districts. Out of the 42 districts, 22 are endemic for trachoma (TF prevalence ≥5%) and seven districts have not completed district-level mapping due to insecurity. Twenty-nine districts have a trichiasis prevalence higher than the WHO elimination threshold of 1 known case per 1,000 population.

Timeline of Events

1987: National Prevention of Blindness Program started
1997-1999: Baseline trachoma prevalence surveys conducted
1999: Carter Center began assisting the National Prevention of Blindness Program
2004: Program adopted five-year strategic plan (2005-2009)
2005: Impact surveys in two districts of Zinder region
2006: Impact surveys in four districts of Zinder region
2007: USAID Neglected Tropical Disease Program launched
2008: The Carter Center and Helen Keller International expanded support to implement the full SAFE strategy
2009: ITI closed its Niamey office
2015: Target date for the elimination of blinding trachoma in Niger

Table 1. Program achievements in 2011

Indicator	National Program Targets	National Program Output	Carter Center Targets	Carter Center Output
Persons operated on for TT	11,244	8,050	7,000	6,610
Doses of azithromycin distributed	5,682,452	4,295,092	2,442,208	2,060,000
Doses of tetracycline distributed	113,510	86,108	49,841	50,508
Villages reached with health education	634	634	634	634
Household latrines constructed	15,000	19,437	15,000	11,498

Surgery

In 2011, the national program conducted 8,050 trichiasis surgeries out of a targeted 11,244, including 6,610 with support from The Carter Center. At the end of 2011, the national program estimated that it needs to operate 48,400 trichiasis cases in 29 districts to meet the WHO criteria for eliminating blinding trachoma. Twenty-four of the 29 districts with greater than 1 case per 1,000 in the whole population have active surgeons. The PNLCC is planning to operate 10,000 trichiasis cases in 2012; 15,000 in 2013 and 2014; and, 8,400 in 2015.

The PNLCC is currently using an unofficial translation of the WHO manual "Final Assessment of Trichiasis Surgeons" to certify surgeons; however, the Ministry of Health does not financially support the certification and retraining of trichiasis surgeons. The PNLCC is focusing certification efforts on the areas with the highest trichiasis prevalence in Maradi and Zinder with support from partners.

In 2011, The Carter Center partnered with the Kilimanjaro Center for Community Ophthalmology and Helen Keller International, with funding from the Conrad N. Hilton Foundation, to assess the status of trichiasis surgery in Niger. The team collected information from trichiasis surgeons, community health care workers, operated trichiasis patients, unoperated patients, and trachoma coordinators.

The PNLCC identified several key observations from the qualitative situational analysis and surgeon assessment. The study results indicated that there is a strong knowledge of trichiasis and the SAFE strategy among the intended beneficiaries. Decentralization of the surgical campaigns helps improve coverage for effective surgery. On an administrative level, documentation of surgical interventions was found to be weak or non-existent from one level to another. The results also supported the need for a four-year plan in order to reach elimination by 2015. This plan was written at the National Program Review Meeting in October 2011. Finally, the surgical manual needs to be revised with a chapter on aseptic technique and new suture placement diagrams added. New strategies based on the data collected will be implemented in 2012.

Major findings from the quantitative interviews are shown in the table below.

Table 2. Interviews with Operated Patients, n=193

Variable		n	%
Mean age (SD)	45.1 (18.8)		
Female		143	74.5
Operated ≥ 3 years ago		100	51.8
Epilated prior to surgery		104	54.2
Satisfied with surgical outcome		179	92.7
Recommended surgery to others		175	90.7
Presence of post-operative trichiasis		64	33.7

Unoperated patients were primarily female (62.9%) and had lived with trichiasis for three or more years (82.4%). One-third were successfully epilating with no lashes in one or both eyes. Almost half had major trichiasis in one or both eyes and over half currently felt pain.

Table 3. Interviews with Unoperated Trichiasis Cases, n=35

Variable		n	%
Mean age (SD)	39.5 (19.5)		
Female		22	62.9
Lived with trichiasis ≥3 years		28	82.4
Successfully epilating (0 lashes in the affected eye or eyes)		11	33.3
Presents with major trichiasis (5+ lashes in one or both eyes)		16	48.5
Feels pain in either or both eyes		20	57.1
Aware that condition will progress unless operated		15	42.9
Most common reasons for not getting operated			
Prefer to epilate		6	19.4
Unaware of time/place		5	16.1
No money for transport/fare		4	12.9

Strategies for improving the performance of surgery include: using town criers and community radio to improve education; planning more surgical outreaches; and involving community volunteers in trichiasis case detection.

Antibiotic Therapy

In 2011, over 5.6 million people were targeted to receive azithromycin; 4,295,092 doses of azithromycin were distributed, of which 2,060,000 were distributed with Carter Center support. The MDA resulted in a population coverage of 75.6% and geographical coverage of 77.8%. The national program has distributed approximately 34.5 million doses of Pfizer Inc-donated Zithromax® since 2002.

The national program has written a distribution plan to assist them in reaching elimination by 2015. The PNLCC conducts MDA in all districts with TF≥10% among children 1-9 years old and at the sub-district level where the TF prevalence is less than 10% and greater than or equal to 5%.

Facial Cleanliness

The PNLCC coordinates health education through radio broadcasts on the SAFE strategy, distribution of cassettes, t-shirts, posters, sketches, and plays. Sanitation and hygiene technicians are trained using flip charts which they then use to deliver health education at the village-level. Hygiene and environmental improvements are supervised by district sanitation and hygiene technicians through the use of a checklist.

Environmental Improvement

The Carter Center and other implementing partners support the construction of Sanplat latrines through the training of masons and the provision of iron reinforcing bars and cement to build the latrine slab. The community is responsible for paying the mason, digging the hole, and providing bricks, sand, gravel, and water. The PNLCC also supports community-led total sanitation in Tahoua, Dosso, Zinder, and Maradi.

Targets for 2012

Surgery (S)

- Operate 10,000 trichiasis patients, 7,000 with Carter Center support
- Train 6 surgeons, all with Carter Center support

Antibiotic Therapy (A)

- Distribute 7,357,703 doses of azithromycin, 2,685,647 doses with Carter Center support
- Distribute 170,000 doses of tetracycline, 100,000 with Carter Center support

Facial Cleanliness

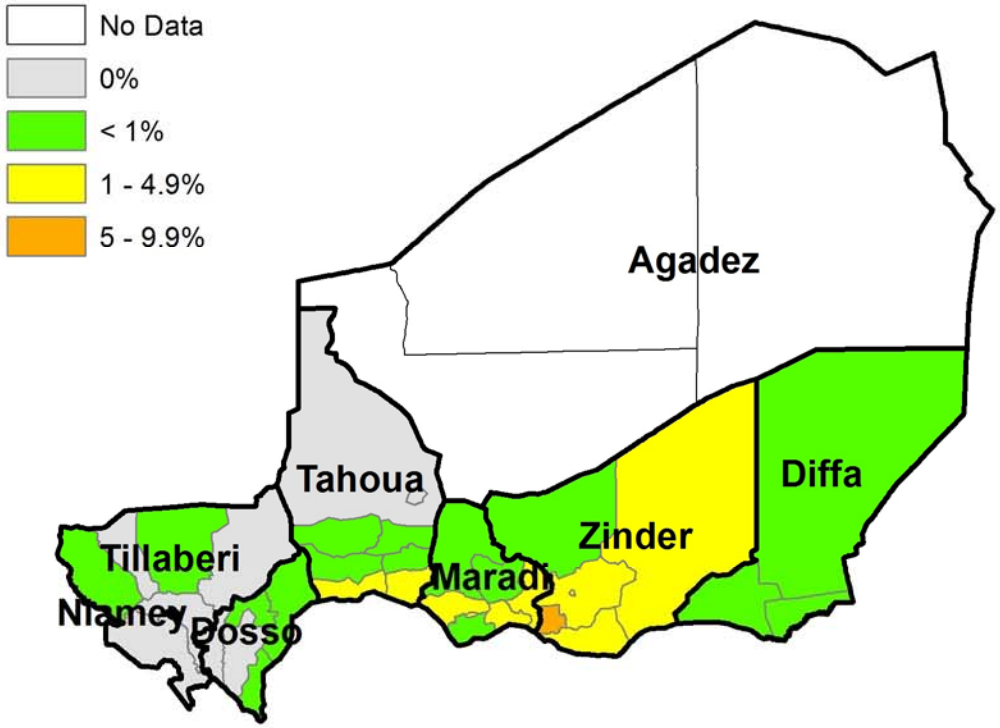
- Conduct health education in 634 villages, all with Carter Center support

Environmental Improvement (E)

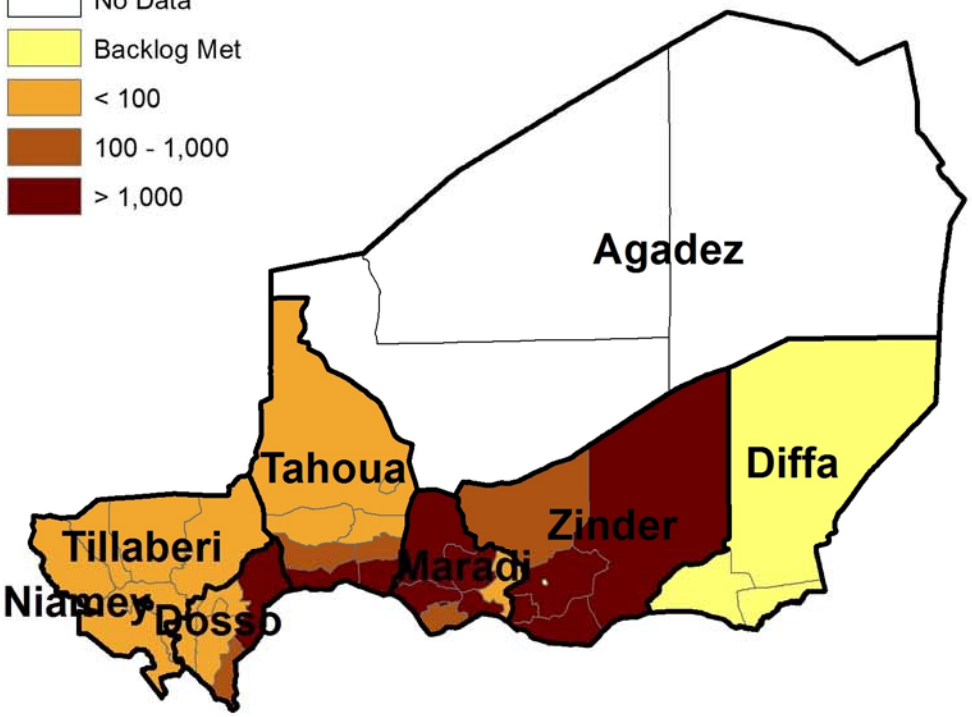
- Build 15,000 latrines, all with Carter Center support

Trichiasis patients waiting for surgery in Maradi, Niger display their registration cards.

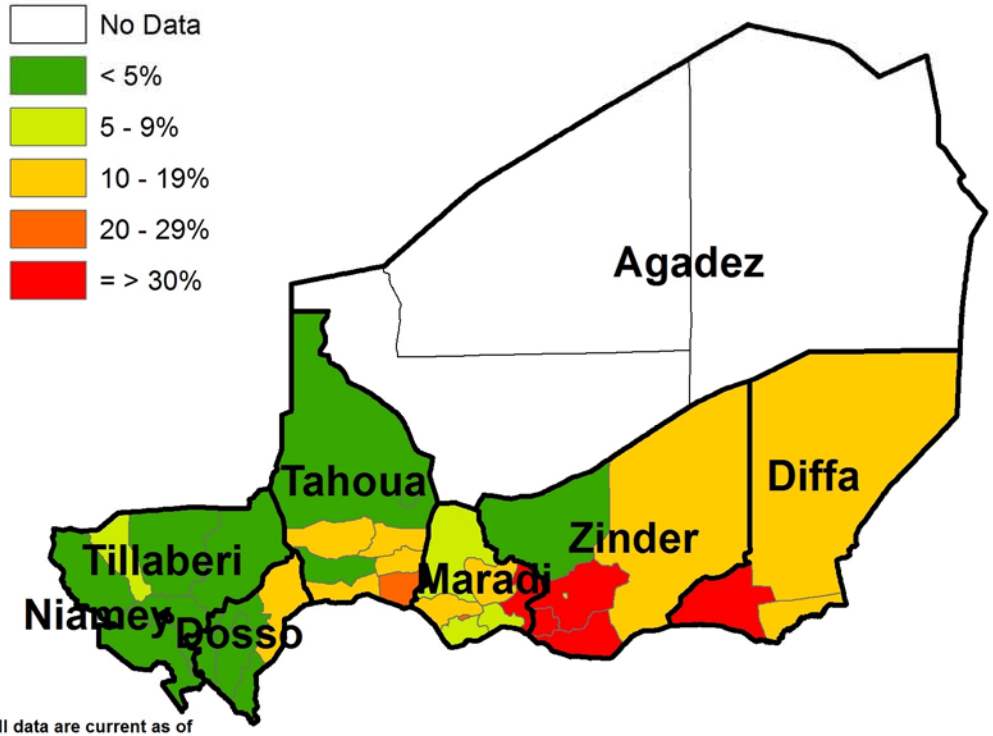
Niger TT Prevalence in Adults



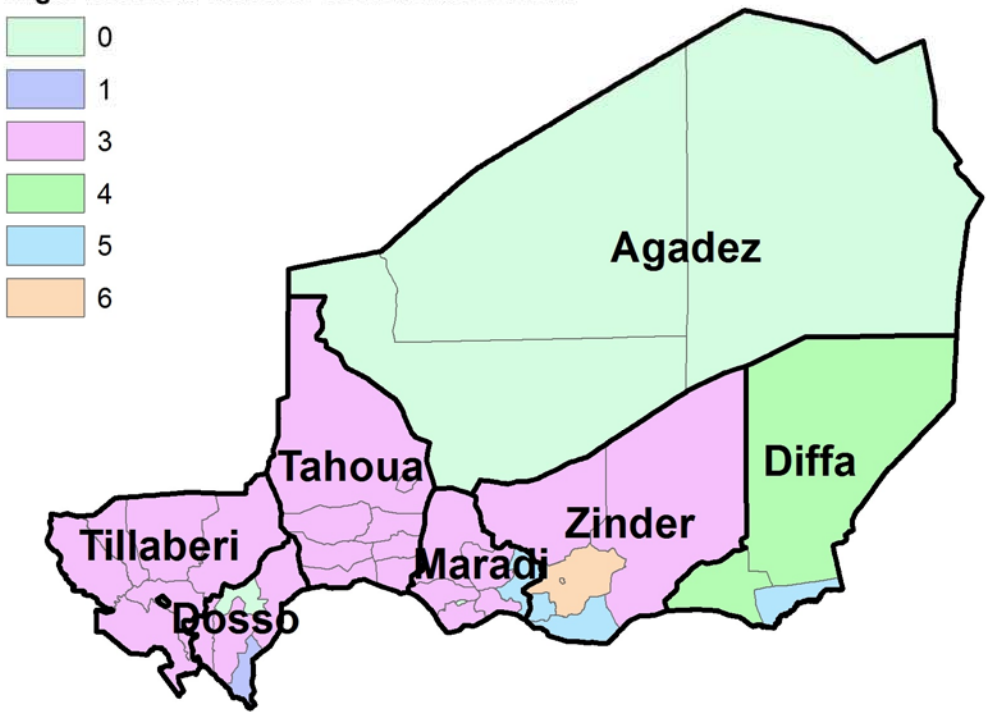
Niger Districts Remainder Against the Backlog



Niger TF Prevalence in Children 1-9 years



Niger Districts Number of Rounds of MDA

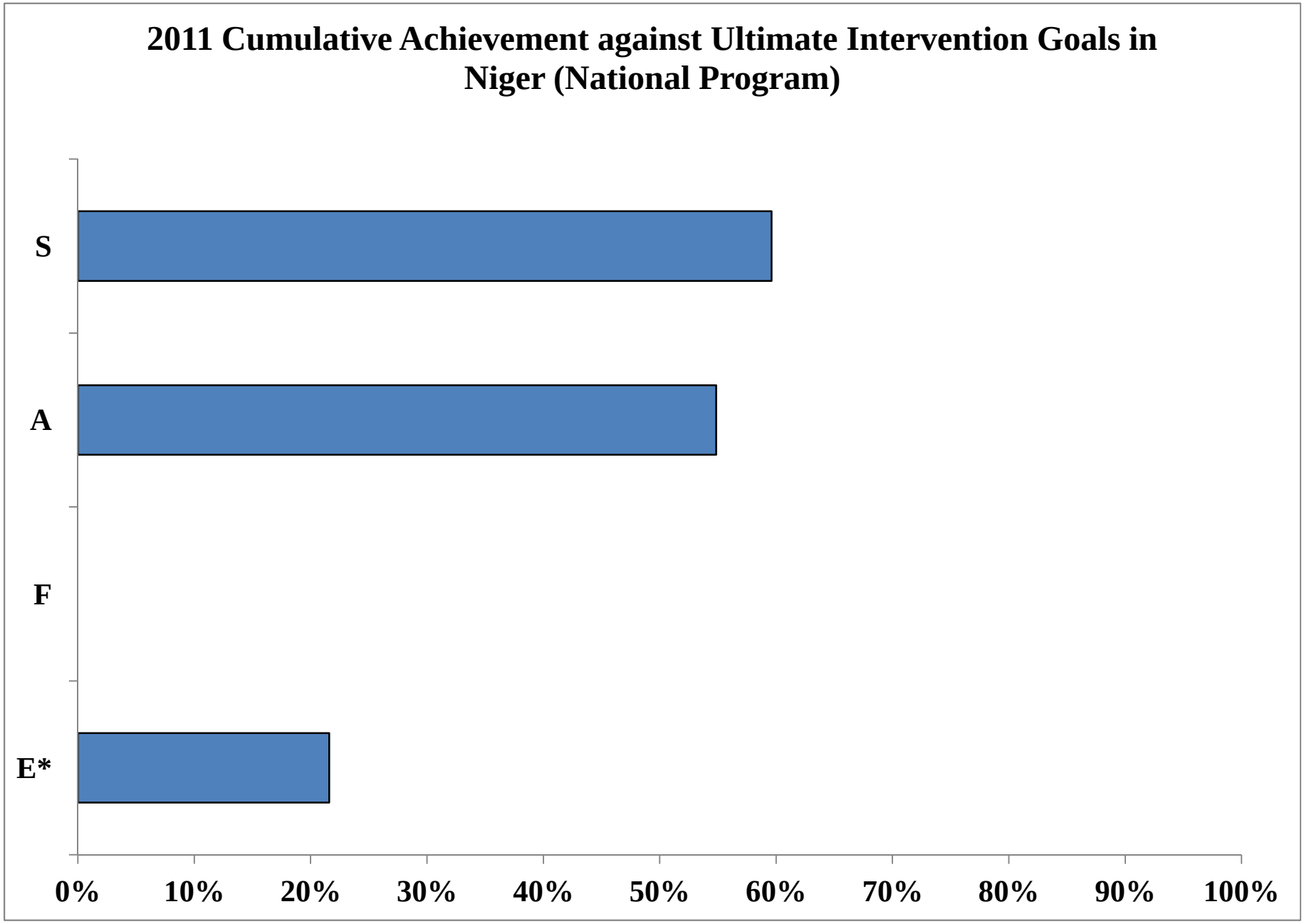


All data are current as of December 2011.

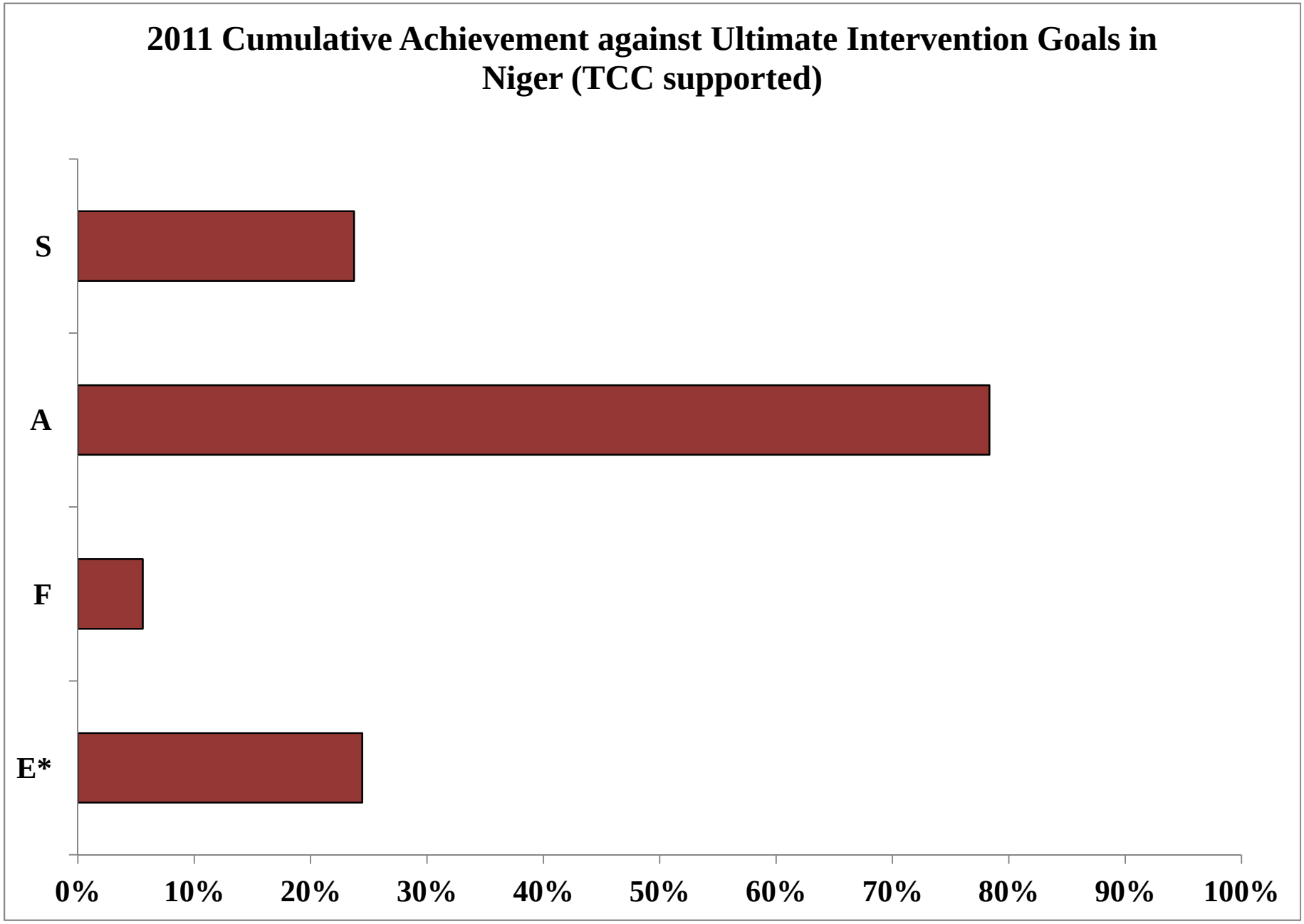
Niger

Intervention	National Achievements	UIG	Percentage of UIG Achieved by National Program
Surgery	59,546	99,896	60%
Antibiotic Distribution	4,300,000	7,838,611	55%
Facial Cleanliness (Villages)	N/R	N/R	N/A
Environmental Change (Latrines)	102,637	475,071	22%

Intervention	TCC-Supported Achievements	UIG	Percentage of UIG Achieved with TCC Support
Surgery	15,057	63,457	24%
Antibiotic Distribution	2,060,000	2,629,399	78%
Facial Cleanliness (Villages)	634	11,370	6%
Environmental Change (Latrines)	65,976	269,904	24%



*Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).



*Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).

Ethiopia Trachoma Control Program

Presented by Mrs. Hiwot Solomon, Federal Ministry of Health, Federal Democratic Republic of Ethiopia

Background

The National Blindness and Trachoma Programs were started in 1976. Vision 2020 was launched in 2002 in Ethiopia. The Federal Ministry of Health (FMOH) has identified 2020 as the target for eliminating blinding trachoma as a public health problem in Ethiopia, although the Amhara region plans to eliminate blinding trachoma by 2015.

In 2005 and 2006, the FMOH of Ethiopia conducted a national blindness and low vision survey with support from The Carter Center, the International Trachoma Initiative, CBM, and other partners. The survey found a blindness prevalence of 1.6%, among the highest in the world. Trachoma was responsible for 12% of all blindness in Ethiopia, second only to cataract. The national prevalence of TF was estimated to be 26.2% among children 1-9 years old, while the national TT prevalence was estimated to be 3.1% among adults. This survey showed Ethiopia to have the highest burden of trachoma cases in the world, with the Amhara National Regional State the most trachoma endemic among all 10 regional states. The survey showed regional prevalence in Amhara at 39.1% TF in children 1-9 years old and 5.2% TT in adults ages 15 and older.

The regional health bureaus coordinate trachoma control activities through a decentralized health system. Various partners support the regional health bureaus to implement the SAFE strategy in Ethiopia including The Carter Center, AMREF, CBM, Lions Clubs International Foundation, Lions Clubs of Ethiopia, Light for the World, GTM, World Vision, and ORBIS International.

Approximately 75.8 million of Ethiopia's total population of 81.9 million people live in the 725 districts that have been confirmed endemic (TF prevalence ≥ 5%). In Ethiopia, 593 districts have a trichiasis prevalence of greater than 1% among adults ages 15 years and older.

Timeline of Events

1976: National Blindness Program and Trachoma Control Program started
2000: Trachoma control activities launched in four districts of South Gondar, Amhara region
2000: Prevalence and KAP surveys in four districts of South Gondar, Amhara region
2002: Vision 2020 launched in Ethiopia
2005: First national strategic plan written for 2006-2010
2005-2006: National blindness and low vision survey
2011: Five year strategic plan for NTDs written
2020: Target for the elimination of blinding trachoma

Table 1. Program achievements in 2011

Indicator	National Program Targets	National Program Output	% Achievement
Persons operated on for TT	140,059	66,409	47%
Doses of azithromycin distributed*	22,000,000	17,239,334	78%
Doses of tetracycline distributed*	480,000	192,783	40%
Household latrines built	14,730,588	14,993,248	102%

**Preliminary reports.*

Surgery
Of the 832 districts in Ethiopia, 593 are priority districts for surgery. Approximately one-third of these districts have active surgeons. At the end of 2011, the FMOH estimated that 1,053,813 trichiasis cases need to be operated in order to clear the backlog. In 2011, the FMOH conducted 66,409 surgeries, 39,076 of which were with Carter Center support. The FMOH plans to work with partners in order be able to conduct 266,579 surgeries in 2012, 379,550 in 2013, 394,191 in 2014, and 335,158 in 2015.

The FMOH has intensified the training of IECWs and reports a total of 722 IECWs in country, 657 of whom work in Amhara. Additional eye care personnel include ophthalmologists (104), cataract surgeons (46), ophthalmic officers (40), ophthalmic nurses (108), and optometrists (27). The FMOH has identified the shortage of trained eye care personnel, instruments, drugs, and supplies in all regions excluding Amhara as challenges to the Trachoma Control Program.

Antibiotic Therapy
Over17.2 million people (78% of the targeted 22 million) received azithromycin in 2011 in Oromia; Tigray; Amhara; and Southern Nations, Nationalities, and Peoples regions. The FMOH plans to distribute 30 million doses of azithromycin in 2012 and 37 million doses of azithromycin in 2013. If additional donor support is forthcoming, the FMOH plans to reach 71 million people in 2015 by increasing the number of districts implementing the SAFE strategy for trachoma control.

Facial Cleanliness and Environmental Improvement
The FMOH reported that all villages and kebeles conducted health education activities at the community level, including through school education. The national program reports construction of 14,993,248 (102%) of the targeted 14,730,588 latrines. Latrine coverage ranges from across the 11 regions in Ethiopia with the lowest in Afar (6%) and the highest in Oromia (96%); the reported national latrine coverage is 86%. In 2011, 455 health extension worker supervisors and other related public health professionals were trained as trainers on implementation and certification of community-led total sanitation. In Ethiopia, 68.5% of the population has access to a functional water source.

The national program's plan is to implement the facial cleanliness component in 292 districts in 2012, increasing to 593 districts by 2015. The national program plans to achieve 100% latrine coverage by 2015.

Targets for 2012

Surgery (S)
- Operate 266,579 trichiasis patients

Antibiotic Therapy (A)
- Distribute 30 million doses of azithromycin

Facial Cleanliness
- Expand "F" component to reach 292 districts

Environmental Improvement (E)
- Increase latrine access so that 85% of population has access to a latrine

Ethiopia Trachoma Control Program – Amhara National Regional State

Presented by Mr. Ayeligne Mulualem, Head, Amhara Regional Health Bureau and Mr. Tesfaye Teferi, Program Officer, The Carter Center Ethiopia

Background

Carter Center-supported trachoma control activities started in four districts of South Gondar in 2000. A prevalence survey during the same year supported anecdotal evidence that this area had high prevalence for both active trachoma and trichiasis. With strong support from the Lions Clubs International Foundation, the Lions Clubs of Ethiopia, and other donors, The Carter Center has expanded the SAFE strategy to cover all 151 districts in the Amhara region.

The Federal Ministry of Health of Ethiopia conducted a blindness and low vision survey in 2005-2006, with support from The Carter Center, the International Trachoma Initiative, CBM and other partners. The survey results identified the Amhara region as the area most affected by trachoma. The survey showed that Amhara had a TF prevalence of 39.1% and a TT prevalence among adults of 5.2%, both higher than the national averages of 26.2% and 3.1%, respectively.

Trachoma control was integrated with malaria diagnosis and treatment in the Amhara region in 2007 through the conception of MalTra Week campaigns. MalTra Weeks cover the whole region semi-annually delivering antibiotics for trachoma control; testing for fever cases for malaria, and providing immediate point of care treatment with frontline drugs; and health education for both trachoma and malaria.

The Carter Center supported 72 sub-district impact evaluation surveys in 2011 in South Gondar and South Wollo zones. TF prevalence in children 1-9 years old ranged from 8.6% to 45.5% and TT prevalence from 2.2% to 7.1%. Following an average of five antibiotic treatment rounds in South Gondar and four in South Wollo, these surveys showed a decrease in TF. District-level surveys were completed in 2006 in South Gondar and zonal-level surveys in South Wollo in 2007. In South Gondar, baseline TF ranged from 62.7% and 94.7%; in South Wollo, TF ranged from 2.1% to 64.4%.

The Amhara region has a population of 18.9 million residing in 151 districts, of which 149 districts are confirmed endemic with TF >5% and 147 districts with a trichiasis prevalence >1% in adults. All districts receive the full SAFE strategy.

Timeline of Events

2000: Trachoma control activities launched in four districts of South Gondar with assistance
2000: Prevalence and KAP surveys in four districts of South Gondar
2002: Expansion to 15 districts in South Gondar and East and West Gojjam
2005-2006: National blindness, low vision and trachoma survey
2006: Expansion to all 151 districts in 10 zones
2008: First MalTra Week campaign
2010: 50 millionth dose of azithromycin distributed
2011: Impact evaluation surveys in South Wollo and South Gondar
2015: Target for the elimination of blinding trachoma in Amhara

Table 1. Program achievements in 2011

Indicator	RHB/Carter Center Targets	RHB/Carter Center Output
Persons operated on for TT	70,441	39,076
Doses of azithromycin distributed	16,696,381	14,830,000
Doses of tetracycline distributed	390,742	401,371
Villages reached with health education	3,427	3,427
Household latrines constructed	727,880	284,423

Surgery

In 2011, the Amhara Regional Health Bureau (RHB) has conducted a total of 39,076 surgeries with Carter Center support out of a targeted 70,441. There are 452 active surgeons and 791 surgical kits. The RHB estimates that there are 477,557 trichiasis cases left to operate in Amhara as of the end of 2011.

The Carter Center partnered with the Kilimanjaro Center for Community Ophthalmology and Helen Keller International, with funding from the Conrad N. Hilton Foundation, to conduct a trichiasis quality improvement study in the Amhara region. The study collected information from surgery beneficiaries, unoperated trichiasis cases, surgeons, health extension workers, and health officials to understand the current practices of trichiasis surgery, and how it is perceived by people in the community and in the health system.

The qualitative situational analysis found that there is a high level of awareness of trichiasis and trichiasis surgery, but inadequate knowledge of how to access the surgery. Community members did not know when or where surgeries were being offered. Many trichiasis patients reported that they did not have a person to accompany them to the surgery or assist them following the surgery. Several misconceptions persist about the surgery, including that surgery was an elective option, painful, not free, and more valuable to those in great pain. Some villagers also believed that the surgery had a long convalescence period (3-12 months) and that crying and smoke would cause recurrence. The study found that health extension workers (HEWs) are integral to educating and mobilizing potential patients; however, they are being under-utilized and need additional training.

An external ophthalmologist found that the organization of surgical camps could be improved to facilitate patient flow and increase surgical output. The ophthalmologist also found that sterility should be improved, lower lid surgery was occurring without training, and some surgeons do not appear to be empathetic with patients. Among operated patients, the majority were female (68.2%), were satisfied with the surgical outcome (87.5%), and had recommended the operation to others (69.6%). Less than 30% of operated patients examined had post-operative trichiasis.

Table 2. Interviews with Operated Patients, n=296

Variable		n	%
Mean age (SD)	54.3 (15.5)		
Female		202	68.2
Operated ≥ 3 years ago		133	45.1
Epilated prior to surgery		209	70.6
Satisfied with surgical outcome		259	87.5
Recommended surgery to others		206	69.6
Presence of post-operative trichiasis		85	28.7

Among trichiasis cases who had not had surgery, the majority were female (73.1%), had lived with trichiasis for three or more years (75.8%) and felt pain in at least one eye (72.3%) Less than a quarter of cases had major trichiasis, and 29.4% were successfully epilating.

Table 3. Interviews with Unoperated Trichiasis Cases, n=120

Variable		n	%
Mean age (SD)	48.7 (16.0)		
Female		87	73.1
Lived with trichiasis ≥3 years		91	75.8
Successfully epilating (0 lashes in the affected eye or eyes)		35	29.4
Presents with major trichiasis (5+ lashes in one or both eyes)		29	24.4
Feels pain in either or both eyes		86	72.3
Aware that condition will progress unless operated		111	92.5
Most common reasons for not getting operated			
Do not have time		35	38.1
Afraid		25	25.8
No one to accompany me		25	25.8

The Amhara National Regional Health Bureau plans to elevate the demand for trichiasis surgeries by improving the quality of surgery, follow-up of operated patients, community awareness and mobilization, and ownership by health extension workers. Supply will be improved through ensuring uninterrupted supply of surgical kits and consumables, training and retraining integrated eye care workers, and improving the reporting system. Health extension workers will be trained to identify, counsel, refer, and support trichiasis patients. Integrated eye care workers and health extension workers will collaborate to improve outreach, mobilization, and follow-up for surgical services at the community level. In addition, supervision of integrated eye care workers and health centers will be increased and sensitization workshops held to ensure that health workers at all levels will appreciate the burden of trichiasis and develop a common understanding of the strategies to clear the backlog. The Amhara National Regional Health Bureau plans to identify and train one peer team leader per woreda, train 380 additional integrated eye care workers, and buy 760 surgical kits. Each active integrated eye care worker will be expected to operate 20 cases per month for 10 months a year.

The Regional Health Bureau plans to operate 80,000 trichiasis patients in 2012 and 200,841 and 196,716 in 2013 and 2014, respectively, in order to clear the estimated backlog.

Antibiotic Therapy

The Amhara National Regional Health Bureau distributed 14,830,000 doses of azithromycin in 2011 out of a targeted 16.7 million, reaching a cumulative total of 65,751,739 doses distributed with Carter Center support since 2003. MalTra Week campaigns have enabled the program to achieve the highest average treatment coverage (93%). The program will distribute over 17 million doses in 2012, 17.3 million doses in 2013, and 17.6 million doses in 2014.

Facial Cleanliness and Environmental Improvement

The Amhara National Regional Health Bureau reached 3,427 kebeles with on-going health education activities and promoted the construction of 284,423 latrines in 2011. Ensuring high mass drug administration coverage and maintaining high coverage of facial cleanliness and environmental improvement are priorities in order to eliminate blinding trachoma as a public health problem.

The Amhara National Regional Health Bureau supported health education in primary schools and at the community level. Teachers and HEWs educated school children and examined facial cleanliness in

collaboration with school-based assessment teams. Health extension workers and community volunteers educated villagers in households and at public gatherings in addition to assessing facial cleanliness.

The Amhara National Regional Health Bureau compared the number of latrines reported monthly and during an impact survey in twelve woredas in South Gondar. The monthly reports estimated the total coverage to be 36.8% and the survey estimated the coverage to be 44.7%. Despite the similarity between reported and observed, there was considerable variation between estimates by woreda. Some woredas were reporting far more latrines than were observed whilst others were significantly under-reporting with more observed than reported.

Targets for 2012

Surgery (S)

- Operate 80,000 trichiasis patients, all with Lions-Carter Center support
- Train 200 surgeons, all with Lions-Carter Center support

Antibiotic Therapy (A)

- Distribute 17,119,035 doses of azithromycin, all with Lions-Carter Center support
- Distribute 349,368 doses of tetracycline, all with Lions-Carter Center support

Facial Cleanliness (F)

- Conduct health education in 3,427 villages, all with Lions-Carter Center report

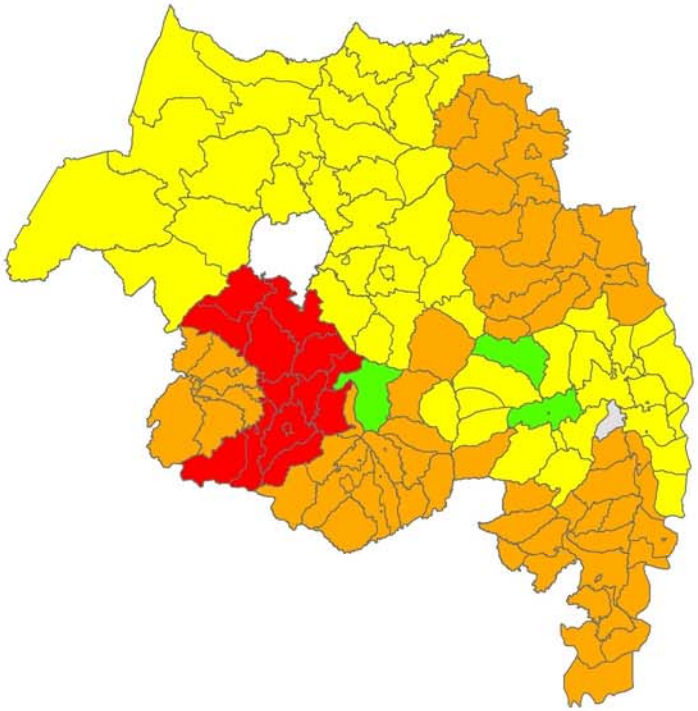
Environmental Improvement (E)

- Construct 118,865 latrines, all with Lions-Carter Center support

A mother hands her child a dose of pediatric suspension oral azithromycin to protect him from trachoma during MalTra Week VI, May 2011.

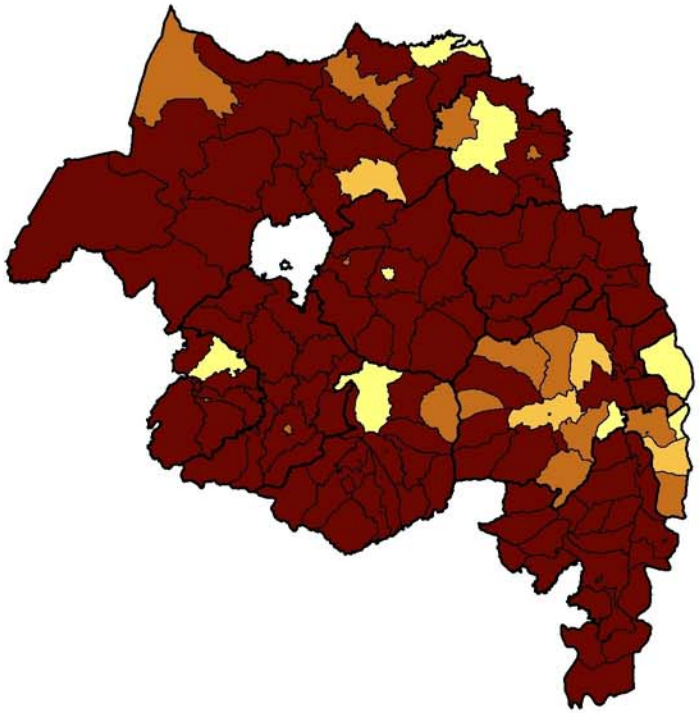
Amhara TT Prevalence in Adults

- No Data
- 0%
- < 1%
- 1 - 4.9%
- 5 - 9.9%
- = > 10%



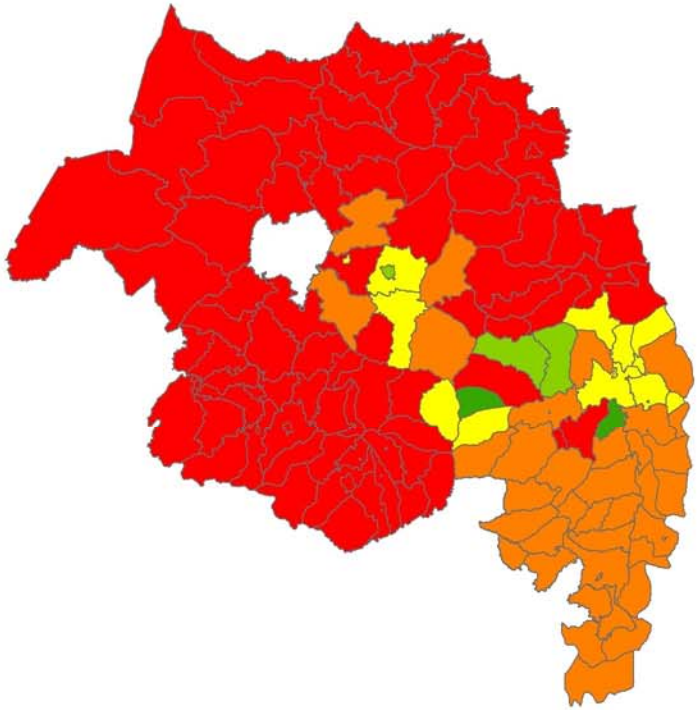
Amhara District Remainder Against the Backlog

- Backlog Met
- < 100
- 100 - 1,000
- > 1,000



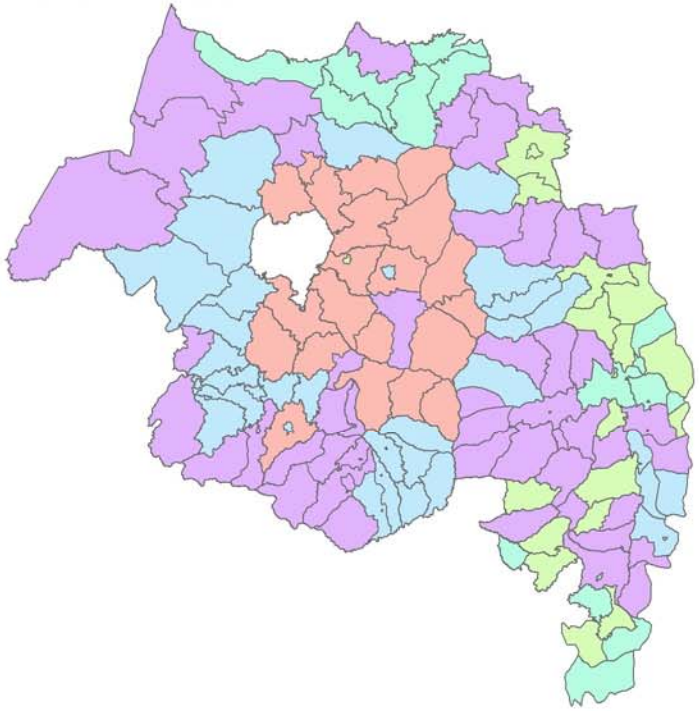
Amhara TF Prevalence in Children 1-9 years

- < 5%
- 5 - 9%
- 10 - 19%
- 20 - 29%
- = > 30%



Number of rounds of MDA in Amhara districts

- 2
- 3
- 4
- 5
- 6

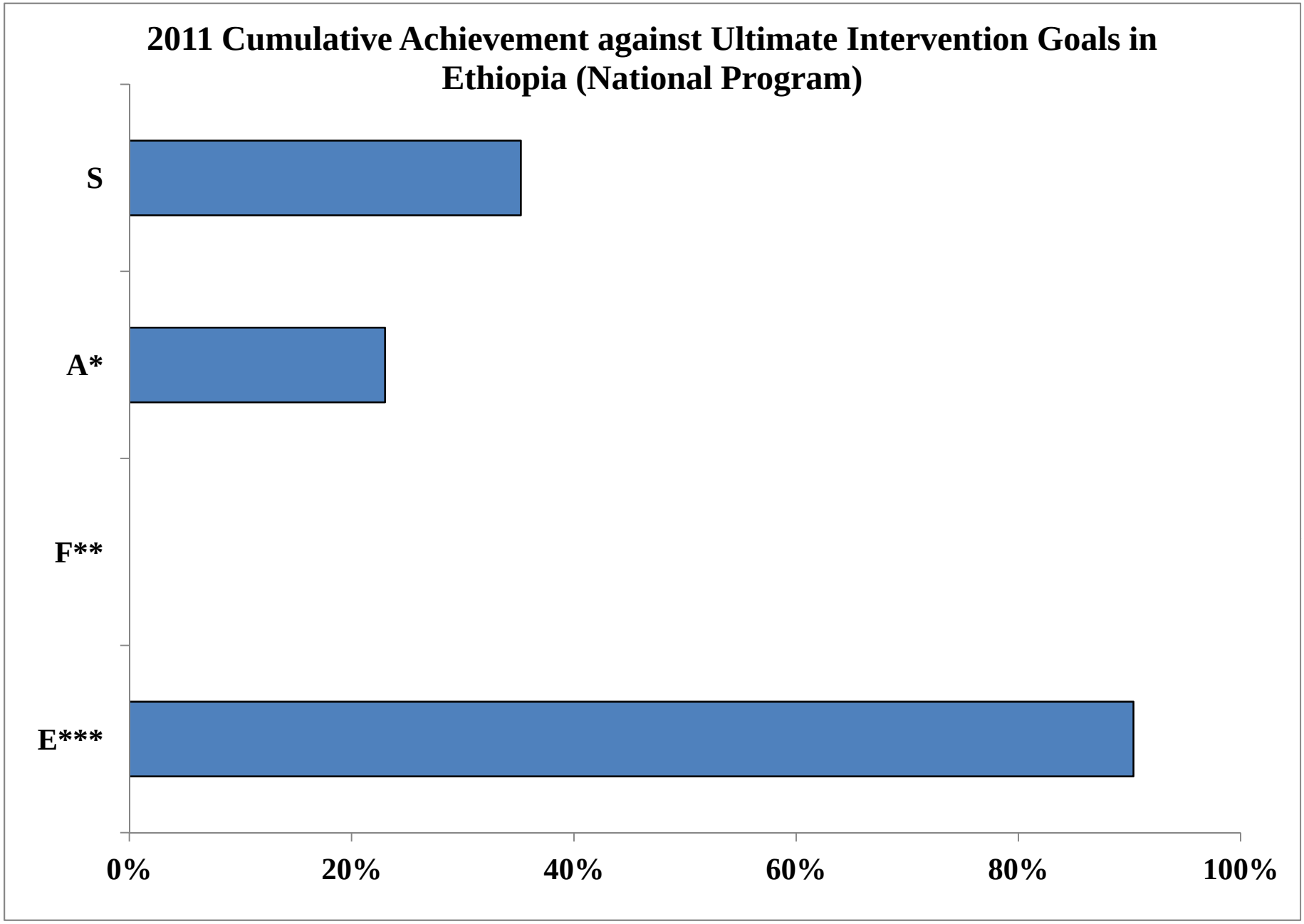


All data are current as of December 2011.

Ethiopia

Intervention	National Achievements	UIG	Percentage of UIG Achieved by National Program
Surgery	573,249	1,627,062	35%
Antibiotic Distribution	17,432,783	75,800,000	N/A
Facial Cleanliness (Villages)	N/R	N/R	N/A
Environmental Change (Latrines)	41,975,000	46,454,000	90%

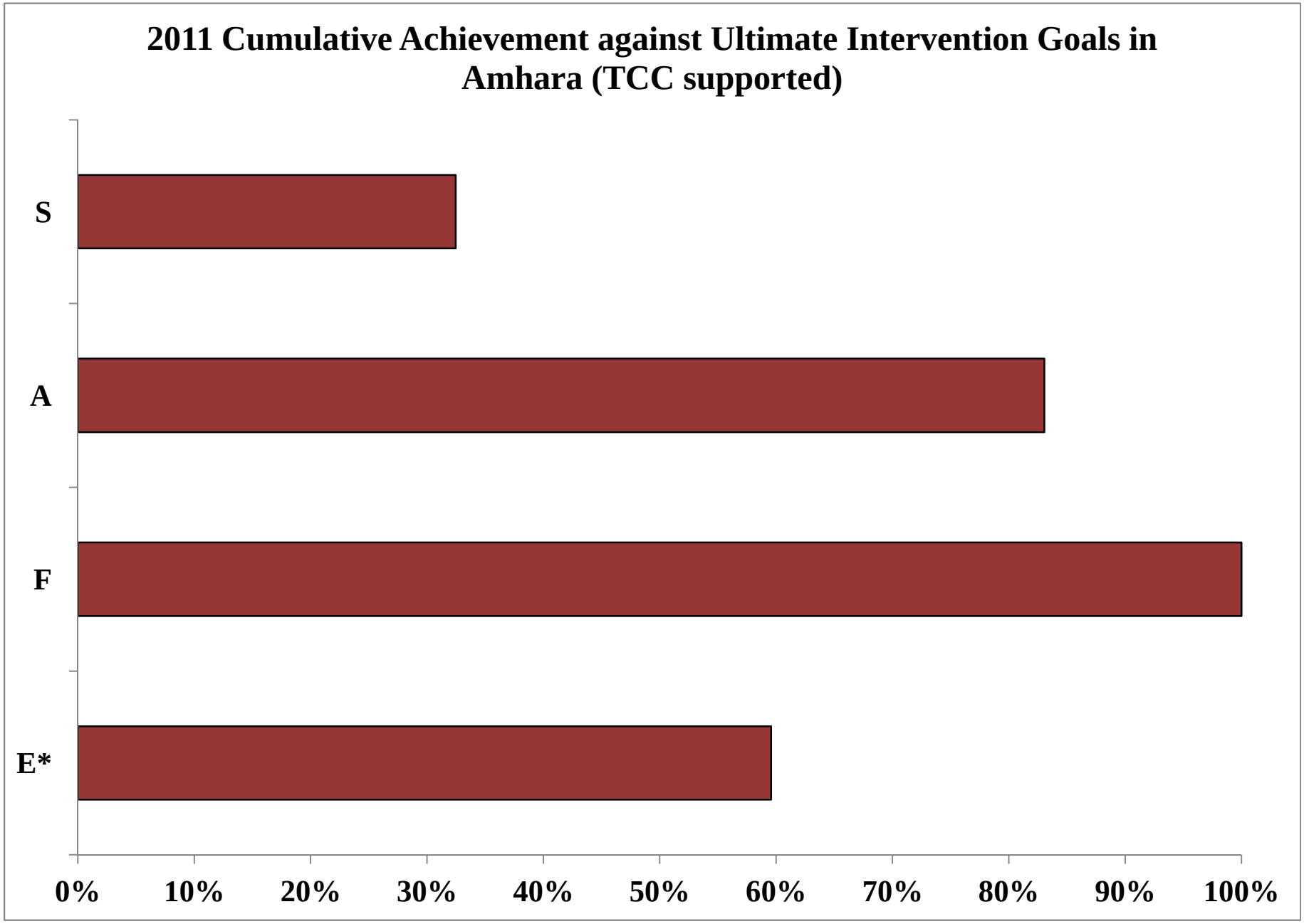
Intervention	TCC-Supported Achievements	UIG	Percentage of UIG Achieved with TCC Support
Surgery	229,682	707,239	32%
Antibiotic Distribution	15,230,967	18,338,629	83%
Facial Cleanliness (Villages)	3,427	3,427	100%
Environmental Change (Latrines)	2,146,603	3,602,992	60%



*Districts TF>5%

**The number of endemic villages nationwide is unknown.

**Ethiopia's target is 100% latrine coverage by 2015.



*Ethiopia's target is 100% latrine coverage by 2015.

Nigeria Trachoma Control Program

Presented by Dr. Benjamin Nwobi, National Eye Health Program, Federal Ministry of Health

Background

Nigeria has a population of approximately 168,000,000. The country is divided into 36 states which are sub-divided into 774 local government areas (LGAs). The northern 11 states are believed to be endemic for trachoma, although mapping has not been completed. The national plan for the elimination of trachoma expired last year, and the program plans to write a new national plan this year. Due to multiple factors including incomplete prevalence mapping and low geographic coverage of mass drug administration in known endemic areas, the National Trachoma Program reports that 2015 is not a realistic target for eliminating blinding trachoma in Nigeria.

Mapping of Zamfara and Taraba states was finished in 2011, and impact assessments are planned for LGAs finishing their third round of MDA. Sentinel site methodology research supported by CDC in Sokoto state is in its second year and will be concluded in 2012.

The national program has plans to engage other sectors to prioritize trachoma-endemic LGAs in latrine promotion and construction, water supply improvement, and in promotion of health education on hygiene and environmental improvement. A results-based financing approach will be piloted by the Federal Ministry of Health to enhance the uptake of surgical services.

Of 774 local government areas, 112 are known to be endemic for TF (TF $\geq$ 5%) and 121 have unknown endemicity. Of the districts surveyed, 194 have TT prevalence higher than the WHO threshold of 1 known case per 1,000 population.

The Carter Center assists with the implementation of the SAFE strategy in Plateau and Nasarawa states with funding from the Bill & Melinda Gates Foundation and other donors.

Timeline of Events

1991: National Program for Prevention of Blindness launched
2001: National Trachoma Control Program began and Trachoma Task Force formed
2005: National blindness survey conducted
2007-2008: Prevalence surveys in Plateau and Nasarawa states
2007: Nigeria approved to receive the Zithromax® donation from Pfizer Inc
2010: Mass drug administration for trachoma control with Pfizer Inc-donated Zithromax® was officially launched
2011: Mapping of Zamfara and Taraba
2020: Target date for the elimination of blinding trachoma in Nigeria

Table 1. Program achievements in 2011

Indicator	National Program Targets	National Program Output	Carter Center Targets	Carter Center Output
Persons operated on for TT	4,500	13,601	N/R	100
Trichiasis surgeons trained	6	N/R	N/R	N/R
Doses of azithromycin distributed	3,175,392	3,642,596	778,872	993,952
Doses of tetracycline distributed	120,000	N/R	15,600	20,732
Villages reached with health education	13,240	1,425	853	855
Household latrines built	N/R	0	N/R	0

Surgery
As of December 2011, there are estimated to be 502,545 trichiasis cases in 194 districts remaining to be operated to reach the WHO threshold of for elimination of blinding trachoma in Nigeria. Of these districts, 68 have active surgeons. The Prevention of Blindness Program conducted 13,601 surgeries in 2011, 100 with Carter Center support. The recently expired national trachoma plan had estimated 100,852 trichiasis patients remained to be operated; however, more recent calculations have increased this estimate. The national program plans to operate 60,000 trichiasis patients in 2012 and 100,000 surgeries each year thereafter. The program plans to conduct 10 campaigns each year, each with 100 surgeons conducting 100 surgeries per camp. To reach this target, the national coordinator reports that the national program plans to train 64 surgeons and establish 69 mobile lid surgery centers, approximately three centers per LGA. To further increase surgical output, community health workers will be trained to identify trichiasis. In addition, each surgeon will be provided with two surgical kits. Finally, the National Trachoma Program will promote the follow-up of post-operative patients. The quality of surgery will also be improved.

Antibiotic Therapy
Twenty-two of the 80 districts eligible for MDA (TF ≥ 10%) receive MDA. A total of 14,798,205 people are estimated to live in these districts. The national program distributed 3,642,596 doses (115% of the targeted 3.1 million) of azithromycin in 2011, 993,952 with Carter Center support, and has plans to scale-up to reach all endemic districts over the next four years. The national program anticipates that new LGAs will be reached by MDA by 2014 and will, therefore, not be evaluated before 2019 following five years of MDA.

During 2011, the Pfizer Inc-donated azithromycin was stalled in customs due to unanticipated fees. The national program has devised an alternate route for the delivery of Zithromax® in 2012.

Facial Cleanliness and Environmental Improvement
In 2011, health education activities reached more than 1,425 villages, 855 with Carter Center support, and more than 2,500,000 people. Health education activities targeted schools, market places, churches and mosques, social gatherings, and trichiasis pre-screening programs. Trained community extension workers educated community members using posters and flip charts. The ultimate intervention goal for the "F" and "E" components is to reach 1,404,378 endemic villages with health education and behavior change promotion.

Latrine construction was not supported by the national program in 2011. Since 2009, other sectors and organizations that support latrine construction have not provided output numbers to the National Trachoma Program. The 2003 Demographic and Health Survey estimated that 65.7% of Nigerians

already use a latrine. The national program estimates that 620,033 latrines need to be built to reach Millennium Development Goal 7c.

Targets for 2012

Surgery (S)

- Operate 60,000 trichiasis patients, 850 with Carter Center support
- Train 64 surgeons

Antibiotic Therapy (A)

- Distribute 6,911,908 doses of azithromycin, 1,092,859 doses with Carter Center support
- Distribute 138,239 doses of tetracycline, 20,732 with Carter Center support

Facial Cleanliness

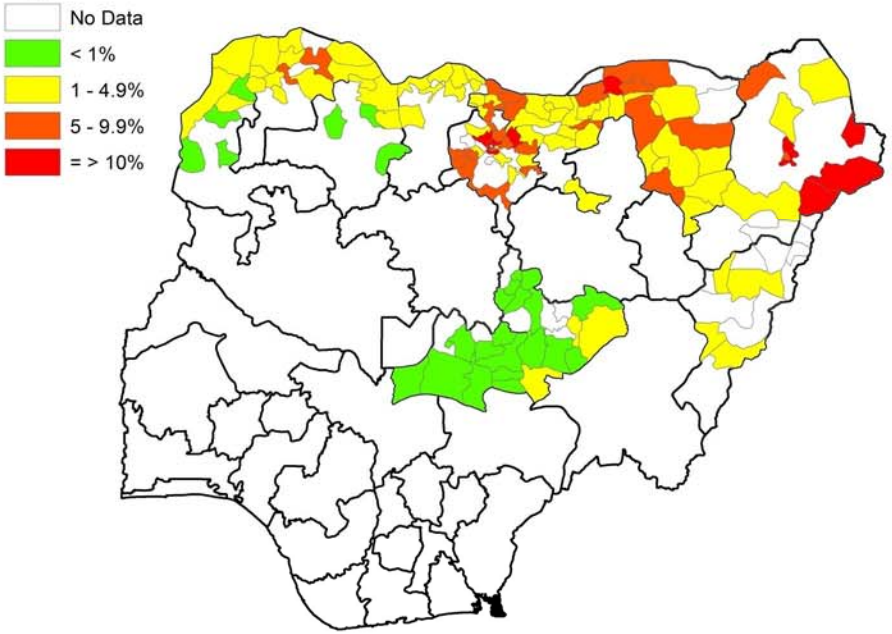
- Conduct health education in >1,425 villages, 855 with Carter Center support

Environmental Improvement

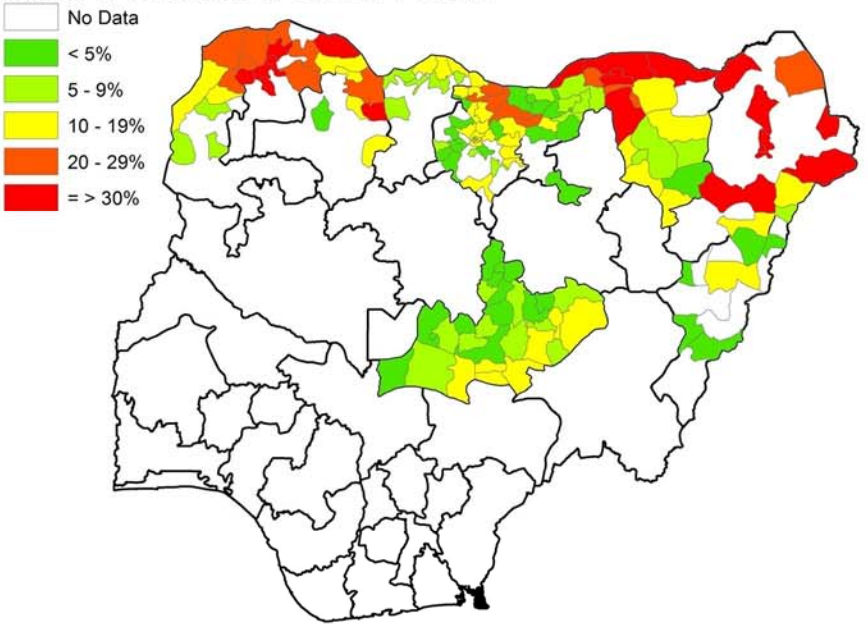
- Promote latrine construction in endemic communities

A patient is operated during a pilot surgical campaign.

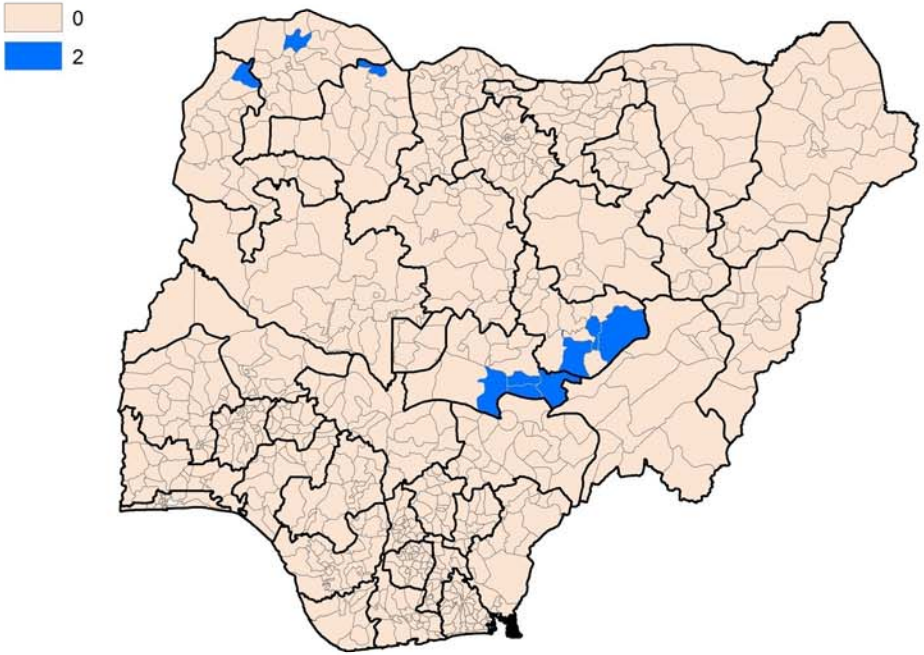
Nigeria TT Prevalence in Adults



Nigeria TF Prevalence in Children 1-9 years



Nigeria Districts Number of Rounds of MDA

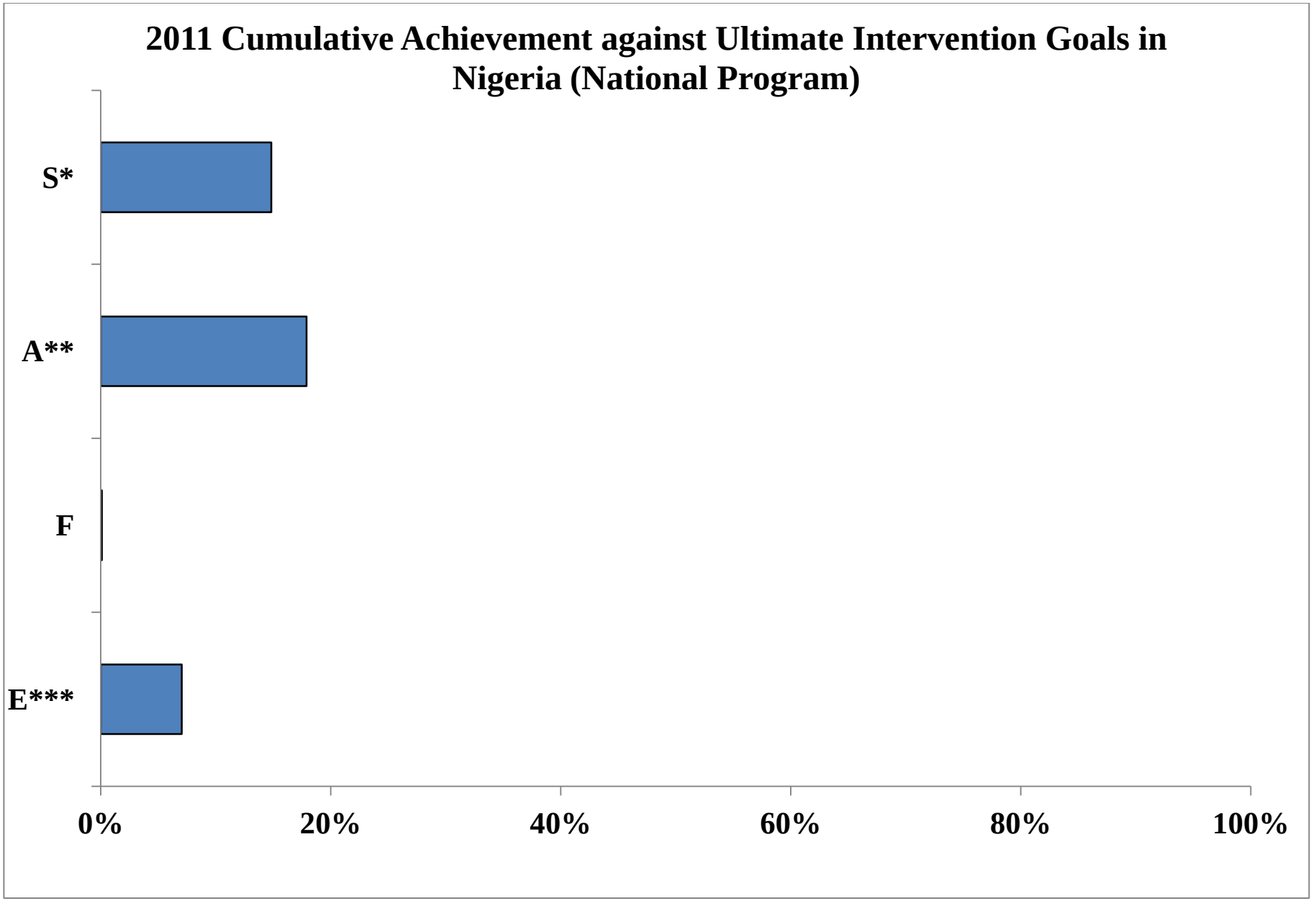


All data are current as of December 2011.

Nigeria

Intervention	National Achievements	UIG	Percentage of UIG Achieved by National Program
Surgery	87,604	590,149	15%
Antibiotic Distribution	2,648,644	14,798,205	18%
Facial Cleanliness (Villages)	1,425	1,404,378	0%
Environmental Change (Latrines)	45,395	643,231	7%

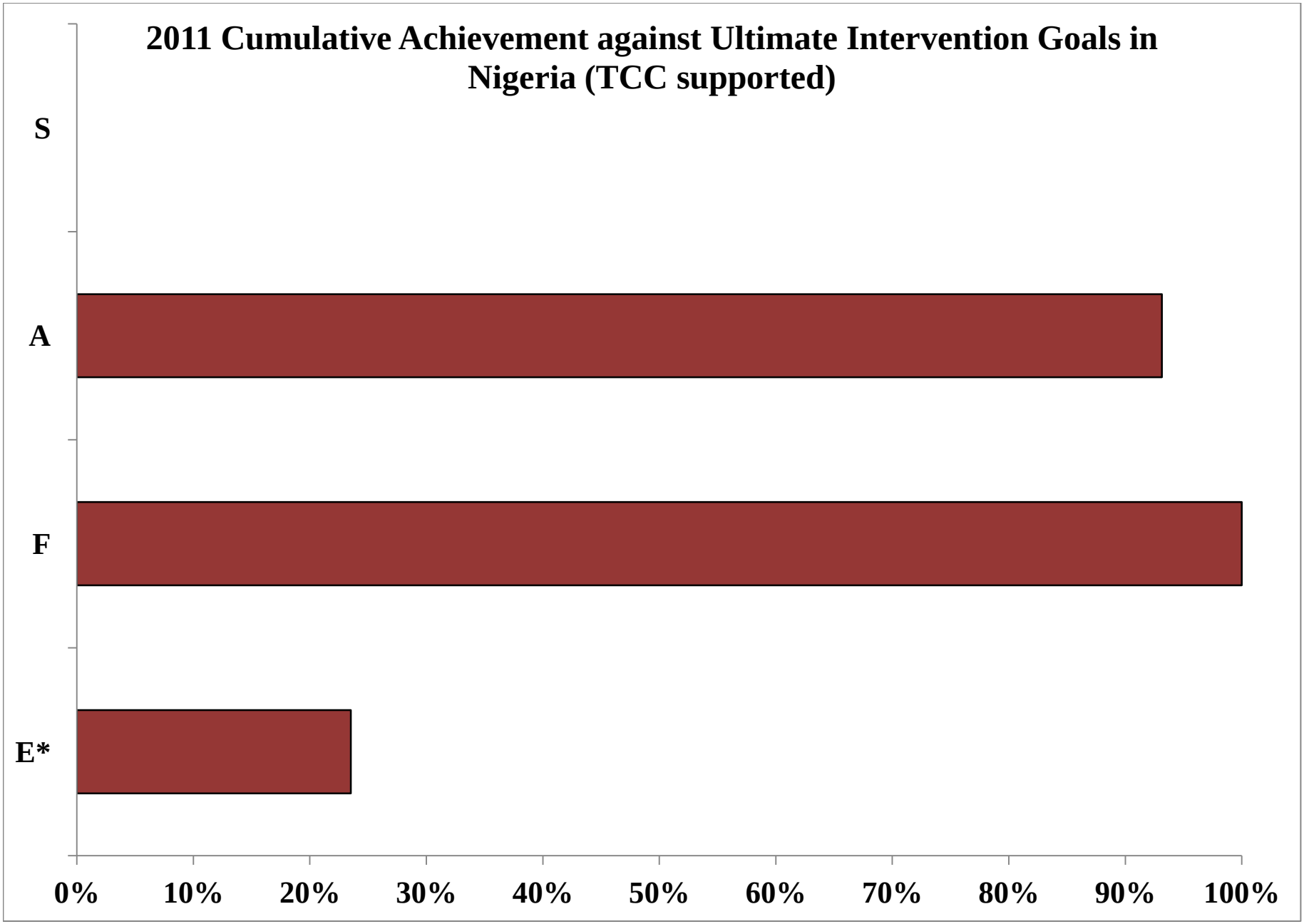
Intervention	TCC-Supported Achievements	UIG	Percentage of UIG Achieved with TCC Support
Surgery	126	N/R	N/A
Antibiotic Distribution	993,952	1,067,245	N/A
Facial Cleanliness (Villages)	855	855	100%
Environmental Change (Latrines)	12,081	51,376	24%



*Based only on districts with previous survey data.

**The denominator is based on surveyed districts where TF>10%.

***Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).



*Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).

Sudan Trachoma Control Program

Presented by Dr. Awad Hassan, Trachoma Control Program, Federal Ministry of Health, Sudan

Background

Sudan formally became two countries in July 2011 following a national referendum in January 2011 when the South Sudanese voted to secede from Sudan. The newly formed Sudan includes 15 states with a population of over 30.8 million people.

The Government of Sudan established the Prevention of Blindness Administration under the Federal Ministry of Health (FMOH) in 1962. The FMOH scaled back trachoma control activities in the late 1970's based on the belief that trachoma was no longer a public health problem. Anecdotal evidence that trachoma and trichiasis continued to be a problem was not confirmed until The Carter Center began to assist the FMOH in conducting prevalence surveys in May 1999. The survey results supported the notion that trachoma persisted as a cause of severe disability and significant blindness.

Pfizer Inc began donating Zithromax® to the FMOH in August 2000 through the International Trachoma Initiative. In March 2005 the Trachoma Control Program became part of the National Program for the Prevention of Blindness. That same year, the program started to decentralize trachoma control activities to the state ministries of health and localities. In June 2005, The Carter Center Khartoum supported the inauguration of Sudan's first Lions Club which has since become quiescent.

In 2006, The Carter Center assisted Sudan's Trachoma Control Program to map trachoma at district level. Mapping was completed in 2010, with the exception of the three Darfur states that remain inaccessible due to insecurity. Of the 139 districts in Sudan, 50 districts have a trichiasis prevalence greater than the WHO elimination of blinding trachoma threshold of 1 case per 1,000 population; 12 districts have a prevalence of trachoma inflammation follicular (TF) greater than the elimination threshold of less than 5%; three of these districts have a TF prevalence greater than 10%. Due to security reasons, mapping has not been completed in Darfur, and therefore, the endemicity of the 47 districts in that region is unknown.

The Carter Center assists with the implementation of the SAFE strategy with funding from the John P. Hussman Foundation, Sightsavers, and the Federal Ministry of Health, Sudan.

Timeline of Events

- 2000: Zithromax® donation by Pfizer Inc began
- 2005: National Trachoma Program moved to the FMOH
- April 2005: Baseline prevalence surveys started
- 2006: Community participation protocol developed
- 2006: TT surgery manual locally adapted for training in Arabic; primary eye care manual modified to include the WHO simplified grading system for trachoma; survey protocol developed
- 2010: Prevalence survey mapping completed (except for three Darfur states)
- 2010: Government pledged US $1 million to support River Blindness and Trachoma programs
- 2011: National prevalence data published in *PLoS NTDs* (Hassan *et al.* in Appendix II)
- 2015: Target date for the elimination of blinding trachoma in Sudan

Table 1. Program achievements in 2011

Indicator	National Program Targets	National Program Output	Carter Center Targets	Carter Center Output
Persons operated on for TT	5,000	1,254	5,000	358
Trichiasis surgeons trained	5,000	30	0	20
Doses of azithromycin distributed	442,931	396,781	442,931	396,781
Doses of tetracycline distributed	14,039	358	14,039	358
Villages reached with health education	260	378	260	378

Surgery
Fifty districts in Sudan have a trichiasis prevalence higher than the WHO elimination of blinding trachoma threshold (0.1%). As of December 2011, an estimated 48,776 cases remain to reach the ultimate intervention goal. All of these districts have at least one active surgeon.

Unlike most countries which utilize Integrated Eye Care Workers for TT surgery provision, only ophthalmologists and ophthalmologic residents conduct trichiasis surgery in Sudan. Service is delivered through both routine static service and outreach campaigns. Thirty surgeons were trained during 2011, bringing the total number of surgeons in Sudan to 150. The FMOH strengthened the capacity of the National Program through the donation of a truck that includes two surgical operating theaters.

A total of 1,254 trichiasis patients were operated in 2011, with The Carter Center supporting 358 of these surgeries. The Carter Center supports outreach campaigns and pays the surgical fees of patients who cannot afford surgery at the Khartoum Eye Centre. Surgeries provided through outreach campaigns are free while patients receiving surgery at a hospital are charged a fee based on sliding scale. All surgical patients receive a dose of azithromycin and a tube of tetracycline eye ointment following surgery to prevent post-operative infection. Starting in 2012, the National Program proposes to offer high quality forceps, counseling and training to enhance epilation for elderly patients with one or two peripheral lashes and patients with minor trichiasis who choose not to be operated.

Antibiotic Therapy
Surveys conducted in 2009 and 2010 show that three districts still have a TF prevalence ≥10% and are therefore eligible for the full SAFE strategy including MDA. These districts are East Galabat in Gedarif state and Gaissan and Kurmuk in Blue Nile state. Mass drug administration in 2011 distributed of 396,781 doses of azithromycin and 358 doses of tetracycline with 87.0-93.6% population coverage. The three states of Darfur, with a population of 7,515,445, have not been surveyed in over 25 years; 2,251,313 people live in districts that were endemic in the 1960's and are still suspected endemic. The future antibiotic distribution plans anticipate expansion from a target population of 451,970 to cover all eligible districts if surveys can be undertaken in Darfur and new districts identified.

The National Program has written a plan to manage the nine districts with TF prevalence between 5-9%. These localities have been randomized to one of two arms: one arm received a single locality-wide drug distribution and impact assessment after one year; the second, the WHO recommended strategy of population-based surveys powered at the sub-district followed by treatment of sub-districts with 10% or greater TF. If successful, a single round of MDA will save time, drugs, and resources while accelerating the progress towards the elimination of blinding trachoma.

Facial Cleanliness
The Carter Center supported ongoing health education in 378 villages and trained a total of 695 people to give health education at the village level. Health education occurs both on an ongoing basis and during mass drug administration campaigns. Drug administration campaigns use television and radio messages to disseminate information about trachoma and the surgical services offered. Village and school-based health education campaigns, posters, stickers, and loud speakers are all used to educate villagers about trachoma control and trichiasis surgery.

A media habits survey was conducted in East Galabat in 2011 to assess the most effective ways to disseminate information about trachoma. It found that literacy and radio ownership were high and that radio messages, posters, stickers, signboards, and direct information by elders were most effective in reaching large numbers of people. DVD shows in TV clubs were not as effective because the distance to travel to reach the club and lack of money prevented many from accessing the health education.

Environmental Improvement
The Sudan trachoma control program does not directly support the construction of household latrines. The three districts with greater than 10% TF have been made priorities for water and sanitation promotion by the UNICEF country office. Health education covers all aspect of SAFE including the importance of improved sanitation.

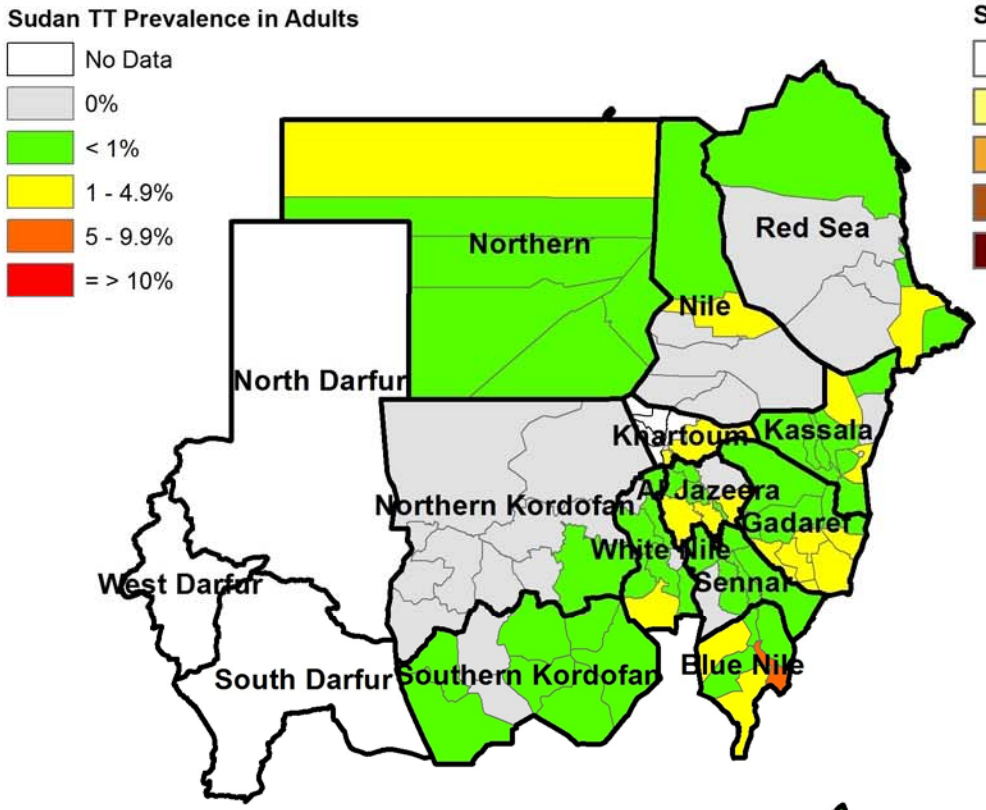
Targets for 2012

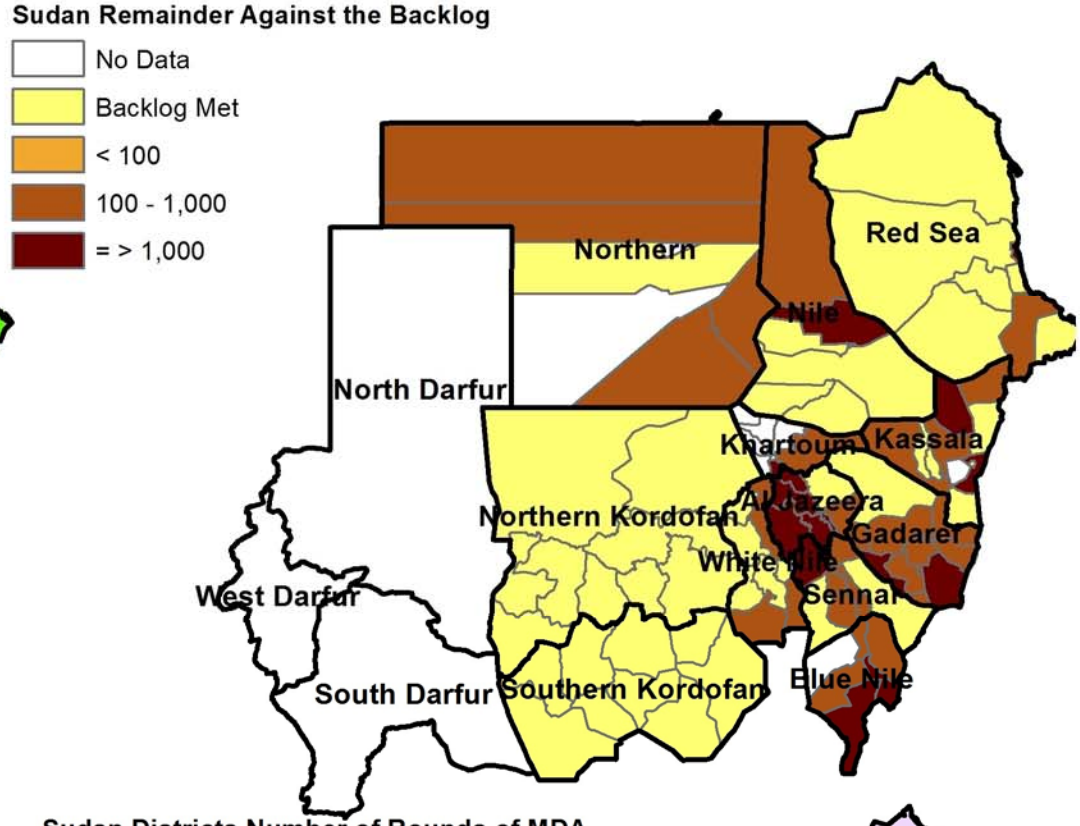
Surgery (S)
- Operate 5,000 trichiasis patients, 3,000 with Carter Center support
- Train 20 surgeons

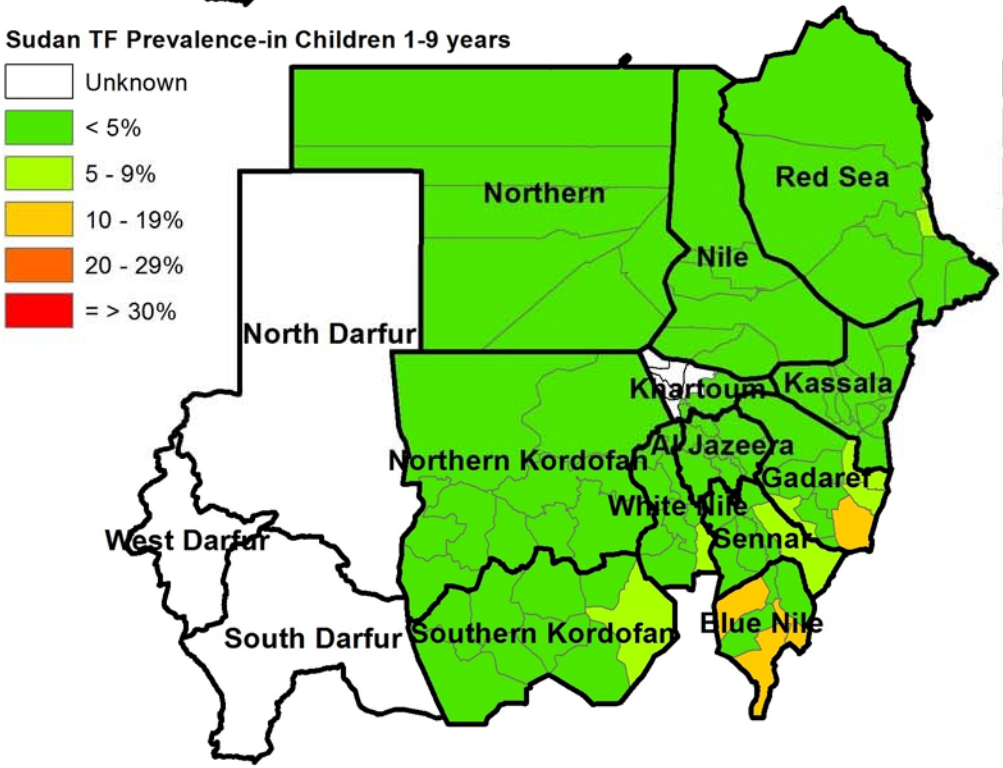
Antibiotic Therapy (A)
- Distribute 1,100,192 doses of azithromycin, 1,100,192 doses with Carter Center support
- Distribute 99,017 doses of tetracycline, all with Carter Center support

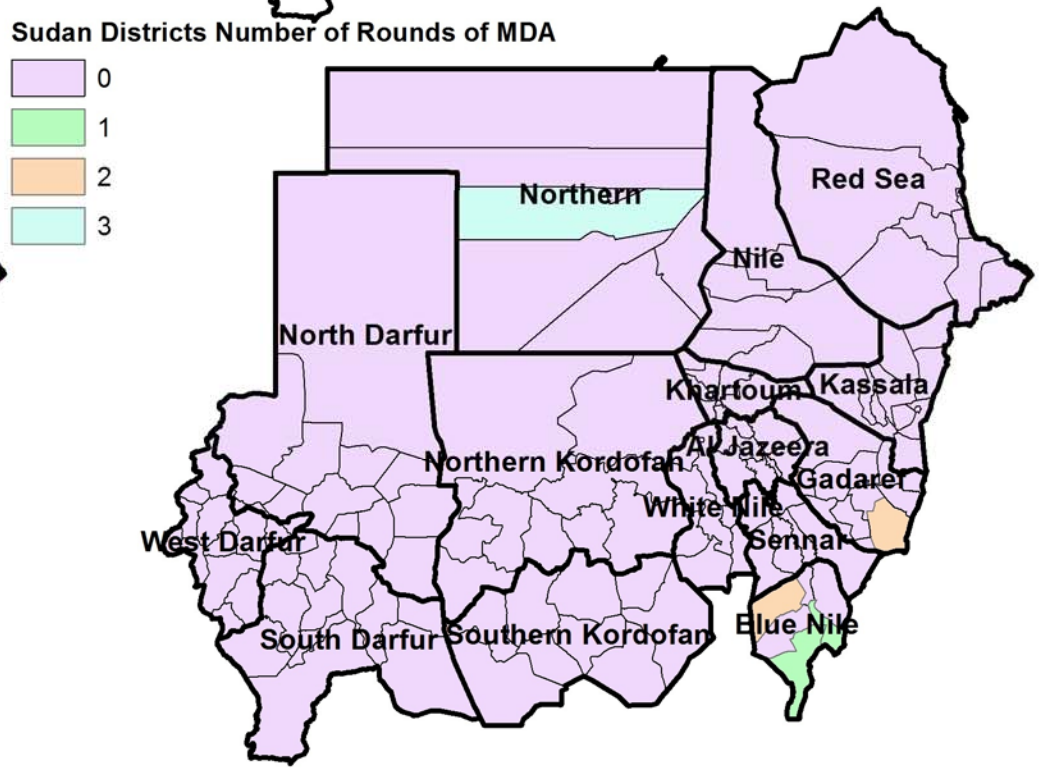
Facial Cleanliness
- Conduct health education in 260 villages, all with Carter Center support

Environmental Improvement (E)
- Continue to collaborate with local partners and the Ministry of Water and Environmental Sanitation to promote household latrine construction.







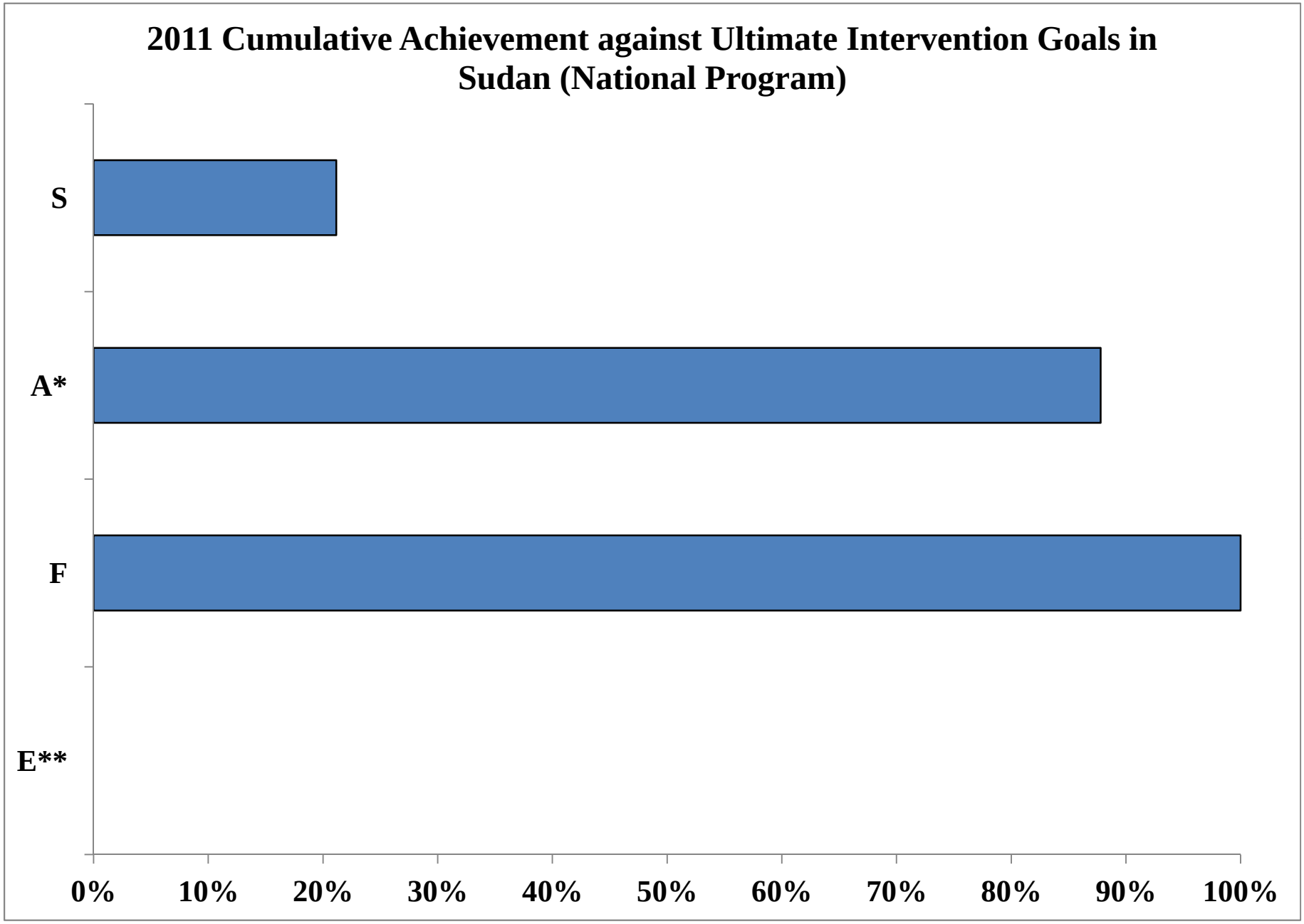


All data are current as of December 2011.

Sudan

Intervention	National Achievements	UIG	Percentage of UIG Achieved by National Program
Surgery	13,097	61,873	21%
Antibiotic Distribution	396,781	451,970	88%
Facial Cleanliness (Villages)	N/R	N/R	N/R
Environmental Change (Latrines)	N/R	N/R	N/R

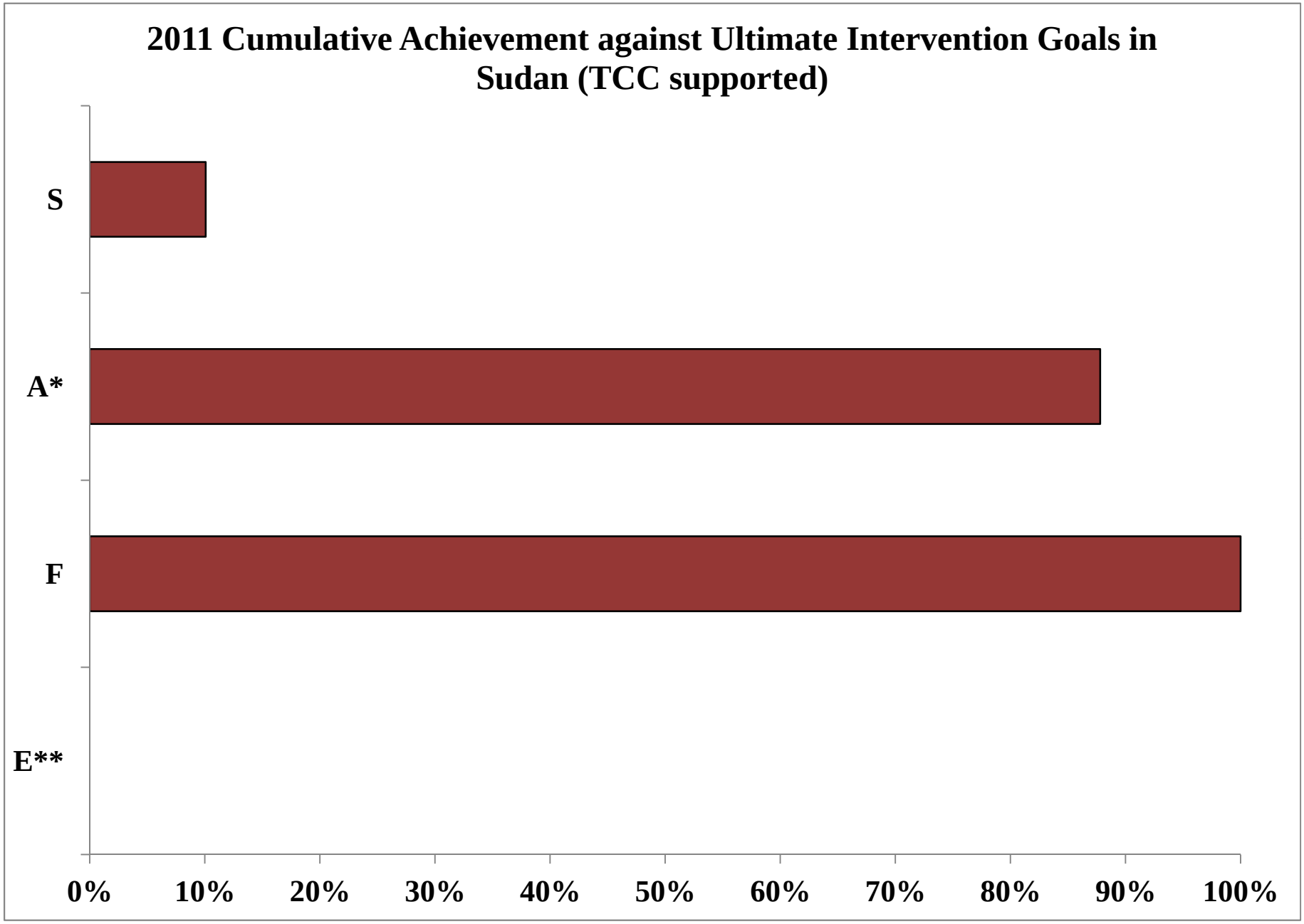
Intervention	TCC-Supported Achievements	UIG	Percentage of UIG Achieved with TCC Support
Surgery	5,463	54,239	10%
Antibiotic Distribution	396,781	451,970	88%
Facial Cleanliness (Villages)	N/R	N/R	N/A
Environmental Change (Latrines)	N/R	N/R	N/R



*The denominator is based on districts where TF>5%.

**Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).

NB: Targets and interventions do not include the three states of Darfur.



*The denominator is based on districts where TF>5%.

**Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).

South Sudan Trachoma Control Program

Presented by Dr. Lucia Kur, Trachoma Control Program, Ministry of Health, Republic of South Sudan

Background

Sudan formally became two countries in July 2011 following a referendum in January 2011 when the South Sudanese voted to secede from Sudan. The newly formed Republic of South Sudan includes 10 states with a population of over 8.3 million people.

Operation Lifeline Sudan (OLS) conducted trachoma control activities in Southern Sudan between 1989 and 2005. OLS was a consortium of United Nations agencies and more than 40 non-governmental organizations that gave humanitarian aid during times of the civil war. In 2000, The Carter Center began assisting some OLS-supported areas to implement the SAFE strategy in collaboration with other non-governmental organizations. In the same year, the International Trachoma Initiative sent Pfizer-donated Zithromax® to support the mass drug-administration campaigns. The Carter Center coordinated activities from Nairobi with assistance from partner NGOs and humanitarian agencies in South Sudan.

In 2001, The Carter Center conducted prevalence surveys in four payams (sub-districts) and three additional payams in 2002. These surveys showed extraordinary prevalence of TF as high as 77.2% in children 1-9 years old and TT prevalence as high as 15.1% among adults 15 years and older. The Comprehensive Peace Agreement (CPA) in 2005 ended the 21-year civil war and established Sudan as one country under two governments: the Government of Sudan which included the northern 15 states and the Government of Southern Sudan including the 10 southern states. The Carter Center office moved from Nairobi, Kenya to Juba soon after the signing of the CPA.

Out of 79 counties (districts), 25 exceed the WHO elimination target of 1 trichiasis case per 1,000 population and 22 exceed the TF elimination of less than 5% prevalence among children 1-9 years old. South Sudan has five counties that are suspected endemic and 48 of unknown endemicity. Mapping the 53 counties with suspect/unknown endemicity is prioritized for 2013 and 2014.

The Carter Center assists with the implementation of the full SAFE strategy in Eastern Equatoria and Jonglei states with funding from the Conrad N. Hilton Foundation.

Timeline of Events

- 2001: Trachoma control activities began
- January 2005: Comprehensive Peace Agreement signed
- 2006: Ministry of Health, Government of Southern Sudan established
- 2007: MOH GOSS Trachoma Control Program established
- 2008: First Annual Trachoma Control Program Review was held; trachoma task force established
- 2009: Second Annual Trachoma Control Program Review held
- 2011: Referendum on self-determination
- 2020: Target date for the elimination of blinding trachoma in South Sudan

Table 1. Program achievements in 2011

Indicator	National Program Targets	National Program Output	Carter Center Targets	Carter Center Output
Persons operated on for TT	6,500	2,369	3,000	761
Trichiasis surgeons trained	26	7	6	0
Doses of azithromycin distributed	858,800	291,704	618,000	257,419
Doses of tetracycline distributed	75,500	10,865	13,000	10,065
Villages reached with health education	5,201	114	3,226	65
Household latrines built	330	393	0	0

Surgery

South Sudan has 23 counties with known TT prevalence greater than 1% in adults 15 years or older. This number is likely much higher, since 53 out of the 79 counties have not been surveyed. Surgery is conducted through static and outreach service. Routine and campaign surgeries were carried out in 10 counties in 2011. The Ministry of Health reports 118,894 cases remaining to be operated to reach the ultimate intervention goal. The Carter Center supports surgeries in Jonglei and East Equatoria states; CMA supports surgeries in Upper Nile and Jonglei; Sightsavers supports surgery in Upper Nile; and CBM supports surgery in Unity. The MOH estimates that its program will need 12 full-time trichiasis surgeons to reach the elimination target of 1 known case per 1,000 persons. As of 2011, an estimated 118,812 cases remain to be operated. The national program plans to operate 5,150 trichiasis cases in 2012.

Health education is conducted during community mobilization for surgical outreach campaigns. Health education includes showing videos in local languages about trachoma in order to educate the community and mobilize trichiasis patients to come for surgery.

Antibiotic Therapy

The Carter Center and Sightsavers International are the primary partners assisting the distribution of azithromycin and tetracycline in South Sudan. The National program distributed a total of 291,704 doses of azithromycin in eight counties during 2011. The national program reports distributing 2,423,077 doses since 2001. This service is vital as South Sudan is the country with the highest known prevalence of trichiasis worldwide, and poor infrastructure and a widely distributed population present barriers to mass drug administration.

Facial Cleanliness and Environmental Improvement

The Carter Center and CMA support health education and facial cleanliness. In 2011, 114 villages received ongoing health education. Community and school-based health education is conducted using flipcharts that illustrate the cause, transmission, and methods of control used to eliminate blinding trachoma. The flipchart also illustrates how trachoma can lead to trichiasis and the value of trichiasis surgery in alleviating pain and preventing further damage to the eye. The national program constructed 393 latrines with CMA support in 2011. The national program plans to complete the epidemiological map of trachoma by the end of 2013, scale-up mass drug administration efforts and scale-up health education efforts in endemic counties in order further the elimination of trachoma from South Sudan.

Targets for 2012

Prepare and have endorsed a trachoma action plan from 2012-2020

Surgery (S)

- Operate 5,150 trichiasis patients, 750 with Carter Center support
- Train 11 surgeons

Antibiotic Therapy (A)

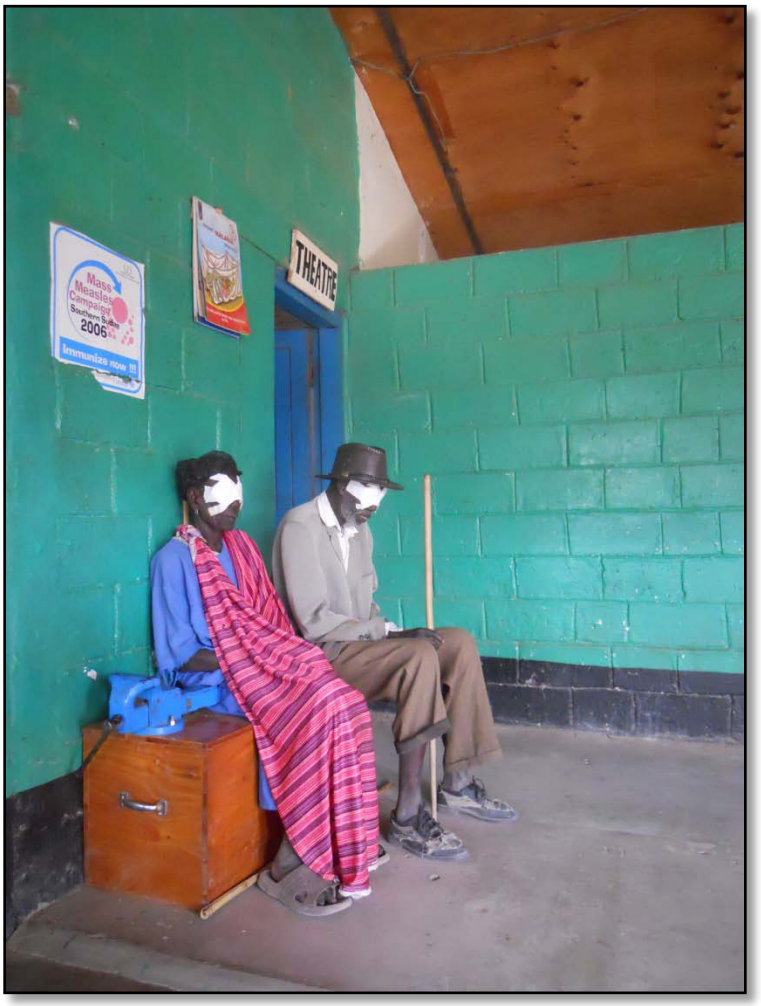
- Distribute 501,000 doses of azithromycin, 363,580 doses with Carter Center support
- Distribute 10,020 doses of tetracycline, 7,420 with Carter Center support

Facial Cleanliness

- Conduct health education in 114 villages, 104 with Carter Center support

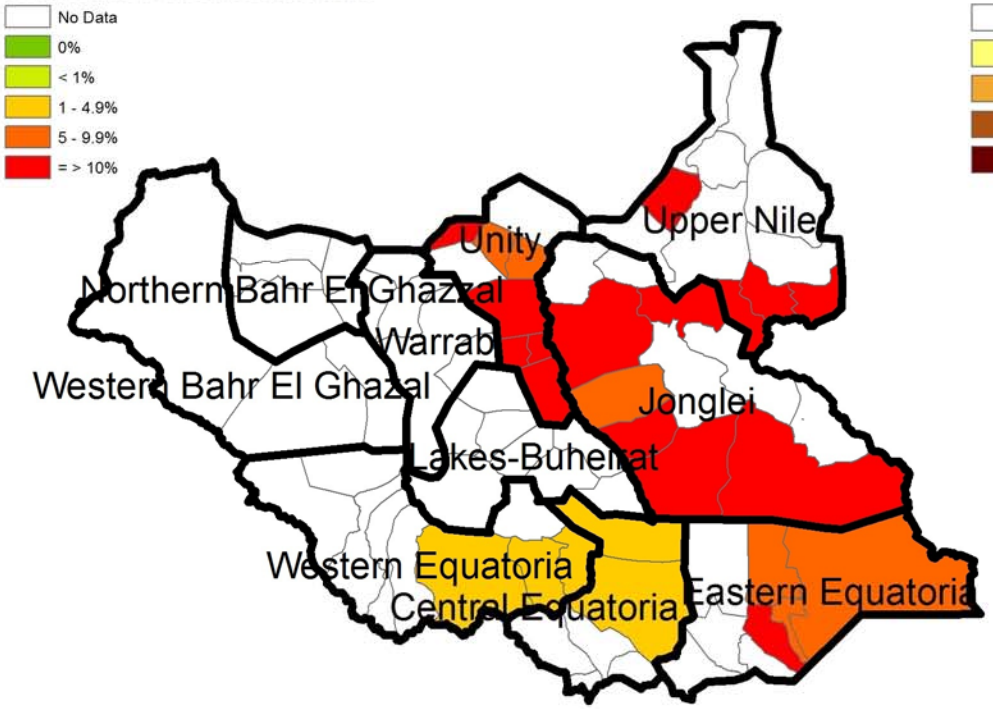
Environmental Improvement (E)

- Construct 300 latrines

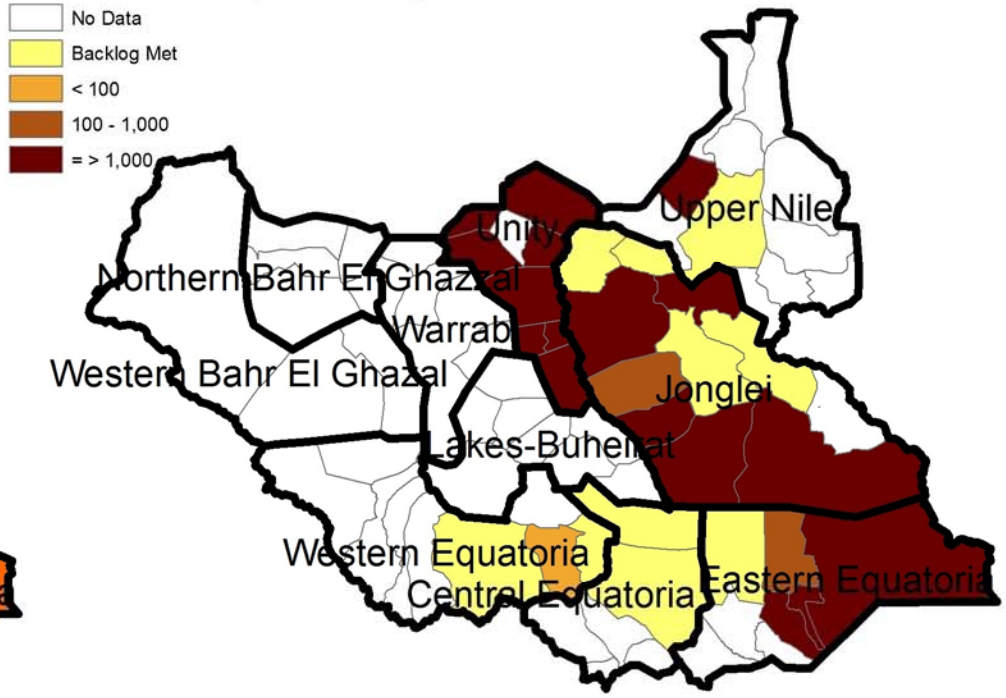


Trichiasis patients wait for a trichiasis surgeon to remove the bandages from their eyes.

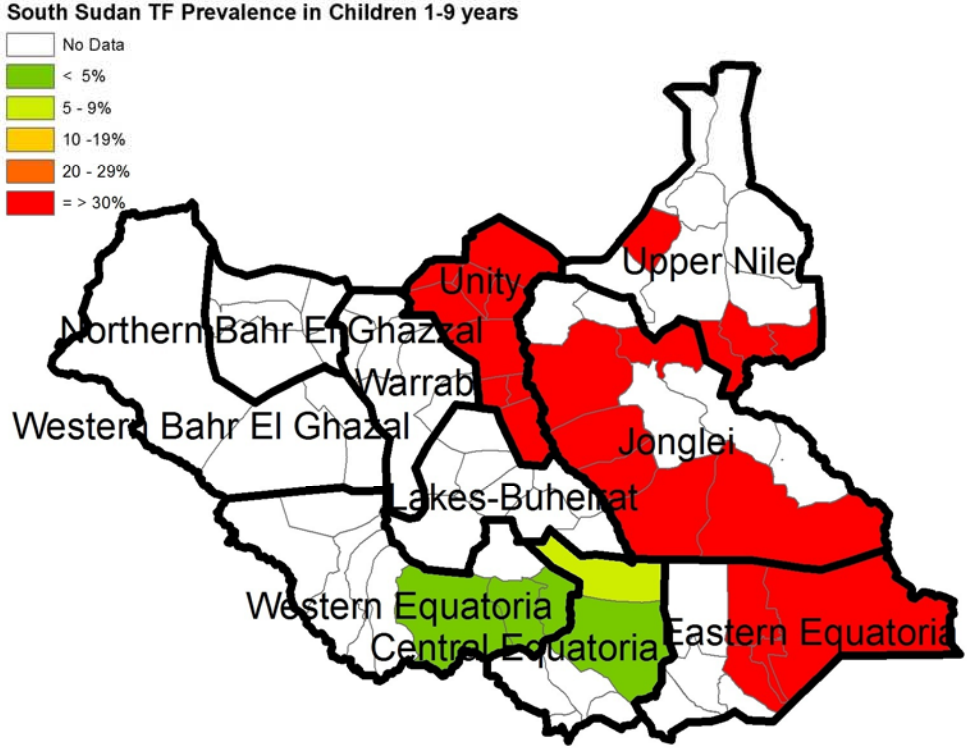
South Sudan TT Prevalence in Adults



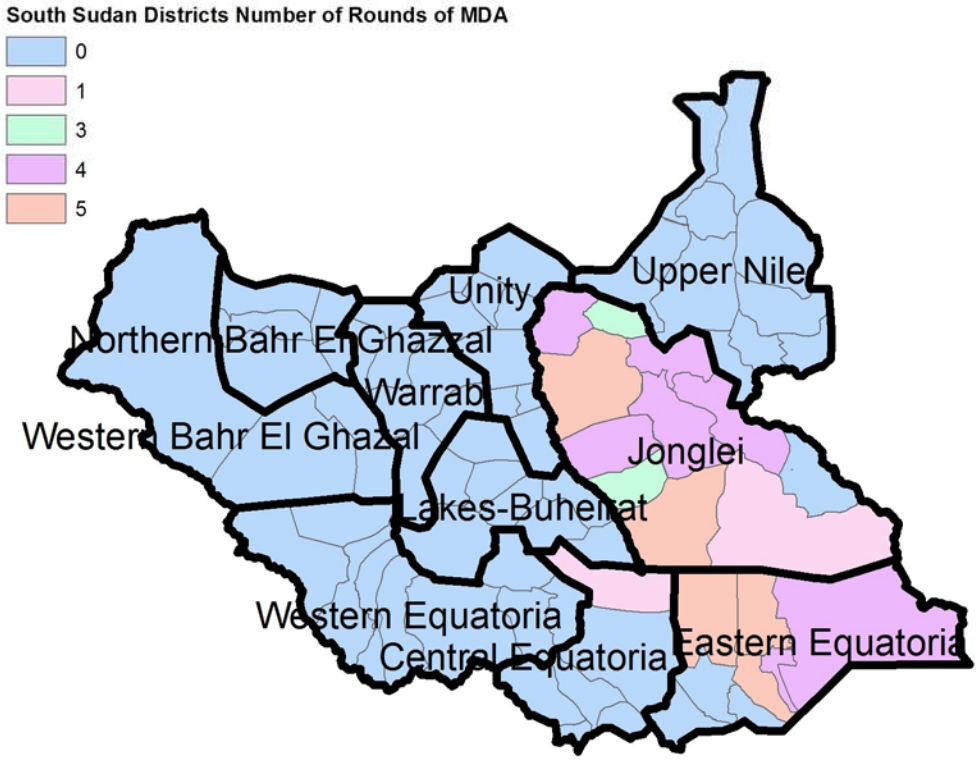
South Sudan Remainder Against the Backlog



South Sudan TF Prevalence in Children 1-9 years



South Sudan Districts Number of Rounds of MDA

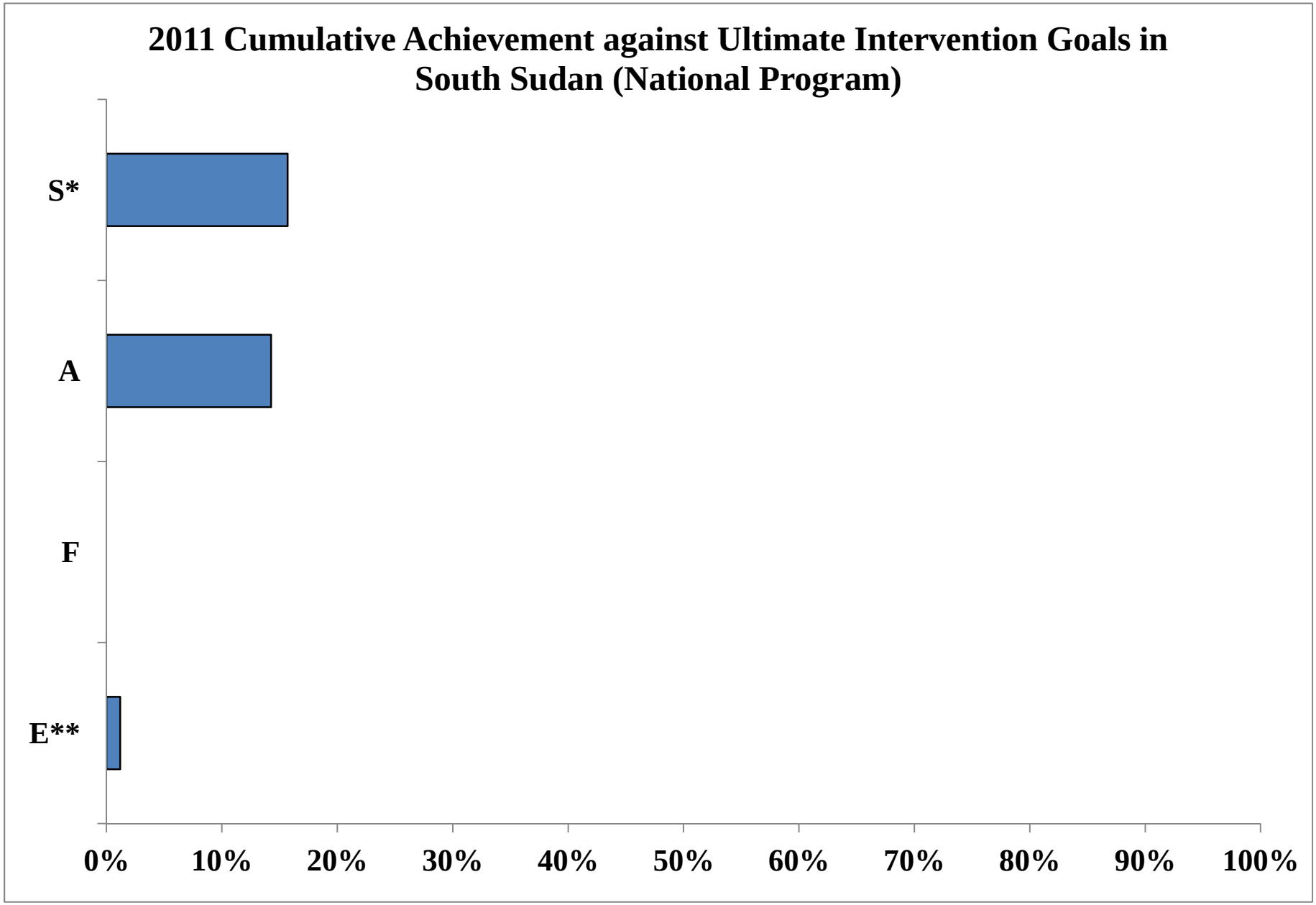


All data are current as of December 2011.

South Sudan

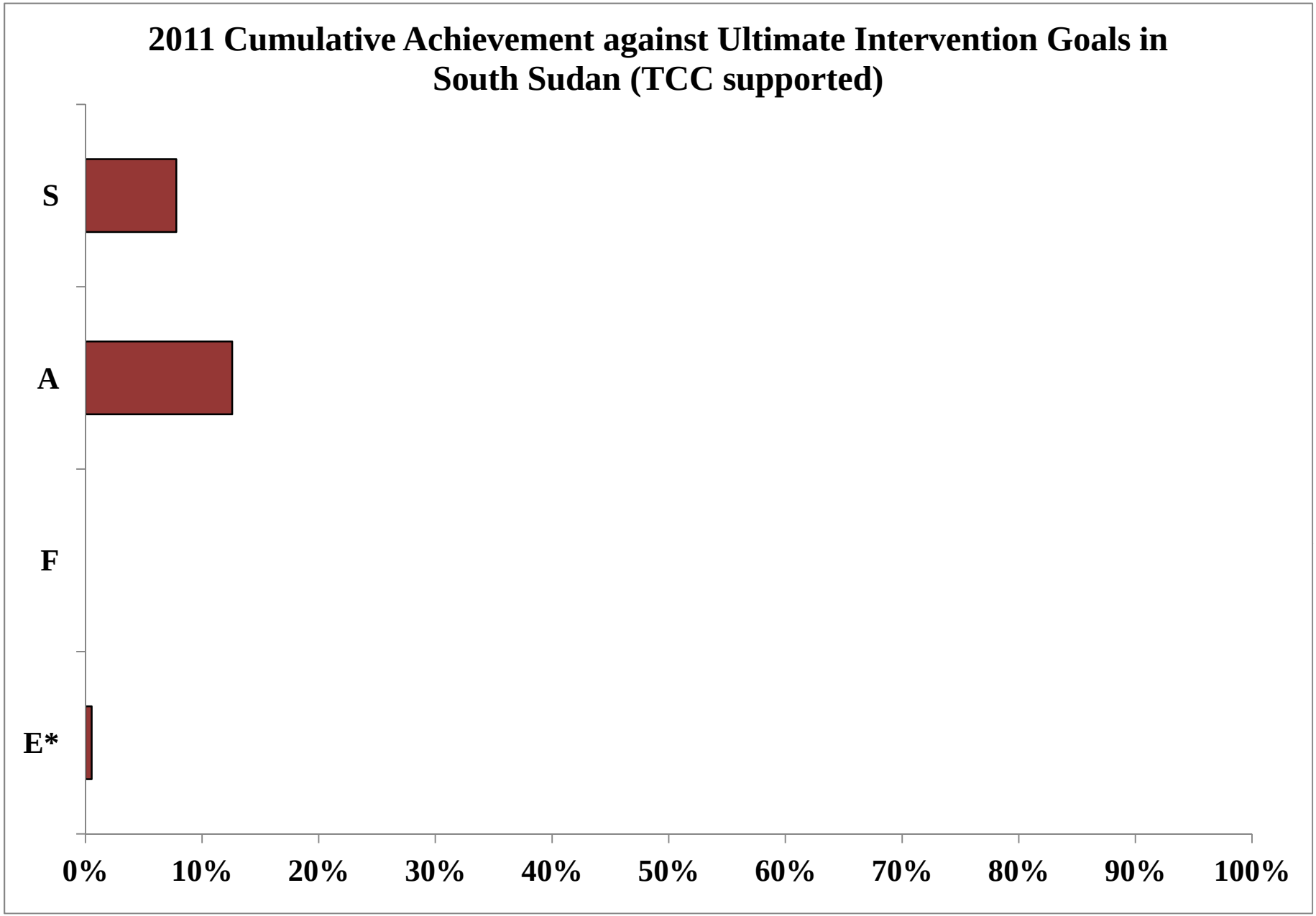
Intervention	National Achievements	UIG	Percentage of UIG Achieved by National Program
Surgery	22,129	141,023	16%
Antibiotic Distribution	291,704	2,046,545	14%
Facial Cleanliness (Villages)	N/R	N/R	N/R
Environmental Change (Latrines)	2,936	N/R	N/R

Intervention	TCC-Supported Achievements	UIG	Percentage of UIG Achieved with TCC Support
Surgery	10,053	128,947	8%
Antibiotic Distribution	257,419	2,046,545	13%
Facial Cleanliness (Villages)	N/R	N/R	N/R
Environmental Change (Latrines)	128	N/R	N/R



*Based on UIG estimated only in surveyed areas.

**Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).



*Target is to halve the proportion of the population without access to a latrine by 2015 (MDG 7c).

Table 1. Summary of National Data from Trachoma Control Program Interventions (Carter Center-Assisted Countries)

National Data as Reported for 2011 at the Thirteenth Annual Program Review, Atlanta, Georgia, February 27-29, 2012

	Mali	Niger	Sudan	South Sudan	Ethiopia-Amhara	Ethiopia* National	Nigeria	Total**
Surgery (S)								
Surgeries	8,510	8,050	1,254	2,369	39,076	66,409	13,601	**100,193**
2011 Target	7,900	11,244	5,000	6,500	70,441	140,059	4,500	**175,203**
Percent Coverage	107.7%	71.6%	25.1%	36.4%	55.5%	47.4%	302.2%	**57.2%**
Antibiotics (A)								
Azithromycin								
Doses	960,000	4,295,092	396,781	291,704	14,830,000	17,239,334	3,642,596	**26,825,507**
2011 Target	2,033,326	5,561,942	442,931	858,800	16,696,381	22,000,000	3,175,392	**34,072,391**
Percent Coverage	47.2%	77.2%	89.6%	34.0%	88.8%	78.4%	114.7%	**78.7%**
Tetracycline								
Doses	20,356	86,108	358	10,865	401,371	192,783	N/R	**310,470**
2011 Target	40,667	113,510	14,039	75,500	390,742	480,000	120,000	**843,716**
Percent Coverage	50.1%	75.9%	2.6%	14.4%	N/A	40.2%	N/R	**36.8%**
Facial Cleanliness and Health Education (F)								
Villages with Health Education	2,490	634	378	114	3,427	N/R	1,425	**8,468**
2011 Target	5,000	634	260	5,201	3,427	N/R	13,240	**27,762**
Percent Coverage	49.8%	100.0%	145.4%	2.2%	100.0%	N/R	10.8%	**30.5%**
Environmental Improvements (E)								
Latrines	11,093	19,437	N/R	393	284,423	14,993,248	N/R	**15,024,171**
2011 Target	15,000	15,000	N/R	330	727,880	14,730,588	N/R	**14,760,918**
Percent Coverage	74.0%	129.6%	N/R	119.1%	39.1%	101.8%	N/R	**101.8%**

N/R=Not Reported

*Not all regions reporting.

**Total does not include Ethiopia-Amhara, which is counted in Ethiopia-National.

N.B. These are national level data from interventions supported by all partners, not exclusively supported by The Carter Center, with the exception of villages in Mali and Niger, which are Carter Center supported only.

Table 2. National Trachoma Control Program Annual Targets 2012 (Carter Center-Assisted Countries)

Targets as Presented at the Thirteenth Annual Program Review, Atlanta, Georgia, February 27-29, 2012 [§]

	Mali	Niger	Sudan	South Sudan	Ethiopia-National	Ethiopia-Amhara	Nigeria	Total*
Surgery								
Persons to operate for trichiasis	10,000	10,000	5,000	5,150	266,579	80,000	60,000	**356,729**
Antibiotic								
Doses of azithromycin to distribute†	876,899	7,357,703	1,100,192	501,000	30,000,000	17,119,035	6,911,908	**46,747,702**
Doses of tetracycline ointment to distribute	17,538	170,000	99,017	10,020	480,000	349,368	138,239	**914,814**
Facial cleanliness								
Villages to reach through health education	2,490	634	260	114	N/R	3,427	1,425	**8,350**
Environmental change								
Household latrines to construct	10,000	15,000	N/R	300	16,429,624	118,865	N/R	**16,454,924**

[§] *All targets are subject to change.*

N/R=Not reported.

**Total does not include Ethiopia-Amhara, which is counted in Ethiopia-National.*

†Antibiotic targets to not reflect ITI-approved allocations of Zithromax

Table 3. Carter Center-Assisted Implementation of SAFE

Summary of Interventions per Country, January - December 2011

	Indicators	Mali	Niger	Sudan	South Sudan	Ethiopia-Amhara	Nigeria	Total
S	Persons operated for trichiasis	5,393	6,610	358	761	39,076	100	**52,298**
	Target persons	6,000	7,000	5,000	3,000	70,441	0	**91,441**
	Percentage	89.9%	94.4%	7.2%	25.4%	55.5%	N/R	**57.2%**
A	Doses of azithromycin distributed	N/R*	2,060,000	396,781	257,419	14,830,000	993,952	**18,538,152**
	Target population	N/R	2,442,208	442,931	618,000	16,696,381	778,872	**20,978,392**
	Percentage	N/R	84.3%	89.6%	41.7%	88.8%	127.6%	**88.4%**
F	Villages with ongoing health education	2,490	634	378	65	3,427	855	**7,849**
E	Household latrines constructed	11,093	11,498	N/R**	N/R**	284,423	N/R**	**307,314**
	Target for latrines	12,000	15,000	N/R	N/R	727,880	N/R	**754,880**
	Percentage	92.4%	76.7%	N/R	N/R	39.1%	N/R	**40.7%**

**The Carter Center does not support the distribution of antibiotics in Mali.*

***The Carter Center advocates for but does not currently support the construction of household latrines in Sudan, South Sudan, or Nigeria.*

N/R=Not Reported.

Table 4. Carter Center-Assisted Implementation of SAFE

	Cumulative Interventions per Country, 1999-2011							
	Indicators	**Mali**	**Niger**	**Sudan**	**South Sudan**	**Ethiopia-Amhara**	**Nigeria**	**Total**
S	Persons operated for trichiasis	17,988	15,057	5,463	11,386	232,338	128	**282,360**
A	Doses of azithromycin distributed	N/A*	3,780,384	2,033,522	2,265,373	65,751,739	1,709,459	**75,540,477**
F	Villages with ongoing health education	2,490	634	664	3,574	3,428	855	**11,645**
E	Household latrines constructed	83,239	65,676	N/R**	571	2,146,603	31,979	**2,328,068**

**The Carter Center does not support the distribution of antibiotics in Mali.*

***The Carter Center advocates for but does not provide support for latrine construction in Sudan.*

N/R=Not Reported.

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

National program data as presented for January - December 2011

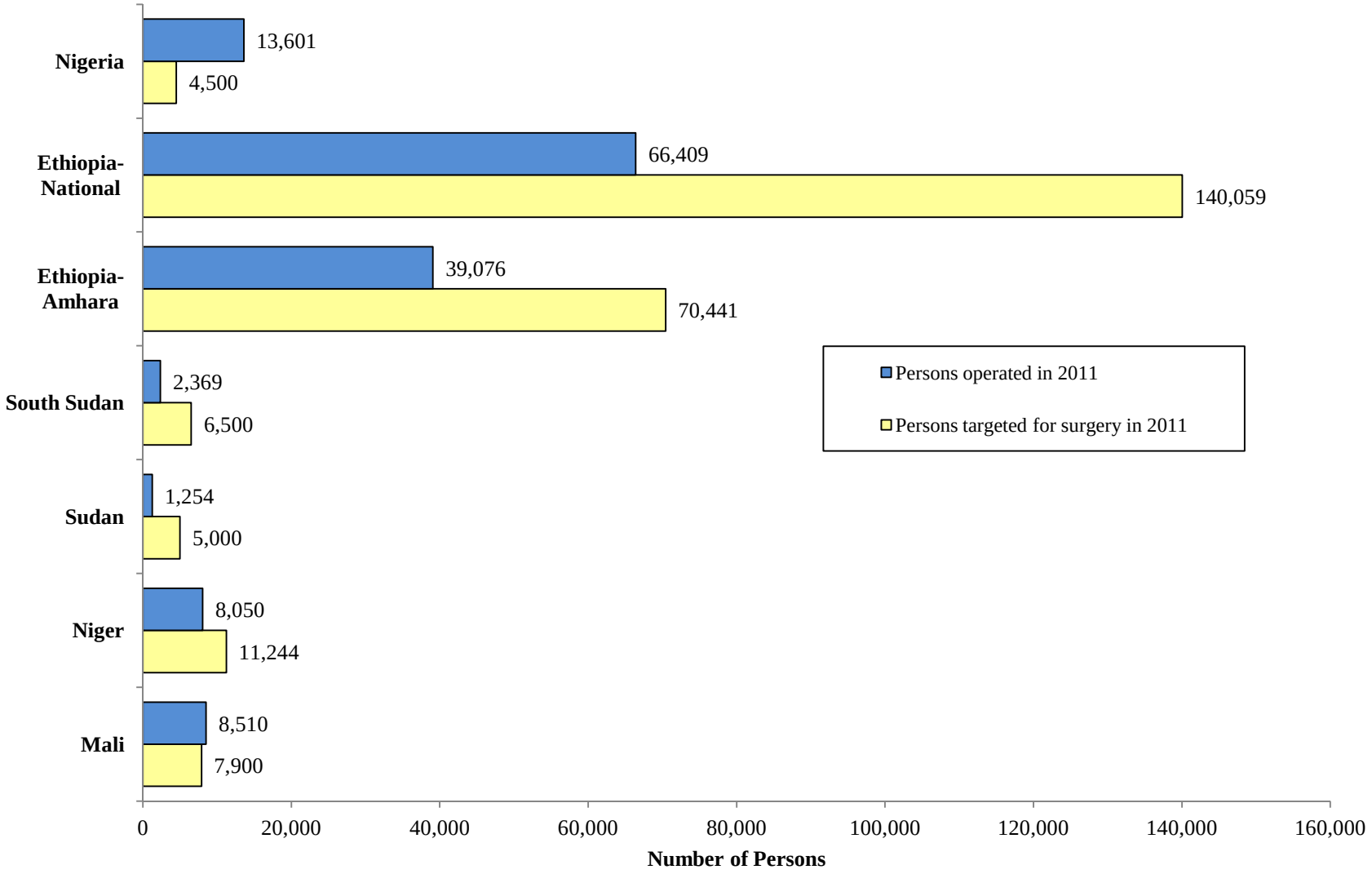


Figure 2. Azithromycin Distribution, Carter Center-Assisted Countries

National program data as presented for January - December 2011

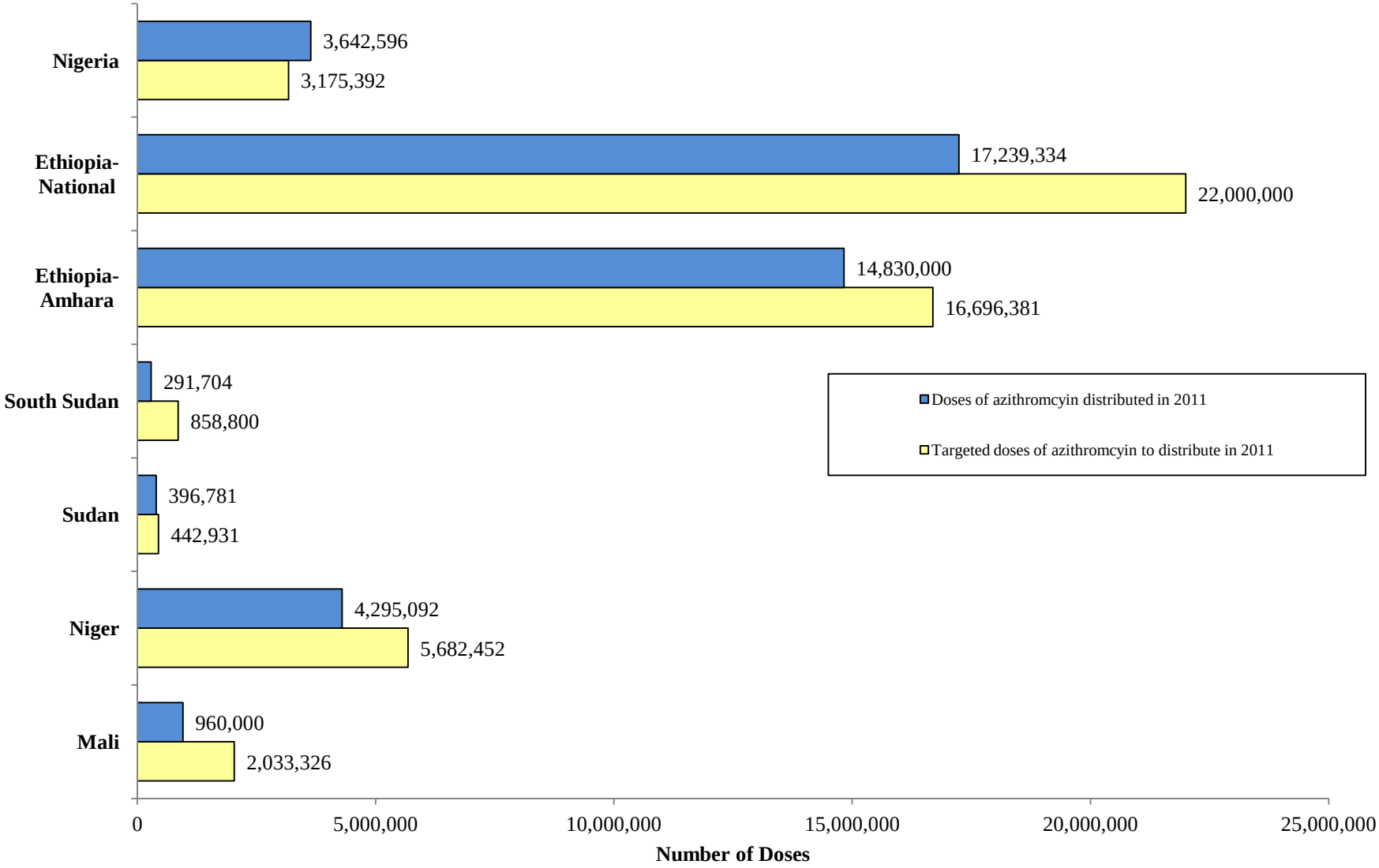
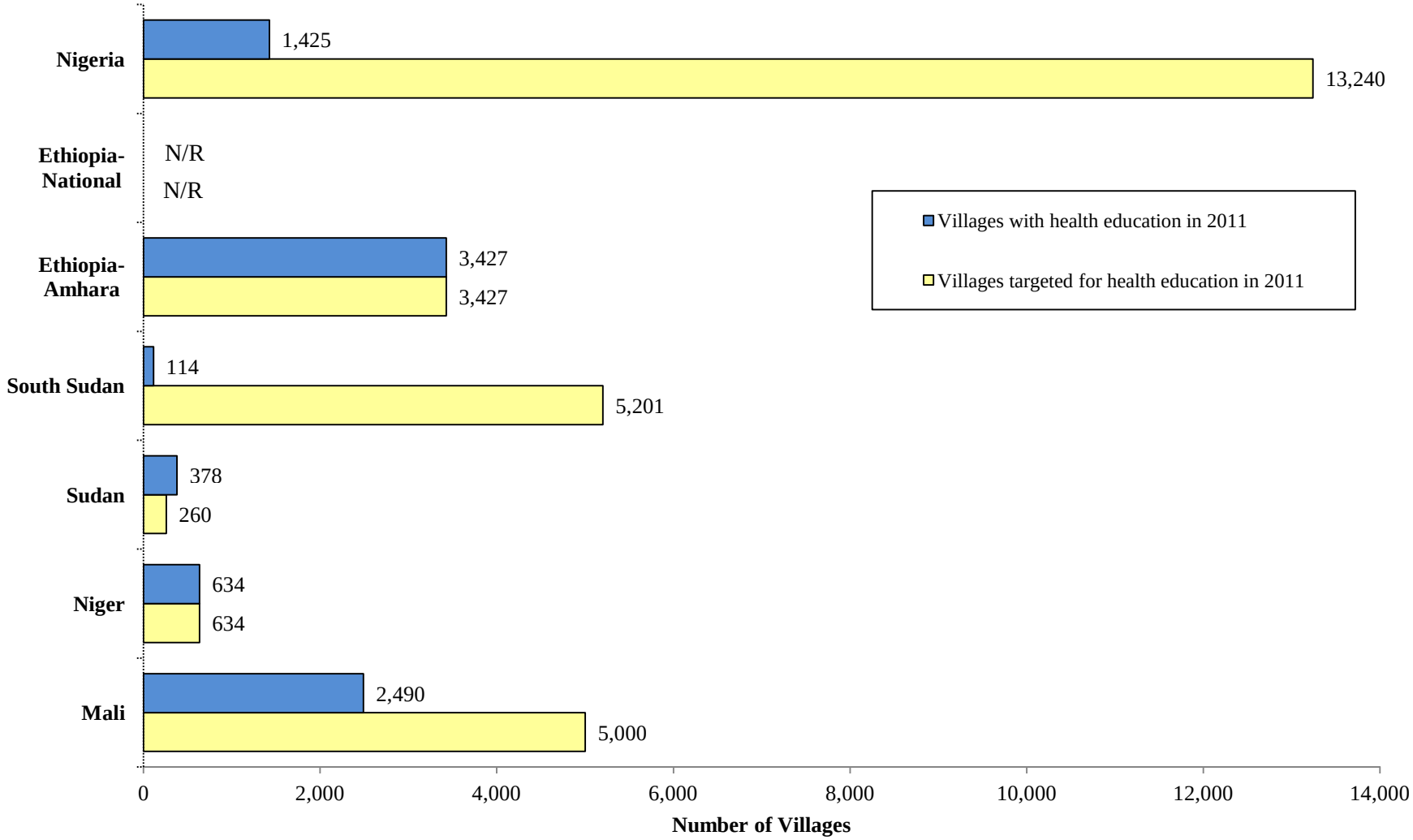


Figure 3. Villages with Health Education, Carter Center-Assisted Countries

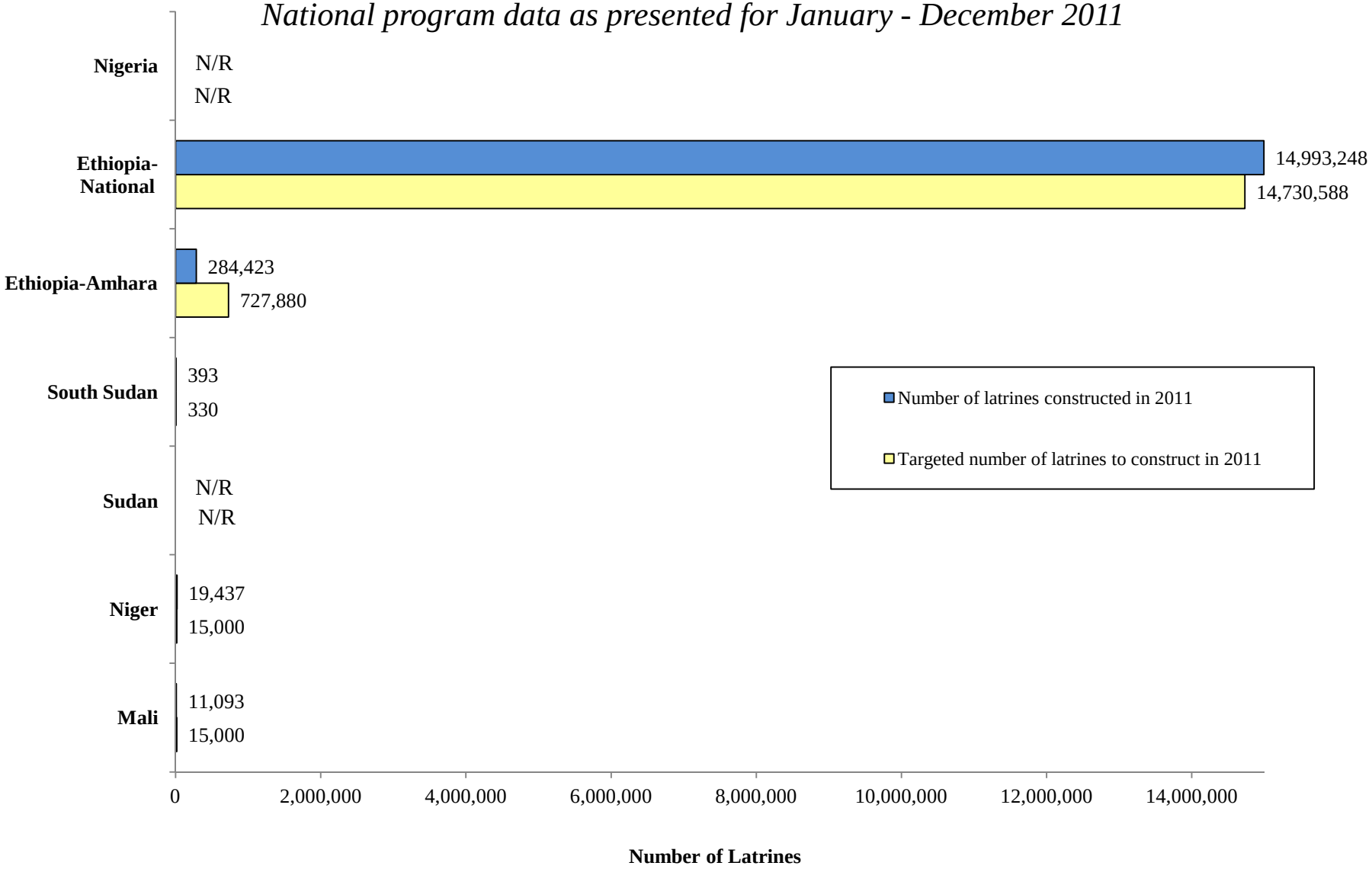
National program data as presented for January - December 2011



N/R=Not reported.

Figure 4. Household Latrines Constructed, Carter Center-Assisted Countries

National program data as presented for January - December 2011



N/R=Not reported.

Trachoma Impact Surveys: What are the Results Telling Us?

As Presented by Dr. Jeremiah Ngondi, The Carter Center

Introduction

Surveys of trachoma are important to quantify disease burden, facilitate estimation of ultimate intervention goals, monitor progress and inform programs when to stop. Proper surveys of trachoma are essential and will facilitate achieving the objectives of GET 2020.

Impact of SAFE in low prevalence settings

There is strong evidence that the surgery, antibiotics, facial cleanliness and environmental change (SAFE) strategy is effective in eliminating trachoma. In The Gambia, a study of 14 villages by Burton *et al*. showed that following a single round of mass antibiotics treatment, the mean prevalence of trachomatous inflammation-follicular (TF) in children aged 1-10 years declined from 15% to 4.5% at 30 months and remained below 10% at 60 months [1]. Programmatic implementation of SAFE in Ghana over a period of 7 years has demonstrated striking declines in the prevalence of TF below the 5% threshold indicating that mass drug administration (MDA) is no longer required [2].

Impact of SAFE in high prevalence settings: Amhara impact surveys

A number of impact surveys have been conducted in the Amhara region of Ethiopia in keeping with the World Health Organisation (WHO) guidelines. In 2007, a three-year evaluation was undertaken in five districts that had completed at least three rounds of MDA. The evaluation showed marked reduction in TF in children aged 1-9 years from a baseline of 65% to 38% (Figure 1). This evaluation also tested for ocular *Chlamydia* infection in a sub-sample of children aged 1-6 years and revealed a mean infection prevalence of 3.1%. In view of the high prevalence of TF, implementation of the full SAFE strategy was continued as per the WHO guidelines.

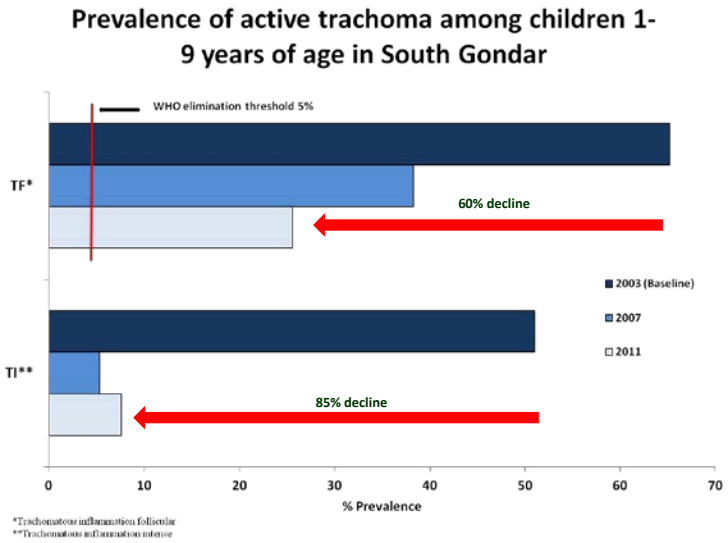
In 2010, new guidelines for trachoma impact surveys and antibiotics distribution were suggested by the 3rd Global Scientific Meeting on Trachoma (GSM 3). The new guidelines advocate for impact surveys at sub-district level to allow better decision-making for prioritising areas that need MDA. In keeping with the new guidelines, impact survey were undertaken in South Wollo zone (December 2010) after three years of SAFE (baseline prevalence of TF was <30%) and in South Gondar zone (July 2011) after five year of SAFE (baseline prevalence of TF was >30%).

In South Wollo, three-year impact surveys revealed that out of 36 sub-districts, two were below the 5% TF prevalence threshold for stopping MDA. Another two sub-districts had TF prevalence of 5-9.9% therefore targeted treatment with antibiotics was warranted. The rest of the S. Wollo sub-districts had TF prevalence of more than 10%. In South Gondar, five-year impact surveys in 36 sub-districts revealed that only one sub-district had TF prevalence of 5-9.9% while the rest had TF prevalence of more than10%. Therefore, with adherence to the new guidelines, these results imply that full SAFE implementation should be continued for another three years in districts where TF prevalence was 10-29% and for five years where TF prevalence was 30% of more. Notably, in three districts of South Gondar where a three-year evaluation had been undertaken the prevalence of TF was 28%, despite five years or more of SAFE (Figure 1).

Potential limitations of the WHO simplified grading system

During the Amhara impact surveys, rigorous training and validation of graders were undertaken and only examiners with a high inter-observer reliability for TF (kappa>0.6) were selected. However, despite having good inter-observer agreement, further analysis of these data showed varying specificity ranging from 78.1% to 90.6%. Therefore even among the best graders, it is plausible that a TF prevalence of 5% or more could be obtained by overcalling TF.

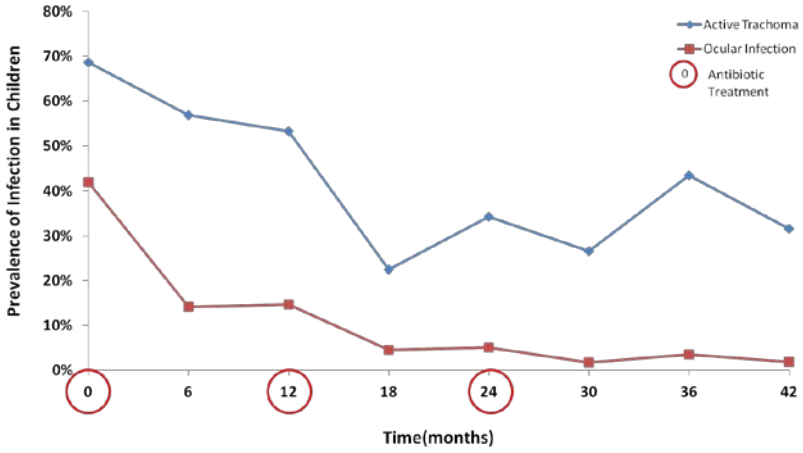
Figure 1. Change in prevalence of active trachoma in three districts of South Gondar zone



Role of ocular *Chlamydia* testing

There is evidence to suggest that following multiple rounds of MDA with azithromycin in trachoma hyper-endemic areas, the prevalence of ocular chlamydial infection drops to very low levels. On the other hand, the prevalence of active trachoma signs (especially TF) initially drops and then plateaus at levels in excess of the 10% TF, the MDA intervention threshold (Figure 2). Programmatic data from three-year evaluation of SAFE in Amhara showed that while the prevalence of active trachoma signs in a sub-sample of children aged 1-6 years was 48%, mean prevalence of ocular *Chlamydia* infection was 3.1% [3]. Since the decision to treat is based on TF prevalence, the Amhara three-year evaluation results implied that further MDA rounds were indicated. However, the results also meant that for every 1,000 children aged 1-6 years treated in the subsequent round on MDA, only 31 children benefited from the treatment.

Figure 2. Prevalence of active trachoma and ocular infection in children with three annual treatments (Adapted from [4])



Proposals for the future

Laboratory evidence suggests that the prevalence of ocular *Chlamydia* infection is less than 3% after three rounds of treatment. After five rounds of MDA we are probably treating very few infections, even though TF is still present. Specificity from inter-observer reliability data suggest that correct field diagnosis of <5% TF may be beyond what we can do with the simplified grading system. In high prevalence areas, impact surveys based on TF may be chasing the wrong sign. Therefore we propose:

- After five years of SAFE should we stop MDA and continue with S, F & E and monitor TF where baseline was >30%TF?
- After three years of SAFE should we stop MDA and continue S, F & E and monitor TF where baseline was 10-30% TF?

These proposals will be subjected to a cluster randomised trial to investigate the effects of stopping azithromycin after multiple rounds of MDA on active trachoma signs and ocular chlamydial infection. Evidence from such trials will be important to inform how best to use MDA with azithromycin in high prevalence settings.

References

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2. Yayemain D, King JD, Debrah O, Emerson PM, Aboe A et al. (2009) Achieving trachoma control in Ghana after implementing the SAFE strategy. Trans R Soc Trop Med Hyg 103: 993-1000.
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4. Gebre T, Ayele B, Zerihun M, Genet A, Stoller NE et al. (2012) Comparison of annual versus twice-yearly mass azithromycin treatment for hyperendemic trachoma in Ethiopia: a cluster-randomised trial. Lancet 379: 143-151.

South Gondar Stool Survey: SAFE impact on intestinal parasites in Ethiopia?

As Presented by Mr. Jonathan D. King, Program Epidemiologist, The Carter Center

The Carter Center supports the efforts of the Amhara National Regional State Health Bureau to eliminate blinding trachoma through the implementation of the SAFE strategy (Surgery, Antibiotics, Facial cleanliness and Environmental improvement). The aim of the F component is to reduce contamination of fingers, flies and fomites by keeping faces free of infectious discharge. The promotion of facial hygiene involves face and hand washing to prevent transmission of *C. trachomatis,* a behavior which prevents transmission of other infections spread by contact with infectious material. The availability of water (an E component) improves the chances of water use for washing. Latrine construction and use, another E component, are promoted due to evidence that where preferred breeding material is reduced, fly populations may be reduced; thus reducing the number of fly to eye contacts in a community. Managing human waste through household latrine use reduces contamination of the environment and likely reduces transmission and new infections of fecal-oral diseases. These environmental improvements should impact transmission of diarrheal diseases, respiratory tract infections and intestinal parasites; however studies to measure these potential collateral benefits of the SAFE strategy have not been conducted.

The purpose of this investigation was to determine the prevalence of intestinal parasites among children 2-15 years of age; determine whether any improvements in sanitation have occurred in the zone; compare current prevalence with prevalence estimated in 1995 during a previous study; and determine whether mass preventive chemotherapy for intestinal helminthic infections is warranted according to guidelines of the World Health Organization (WHO). In July 2011, stool specimens were collected from randomly selected children in 99 communities in 10 woredas of South Gondar zone during trachoma impact assessment surveys. Approximately 1 g of stool was preserved in 10 ml of sodium acetate-acetic acid-formalin and later processed in the laboratory using a standardized concentration technique and assessed for the presence and quantity of eggs and cysts. All randomly selected children were offered 400mg albendazole regardless of participation.

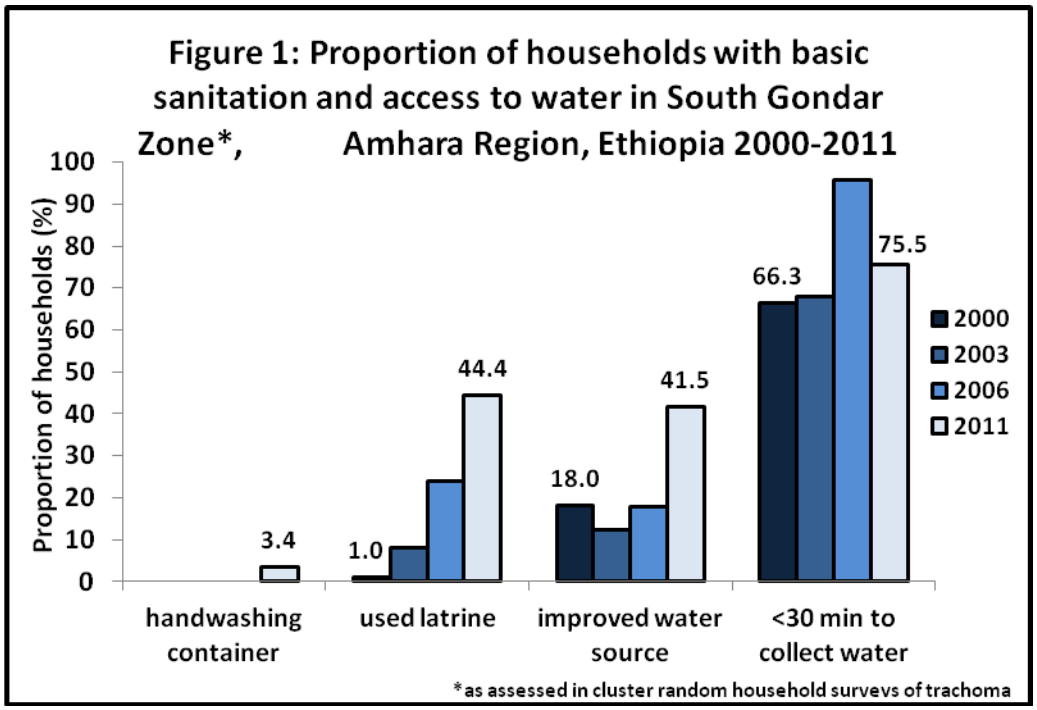
A total of 2,338 specimens were provided, processed and linked to survey data from a total of 2,657 randomly selected children (88% response). The mean age of children providing specimens was 6.8 years (SD 3.6) and 46.8% of the specimens were from boys. The zonal-level prevalence of ascariasis, hookworm, trichuriasis and any of these three STH infections was 10.6% (95%CI 7.9-13.3%), 9.8% (6.8-12.7%), 2.5% (1.6-3.4%), and 20.1% (16.8-23.5%) respectively. The prevalence of intestinal schistosomiasis was 2.0% (0.4-3.7%) at the zonal level, but the proportion of children infected by community ranged from (0-52.4%). Intense helminth infections (≥100 eggs/g) were observed for ascariasis (16.4% of infections) only and no other helminth infection. The prevalence of infection with any protozoan was 78.1% (75.8-80.4%) and 23.0% (20.3-25.6%) of children had giardia cysts in stool.

Figure 1 shows the improvements in household-level sanitation and water access that have occurred in South Gondar zone since 2000 prior to any SAFE interventions. SAFE interventions were piloted in a few areas until 2003 and by 2006 the implementation of SAFE activities was at scale in all woredas within the zone. A cumulative total of 339,913 household latrines were constructed since the program began resulting in the proportion of households with a latrine to increase from 1% to 44.4%. The proportion of households with access to an improved water source had also increased. For the first time, a proportion of households were observed to have a hand-washing container located outside their latrine as is promoted.

Both the prevalence and intensity of helminth infections has significantly reduced since a previous survey in 1995 (Figures 2 and 3). While the proportion of children infected with hookworm was not significantly lower than in 1995, none of the current infections were intense. A total of 945,991 doses of mebendazole

or albendazole have been distributed within the zone to preschool-aged children, yet the proportion of this target population that reported to have taken this medicine was 33.0% (24.4-41.5%).

Improvements in sanitation and perhaps recent albendazole distribution among pre-school aged children have played a role in the observed decline in intestinal helminthiasis. In addition to continued promotion of hygiene and household-level sanitation, expansion of the current de-worming program to school-aged children should be considered. At the woreda level, the prevalence of schistosomiasis in one woreda exceeds the WHO threshold (10%) for warranting mass distribution of praziqantel and in five woredas the prevalence of soil-transmitted helminths exceeds the WHO threshold of (20%) for warranting mass distribution of albendazole. The frequency of protozoan infections suggests poor water-quality or unsanitary water collection and storage practices and warrants further investigation. Further investigation is also warranted to determine the household, community, and geospatial factors associated with intestinal parasite infection prevalence.



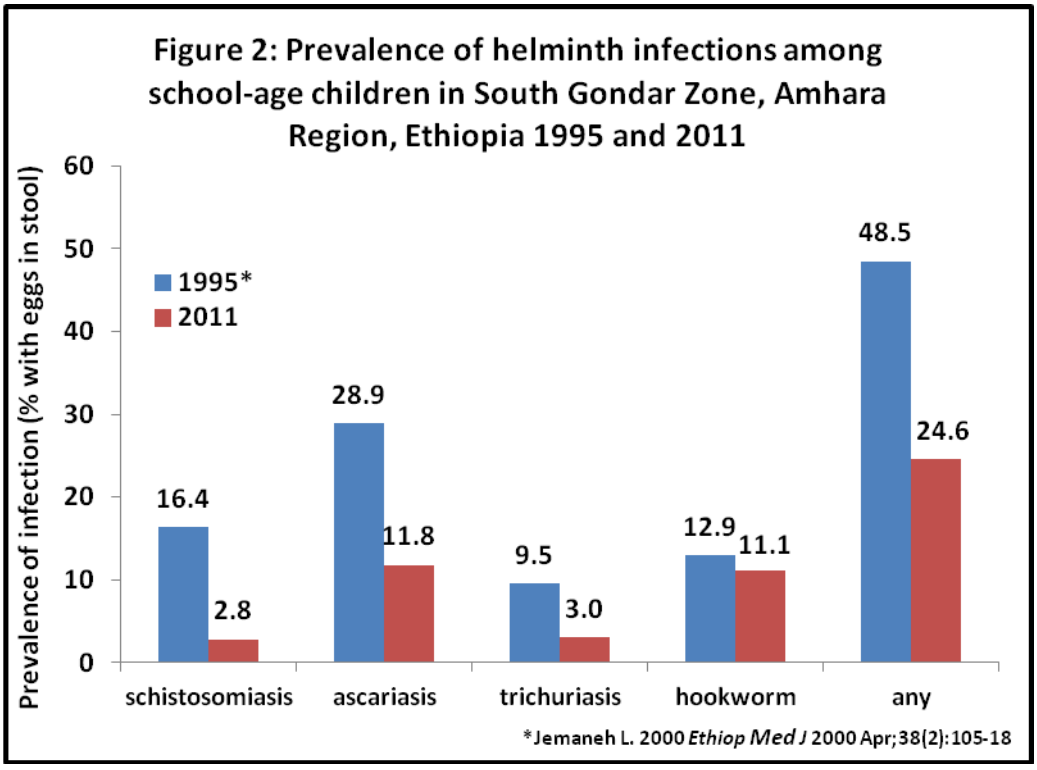


Figure 2: Prevalence of helminth infections among school-age children in South Gondar Zone, Amhara Region, Ethiopia 1995 and 2011
Prevalence of infection (% with eggs in stool)
60
50
40
30
20
10
0
1995*
2011
16.4
2.8
28.9
11.8
9.5
3.0
12.9
11.1
48.5
24.6
schistosomiasis
ascariasis
trichuriasis
hookworm
any
*Jemaneh L. 2000 Ethiop Med J 2000 Apr;38(2):105-18

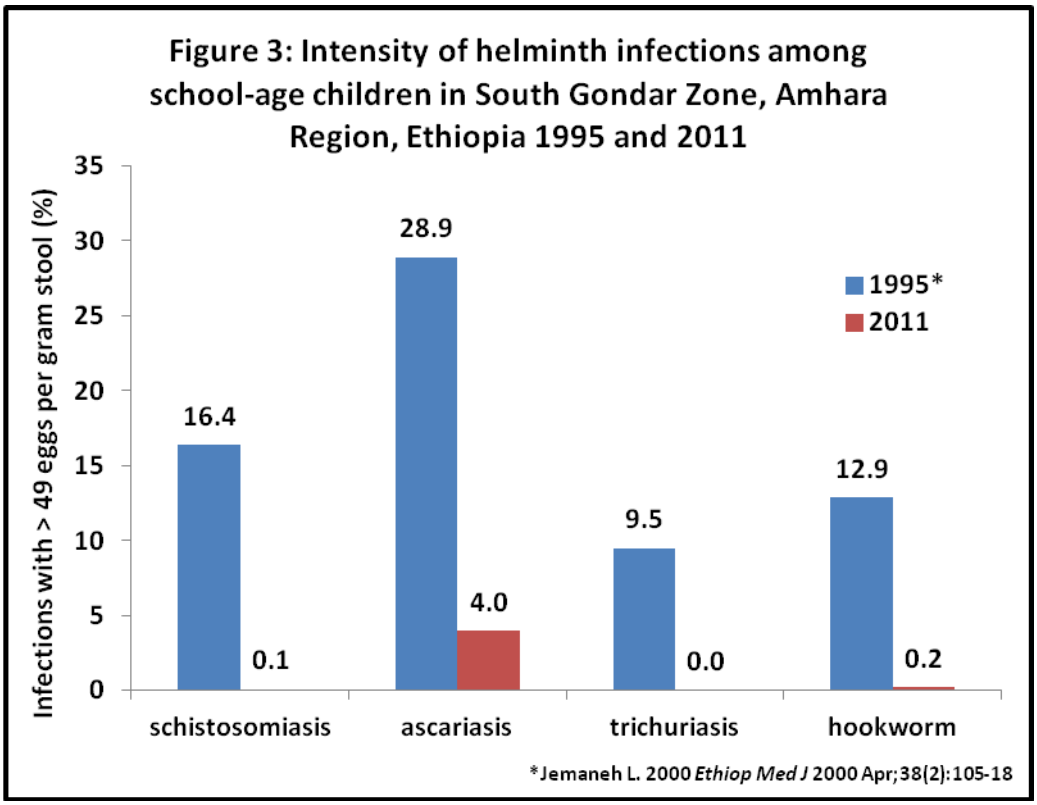


Figure 3: Intensity of helminth infections among school-age children in South Gondar Zone, Amhara Region, Ethiopia 1995 and 2011
Infections with > 49 eggs per gram stool (%)
35
30
25
20
15
10
5
0
1995*
2011
16.4
0.1
28.9
4.0
9.5
0.0
12.9
0.2
schistosomiasis
ascariasis
trichuriasis
hookworm
*Jemaneh L. 2000 Ethiop Med J 2000 Apr;38(2):105-18

Conclusions from the WHO/KCCO Global Trichiasis Scientific Meeting

As presented by Dr. Paul Courtright, Kilimanjaro Centre for Community Ophthalmology

From January 30-February 1, 2012 KCCO hosted the WHO/KCCO Global Trichiasis Scientific Meeting with support from Lions SightFirst Initiative and the Fred Hollows Foundation. The meeting had around 30 participants, a mix of national experts, researchers, and NGO partners. There has been a growing body of evidence on trichiasis (the spectrum of disease, surgery, and programmatic interventions) and there was a call to conduct a meeting that would review the existing evidence and make conclusions based upon that evidence. The three day meeting was based around three areas of work: trichiasis surgical guidelines, surgical outcomes, and surgical output. Throughout the three days the participants sought to keep the discussion focused on [a] patient centered care, [b] quality outcomes, [c] reaching GET 2020 targets, [d] health systems strengthening, and [e] the use of evidence to guide discussions.

Highlights of the discussion and conclusions included:

- Recognition that trichiasis is a spectrum of disease which may include a single peripheral lash that does not touch the cornea to severe entropion with more than 20 lashes abrading the cornea. Much discussion centered on when to operate given the concerns about the quality of outcomes noted.
- Currently data are very limited regarding whether or not the currently practiced operations (BLTR and Trabut) are equivalent in terms of results. There are no practical guidelines for management of post-operative trichiasis. It was recognized that TT surgical service must be tailored to the patient needs and clinical condition and the specific country context.
- The WHO "yellow manual", now over 20 years old, would benefit from review and updating. The WHO Final Assessment Manual needs to be used in all settings more assiduously.
- Operated patients presenting with TT should not be labeled as "recurrent" but should be re-defined as "post-operative TT" that can be early or late, clinically significant or not-significant. The reasons for poor outcomes vary, with poor surgery likely the reason for post-operative TT within the first six months.
- Outcomes, often poor in routine settings, could be much better. All patients should have a post-operative assessment within six months and corrective action taken, if necessary.
- Since attrition of health workers trained in trichiasis surgery is high, efforts are needed to improve selection and retention through advocacy with government health services. Furthermore, supportive supervision needs to be strengthened.
- At current levels of productivity it will take more than 28 years to manage the known TT backlog. Productivity is high when outreach is used; in many countries over three-quarters of TT surgeries done are done on outreach. That said, outreach can be made more efficient and effective. Static service, on its own, will be insufficient to reach GET 2020 targets.
- All TT patients deserve to be offered a management proposal; this also includes people who refuse to have TT surgery. That proposal should be appropriate for their condition.

Work will start soon on drafting guidelines on supportive supervision, training of trainers, and efficient and effective TT outreach. The report, after review by the participants, will be submitted to WHO.

Barriers to Accessing Trichiasis Surgery: The Patient's Perspective

As Presented by Dr. Matthew Burton, The London School of Hygiene and Tropical Medicine

Despite the scale-up of surgical services in many trachoma-endemic settings, over seven million trichiasis patients are estimated to need surgery. Many reasons are attributed to this figure, which has changed little over the past decade, including insufficient surgical provision, incident and post-operative trichiasis cases, and patients not accessing the existing services.

A review of the literature reveals that only 18-66% of trichiasis patients present for surgery; this study aimed to examine the barriers to presenting for surgery from the patient's perspective in Ethiopia. A total of 2,591 participants with previously unoperated trichiasis were interviewed through the use of an open-ended questionnaire to ascertain why they had not yet received surgery for their trichiasis. Patients were allowed to list as many reasons as they wanted; they were then asked to select the two most important reasons that prevented them from being operated.

The most frequently cited barriers to previous attendance for surgery were lack of time (45.3%), financial constraints (42.9%) and lack of an escort (35.5% in females, 19.6% in males). Women were more likely to report a fear of surgery (7.7% vs. 3.2%, $p<0.001$) or unaware of where to access services (4.5% vs 1.0% $p<0.001$); men were asymptomatic more frequently (19.6% vs. 10.1%, $p<0.001$). Women and men were similarly constrained by lack of time (44.7% vs. 47.0%), finances (42.8% vs. 43.2%) and transportation difficulties (2.9% vs. 2.5%). Those 50 and older were more likely to report financial constraints (46.4% vs. 38.8%, $p<0.001$); lack of an escort (33.4% vs. 28.5%, $p<0.001$); and lack of transportation (3.8% vs. 1.6%, $p=0.001$) as barriers. Trichiasis patients under the age of 50 were more likely to cite lack of symptoms (16.1% vs. 9.9%, $p<0.001$) and lack of time (47.7% vs. 43.3%, $p=0.013$).

Many of the barriers to surgery reported by trichiasis patients relate to the direct and indirect costs of accessing surgical services. National trachoma control programs can overcome many of these barriers by providing surgery free of charge at the community level, and by diffusing targeted messages with the time and place of the surgery, as well as accurate information on the surgery itself.

Documenting MDA "Best Practices"

As Presented by Mr. Esmael Habtamu & Dr. Paul Courtright, Kilimanjaro Centre for Community Ophthalmology

Mass administration of Zithromax® is one of the components of the WHO SAFE strategy for the control of blinding trachoma. The goal of antibiotic administration is to treat the pool of trachoma infection in communities to control transmission. Within the next five years about 300 million doses of Zithromax® should be distributed to reach targets requiring a significant scale up of programs. However, many programs are struggling to determine the best approaches to implement various aspect of Zithromax® MDA (Mass Drug Administration). Guidelines for community-wide Zithromax® distribution are currently not available nor is there adequate literature on best practices of Zithromax® MDA. We therefore set about to compile best practices from various programs which distribute Zithromax® during MDAs to develop practical guidelines of use to the global program.

Existing literature on Zithromax® MDA and other NTDs was reviewed. National approaches to Zithromax® MDA programs throughout Africa have been collected from national coordinators. Zithromax® distribution strategies are largely dependent on the local context and there is no single "best practice". We therefore used the case study approach to document practices from various programs from which "best practices" will be compiled. Prior to commencing the field work, country representatives and/or coordinators of programs were contacted. The aim of the project was discussed and schedules for the field visits and data collection were developed. When possible, the data collection was organized in times of on-going Zithromax® distribution. Data was mainly collected through observation and in-depth interviews with coordinators, distributors and beneficiaries. Distribution coverage and cost data were extracted from program databases. A predesigned framework was used to guide the data collection.

Relatively well established programs were selected for the case studies. In addition, balance was sought among the various strategies. Accordingly, three programs were selected for the case studies from Ethiopia: The Carter Center Amhara region program, the ORBIS Gamo-Gofa, South region program, and the GTM – South/Oromiya region program; two from Nigeria: the Sightsavers – Sokoto state program and The Carter Center –Nasarawa state program; and two from Mali and Kenya.

The data will be organized into cases studies. The cases studies then will be sent back to the programs to be reviewed. Best practices from each program will be compiled and a manual will be drafted and disseminated to programs. A meeting of interested organizations and individuals will be held in Moshi in late July.

Use of Height-Based Dosing in Azithromycin Distribution, Amhara Ethiopia

As Presented by Ms. Laura Scott, London School of Hygiene & Tropical Medicine

Study Aims

- Assess MDA distribution teams' ability to correctly apply the height-based dosing method and deliver correct doses
- Assess accuracy of recorded dose data
- Assess distribution of delivered dose referring to the therapeutic range (15-30mg/kg)
- Assess accuracy of dosing algorithm in study population

Data Collection

Data on 2,134 children aged six months to nine years was collected at 22 distribution sites during one round of the MDA. The information gathered included: height, weight, age, sex, observed treatment, recorded treatment, time, day of campaign, wasted and refused doses, dose stick measurements. The distribution teams were blinded to the purpose of the study to prevent any alterations in the use of the dosing method.

Results

The dosing method was correctly applied by the program staff to deliver a correct dose for 91.6% (1,955/2,134) of children observed. The mean delivered dose varied by distribution site from 24.3-32.5mg/kg. However, clustering of incorrect doses at any one distribution site was not observed.

Recorded dose data was highly accurate, with 1.3% (27/2,134) of doses incorrectly recorded in the program logbooks. The majority of these inaccuracies (59% or 18/27) were where the dose was recorded as received but in fact spat out. These data support the validity of logbook dose reports. Delivered doses ranged from 5.9 - 63.6mg/kg, but with 95% of observations between 18.7-40.1 mg/kg a low incidence at the extremities of the dose distribution is illustrated.

Relating the distribution to the therapeutic range reveals a low incidence (0.4% or 9/2,134) of under target dosing (<15mg/kg). The majority (55.8% or 1,191/2,134) received a dose within the therapeutic range (15-30mg/kg). Over target dosing (>30mg/kg) was frequent at 43.8% (935/2,134).

The nine under target doses are associated with: age (8/9 were <2 years of age), POS (Pediatric Oral Suspension) mode of treatment (9/9), and mistakes in the application of the dosing method (9/9).

Over target doses were mainly caused by a dosing algorithm problem (81% or 757/935). Overall, 35.8% of children (764/2,134) had their weight (and therefore dose) incorrectly estimated by the dosing method. These individuals were found by z-test to be, on average, taller than the remaining dataset but no heavier, typifying them as more tall and slender than assumed by the algorithm.

Conclusion

MDA protocols appear to be well adhered to with accurate recorded dose data and lack of dose error clustering. Incidence of mistakes in application of dosing method is tolerable at 8.4% but there is room for improvement.

Use of this dosing method in the MDA effectively safeguards against the delivery of under target doses to the population.

Adjustment to the dosing algorithm could reduce rates of over target dosing in the population. However, this is not an operational necessity, as issues with the algorithm's appropriateness for the local population have not increased under target dose rates.

Adverse events after mass azithromycin treatments for trachoma in Ethiopia

As Presented by Ms. Nicole Stoller, F.I. Proctor Foundation, University of California San Francisco

During a cluster-randomized clinical trial for trachoma in Ethiopia, two rounds of adverse event surveillance were performed in a random sample of communities after community-wide mass azithromycin treatment. The prevalence of any reported adverse event ranged from 4.9% to 7.0% in children 1-9 years of age and from 17.0% to 18.7% in persons ≥ 10 years of age. Adverse events appeared to cluster by household and perhaps by village. Mass azithromycin distributions were well tolerated in this setting.

Androids in Amhara

As Presented by Ms. Joy Buolamwini and Mr. Andrew Panfel, the Georgia Institute of Technology

The Carter Center's trachoma control program aimed to carry out impact evaluations of three years of SAFE strategy implementation in South Gondar zone, Amhara, Ethiopia in July-August 2011. In order to determine the prevalence of trachomatous inflammation follicular (TF) and trachomatous trichiasis (TT) at the district and sub-district levels, over 40,000 individuals from over 350 communities were required to be surveyed. Because of the scale of the survey, paper-based data collection tools would have been impractical and time-consuming.

Two students from the Georgia Institute of Technology were approached to create a handheld computer-based data entry program. Usage of tablets negates the need for double-entry data and mistakes made due to non-adherence to skip patterns, illegible writing on forms, or missing pages, as well as the storage of the completed surveys. Tablets also ease the burden of supplies carried by survey team members and provide GPS and barcode recording to eliminate the need for multiple electronic tools. However, usage of the tablets included some challenges, such as the need for increased time for training, software update requirements, and ensuring the availability of equipment to charge the tablets' batteries in remote areas without electrical systems.

Keeping these requirements and challenges in mind, the students selected several tablets for field-testing, and determined that the Samsung Galaxy Tab had the best battery life, a screen visible in bright sunlight, and had the additional advantage of a camera. The students also created a data-entry tool through Open Data Kit, an open-source data collection tool. The tool is a free online application specifically designed to create tools for handheld computers and integrates GPS into the programming. In addition, Open Data Kit accommodated English and Amharic keyboards and data entry forms.

Although the surveys took approximately eight weeks to implement, results were available as soon as the data were downloaded and merged from the tablets. The tablets allow the program to react quickly to new information and to make decisions based on current data.

What is the role of laboratory testing in the elimination of trachoma?

As Presented by Dr. Robin Bailey, London School of Hygiene and Tropical Medicine

I. PRET (Partnership for the Rapid Elimination of Trachoma) in The Gambia

Background

The prevalence of trachomatous inflammation follicular (TF) is the basis for trachoma programmatic decision-making, including whether to start, stop, or continue mass antibiotic treatment with azithromycin. However, antibiotics treat infection with *Chlamydia trachomatis*, and there is not always a strong relationship between TF and infection, particularly after mass drug administration, in low prevalence areas.

Methods

A baseline survey was conducted in 48 enumeration areas of the Gambia. In each enumeration area, a random selection of 100 children ages 0-5 years were examined for clinical signs of trachoma, their eyelids photographed for validation, and eyelid swabs taken for PCR analysis. After the baseline assessment, mass treatment with azithromycin was conducted. Evaluations were conducted every six months for three years in each enumeration area. Each enumeration area was randomly assigned to one of four arms to determine further treatment:

1) Three years of yearly mass treatment with azithromycin at standard coverage (80-89%);
2) Three years of yearly mass treatment with azithromycin at enhanced coverage (≥90%);
3) one mass treatment with azithromycin at standard coverage and stopping treatment if either no TF (defined as <5% prevalence) or infection at six months;
4) one mass treatment with azithromycin at enhanced coverage and stopping if either no TF or infection at 6 months.

Results

Baseline TF prevalence in the annually treated enumeration areas averaged 6.6% and 6.5% in the enumeration areas with stopping rules. Average infection prevalence was 0.85% at baseline in the annually treated arms and 0.64% in the enumeration areas with stopping rules. At six months, the prevalence of *C. trachomatis* infection had fallen to 0.2% in the annually treated arms and to 0% in the arms with stopping rules. At 12 months, infection had fallen to 0% in the annually treated arm and remained at 0% in the arm with the stopping rule. However, at 36 months, infection had re-emerged: 0.63% prevalence in the annually treated arm and 0.42% in the stopping rule arms. TF prevalence dropped sharply after one round of treatment then leveled off with no further reductions with subsequent treatment or increase in the areas not receiving annual treatment. At 36 months of follow-up, the annually treated arm still had a prevalence of TF of 2.7% and the arms with the stopping rule had a TF prevalence of 2.9%.

Conclusions

There was no difference in TF or *C. trachomatis* infection between arms with three annual treatments and those stopping after one, and there was no difference between arms with standard or enhanced coverage. One dose of azithromycin was sufficient to reduce the TF prevalence to below the WHO threshold of 5% to stop annual mass treatments in areas of low trachoma prevalence. The re-infections occurred in a cluster and are likely sporadic and not an indication of re-emergent disease.

II. Cost of Treatment vs. Examination and Laboratory Testing

Given the results of the above study, we aimed to determine the costs involved with treating entire enumeration areas at standard and enhanced coverage (operationalized as an additional visit to each enumeration area) versus examining and testing 100 children per enumeration area.

Included in the treatment cost calculation were personnel (per diem, salary), supervision (salary, vehicle depreciation, fuel), vehicle depreciation, fuel, cost of antibiotics (tetracycline eye ointment and azithromycin, assuming donated or purchased), equipment depreciation (height sticks and scales), consumables (paper and printing), and data entry costs (including computer depreciation and salary). Included in the examination costs were personnel, supervision (salary, vehicle depreciation, fuel), vehicle depreciation, fuel, examination supplies (loupes, scales, sticks), field consumables (gloves, flashlight batteries, swabs, paper), lab consumables and cold chain, testing costs (salary, equipment depreciation, test kits), supervision by senior scientific officer, and data entry costs.

The estimated cost to treat an entire enumeration area was $217.40 (with donated azithromycin) at standard coverage, with the main cost drivers of personnel and supervision at 53.8% and 35.8% of the total cost, respectively. The cost with enhanced coverage increased to $275.95 per enumeration area; the cost drivers remained the same but with increased proportionate share for personnel (60.8%) and decreased share for supervision (28.2%). However, if the azithromycin was not donated, it would cost an estimated $1,460.23 to treat each enumeration area at standard coverage and $1,696.54 at enhanced coverage. The cost of the azithromycin would be the main driver (85.1% and 83.7% of the total cost at standard and enhanced coverage, respectively). The estimated cost to examine and test 100 children per enumeration area is $798.90, with the main driver as the cost of the Amplicor test kits ($481.75 or 60.3% of the total).

When considering only the 48 enumeration areas included in the study, two annual standard treatments would cost an estimated $23,233, which is less expensive than examining and testing the 48 enumeration areas at an estimated $38,165 at current costs of Amplicor test kits. The price of the test kit would need to be approximately $1.12 to break even. However, when extrapolating the results to all 102 enumeration areas in The Gambia, the cost to provide two annual treatments in all areas is estimated at $46,466, and taking a sample of 48 enumeration areas to test would remain at $38,165. This cost decreases with the number of enumeration areas selected for sampling.

The International Trachoma Initiative and the International Centre for Eye Health estimate that approximately 40 million persons live in areas with TF prevalence between 5-9%, such as those in the present study. A strategy of one mass antibiotic treatment followed by testing for infection a 10% sample of communities might save nearly $25 million versus providing three annual treatments. This would be true even at the current cost of the Amplicor test kits.

III. Tests for Infection with *Chlamydia trachomatis*

Although the PRET study has shown that TF prevalence does not necessarily reflect the prevalence of infection in a community, no ideal test of infection exists either. Available tests include culture and direct visualization, which are considered obsolete; NAATs (Nucleic Acid Amplification Tests) targeting DNA (Amplicor) and RNA (Aptima) and tests of immunological memory, which are currently undergoing validation.

Amplicor, a PCR test, is the only commercial test to have been validated on ocular samples, but it is only made on request. Additionally, the sequence of chlamydial plasmid targeted by the test is missing in some organisms. Aptima, a TMA (Transcription-Mediated Amplification) test, targets the bacterial ribosome, of which there are 10,000 copies per organism. Both of these tests require a stable electric supply and outlay on equipment. They are very specific but more sensitive than needed to classify trachoma-endemic communities. An additional problem with these tests is that false positives occur more frequently in hot, dry conditions—precisely the conditions where trachoma occurs.

Antibody Tests: A New Tool for Monitoring Trachoma Programs?

As Presented by Dr. Patrick Lammie, U.S. Centers for Disease Control and Prevention

Patrick Lammie with the U.S. Centers of Disease Control and Prevention presented on efforts made to develop an antibody test that could be used to assess individuals at the community level for active trachoma and other neglected tropical diseases like malaria, lymphatic filariasis, and onchocerciasis. The development of a sensitive test that could distinguish *Chlamydia trachomatis*, the infective agent which causes trachoma, from other agents could facilitate and monitor progress of trachoma elimination goals.

Some possible uses of this test for national programs could be: 1) mapping the active prevalence in children prior to mass drug administration to better target use of azithromycin; 2) monitoring the antibody response in children following treatment; and 3) using collected data in their decision making to stopping and starting MDA.

Some work has been done on the development of a multiplex designed assay and a few antigen models have been tested in Tanzania and Haiti. It is hoped that the data collected can demonstrate how this test can show subtle differences in disease infection across communities and could be used as a tool for measuring change based on different interventions. The results seem promising but the work continues to achieve the ultimate goal of a one-stop test that could be implemented as a part of national survey efforts (DHS or MIS) to enhance integrated NTD surveillance.

Trachoma Radio Impact Survey in Mali

As Presented by Ms. Emily Toubali, Helen Keller International

Since 2008, the National Blindness Prevention Program in Mali has partnered with the Union of Free Radio and Televisions of Mali to broadcasts messages on the radio about trachoma as part of the country's implementation of the SAFE strategy (Surgery, Antibiotics, Facial cleanliness, Environmental improvement). Each year, the broadcasts have covered a six-month period and have been played daily, reaching millions of Malians with messages about trachoma transmission and prevention in the regions of Kayes, Koulikoro, Mopti, Segou, and Sikasso.

In July of 2011, Helen Keller International supported a radio impact survey in the regions of Kayes and Segou to assess radio listening habits, coverage of the trachoma radio broadcasts, community knowledge and behavior specific to trachoma, and the presence of ocular and nasal discharge on the faces of children. The survey used multi-stage cluster sampling to sample villages and households. Household interviews were conducted with the main caregiver of children in the house (391 women and men) and the presence of ocular and nasal discharge were assessed in all children under the age of 10 years (687 children).

The survey found that a large percentage of the respondents had access to the radio (87%) and listened to it (91%); 60% reported hearing a message on the radio about trachoma. A high percentage of respondents knew that trachoma is an eye disease/condition that causes blindness (79%), is associated with bacteria, flies, sharing towels/bed with infected person, and/or dirty environment (64%), can result in blindness/reduced vision (87%), and can be prevented through one or more components of the SAFE strategy (85%). Additionally, 66% reported washing their children's faces at least twice each day, 94% reported disposing feces in a latrine, and 66% reported that latrines are regularly used by children. For each of these questions, the majority of persons who gave a positive response reported hearing the trachoma messages on the radio. In addition, over half of those surveyed reported that the radio is where they have learned about trachoma. The presence of ocular discharge (4.5%) was low with nasal discharge (16.3%) found to be much higher. There was not a difference in ocular or nasal discharge when comparing children whose primary caregiver had/had not heard the trachoma messages.

Using the specific findings from the survey, the current messages will be revised to include more concise and focused messaging for behavior change that highlight the importance of face washing and latrine usage. In addition, 100 radio animators in the five regions will be trained/retrained in the use of the messages.

APPENDIX I: The Disease

Trachoma is the world's leading cause of preventable blindness. The World Health Organization (WHO) estimates that 1.2 million people are blind due to trachoma, most of whom are women, and another 110 million are at risk of blindness or severe visual impairment. Approximately 4.6 million are in the advanced stage of the disease, trichiasis. Trachoma is caused by repeated infections of the conjunctiva (the lining of the eye and eyelid) by the bacterium *Chlamydia trachomatis*, and can be prevented through simple hygiene practices. Most cases occur in rural, arid areas of developing countries, such as the Sahelian region of Africa, where access to clean water is limited.

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. Repeated cycles of infection and resolution lead to the formation of scar tissue on 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 by contact with hands, towels and clothing, or by flies, which are attracted to ocular and nasal discharge. As trachoma patients' eyelids are repeatedly infected with *chlamydia*, 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 and physically abrades the cornea, scratching it and introducing other infections. Trichiasis is horrific in itself but also rapidly leads to blindness.

Recent developments have brought new hope that we can effectively control this disease. In 1987, eye care experts and the World Health Organization 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. In addition, with support from the Edna McConnell Clark Foundation and WHO, the *SAFE strategy* was created to control trachoma through community-based interventions.

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 tetracycline eye ointment, the previously recommended therapy. In 2009, Pfizer Inc, manufacturer of Zithromax®, recommitted to supporting the WHO GET2020 goal of eliminating blinding trachoma by the year 2020. Since the beginning of the donation in 1998, approximately 235 million doses of Zithromax® have been donated by Pfizer Inc and managed by the International Trachoma Initiative. The donation has reached 19 countries with plans to expand to an additional five to seven countries from 2011 to 2012. The existence of the donation program has served to invigorate national trachoma programs and global support for the elimination of blinding trachoma.

APPENDIX II : List of Papers Published in 2011

1. Ayele B, Gebre T, House JI, Zhou Z, McCulloch CE, et al. (2011) Adverse events after mass azithromycin treatments for trachoma in Ethiopia (short report). *Am. J. Trop Med. Hyg* **85(2)**: 291-294. doi:10.4269/ajtmh.2011.11-0056.

2. Burton MJ, Rajak SN, Bauer J, Weiss HA, Tolbert SB, et al. (2011) Conjunctival transcriptome in scarring trachoma. *Infection and Immunity* **79(1)**: 499-511. doi:10.1128/IAI.00888-10.

3. Chen C, Cromwell EA, King JD, Mosher A, Harding-Esch EM, et al. (2011) Incremental cost of conducting population-based prevalence surveys for a neglected tropical disease: The example of trachoma in 8 national programs. *PLoS Negl Trop Dis* **5(3):** e979. doi:10.1371/journal.pntd.0000979.

4. Gebre T, Ayele B, Zerihun M, House JI, Stoller NE, et al. (2011) Latrine promotion for trachoma: Assessment of mortality from a cluster-randomized trial in Ethiopia. *Am J. Trop Med. Hyg* **85(3)**: 518-523. doi:10.4269/ajmh.2011.10-0720.

5. Habtamu E, Rajak SN, Gebre T, Zerihun M, Genet A, et al. (2011) Clearing the backlog: Trichiasis surgeon retention and productivity in northern Ethiopia. *PLoS Negl Trop Dis* **5(4)**: e1014. doi:10.1371/journal.pntd.0001014.

6. Hassan A, Ngondi JM, King JD, Elshafie BE, Ginaid GA, et al. (2011) The prevalence of blinding trachoma in the northern states of Sudan. *PLoS Negl Trop Dis* **5(5)**: e1027. doi:10.1371/journal.pntd.001027.

7. Keenan JD, Ayele B, Gebre T, Zerihun M, Zhou Z, et al. (2011) Childhood mortality in a cohort treated with mass azithromycin for trachoma. *CID* **52(7)**: 883-888. doi:10.1093/cid/cir069.

8. Stoller NE, Gebre T, Ayele B, Zerihun M, Assefa Y, et al. (2011) Efficacy of latrine promotion on emergence of infection with ocular *Chlamydia trachomatis* after mass antibiotic treatment: A cluster-randomized trial. *International Health* **3(2)**: 75-84. doi:10.1016/j.inhe.2011.03.004.

9. Ross RK, King JD, Damte M, Ayalew F, Gebre T, et al. (2011) Evaluation of household latrine coverage in Kewot woreda, Ethiopia, 3 years after implementing interventions to control blinding trachoma. *International Health* **3(4)**: 251-258. doi: 10.1016/j.inhe.2011.06.007.

10. Lietman TM, Gebre T, Ayele B, Ray KJ, Maher MC, et al. (2011) The epidemiological dynamics of infectious trachoma may facilitate elimination. *Epidemics* **3(2)**: 119-124. doi: 10.1016/j.epidem.2011.03.004

11. Rajak SN, Habtamu E, Weiss HA, Kello AB, Gebre T, et al. (2011) Absorbable versus silk sutures for surgical treatment of trachomatous trichiasis in Ethiopia: a randomized controlled trial. *PLoS Med*, **8(12)**: e1001137. doi:10.1371/journal.pmed.1001137.

12. Rajak SN, Habtamu E, Weiss HA, Kello AB, Gebre T, et al. (2011) Surgery versus epilation for the treatment of minor trichiasis in Ethiopia: a randomized controlled noninferiority trial. *PLoS Med*, **8(12)**: e1001136. doi:10.1371/journal.pmed.1001136.

13. Gebre T, Ayele B, Zerihun M, Genet A, Stoller NE, et al. (2011) Comparison of annual versus twice-yearly mass azithromycin treatment for hyperendemic trachoma in Ethiopia: a cluster-randomised trial. *Lancet*, **378**. doi:10.1016/S0140-6736(11)61515-8.

14. Ayele B, Gebre T, Moncada J, House JI, Stoller NE, et al. (2011) Risk factors for ocular chlamydia after three mass azithromycin distributions. *PLoS Negl Trop Dis* **5(12)**: e1441. doi:10.1371/journal.pntd.0001441.

15. Rajak SN, Habtamu E, Weiss HA, Bedri A, Gebre T, et al. (2011) The clinical phenotype of trachomatous trichiasis in Ethiopia: note all trichiasis is due to entropion. *Invest Ophthalmolo Vis Sci* **52(11)**: 7974-80.

APPENDIX III: Progress towards Ulimate Intervention Goals (UIGs) 2011

Definitions Used

Surgery	Sum of surgeries to date / Sum of surgeries to date + most recently calculated backlog
Antibiotics*	Annual sum of azithromycin and TEO distributed / Total population where TF in children ages 1-9 > 10%
Facial Cleanliness	Number of villages in which there is routine health education / Total number of villages in districts where TF in children ages 1-9 > 10% + any villages where TF in children ages 1-9 >10% in non-endemic districts
Environmental Improvement**	Sum of household latrine construction to date / Total households without a latrine x 0.5

NB: Progress against UIGs was calculated for both Carter Center-assisted output and for national program output.

**The goal for antibiotic distribution is not strictly a UIG; it is the proportion of the Annual Treatment objective obtained.*

***The Millenium Development Goal 7c (MDG7c) calls to halve the proportion of the population without access to a latrine by 2015.*

APPENDIX IV

"Shaping Programs to Fit the Need: The Relevance of Prevalence"

The Thirteenth Annual Trachoma Control Program Review

February 27-29, 2012

Monday, February 27

7:30	***Shuttle Pick-up at Hotel***	
8:00 – 8:30	Breakfast	
8:30 – 9:00	Welcome and Introductory Remarks Participant Introductions	Dr. Donald Hopkins
9:00 – 9:45	Opening Remarks and QAS overview	Dr. Paul Emerson
9:45 – 11:00	Mali	Dr. Sanoussi Bamani
11:00 – 11:30	Coffee Break	
11:30 – 12:45	Niger	Dr. Kadri Boubacar
12:45 – 1:45	Lunch	
1:45 – 2:00	Announcements	
2:00 – 3:15	Ethiopia—Amhara	Mr. Ayeligne Mulualem
3:15 – 3:45	Coffee Break	
3:45 – 4:15	Trichiasis surgery meeting update	Dr. Paul Courtright
4:15 – 4:45	Barriers to Surgery	Dr. Matthew Burton
4:45 – 5:00	Discussion	
5:30	***Shuttle Departure for Renaissance Hotel***	

APPENDIX IV

"Shaping Programs to Fit the Need: The Relevance of Prevalence"

The Thirteenth Annual Trachoma Control Program Review

February 27-29, 2012

Tuesday, February 28

7:30	***Shuttle Pick-up at Hotel***	
8:00 – 8:30	Breakfast	
8:30 – 9:00	International Trachoma Initiative update	Dr. Danny Haddad
9:00 – 9:20	Sightsavers Fast Track Initiative for Trachoma—an Update	Mr. Simon Bush
9:20 – 9:40	Helen Keller International update	Ms. Emily Toubali
9:40 – 10:00	Fred Hollows Foundation update	Dr. Richard Le Mesurier
10:00 – 10:20	CBM update	Dr. Martin Kollmann
10:20 – 10:50	Coffee Break & Group Photo	
10:50 – 11:50	Nigeria	Dr. Benjamin Nwobi
11:50 – 12:50	Sudan	Dr. Awad Hassan
12:50 – 1:45	Lunch	
1:45 – 2:00	Announcements	
2:00 – 2:30	Documenting "Best Practices" of MDA	Mr. Esmael Habtamu
2:30 – 3:00	Evaluation of the Use of Height-Based Dosing of Azithromycin in the Trachoma Control Program in Amhara, Ethiopia	Ms. Laura Scott
3:00 – 3:30	Adverse Events after Mass Azithromycin Treatments for Trachoma in Ethiopia	Ms. Nicole Stoller
3:30 – 4:00	Coffee Break	
4:00 – 5:00	Androids in Amhara: Tablets Offer a Human Touch	Ms. Joy Buolamwini / Mr. Andrew Panfel
5:30	***Shuttle Departure for Renaissance Hotel**	
6:00 – 9:00	**Reception at Renaissance Hotel**	

APPENDIX IV

"Shaping Programs to Fit the Need: The Relevance of Prevalence"

The Thirteenth Annual Trachoma Control Program Review

February 27-29, 2012

Wednesday, February 29

7:30	***Shuttle Pick-up at Hotel***	
8:00 – 8:30	Breakfast	
8:30 – 9:00	Ethiopia—National Perspective	Mrs. Hiwot Solomon
9:00 – 10:00	South Sudan	Dr. Lucia Kur
10:00 – 10:30	Coffee Break	
10:30 – 11:30	Trachoma Impact Surveys: What are the Results Telling Us?	Dr. Jeremiah Ngondi
11:30 – 12:00	What is the Role of Laboratory Testing in the Elimination of Trachoma?	Dr. Robin Bailey
12:00 – 12:30	Antibody Tests—A New Tool for Monitoring Trachoma Programs?	Dr. Patrick Lammie
12:30 – 1:45	Lunch	
1:45 – 2:00	Announcements	
2:00 – 2:30	Discussion	
2:30 – 3:00	Radio Impact Survey Results	Ms. Emily Toubali
3:00 – 3:30	South Gondar Stool Survey: SAFE Impact on Intestinal Parasites?	Mr. Jonathan King
3:30 – 4:00	Coffee Break	
4:00 – 5:00	Conclusions and Recommendations	
5:30	***Shuttle Departure for Renaissance Hotel***	

APPENDIX V: List of Participants

Ethiopia
Dr. Ayeligne Mulualm (ARHB)
Mrs. Hiwot Solomon (FMOH)
Dr. Zerihun Tadesse (The Carter Center)
Mr. Tesfaye Teferi (The Carter Center)
Mr. Mulat Zerihun (The Carter Center)

Government of Sudan
Dr. Awad Hassan (NPPB)
Dr. KamalEldin Hashim (NPPB)
Dr. Nabil Aziz Awad Alla (The Carter Center)

Government of South Sudan
Dr. Lucia Kur (FMOH)
Mr. David Stobelaar (The Carter Center)
Mr. Peter Magok (The Carter Center)

Mali
Dr. Bamani Sanoussi (PNLCC)
Mr. Sadi Moussa (The Carter Center)
Mr. Yaya Kamissoko (The Carter Center)

Niger
Dr. Kadri Boubacar (PNLC)
Mr. Mohamed Salissou Kané (The Carter Center)
Dr. Sabo Hassan Adamou (The Carter Center)

Nigeria
Dr. Benjamin Nwobi (FMOH)
Dr. Emmanuel Miri (The Carter Center)
Dr. Nimzing Jip (The Carter Center)

CBM
Dr. K.H. Martin Kollmann

The Centers for Disease Control and Prevention
Dr. LeAnne Fox
Dr. Patrick Lammie

Francis I. Proctor Foundation
Ms. Nicole Stoller

Fred Hollows Foundation
Dr. Richard Le Mesurier
Ms. Virginia Sarah

Georgia Institute of Technology
Ms. Joy Buolamwini
Mr. Andrew Panfel
Ms. Jessica Watson

Helen Keller International
Mr. Chad MacArthur
Ms. Emily Heck Toubali

International Trachoma Initiative
Dr. Danny Haddad
Dr. Teshome Gebre (Ethiopia)
Mr. Colin Beckwith
Ms. PJ Hooper
Mr. Noah Kafumbe
Ms. Chantal Veira
Ms. Alexis Serna

Kilimanjaro Centre for Community Ophthalmology
Dr. Paul Courtright
Mr. Esmael Habtamu

Lions Clubs of Ethiopia
The Honorable World Laureate Dr. Tebebe Y. Berhan

London School of Hygiene and Tropical Medicine
Dr. Robin Bailey
Dr. Matthew Burton
Ms. Laura Scott

Pfizer Inc
Ms. Julie Jenson

RTI International
Ms. Lisa Rotondo

Rollins School of Public Health
Dr. Christine Moe
Dr. Asrat Genet

Sightsavers
Mr. Simon Bush
Dr. Agatha Aboe
Mr. Dominic Haslam

Taskforce for Global Health
Dr. Mark Rosenberg

World Health Organization
Dr. Silvio Mariotti

The Carter Center
Ms. Sarah Bartlett
Ms. Rebecca Brookshire
Ms. Kelly Callahan
Ms. Michele Cullom
Mr. Yohannes Dawd
Mr. Don Denard
Ms. Lisa Dickman
Dr. Paul Emerson
Mr. Darin Evans
Ms. Madelle Hatch
Ms. Alicia Higginbotham
Dr. Donald Hopkins
Ms. Nicole Kruse
Mr. Jonathan King
Mr. Aryc Mosher
Dr. Jeremiah Ngondi
Dr. Greg Noland
Ms. Stephanie Palmer
Ms. Amy Patterson
Dr. Frank Richards
Dr. Ernesto Ruiz-Tiben
Ms. Alethia Sanon
Mr. Randall Slaven
Ms. Emily Staub
Mr. Adam Weiss
Mr. Craig Withers