

The Ethiopian SORT IT Course 2022

Surgical output within the Fast Track Initiative against trachoma in Amhara region, Ethiopia

Begashaw Hailemariam¹, Eshetu Sata¹, Mengesha Halefom¹, Andrew R Deathe², Mulat Zerihun¹, Kimberly A Jensen², E Kelly Callahan², Melkamu Beyene³, Wim Adriaensen⁴, Philip Owiti⁵, Mbazi Senkoro⁶, Maria Zolfo⁴, Scott D Nash²

¹ Trachoma Control Program, The Carter Center, Addis Ababa, Ethiopia

² Trachoma Control Program, The Carter Center, Atlanta, GA, United States

³ Amhara Regional Health Bureau, Bahir Dar, Ethiopia

⁴ Institute of Tropical Medicine, Antwerp, Belgium

⁵ The International Union Against Tuberculosis and Lung Disease, Paris, France

⁶ National Institute for Medical Research-Muhimbili Center, Dar es Salaam, Tanzania

Abstract

Introduction: Trachomatous trichiasis (TT) is the advanced stage of trachoma where lashes touch the globe of the eye causing permanent damage. Without eyelid surgery, TT can lead to irreversible blindness. In 2015 the Ethiopian Ministry of Health launched the Fast Track Initiative with the aim of enhancing the provision of surgical services for TT. The aims of this study were to determine the productivity of individual surgeons during the 2017 Initiative, to compare this productivity with the Ministry's annual target indicator of ≥ 200 surgeries, and to assess the factors associated with surgical output.

Methodology: This retrospective cross-sectional study utilized programmatic data on surgical output from 140 surgeons active from January 2017 through December 2017 in the eastern half of Amhara region, Ethiopia. Data were collected from a surgery monitoring dataset, analyzed, and compared to the performance targets set by the Ministry.

Results: The mean annual number of surgeries carried out per surgeon was 169 (standard deviation: 111) for a total of 23,616 surgeries. Among the 140 surgeons, 38% achieved the target set by the Ministry. Location of surgical training site and estimated surgical backlog were significantly associated with a higher surgery output.

Conclusions: An increase in surgical output was observed compared to productivity prior to the Initiative, although the average annual output during the 2017 Fast Track Initiative was lower than the Ministry's target. Using data driven approaches to setting annual productivity goals should be considered, particularly in light of fewer remaining TT cases as a result of the successful Initiative.

Key words: integrated eye care workers; operational research; surgical productivity; trachomatous trichiasis.

J Infect Dev Ctries 2022; 16(8.1):8S-14S. doi:10.3855/jidc.15978

(Received 28 October 2021 – Accepted 21 April 2022)

Copyright © 2022 Hailemariam *et al.* This is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction

Trachoma is a chronic kerato-conjunctivitis disease caused by *Chlamydia trachomatis* [1]. Repeated infection with *C. trachomatis* results in scarring and shortening of the upper eyelid and an in-turning of the eyelashes. In this later stage of the disease, known as trachomatous trichiasis (TT), in-turned eyelashes may scratch the cornea, which can lead to irreversible blindness [1].

Recent global estimates suggest that 136.9 million people live in trachoma endemic districts warranting intervention, 50% of whom live in Ethiopia [2]. In 2020, the estimated total global burden of TT was 2.0 million cases [2]. Guidelines by the World Health Organization (WHO) stipulate that TT is no longer a public health

problem if all previously endemic districts demonstrate a TT prevalence below 0.2% among individuals ages ≥ 15 years. Amhara National Regional State is historically the most trachoma endemic region in Ethiopia [3]. Between 2011 and 2015, surveys in Amhara region estimated that the district TT prevalence ranged from 0.0% to 10.5%, with an average prevalence of 3.9% [4].

The goal of the National Trachoma Program in Ethiopia is to eliminate trachoma as a public health problem in the country [5]. Between 2012 and 2014 an average of approximately 110,400 TT eyelid surgeries were conducted every year in Ethiopia. Considering the high burden of TT, the Ethiopian Ministry of Health (MOH) launched the Fast Track Initiative (FTI) in 2015 to strengthen the surgical component of the SAFE

(Surgery, Antibiotics, Facial cleanliness, and Environmental improvement) strategy. [6]. The Integrated Eye Care Workers (IECWs) who provide surgical services are general health care workers trained and certified according to the WHO training protocol (Table 1) [7]. Prior to the FTI the MOH set an annual ‘productivity’ target indicator of ≥ 200 surgeries conducted per IECW. As a result, as part of the FTI, the number of TT cases (persons operated) nationwide in 2015, 2016, and 2017 was 117,087, 184,192, and 173,945, respectively [8-10]. Fifty-eight percent of these surgeries were conducted in Amhara region. As of July 2018, it was estimated that 358,066 TT cases remained in need of management nationwide, including 152,368 remaining in Amhara region [11].

Given the considerable remaining TT backlog within Ethiopia and other trachoma endemic countries worldwide, large scale initiatives such as the FTI will likely be needed to reach elimination thresholds by 2030 [12]. The aim of this study was to determine the surgical productivity of individual IECWs who took part in the FTI in 2017 in eastern Amhara and to provide insights about the possible factors affecting IECW productivity.

Methodology

Study design

A retrospective cross-sectional study design was employed using routinely collected surgical performance monitoring data from 2017. Out of those IECWs deployed in the eastern part of the Amhara region (5 administrative zones, 73 districts, and 357 health centers), only IECWs who were providing

surgical services (n = 140) from January 2017 through December 2017 were included in this study.

Data collection

During surgical service provision, IECWs conducting the procedure recorded the profile of each operated case on a paper-based logbook held in catchment health centers. Monthly reports from the logbooks were compiled at the health center level and sent to district and zonal health departments. The Carter Center zone project coordinators entered the reported data into a Microsoft Excel database and shared electronic copies of the reports with the Amhara Regional Health Bureau and the Carter Center Regional Office monthly.

An inventory of TT surgical kits for each of the 140 IECWs was conducted in June 2017. At the completion of training in Amhara, TT surgeons were provided with a minimum of 3 TT surgical kits (contents of each kit indicated in Table 2). The inventory data was entered into Excel by the Carter Center zone project coordinators and reported to the Carter Center Regional Office.

We extracted data for the following variables: socio-demographic characteristics of IECWs, training site, training year, TT kit inventory result, type of duty station of IECWs (Health Center, Hospital, or District Health Office), and number of TT cases operated. TT backlog per district as of January 2017, estimated from trachoma impact surveys, was also extracted and documented in an Excel form [4].

Table 1. Trachomatous trichiasis surgery in Fast Track Initiative (FTI).

The ambitious goal of the National Trachoma Program in Ethiopia—to eliminate trachoma as a public health problem through the implementation of the SAFE (Surgery, Antibiotics, Facial cleanliness, and Environmental improvement) strategy is in line with the World Health Organization Alliance for the Global Elimination of Trachoma by 2020 (GET2020). Due to the high burden of trachomatous trichiasis (TT) in the country, the Ethiopian Ministry of Health (MOH) designed and piloted a TT backlog clearance initiative in April 2015—the Fast Track Initiative (FTI). After piloting in several zones across the country, the FTI was scaled up nationwide starting in September 2015. To achieve this initiative, enhanced attention was given to capacity building, resource and community mobilization, advocacy for multisectoral collaboration, and monitoring and supervision activities.

The aim of the FTI was to clear the backlog of remaining TT cases in a condensed period of time in order to achieve the elimination threshold of less than 0.2% among individuals ages ≥ 15 years. To achieve this objective, the MOH set two broad approaches for TT surgical service provision (free of charge): health facility based service and outreach (“campaign”) service. In the health facility based approach, the service is delivered in an integrated manner with routine clinical services. The catchment population is informed about the service, and patients are expected to visit the clinic for assessment and treatment as required. In the outreach or campaign approach, a temporary service site and operating theater are set up, usually in a rural setting without preexisting facilities. The short term surgical campaign is advertised to the local community, and those presenting for surgery are operated as needed.

In Ethiopia, TT surgery service is provided by Integrated Eye Care Workers (IECWs), general health care workers who receive specialized training to conduct corrective eyelid surgery. In Amhara National Regional State, the IECWs are trained and certified to perform the Posterior Lamellar Tarsal Rotation surgery. In this surgical procedure the eyelid is fixed on the Trabut plate, incised through the conjunctiva and tarsal plate parallel to the eyelid margin, and stopping at the orbicularis muscle. The muscle is dissected from the tarsal plate in both fragments, and the fragments are resutured so that the eyelid margin is rotated outwards and the eyelashes no longer touch the globe. A single eyelid surgery takes approximately 20 minutes.

Statistical analysis and definition of terms

The final dataset was exported to EpiData Entry software (version 3.1, EpiData Association, Odense, Denmark) for data cleaning and then to SPSS (Statistical Package for the Social Sciences; IBM v20) for analysis. IECW productivity was defined as the number of persons operated per IECW during the year. The association between an IECW's productivity and other variables was examined using a chi-square test. A logistic regression model was fit to analyze factors associated with IECW performance, defined as performance of ≥ 200 surgeries per year (annual MOH productivity target). For the modeling procedure, the first category of each categorical variable was used as a reference (as a dummy variable). Those variables with a p -value of ≤ 0.25 in the bivariate model were considered for a multivariable model. The degree of association for statistical significance was calculated using the 95% Confidence Interval (CI) and p -value < 0.05 in the final multivariable model. Operationally defined terms and phrases are annexed in Table 2.

Ethical considerations

Permission to conduct the study was obtained from the Amhara Regional Health Bureau, Bahir Dar, Ethiopia (APHIHRTD/03/349/2019 on 19/04/2019). Local ethical approval was received from the Institutional Review Board (IRB) of the Amhara Public Health Institute, Bahir Dar, Ethiopia. The study was also approved by the Ethics Advisory Group of the International Union against Tuberculosis and Lung Disease, Paris, France (EAG number: 106/18, on 10/01/2019). Informed consent did not apply as this was a retrospective chart review.

Results

Demographic characteristics

One hundred forty IECWs performed surgery from January 2017 through December 2017. Most of the IECWs (84%) were male, and the mean age of the IECWs was 28 years (Standard Deviation [SD] = 4.7) (Table 3). As of January 2017, the estimated surgical backlog of the districts where the IECWs were working was 214,290 cases, including 62,952 from North Shoa zone, 10,632 from Oromia zone, 64,724 from South Wollo zone, 60,141 from North Wollo zone, and 15,841 from Waghimra zone. Sixty-eight percent of the districts with an estimated backlog of $\geq 2,000$ were located in South Wollo, North Wollo, and Waghimra zones; 34% of the IECWs included in the analysis were working in districts having a TT backlog of $\geq 2,000$ at the beginning of January 2017. Professionally, the majority of IECWs were diploma nurses (79%). Eighty-one percent of the IECWs had at least one complete TT kit and 85% had at least one functional TT kit. The most common training sites among this IECW cohort were Debre Berhan hospital in North Shoa zone, 44 (31%) and Borumeda hospital in South Wollo zone, 48 (34%).

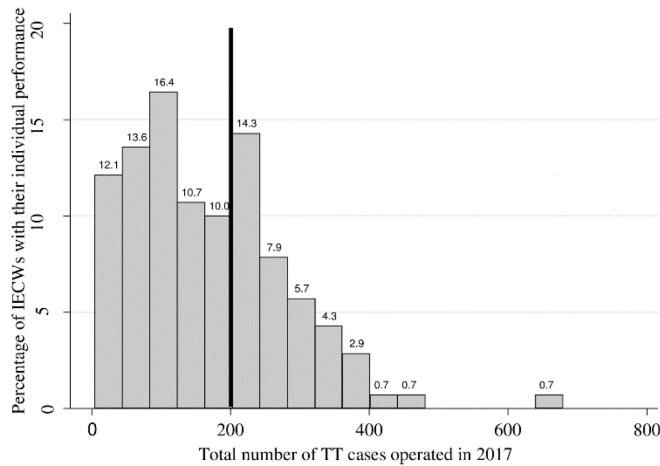
Surgical productivity

The mean number of surgeries performed per IECW in 2017 was 169 (SD = 111) and the median was 149 (Interquartile Range [IQR] = 81-239) (Figure 1). The number of surgeries per IECW ranged from 8 to 679. Among the 140 IECWs, 53 (38%) met the productivity target of ≥ 200 surgeries per year set by the MOH. The mean monthly output was 14 (SD = 9) surgeries per IECW. A total of 23,616 surgeries were performed in 2017 by the 140 IECWs.

Table 2. Operational definitions.

- **Fast Track Initiative (FTI) for intervention of Trachomatous Trichiasis (TT):** a new plan established by the Ethiopian Ministry of Health to enhance provision of eyelid surgery service for TT cases to achieve the elimination threshold for surgery within a short period of time.
- **Integrated Eye Care Worker (IECW):** a general health care worker (nurse or health officer) who has received theoretical and practical training and is certified to provide primary eye care services, including corrective lid surgery for individuals with TT presenting at health facilities and during community-based campaigns.
- **Surgical productivity:** the mean number of persons operated per IECW per year.
- **Surgery service for TT:** corrects the position of the scarred eyelid margin so that the in-turned eyelashes no longer touch/scratch the cornea.
- **Trachomatous Trichiasis (TT):** at least one eyelash touching the eyeball, or evidence of recent removal of in-turned eyelash(es), known as epilation.
- **Trachomatous Trichiasis (TT) Backlog:** the number of TT cases determined by multiplying the prevalence of TT in a district by the district population and then multiplying that number by the national estimate of the proportion of the district population estimated to be ≥ 15 years old.
- **Complete TT Kit:** a surgical kit that contains the following items: lid evertor, scalpel holder for blade, needle holder, toothed tissue forceps, non-toothed tissue forceps, scissor, and two artery forceps.
- **Incomplete TT Kit:** a kit with one or more items from the complete TT kit missing or damaged.
- **Functioning TT Kit:** a kit having at least the following five required items: lid evertor, needle holder, scissor, artery forceps, and one toothed/non-toothed tissue forceps.

Figure 1. Surgery performance of individual Integrated Eye Care Workers (IECWs) from January 2017 to December 2017 in eastern Amhara, Ethiopia.

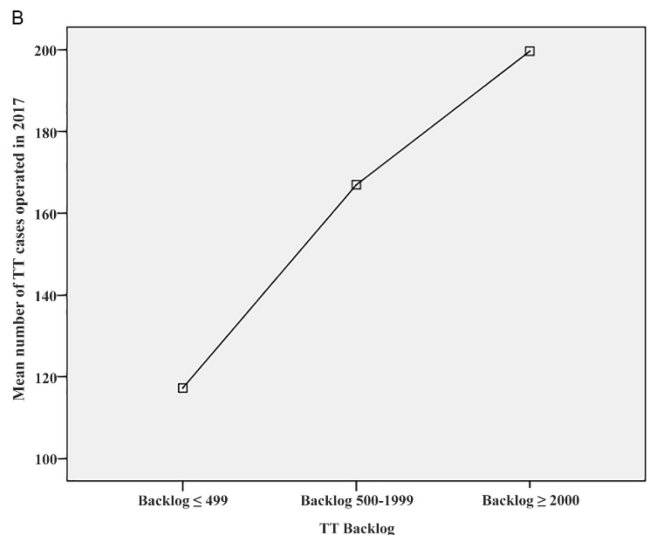
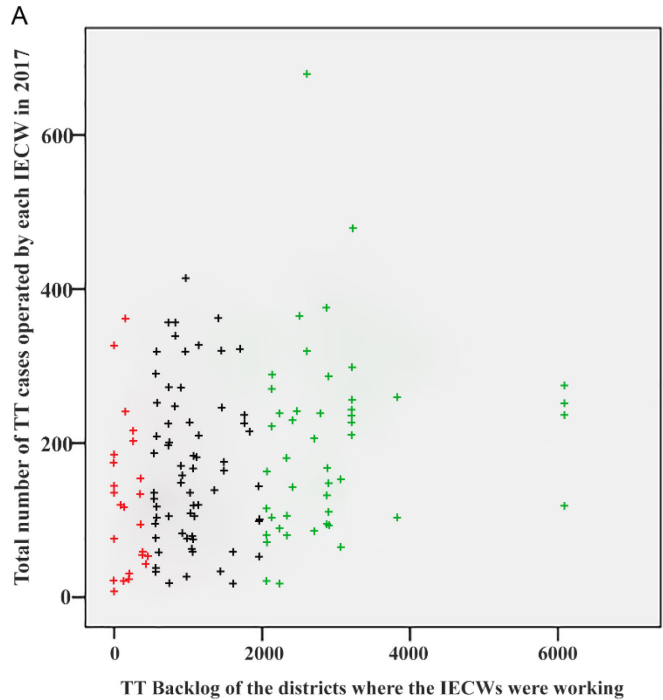


TT: trachomatous trichiasis. Vertical black line = Target threshold set by Ministry of Health (≥ 200 surgeries per year); Sample size = 140, Mean = 169, Standard deviation = 111.

Table 3. Demographic characteristics of Integrated Eye Care Workers (IECWs) in eastern Amhara, January 2017-December 2017.

| Demographic, Provider, and Facility Characteristics | Number of IECWs (N = 140) (%) |
|--|-------------------------------|
| Male, N (%) | 118 (84) |
| Age in years, mean (SD) | 28 (5) |
| Place of Residence N (%) | |
| North Shoa | 41 (29) |
| Oromia | 13 (9) |
| South Wollo | 33 (24) |
| North Wollo | 41 (29) |
| Waghimra | 12 (9) |
| Profession, N (%) | |
| Diploma Nurse | 111 (79) |
| BSC Nurse | 11 (8) |
| Health Officer | 17 (12) |
| Health Assistant | 1 (1) |
| Duty Station, N (%) | |
| Health Center | 129 (92) |
| Woreda Health Office | 6 (4) |
| Hospital | 5 (4) |
| TT backlog, N (%) | |
| Backlog ≤ 499 TT cases | 26 (19) |
| Backlog 500-1,999 TT cases | 67 (49) |
| Backlog $\geq 2,000$ TT cases | 47 (34) |
| Initial IECW training site, N (%) | |
| Debre Berhan Hospital (North Shoa Zone) | 44 (31) |
| Borumeda Hospital (South Wollo Zone) | 48 (34) |
| Dessie Hospital (South Wollo Zone) | 22 (16) |
| Woldiya Hospital (North Wollo Zone) | 21 (15) |
| Other | 5 (4) |
| Number of TT surgery kits owned by IECW, N (%) | |
| 1-2 TT Kits | 19 (14) |
| 3-5 TT Kits | 89 (64) |
| ≥ 6 TT Kits | 16 (11) |
| Not recorded | 16 (11) |
| TT kit completeness status, N (%) | |
| Number of IECWs who have no complete TT kit | 10 (7) |
| Number of IECWs who have one or more complete TT kit | 114 (81) |
| Not recorded | 16 (11) |
| TT kit functionality status, N (%) | |
| Number of IECWs who have no functional TT kit | 5 (4) |
| Number of IECWs who have one or more functional TT kit | 119 (85) |
| Not recorded | 16 (11) |

Figure 2. Integrated Eye Care Workers (IECWs) surgical output vs. TT backlog of the districts where the IECWs were working, January 2017-December 2017, eastern Amhara, Ethiopia. (a) Distribution of individual IECW’s productivity by backlog category of the districts where the IECWs were working; (b) Mean number of surgeries carried out vs. TT backlog of the districts where the IECWs were working.



+ (red) = Backlog ≤ 499 ; + (black) = Backlog 500-1999; + (green) = Backlog ≥ 2000 .

The majority of the IECWs (66%) were working in districts having a TT backlog of < 2,000 (Figure 2a). Those IECWs working in districts with a backlog < 500 had a mean number of 117 surgeries per year, while those working in districts with $\geq 2,000$ backlog had a mean output of 200 surgeries per year. IECWs from districts with higher TT backlogs had higher productivity in 2017 ($p = 0.024$) (Figure 2b).

Factors associated with surgical productivity of IECWs

Profession of IECW, TT backlog (of the district where the IECW worked), number of TT kits owned, TT kit completeness, and site and time of initial IECW training met the p -value cutpoint ($p < 0.25$) for association with surgeon productivity (Table 4).

From the multivariate analysis fit to these variables and age and sex, initial IECW training site and TT backlog had a statistically significant association ($p < 0.05$) with productivity. Those IECWs initially trained in Borumeda (Adjusted Odds Ratio [AOR] = 4.7; 95% CI = 1.43, 15.23), Dessie (AOR = 21.4; 95% CI = 3.23, 141.74), and Woldiya (AOR = 11.8; 95% CI = 1.71,

81.45) hospitals were more likely to perform ≥ 200 surgeries per year as compared to those who received initial training at Debre Berhan Hospital. IECWs working in districts with a backlog of > 2,000 TT cases were more likely to operate ≥ 200 surgeries (AOR = 6.7; 95% CI = 1.53, 28.84) per year as compared to those who were working in districts having a backlog of < 500 TT cases.

Discussion

The data from five trachoma endemic zones of Amhara demonstrated that during 2017, IECWs averaged 169 surgeries per year, and IECW training location and the TT backlog of the district where an IECW worked were associated with annual surgical performance. In some countries, large-scale surgical initiatives may be needed to achieve elimination of trachoma as a public health problem by the year 2030. Setting realistic targets by accounting for local TT backlogs may help in achieving this important goal.

Prior to implementation of the FTI, the Ethiopian MOH set a productivity target of ≥ 200 surgeries per

Table 4. Provider and facility factors associated with Integrated Eye Care Workers (IECWs) performing ≥ 200 surgeries per year in eastern Amhara, Ethiopia, January 2017-December 2017.

| Variables | IECWs with performance < 200 (n = 87) | | IECWs with performance ≥ 200 (n = 53) | | p -value | Adjusted odds ratio, 95% CI | p -value |
|--|---------------------------------------|----|--|----|------------|-----------------------------|------------|
| | n | % | n | % | | | |
| Sex | | | | | | | |
| Male | 72 | 61 | 46 | 39 | 0.525 | 1 | |
| Female | 15 | 68 | 7 | 32 | | 0.61 (0.18, 2.08) | 0.43 |
| Age | | | | | | | |
| < 30 Years | 66 | 61 | 42 | 39 | 0.644 | 1 | |
| ≥ 30 Years | 21 | 66 | 11 | 34 | | 1.04 (0.30, 3.59) | 0.946 |
| Profession | | | | | | | |
| Diploma Nurse and Health Assistant | 73 | 65 | 39 | 35 | 0.139 | 1 | |
| BSC Nurse and Health Officer | 14 | 50 | 14 | 50 | | 2.22 (0.76, 6.47) | 0.144 |
| TT Backlog | | | | | | | |
| Backlog ≤ 499 TT cases | 21 | 81 | 5 | 19 | 0.024 | 1 | |
| Backlog 500-1,999 TT cases | 43 | 64 | 24 | 36 | | 2.16 (0.52, 9.05) | 0.291 |
| Backlog $\geq 2,000$ TT cases | 23 | 49 | 24 | 51 | | 6.65 (1.53, 28.84) | 0.011 |
| Time since initial IECW training | | | | | | | |
| ≤ 2 years | 35 | 55 | 29 | 45 | 0.095 | 1 | |
| > 2 years | 52 | 68 | 24 | 32 | | 0.26 (0.05, 1.38) | 0.114 |
| Initial IECW training site | | | | | | | |
| Debre Berhan Hospital | 38 | 86 | 6 | 14 | < 0.001 | 1 | |
| Borumeda Hospital | 22 | 46 | 26 | 54 | | 4.66 (1.43, 15.23) | 0.011 |
| Dessie Hospital | 11 | 50 | 11 | 50 | | 21.39 (3.23, 141.74) | 0.002 |
| Woldiya and other hospitals | 16 | 62 | 10 | 39 | | 11.79 (1.71, 81.45) | 0.012 |
| Number of TT kits owned by the IECW | | | | | | | |
| 1-2 TT Kits | 16 | 84 | 3 | 16 | 0.068 | 1 | |
| 3-5 TT Kits | 52 | 58 | 37 | 42 | | 1.86 (0.39, 8.89) | 0.437 |
| ≥ 6 TT Kits | 8 | 50 | 8 | 50 | | 2.47 (0.37, 16.25) | 0.348 |
| Status of TT kit completeness | | | | | | | |
| No. of IECWs who have no complete TT kits | 9 | 90 | 1 | 10 | 0.05 | 1 | |
| No. of IECWs who have one or more complete TT kits | 67 | 59 | 47 | 41 | | 10.69 (0.86, 133.81) | 0.066 |

IECW per year to achieve its surgical goals. This was an ambitious goal as data from previous studies in Ethiopia and Tanzania reported mean surgical productivity at 41 and 22 surgeries per surgeon per year, respectively [13,14]. This study demonstrated that the mean annual IECW productivity of 169 surgeries with a maximum of 679 surgeries far surpassed the results from those previous studies. While only 38% of surgeons reached the productivity target set by the MOH, this target did lead to a large number of TT surgeries conducted over the course of one year. Given the difficulty of even highly productive IECWs reaching the MOH target, the MOH should consider revising the annual surgical productivity target moving forward. Considering the decreasing estimated backlog and increased difficulty associated with locating the remaining TT cases for surgery, more realistic, data driven targets may be needed.

As of May 2020 in Ethiopia, 716 districts had a TT prevalence $\geq 0.2\%$ among individuals ages ≥ 15 years [2]. Given the scale of this problem, a better understanding of factors associated with surgical output would be helpful to trachoma control programs. This current study focused on the relationships between provider-related factors and surgical productivity. Those IECWs who received their IECW training at Borumeda, Dessie, and Woldiya hospitals were more likely to complete ≥ 200 surgeries per year than IECWs initially trained at Debre Berhan Hospital. Though all hospitals were advised to use the same guidelines and training procedure, the difference in output may be related to differences in training methodology or execution. A majority (68%) of the districts which had a surgical backlog of $\geq 2,000$ were found in South Wollo, North Wollo, and Waghimra zones, which had IECWs trained at Borumeda, Dessie, and Woldiya hospitals. IECWs working in districts with backlogs of $> 2,000$ cases were likely to find more TT cases, and thus had higher productivity over the course of the year. Program managers should use existing locally-based TT backlog estimates to set annual performance goals for TT surgeons and should consider shifting increased surgical resources to areas with the largest estimated backlogs.

The study had several limitations. This study focused on five administrative zones in one region of Ethiopia, which may have limited its generalizability to other trachoma endemic regions. However, these five zones were highly trachoma endemic and accounted for a large proportion of the TT case backlog within Ethiopia. This study used routine program data that was paper-based, and data were extracted from

programmatic data sets; therefore, missing data may have hampered the detection of additional statistical associations. Actual patient outcome after surgery was not included in this study since it was not captured by the programmatic dataset, and therefore, we could not examine associations between productivity and surgical quality. Future studies should be considered for Ethiopia to determine whether additional factors influence the productivity of the IECWs and the quality of TT surgical outcomes under large scale surgical initiatives.

Conclusions

The FTI was a successful, MOH-led initiative that resulted in 475,224 TT surgeries performed over a period of three years. A cadre of 140 IECWs were active in 2017 in eastern Amhara alone, and those IECWs operated an average of 169 patients per year, achieving a total of 23,616 surgeries. Since it will become harder to locate TT cases in the future as the Program nears the elimination threshold, using local TT backlog data should help in defining realistic annual goals. Using data driven approaches to goal setting should help Ethiopia and other trachoma endemic countries reach elimination of trachoma as a public health problem by 2030.

Acknowledgements

This research was conducted through the Structured Operational Research and Training Initiative (SORT IT), a global partnership coordinated by TDR, the Special Programme for Research and Training in Tropical Diseases, hosted at the WHO. The training model is based on a course developed jointly by the International Union against Tuberculosis and Lung Disease and Médecins Sans Frontières-Luxembourg (LuxOR). The specific SORT IT program that led to this work included a joint implementing partnership between TDR, the Institute of Tropical Medicine Antwerp, the University of Gondar, Ethiopia, the WHO Ethiopia country office, Médecins Sans Frontières, Luxembourg (LuxOR), and The International Union against Tuberculosis and Lung Disease. The data used for this study was collected by the Amhara Regional Health Bureau with the support of the Carter Center's Ethiopia Trachoma Control Program. The principal investigator acknowledges the two institutions for their permission to use the Program's data records. The funding support for the training program was provided by TDR and the Institute of Tropical Medicine Antwerp and supported by various implementing partners. All program-related activity and data collection were funded by the Lions-Carter Center SightFirst Initiative supported by Lions Club International Foundation and the Lions Club of Ethiopia, the UK Department for International Development (DFID/Sightsavers), and the Noor Dubai Foundation.

References

1. Hu VH, Harding-Esch EM, Burton MJ, Bailey RL, Kadimpeul J, Mabey DC (2010) Epidemiology and control of trachoma: systematic review. *Trop Med Int Health* 15: 673-691.
2. World Health Organization (WHO) (2020) WHO alliance for the global elimination of trachoma by 2020: progress report, 2019. Available: <https://www.who.int/publications/i/item/who-wer9530>. Accessed 12 February 2021.
3. Berhane Y, Worku A, Bejiga A, Adamu L, Alemayehu W, Bedri A, Haile Z, Ayalew A, Adamu Y, Gebre T, Kebede T, West E, West S (2007) Prevalence of Trachoma in Ethiopia. *Ethiopian Journal of Health Development* 21: 211-215.
4. Stewart AEP, Zerihun M, Gessese D, Melak B, Sata E, Nute AW, Astale T, Endeshaw T, Teferi T, Tadesse Z, Callahan EK, Chanyalew M, Gaudie B, Emerson PM, King JD, Nash SD (2019) Progress to eliminate Trachoma as a public health problem in Amhara National Regional State, Ethiopia: results of 152 population-based surveys. *Am J Trop Med Hyg* 101: 1286-1295.
5. Federal Democratic Republic of Ethiopia, Ministry of Health (2016) Second Edition of National Neglected Tropical Diseases Master Plan. Available: https://e-library.moh.gov.et/library/wp-content/uploads/2021/07/NTD-Master-Plan_Ethiopia-2016-2020.pdf. Accessed 17 May 2022.
6. World Health Organization (WHO) (2010) Report of the 3rd global scientific meeting on Trachoma. Baltimore, USA. Available: <https://apps.who.int/iris/handle/10665/329074>. Accessed 16 May 2022.
7. World Health Organization (WHO) (2015) Trichiasis surgery for trachoma, second edition. Available: <https://www.who.int/publications/i/item/9789241549011>. Accessed 21 June 2019.
8. The Carter Center (2016) Summary proceedings, seventeenth annual trachoma program review, all eyes on 2020. Available: https://www.cartercenter.org/resources/pdfs/news/health_publications/trachoma/trachomareview-final-eng-2016.pdf. Accessed 13 December 2019.
9. The Carter Center (2017) Summary proceedings, eighteenth annual trachoma program review, focusing on 2020: 4 years remaining. Available: https://www.cartercenter.org/resources/pdfs/news/health_publications/trachoma/trachomareview-final-eng-2017.pdf. Accessed 13 December 2019.
10. The Carter Center (2018) Summary proceedings, nineteenth annual trachoma program review, celebrating 20 years of impact. Available: https://www.cartercenter.org/resources/pdfs/news/health_publications/trachoma/trachomareview-final-eng-2018.pdf. Accessed 13 December 2019.
11. The Carter Center (2019) Summary proceedings, twentieth annual trachoma program review, seeing trachoma disappear: the magic of passion, partnerships, and possibilities. Available: https://www.cartercenter.org/resources/pdfs/news/health_publications/trachoma/trachomareview-final-eng-2019.pdf. Accessed 15 October 2020.
12. World Health Organization (WHO) (2020) Ending the neglect to attain the Sustainable Development Goals: a road map for neglected tropical diseases 2021–2030. Available: <https://www.who.int/publications/i/item/9789240010352>. Accessed 12 February 2021.
13. Habtamu E, Rajak SN, Gebre T, Zerihun M, Genet A, Emerson PM, Burton MJ (2011) Clearing the backlog: trichiasis surgeon retention and productivity in northern Ethiopia. *PLoS Negl Trop Dis* 5: e1014.
14. Lewallen S, Mahande M, Tharaney M, Katala S, Courtright P (2007) Surgery for trachomatous trichiasis: findings from a survey of trichiasis surgeons in Tanzania. *Br J Ophthalmol* 91: 143-145.

Corresponding author

Scott D Nash, PhD
 The Carter Center, 453 John Lewis Freedom Parkway NE, Atlanta, GA 30307
 Phone: 404-420-3838
 Email: scott.nash@cartercenter.org

Conflict of interests: No conflict of interests is declared.