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A cost-analysis of conducting population-based prevalence surveys for the validation of the elimination of trachoma as a public health problem in Amhara, Ethiopia

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Applied Epidemiology
2017

Abstract

A cost-analysis of conducting population-based prevalence surveys for the validation of the elimination of trachoma as a public health problem in Amhara, Ethiopia

By Randall P. Slaven

Background: Trachoma impact surveys (TIS) provide information to program managers on the impact of the SAFE strategy and current burden of disease, and provide a crucial component of the evidence base necessary for the validation of the elimination of trachoma as a public health problem. TIS are multi-level cluster random surveys that provide population-based estimates for program planning. This study conducted an analysis of the cost of eight rounds of trachoma impact surveys conducted in Amhara, Ethiopia, 2013 – 2016, comprising 232,365 people examined over 1,828 clusters in 187 districts.

Methodology and Findings: Cost data were collected retrospectively from accounting and procurement records and coded by activity (i.e. training, field work, and processing) and input category (i.e. personnel, transportation, supplies, venue rental, and other). Estimates of staff time were obtained from the Carter Center's Ethiopian project manager and staff and were included in the analysis. Data were analyzed by activity, input category, and location (East or West Amhara). The mean total cost per cluster surveyed was $753 (inter-quartile range of $670-$854). Primary drivers of costs were personnel (38.7%) and transportation (50.3%), with costs increasing in the last 3 rounds of TIS.

Conclusion: Despite their considerable cost, trachoma impact surveys provide necessary information for program managers. Few options are available to reduce the costs of TIS. Surveys must be designed with feasibility in mind, as the need for precision is balanced against the financial and staff resources required to conduct the sight-saving components of the SAFE strategy. Program managers can use these findings to improve estimates of the total cost of a survey and its components to ensure that ample resources are budgeted accordingly.

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Acknowledgements

To Aisha Stewart: Thank you for countless hours of your guidance and for your indefatigable patience. I still do not believe I've ever heard you say "I do not know", and I'm fairly certain that streak continues to this day.

To Dr. Deb McFarland: Thank you for your insight and suggestions. I had no experience with this type of analysis before I started this thesis, and so I thank you for all of your understanding and expertise as I come to learn the finer points of GDP deflators and the like.

To Yohannes Dawd, Arjan Wietsma, and Andrew Nute: Thank you all for your assistance in gathering the data necessary to complete this project. The confidence I feel in these results is due to the effort you put in to provide me with high-quality information.

To Dr. Zerihun and the entirety of the Ethiopian Program: Your work (and meticulous accounting records) were necessary for this thesis to exist, and are what truly gives it meaning.

To Dr. Scott Nash: Thank you for your review and counsel. Your sagacious knowledge of trachoma literature and calm demeanor were always appreciated, as were your methodological and stylistic suggestions.

To Kelly Callahan and the Carter Center's Trachoma Program: It is one of the honors of my life to work in support of the world's greatest trachoma program and team. I thank each of you for your assistance in this project.

To Madelle Hatch, Nicole Kruse, and Phil Wise: Thank you all for your support and understanding as I worked to complete this project. My professional mandate is to work in support of our programs, and I thank you for letting me creatively interpret that stricture.

To Sarah Austin: Thank you for your love, support, and forbearance throughout this process.

To Elizabeth Slaven: Thank you for being a constant source of inspiration and motivation to complete this project.

Table of Contents

I. Background and Literature Review

Trachoma: The Disease and the International Effort to Prevent the Blindness it Causes

Trachoma, a neglected tropical disease, is the leading cause of preventable, infectious blindness worldwide [1]. By 2020, World Health Assembly resolution 51.11has scheduled trachoma for elimination as a public health problem in 42 countries, with 181 million people at risk worldwide [2]. The greatest burden of the disease is in west Africa and the savannah areas of east and central Africa, where an estimated 129.4 million people live in trachoma endemic areas [3, 4]. It is most prevalent in poor, rural areas that lack access to clean water and the infrastructure necessary to support basic hygiene and adequate sanitation [4]. Trachoma is combated through the SAFE strategy: S for Surgery for the most severe cases of the disease, A for antibiotics, F for Facial Cleanliness and E for Environmental Improvement through latrine construction and other water-source provision [5, 6]. Trachoma impact surveys (TIS) provide information to program managers on the impact of the SAFE strategy and current burden of disease, and provide a crucial component of the evidence base necessary for the validation of the elimination of trachoma as a public health problem.

The WHO has endorsed a simple grading system for assessing the severity of trachoma using five grades (in order of severity): trachomatous inflammation- follicular (TF), trachomatous inflammation-intense (TI), trachomatous scarring (TS), trachomatous trichiasis (TT) and corneal opacity (CO) [7, 8]. The bacteria that cause trachoma are spread via direct contact with ocular and nasal discharge from an infected person, including that which is left on unwashed towels or cloths. Transmission also is believed to occur through flies that seek out ocular or nasal discharge [9]. Over time the disease causes granular-like roughening to build on the inner eyelid, which with repeated infections scars and physically distorts the eyelid. Due to this scarring and distortion, the eyelashes turn inward and begin to scrape the globe of the eye, causing trauma to the cornea that results in blindness [9]. *Musca sorbens*, a fly, is the principle insect vector that is believed to facilitate the transmission of trachoma [10].

The global trachoma campaign does not have a true elimination goal. There are two primary intervention targets set forth by the GET2020 (Global Alliance for the Elimination of Trachoma by 2020) in order to successfully declare the elimination of blinding trachoma as a public health problem [11]. The first is prevalence at the sub-district level of TF, the first stage of the disease, of less than 5% in children aged 1-9 years. The second criteria focuses on the most severe stage of the disease, where no more than 1 case of trichiasis can be unknown to the health system per 1,000 total population at the district level. Known cases are from failed or refused surgery, as well as trichiasis patients that have scheduled surgeries that have yet to be completed.

Trachoma is associated with poor facial cleanliness [12], household fly density [12], altitude [13, 14], water access [15], latrine ownership [16], cattle ownership [15], sleeping near a cooking fire [17], and socioeconomic status [13]. Although the literature focuses primarily on the African context, similar associations have been shown in Asia [18].

The burden associated with trachoma impedes economic development [19]. Although children are primarily the reservoir of disease in an endemic community, the most severe complications, including blinding, occur primarily in the older population in these areas. Caretaking women are more likely to have active infection or trichiasis [20]. For people living with trichiasis, additional irritation and pain can be caused by smoke, dust or bright light. This pain often prevents people from conducting normal daily activities, such as cooking, farming or basic household chores [21].

The Importance of Surveys in Program Management

Accurate data on the prevalence of TF and TT at district level are vital for identifying program progress, planning future activities, and fundraising [22-24]. Although surveys are carried out in clusters, districts are typically the unit of focus in surveys, as they are the most common programmatic implementation unit, for practical and technical reasons [25]. The WHO classifications of the stages of trachoma were designed to assess the prevalence and severity of the disease in a community, not to determine individual diagnoses [26] and are used as a result of their simplicity and inexpensiveness, and when collected in a survey they can assist program managers in determining the course of action to be taken in a given implementation unit or district [27]. Surveys are a tool used by all program managers, even in diverse contexts such as The Gambia in 1959 [28], Japan [29], Kenya [30], China [31], Egypt [32], Malawi [33], Vietnam [34], and Nepal [18].

Methods Commonly Used by Trachoma Programs to Conduct Surveys

There are three main survey methods used to determine the prevalence of trachoma: population-based prevalence surveys (PBPS), acceptance sampling trachoma rapid assessment (ASTRA), trachoma rapid assessment (TRA). Population-based prevalence surveys (PBPS) are the "gold standard" survey to estimate the prevalence of trachoma in a given population [35]. The sample size of a CRS survey is determined by the estimated prevalence, precision desired, confidence level, level of significance and design effect caused by the variance introduced by cluster sampling. The first step in this process is to randomly select sample villages, which should be representative of the area. These should be weighted with a probability that is proportionate to their size, to avoid the overselection of smaller villages. The sampled clusters should be visited in advance to get the buy-in of local leaders and to get assistance in locating and acquiring information on the various households in the community [6]. At each village, the surveyors should randomly sample households. All persons living in those households are to be surveyed and these households should be representative of the village as a whole. An advantage of this style of survey is that program managers can get information on multiple indicators in one survey (e.g. TF and TT).

The WHO-endorsed Trachoma Rapid Assessments (TRA) [36] are also another survey method, which has expedience and low-cost as its key features [6]. TRA is used to assess active trachoma in children and trichiasis in older, usually female, patients. Communities or districts are selected that are believed have significant trachoma. This quick survey checks to see how many people have TT and then polls 50 children ages 1-9 selected from the poorest households to see how many have TF. While this is an inexpensive tool, it is inferior to the gold standard and has limitations when compared to even standard surveys using the clinical examination. In this method, all people with suspected TT are assumed to have it unless examined and proven otherwise. This is an intentional feature of the survey design, as it reduces the time spent hunting for suspected cases. The design of this survey is intended to overestimate the prevalence of trachoma, given its targeting of the most disadvantaged children in the community. It is only to be used as a tool to provide managers with a rough estimation of burden, and is too imprecise to use for elimination targets. Although this was not designed to take the place of standard surveying, results from TRA have been incorrectly reported and interpreted as though the prevalence of trachoma were actually revealed through TRA [35].

Acceptance sampling trachoma rapid assessment (ASTRA) is another less expensive method of surveying a community for trachoma that is an alternative to TRA [37]. ASTRA uses a method known as lot quality assurance sampling (LQAS), which was originally used for quality control in manufacturing, but has been shown to have utility in public health [38]. A trachoma-specific investigation concluded that LQAS did not return results consistent with the gold standard, CRS

[39]. ASTRA generally provides a dichotomous result: either an area has significant active trachoma or is within tolerable limits. Surveyors examine a population until a pre-determined number of cases are found. If this occurs before a pre-determined number of people are examined, then the area is judged to be outside of acceptable limits. Variants of this technique exist, and attempt to provide additional information by increasing the number of people surveyed, however this is hampered by the imprecise nature of the estimates this methodology returns [35]. School-based surveys for trachoma have also been attempted as a low-cost option, but have significant drawbacks as TT prevalence cannot be determined through examination of children [40].

Ideally, trachoma graders are experienced in eye-care, although trainees with no previous experience can conduct the assessments provided more in-depth training is provided [6]. After receiving training, graders are tested to ensure that they are in agreement. The International Trachoma Initiative's (ITI) training materials suggest four team members are needed to conduct a survey: one trained and validated trachoma grader and three field assistants who will count households and take records. Assistance from community members is also helpful in finding households or translating.

Alternatives to Surveys That Use the Clinical Signs of Trachoma

There are other methods that are less frequently used in place of surveys using the clinical signs of the disease. Gold-standard analysis is cost-prohibitive for most program managers [27]. Given the lack of participation in the health system by patients with acute follicular trachoma or patients seeking surgery, any estimation of the prevalence of trachoma that relies on data generated by passive surveillance would underestimate the true burden of disease, and thus is not used. A determination of the prevalence of trachoma is also possible through monitoring antibodies, although no information on cost is provided; this method is rarely used [25].

Efforts to Map Trachoma on a Larger Scale

Early attempts to map the extent of the burden of trachoma on a larger scale were limited in scope and were in essence meta-analysis of surveys that had been published [24]. When Polack et al. compiled their data, there were insufficient epidemiological data on the global distribution of trachoma. Data were sparse, and especially for trachoma programs in Africa. After several years, a second attempt to collect and summarize trachoma mapping data was initiated. The Global Atlas of Trachoma (GAT) was a joint-project of the International Trachoma Initiative and the London School of Tropical Medicine and Hygiene, which had a goal of providing standardized maps of the prevalence of trachoma [4]. It was compiled by converting existing published research that included mapping with unpublished national program results into a standardized database. Despite including more than 1,300 surveys, only 20.6% of suspected-endemic districts had been mapped using PBPS.

While the Global Atlas of Trachoma was a retrospective project that focused primarily on collating already existing data, the Global Trachoma Mapping Project (GTMP) was created to proactively map the extent of trachoma in all endemic districts in each endemic country worldwide. It is the largest disease-mapping project ever conducted [41]. The GTMP divided each endemic area into evaluation units (EUs), which comprised 100,000 to 250,000 people. Ministry of Health staff were trained to conduct PBPS surveys using WHO-endorsed methodology, with a portion of villages excluded from the sampling frame for convenience.

Cost Analysis of Trachoma

Global-scale cost-effectiveness analysis of trachoma programming is a relatively recent endeavor [42]. As global trachoma-advocacy efforts increase, cost estimates of the SAFE strategy are often done for advocacy or fundraising purposes [42]. Cost-effectiveness analysis generally has to derive two main components: the cost of the intervention that is being studied compared to the intervention's effectiveness. With surveys, it is challenging to derive the actual utility of the activity, as surveys are used as an input for other work. This study will focus on the cost of surveys, so that program managers might impute the believed utility of a survey against cost numbers that are rigorously derived. It is important to precisely determine the cost of an activity so that resources may be prioritized effectively or policies designed with cost in mind.

The cost-effectiveness of surveys depends on the cost effectiveness of the various interventions a trachoma program manager has to implement; if interventions were not effective, there would be limited utility in conducting surveys. In 1985 prior to widespread MDA campaigns with Azithromycin, Dawson and Schachter created some of the first estimates of the costs of using topical antibiotics in a control program. They treated survey costs very crudely, estimating that one "medium-grade" ministry of health worker would be able to conduct all surveys in an EU or district [43]. Modern practices include at least four people to conduct surveys. Dawson and Schachter did not include any consumables or transportation costs in this component of their analysis.

Further analysis of the components of SAFE have been conducted, although surveys were out of scope for these papers. Surgery and antibiotics have been demonstrated to be cost effective [44-48]. Health education, specifically the facial cleanliness component of the SAFE strategy, has seen mixed results in various studies, although latrine promotion has the least evidence of all interventions in terms of cost effectiveness [45, 49].

The International Coalition for Trachoma Control (ICTC) derived an estimate of the global cost of SAFE, and specifically placed surveys into their own category [50]. The ICTC estimated a per district cost of $5,000 for baseline surveys, $7,500 for impact surveys, and $6,000 for surveillance surveys in 2011 USD. They estimated a total global cost of $14m for all remaining surveys, although this was before the Global Trachoma Mapping Project, which would reduce costs remaining as a result of reducing the amount of mapping needed. Still, cost data remain sparse, resulting in another set of estimates that included a wide gap in estimated costs to treat trachoma, from $1 per case to $5,513 [42]. Factors such as the size of a district or the makeup of the population make it challenging to extrapolate costs from district to district [51].

Historically, most NTD programs have focused on specific diseases, and have worked in isolation from other NTDs [52], although it is possible for a single survey to cover multiple diseases effectively [19] and there is often geographic overlap between trachoma and other NTDs [53]. In 2010, Kolaczinski et al., conducted an analysis of integrated surveys for three non-trachoma NTDs in Southern Sudan. The main drivers of cost were lab consumables and personnel with an average economic cost per county surveyed of $40,206. This is not a perfect comparison, as trachoma survey methodology is different, and as a result of the cost and complexity, laboratory tests are rarely used to confirm a clinical diagnosis of trachoma [27], as they were in Kolaczinski et al.

In 2011, Chen et al. performed an in-depth analysis of trachoma survey costs across eight national trachoma control programs [54]. The median cost of a survey was estimated at $4,784 (with an IQR of $3,508 to $6,650) per district. The median cost of a cluster was $311 (IQR $119-$393).

Chen et al. analyzed the data by cost category (personnel, transportation, supplies, and miscellaneous) as well as by activity (training, field work, supervision, and data entry). Personnel (64.6%) and transportation (25.7%) costs were the majority of expenses. From an activity perspective, training resulted in 5.9% of total expense, field work in 69.9%, supervision in 13.2% and data entry in 10.9%. Chen et al. relied on the eight field offices included in this study to provide categorized data, introducing potential variation as a result of different interpretations of costs by different respondents. Additionally, Chen et al. utilized currency conversions that were so simplistic as to distort the true cost of the program in a widely varying exchange rate situation, and there was no attempt to normalize costs to a base year.

My investigation will improve on Chen's work, which is now out of date. By taking transaction-level cost information from Trachoma Impact Surveys (TIS) conducted by the Carter Center's Trachoma Program in Amhara, Ethiopia, I will arrive at a stronger estimate of the current cost incurred by an NGO in conducting TIS. The findings of this paper will assist NGO trachoma program managers in accurately budgeting for trachoma impact and surveillance surveys.

Contribution of Student

I reviewed program budgets and TIS protocols to determine the 46 categories that costs were binned into. I reviewed every cost incurred by The Carter Center in Ethiopia or procured for TIS in Atlanta (n=36,942), and coded them with respect to category and survey. I created the Excel document to house this data, and to aggregate individual observations into summaries. I created the Excel sheet that transformed existing figures into 2016 USD and other sheets that were used in the analysis. I analyzed results with guidance from Aisha Stewart, Deb McFarland, Scott Nash and Kelly Callahan, and executed steps to shore up deficiencies in the data or my process. I drafted the manuscript, including all figures and tables, which were reviewed by co-authors. -RPS

II. Manuscript in PLOSNTD Format

Title: A cost-analysis of conducting population-based prevalence surveys for the validation of the elimination of trachoma as a public health problem in Amhara, Ethiopia

Short Title: Accurate analysis of cost of conducting trachoma impact surveys

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Abstract

Background: Trachoma impact surveys (TIS) provide information to program managers on the impact of the SAFE strategy and current burden of disease, and provide a crucial component of the evidence base necessary for the validation of the elimination of trachoma as a public health problem. TIS are multi-level cluster random surveys that provide population-based estimates for program planning. This study conducted an analysis of the cost of eight rounds of trachoma impact surveys conducted in Amhara, Ethiopia, 2013 – 2016, comprising 232,365 people examined over 1,828 clusters in 187 districts.

Methodology and Findings: Cost data were collected retrospectively from accounting and procurement records and coded by activity (i.e. training, field work, and processing) and input category (i.e. personnel, transportation, supplies, venue rental, and other). Estimates of staff time were obtained from the Carter Center's Ethiopian project manager and staff and were included in the analysis. Data were analyzed by activity, input category, and location (East or West Amhara). The mean total cost per cluster surveyed was $753 (inter-quartile range of $670-$854). Primary drivers of costs were personnel (38.7%) and transportation (50.3%), with costs increasing in the last 3 rounds of TIS.

Conclusion: Despite their considerable cost, trachoma impact surveys provide necessary information for program managers. Few options are available to reduce the costs of TIS. Surveys must be designed with feasibility in mind, as the need for precision is balanced against the financial and staff resources required to conduct the sight-saving components of the SAFE strategy. Program managers can use these findings to improve estimates of the total cost of a survey and its components to ensure that ample resources are budgeted accordingly.

Author Summary

Population-based trachoma impact surveys are necessary to determine the impact of interventions and to build the case for the validation of elimination as a public health problem. As trachoma prevalence is in the many areas worldwide receiving intervention, the total number of surveys will increase, requiring programs to allocate additional funding and staff resources. The authors conducted a review of costs accrued during eight rounds of trachoma impact surveys in Amhara, Ethiopia, representing a total of 1,828 clusters in 187 districts. The costs were sorted by activity (i.e. training, field work, and processing) and input category (i.e. transportation, personnel, venue rental, supplies, other). The data show that field work is the most expensive activity for TIS, with transportation and personnel as the most significant drivers of cost. Opportunities for cost savings are challenging to find as the main drivers of cost (transportation and personnel) are dependent on one another. Reducing the number of teams carrying out the survey will only increase the number of days remaining teams and vehicles are in the field. Surveys must be designed with feasibility in mind, as the need for precision of prevalence estimates is balanced against the financial and staff resources required to conduct the sight-saving components of the SAFE strategy. Program managers can use these findings to improve estimates of the total cost of a survey and its components to ensure that ample resources are budgeted accordingly.

Introduction

Trachoma, a neglected tropical disease, is one of the leading causes of preventable blindness worldwide [1]. By 2020, a World Health Assembly resolution has scheduled trachoma for elimination as a public health problem in 42 countries, with 181 million people at risk worldwide [2]. In order to meet WHO guidelines for the validation of elimination of trachoma as a public health problem, national programs must submit evidence garnered from surveys to show that each district has a prevalence of trachomatous trichiasis unknown to the health system of less than 1 case per 1,000 total population, and a prevalence of trachomatous inflammation-follicular (TF) in children ages 1-9 years of less than 5% in each formerly endemic district, with a district being defined as the administrative unit for health care management, consisting of a population between 100,000 and 250,000 persons [55].

Population-based prevalence surveys are the “gold standard” to estimate the prevalence of trachoma in a given population [35]. They use a multi-stage survey method, which randomly selects clusters and then randomly selects households in those clusters. People living in selected households are examined in their entirety using the WHO Simplified Grading System, which looks for clinical signs of the disease [7].

This paper presents an analysis of the costs incurred over four years in eight rounds of TIS. The rounds of TIS included a total of 187 district-level observations by the Carter Center’s trachoma program operating in Amhara, Ethiopia, which was believed to be the most endemic area in Ethiopia when the program began [56]. Certain districts were included in multiple rounds of TIS.

Methods

Summary data on 187 districts surveyed over eight bi-annual rounds of trachoma impact surveys (TIS) conducted between January 2013 and December 2016 were collected from existing records and reports, and the number of clusters in each TIS round was verified. A cluster was defined as a group of households (a ‘Gott’ or village) and the geographic area that they cover as selected by random systematic sampling using a probability proportional to estimated size. No villages were excluded from the sampling frame, which included all villages in a district regardless of ease of access by survey teams.

To categorize the data activity categories, input categories, and cost codes were defined for simplicity and comparability after a review of the literature [54, 57], survey protocols and budgets, and interviews with staff. Activity categories consisted of the three primary components of a TIS: training, field work (the survey itself), and processing (data cleaning) (table 1). Input categories were defined as the primary components of each activity. The training activity consists of the input categories of technical personnel, transportation, supplies, and venue rental. The field work activity consists of the input categories of personnel, transportation, supplies and other costs (e.g. medical reimbursement, photocopying and others). The data processing activity consisted only of the input category of personnel, as all survey data were collected electronically, with limited data processing costs. "Other" costs included photocopying, medical reimbursement, and the cost of air travel from Addis for supervision of TIS round 8. To enable a more in-depth review of each input category and activity, 46 cost codes were defined, and included the most common charges in each category (e.g. for transportation under field work there were separate codes for vehicle rental, fuel cost, vehicle repair, and drivers.)

Table 1: Activities and Input Categories for Trachoma Impact Surveys, Amhara, Ethiopia

	Activities		
	Training	**Field Work**	**Processing**
Input Categories	Personnel	Personnel	Personnel
	Transportation	Transportation	
	Supplies	Supplies	
	Venue Rental	Other	
	Other		

Every cost incurred in Ethiopia from January 2012 through February 2017 (n=36,942) was exported from the Carter Center's accounting records using Intuit's Quickbooks (Intuit, Enterprise Canada version, Mountain View, CA, 2016). These costs were exported to Microsoft Excel 2016 and reviewed line by line to isolate all TIS-related expenses for further coding. After all TIS costs were compiled, each was given a numerical code that corresponded to the respective activity and input category. Each expense was also assigned a variable that indicated which of the rounds of TIS it was incurred for, which was derived using the date and location (east or west Amhara) of that cost. Certain observations included expenses for both training and field work, as cash advances for both activities were included only upon being rectified at the end of the TIS, and thus were unable to be split between the two activities. In these circumstances, all expenses were categorized under field work.

The Carter Center Ethiopia program staff provided the number of days they worked on each activity (i.e. training, field work, and data processing) to perform the most recent TIS (TIS round #8). A per cluster cost of staff time was estimated for each activity by multiplying each staff member's daily salary rate (inclusive of benefits) by the reported number of days they spent on each activity for TIS round 8, which was then divided by the number of clusters surveyed in that round. Estimated salary costs were added to each of the other TIS rounds by multiplying the number of clusters in a TIS by the per cluster rate derived from TIS round 8, and adding this product to the personnel categories of each of the remaining rounds of TIS. Estimates of time spent by staff on earlier TIS rounds were not requested, as it was assumed that the allocation of effort would be similar, and that responses for previous rounds would become increasingly less accurate due to recall bias and attrition [58]. Staff were fairly consistent over the 8 rounds of TIS.

Special attention was given to costs that were incurred by the program, but would not normally be part of a TIS, such as swab collection to analyze ocular *Chlamydia trachomatis* and stool collection to determine the prevalence of intestinal parasites. These costs were removed from the analysis. Per diem charges were reduced by the specific cost of swab collectors to increase comparability of analysis. Specific TIS-related procurements costs that were accrued at the headquarters level in Atlanta, such as tablets, SD cards or labels, were provided by the procurement team, coded using the same methodology as the expenses incurred in Ethiopia and added to the overall data set.

Fixed costs, such as building or vehicle purchase, were intentionally excluded, as it is assumed that programs conducting these surveys already have these items and that increased TIS would not result in an increase in these costs, whereas additional staff would have to be hired if additional TIS were to be conducted. Supplies procured in the US and shipped to Ethiopia were included in the analysis.

The cost of technical and logistical assistance from headquarters in the United States, including salaries or any other headquarters overhead, were not included in the data to improve comparability with other research, and to simplify the analysis by reducing the number of assumptions about the allocation of these costs to each survey.

All costs were normalized to 2016 dollars, using the annual GDP implicit price deflator for Ethiopia for the year each survey was primarily conducted during [59]. Data were entered into Microsoft Excel 2016, which was used to generate descriptive statistics on the cost of each round of TIS, including cost per cluster by activity and input category. Costs were compared across the 8 rounds of surveys to see trends in the overall cost of TIS and the composition of costs for each survey.

Results

The 8 rounds of TIS included 1,828 total clusters in 187 districts (9.78 clusters per district). The mean cost per cluster was $753 [IQR $670 - $854] with a median cost of $735 (Table 2). Mean costs were $686 [IQR $628 - $735] for the first five surveys, compared to $864 [IQR $793 -

$925] for the final 3 rounds. Per cluster costs for the final 3 rounds of TIS were significantly different from the first five (p <.01) using the Student's T Test. The mean per cluster cost of training was $103 [IQR $77 - $123]. The mean per cluster cost of field work was $649 [IQR $575 - $735]. The mean per cluster cost of data processing was $1.18 [IQR $0.83 - $1.41].

Table 2: Trachoma Impact Surveys Costs, Amhara, Ethiopia, 2012-2016

Survey Round	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8	All Surveys
Location of Survey	East Amhara	West Amhara	East Amhara	West Amhara	East Amhara	West Amhara	East Amhara	West Amhara	West and East Amhara
Date of Survey	Dec - Jan 2013	June - July 2013	Jan 2014	June 2014	Feb 2015	Oct 2015	Dec - Jan 2016	Aug - Nov 2016	Dec 2012 - Nov 2016
Clusters	317	359	270	119	99	248	128	288	1,828
Districts	29	41	33	5	10	26	13	30	187
Cost Per Cluster	$ 724	$ 658	$ 745	$ 598	$ 705	$ 925	$ 793	$ 874	$ 753
Cost Per District	$ 7,915	$ 5,764	$ 6,097	$ 14,242	$ 6,975	$ 8,821	$ 7,803	$ 8,390	$ 8,251
Total Cost, Training	$ 31,087	$ 20,019	$ 33,913	$ 8,326	$ 13,669	$ 24,982	$ 14,872	$ 33,613	$ 180,482
Total Cost, Field Work	$198,131	$215,988	$167,072	$ 62,785	$ 56,005	$203,994	$ 86,411	$217,398	$ 1,207,784
Total Cost, Processing	$ 322	$ 331	$ 225	$ 99	$ 74	$ 360	$ 162	$ 675	$ 2,249
Training: Per Cluster Cost	$ 98	$ 56	$ 126	$ 70	$ 138	$ 101	$ 116	$ 117	$ 103
Field Work: Per Cluster Cost	$ 625	$ 602	$ 619	$ 528	$ 566	$ 823	$ 675	$ 755	$ 649
Processing: Per Cluster Cost	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 2	$ 1

The bulk of all costs were four major cost drivers: personnel and venue rental in training, and personnel and transportation in field work (Table 3). The lack of transportation costs for the training activity resulted from data that could not be disaggregated between training and field work costs.

Table 3: Total Costs of Trachoma Impact Surveys by Activity and Input, Amhara, Ethiopia, 2012-2016

Survey Round	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8
Location of Survey	East Amhara	West Amhara	East Amhara	West Amhara	East Amhara	West Amhara	East Amhara	West Amhara
Date of Survey	Dec - Jan 2013	June - July 2013	Jan 2014	June 2014	Feb 2015	Oct 2015	Dec - Jan 2016	Aug - Nov 2016
Clusters	317	359	270	119	99	248	128	288
# of Districts	29	41	33	5	10	26	13	30
Training								
Personnel	$ 17,383	$ 6,660	$ 18,332	$ 6,397	$ 7,178	$ 9,950	$ 8,459	$ 13,070
Transportation	$ -	$ 1,263	$ 141	$ -	$ -	$ -	$ -	$ -
Supplies	$ 413	$ 209	$ -	$ -	$ -	$ 338	$ -	$ -
Venue Rental	$ 13,291	$ 11,887	$ 15,440	$ 1,928	$ 6,492	$ 14,695	$ 6,413	$ 20,543
Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Field Work								
Personnel	$ 85,523	$ 104,463	$ 70,264	$ 22,796	$ 19,734	$ 65,015	$ 24,109	$ 69,602
Transportation	$ 108,245	$ 97,839	$ 90,732	$ 37,915	$ 34,117	$ 128,913	$ 58,446	$ 126,066
Supplies	$ 4,296	$ 13,686	$ 6,075	$ 2,075	$ 2,137	$ 9,402	$ 3,856	$ 18,594
Other	$ 68	$ -	$ -	$ -	$ 17	$ 664	$ -	$ 3,137
Processing								
Personnel	$ 322	$ 331	$ 225	$ 99	$ 74	$ 360	$ 162	$ 675

Training costs represented a median of 13.4% of total costs (IQR 11.1% - 16.3%) (Table 4). For training, the main cost drivers were personnel and venue rental, accounting for 53.3% and 46.5% of total training costs. Field work costs accounted for a median of 86.3% of total costs (IQR 83.6% - 88.8%). Personnel and transportation costs represented more than 90% of the cost of field work in each survey. Data cleaning and processing accounted for a median of 0.1% of total costs (IQR 0.1% - 0.2%). Although the total cost and cost per cluster varied between each survey, the proportion of costs for each of these activities was relatively stable.

Table 4: Costs by Activity and Input as Proportion of All Costs, by Trachoma Impact Survey, Amhara, Ethiopia, 2012-2016

	Survey 1		Survey 2		Survey 3		Survey 4		Survey 5		Survey 6		Survey 7		Survey 8		All Rounds - Median [IQR]
Training	13.5%		8.5%		16.9%		11.7%		19.6%		10.9%		14.7%		13.4%		13.4% [11.1 - 16.3]
Personnel		*55.9%*		*33.3%*		*54.1%*		*76.8%*		*52.5%*		*39.8%*		*56.9%*		*38.9%*	53.3%
Transportation		*0.0%*		*6.3%*		*0.4%*		*0.0%*		*0.0%*		*0.0%*		*0.0%*		*0.0%*	0.0%
Supplies		*1.3%*		*1.0%*		*0.0%*		*0.0%*		*0.0%*		*1.4%*		*0.0%*		*0.0%*	0.0%
Venue Rental		*42.8%*		*59.4%*		*45.5%*		*23.2%*		*47.5%*		*58.8%*		*43.1%*		*61.1%*	46.5%
Field Work	86.3%		91.4%		83.0%		88.2%		80.3%		88.9%		85.2%		86.4%		86.3% [83.6 - 88.8]
Personnel		*43.2%*		*48.4%*		*42.1%*		*36.3%*		*35.2%*		*31.9%*		*27.9%*		*32.0%*	35.8%
Transportation		*54.6%*		*45.3%*		*54.3%*		*60.4%*		*60.9%*		*63.2%*		*67.6%*		*58.0%*	59.2%
Supplies		*2.2%*		*6.3%*		*3.6%*		*3.3%*		*3.8%*		*4.6%*		*4.5%*		*8.6%*	4.1%
Other		*0.0%*		*0.0%*		*0.0%*		*0.0%*		*0.0%*		*0.3%*		*0.0%*		*1.4%*	0.0%
Processing	0.1%		0.1%		0.1%		0.1%		0.1%		0.2%		0.2%		0.3%		0.1% [0.1 - 0.2]
Personnel		*100%*		*100%*		*100%*		*100%*		*100%*		*100%*		*100%*		*100%*	100.0%

The transportation and personnel inputs together were responsible for the majority of all cost drivers (89.0%) (Figure 1). Other input categories included supplies (4.1%), venue (6.6%) and other (0.2%). Per diems represented 82.9% of all personnel costs ($241.75 per cluster), while the derived expense of Carter Center Ethiopia staff time that were estimated from reports on the effort spent on the 8th round of TIS account for 20.4% ($59.37) of the total personnel cost for all surveys (Figure 2).

Fig 1: Proportion of Total Costs by Input Category (for all activities), Amhara, Ethiopia, 2012-2016

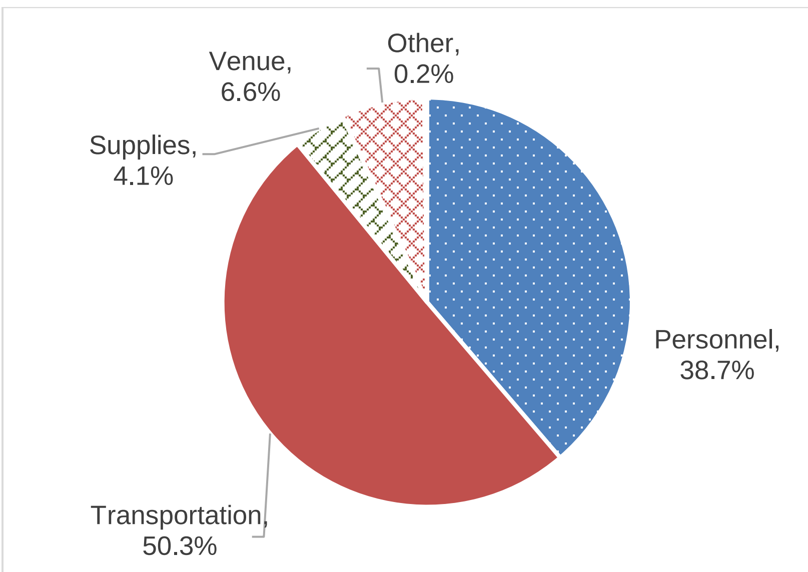
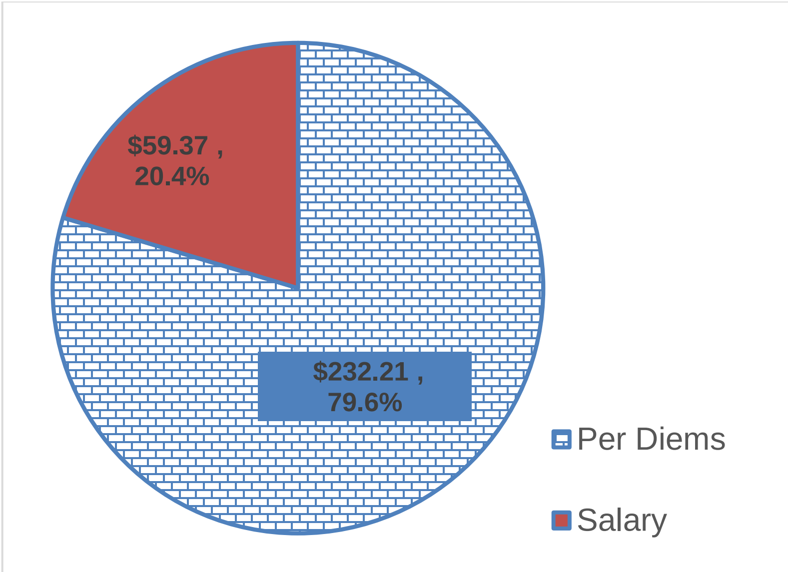
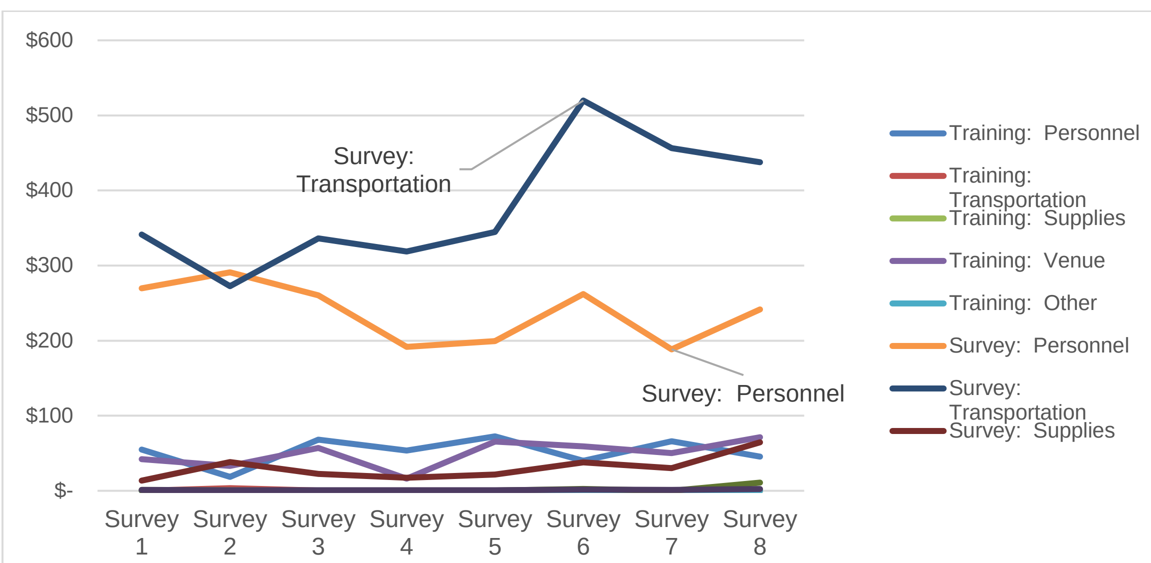


Fig 2: Proportion of Personnel Expenses by Source for 8 Rounds of Trachoma Impact Surveys, Amhara, Ethiopia, 2012-2016



The per cluster costs of the inputs in each category changed at different rates (Figure 3). Transportation costs incurred during the survey were the largest single driver of increasing costs, especially during the final three rounds of surveys, when the mean per cluster cost of transportation during field work increased to $471 from $323 for the first five rounds, a 46.1% increase.

Fig 3: Per Cluster Costs by Input/Category, in 2016$ for 8 Rounds of Trachoma Impact Surveys, Amhara, Ethiopia, 2012-2016



Per cluster costs of each input for the first 5 rounds of TIS were compared to the final 3 rounds to determine the primary drivers of increased cost (Table 5). Transportation during field work accounted for 84% of the overall increase in per cluster cost between the two periods. The primary driver of the increase in those transportation costs was an increase in vehicle rental costs, which accounted for a $129.77 increase in per cluster cost over the two periods (73.1% of the total increase in costs). A slight decrease in per cluster cost of personnel was observed over the two periods. Per cluster costs were not significantly different between survey rounds conducted in East Amhara or West Amhara (Table 6) using the Student's T-Test.

Table 5: Drivers of Increased Cost From First 5 Rounds to Final 3 Rounds of TIS

	Mean Per Cluster Cost of First 5 Survey Rounds	Mean Per Cluster Cost of Last 3 Survey Rounds	Increase (Decrease) from First 5 Survey Rounds to Last 3 Survey Rounds	Proportion of Total Increase from First 5 to Last 3 Rounds
Training				
Personnel	$ 54	$ 51	$ (3)	-2%
Transportation	$ 1	$ -	$ (1)	0%
Supplies	$ 0	$ 0	$ 0	0%
Venue Rental	$ 43	$ 60	$ 17	10%
Field Work				
Personnel	$ 242	$ 231	$ (12)	-7%
Transportation	$ 323	$ 471	$ 149	84%
Supplies	$ 23	$ 44	$ 22	12%
Other	$ 0	$ 5	$ 4	3%
Processing				
Personnel	$ 1	$ 2	$ 1	0%

Table 6: Per Cluster Costs by East/West Amhara

	East Amhara (Surveys 1, 3, 5 7)		West Amhara (Surveys 2, 4, 6, 8)		P-Value
Total Cost	$	741.60	$	763.84	0.80
Training	$	119.48	$	85.79	0.08
Field Work	$	621.15	$	676.66	0.47
Processing	$	0.97	$	1.39	0.29
Median Training cost per cluster	$	120.90	$	85.35	
Median Survey cost per cluster	$	621.90	$	678.25	
Median Processing cost per cluster	$	0.92	$	1.19	

Discussion

Program managers should budget ample human and financial resources to conduct TIS surveys. Total per cluster survey costs ranged from $598 to $925 per cluster, with costs increasing significantly for the final 3 rounds of TIS conducted in the second half of 2015 and 2016. Data were included from 1,828 clusters in 187 districts. Current guidance from the WHO recommends that TIS be conducted in “20 to 30” clusters per district [60]. Assuming per cluster costs remain constant, increasing the number of clusters per district to 20 for the minimal two rounds of TIS necessary for elimination for each of the 167 districts of Amhara would result in $2,570,557 in additional costs over the amount expected for the Carter Center’s current 9.78 clusters per district observed. Increasing to 30 clusters per district would result in $5,084,647 in increased cost when compared to the expected cost of 9.78 clusters per district. This estimation likely underestimates the likely increase in cost; although 17 districts in Amhara have reached their elimination targets as of 2017, many will likely require several rounds of TIS as a result of not meeting elimination targets.

Changes in vehicle rental costs were a significant source of the increase in cost of the final 3 rounds of TIS. Total vehicle time used for each survey is a function of the number of teams and number of days that the teams are in the field conducting the survey. Attempts to reduce the number of teams would only increase the number of days necessary for each survey (and viceversa), resulting in no change to the total days of vehicle time required. As 89.0% of all costs were transportation or personnel, there is relatively little room for program managers to cut costs unless there is a change in survey methodology. Per diems, not salary costs, were the main driver of the cost of labor accounting for 82.9% total personnel cost.

Although this analysis excludes costs incurred by the ministry of health, in no way should that exclusion be seen as a minimization of their role or importance in the survey process. Without ministry of health approval, support, expertise and staff, no survey would be possible. Although this results in a narrowing of the focus of this study to exclude the always-important MOH perspective, such an assumption was necessary to reduce the scope of the data collection and number of assumptions necessary.

The International Coalition for Trachoma Control (ICTC) derived an estimate of the global cost of SAFE, and specifically estimated a per district cost of $7,500 for impact surveys [50]. Chen et al. performed an in-depth analysis of trachoma survey costs conducted between 2006 and 2010 in eight national trachoma control programs [54]. The median cost of a survey was estimated at $4,784 (with an interquartile range (IQR) of $3,508 to $6,650) per district. The median cost of a cluster was $311 (IQR $119-$393), with clusters per district ranging from 11 to 40. The Global Trachoma Mapping Project estimated a per cluster cost of $692, inclusive of headquarters costs, for mapping trachoma in 1,546 districts across 17 countries [61].

Limitations on this study stem from the methods used to collect cost information. Data were coded according to available information from Quickbooks. It is likely that certain costs were omitted or included incorrectly, because of data entry errors. Training costs were likely included improperly in field work costs because of accounting practices that did not separate those costs. An example of this would be the cost of transportation during training, which although necessary, was only present in survey rounds 2 and 3. Although this analysis intentionally removed any identifiable costs for TIS activities that were supplementary and non-standard, such as stool collection for STH analysis, it is likely that a portion of the costs of these remained, skewing the cost per cluster upward. The changes in this protocol were made in 2015.

These costs were all incurred in the same geographic area by one non-governmental organization (NGO), and thus are less generalizable than if this study included surveys done in other areas by other NGOs. Unlike many other NGOs or governments, The Carter Center provides training before each round of TIS, increasing the total cost of a survey and of the training component when compared to other NGOs.

Despite the considerable cost of conducting TIS, these surveys remain a vital tool in the trachoma program manager's toolbox. As countries move swiftly toward the 2020 target for the elimination of trachoma as a public health problem, the evidence provided by TIS will continue to play an important role in the prioritization of limited programmatic resources, and in the ultimate creation of dossiers necessary for national elimination validation. Program managers and donors can use these results to ensure that ample resources are devoted to these surveys and that program priorities are established. In resource-challenged areas without NGO partners, it may be difficult or impossible for MOHs to find the funding necessary to conduct these surveys, which would prevent them from building the dossier necessary for the validation of elimination of trachoma as a public health problem.

Acknowledgements

The authors would like to thank Yohannes Dawd, Andrew Nute and Arjan Wietsma for their assistance in collecting data.

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III. Summary, Public Health Implications, Possible Future Directions

The analysis conducted for this thesis, although limited to one NGO in one state of one country, provides a detailed and rigorous look into the cost of conducting TIS. Program managers can use these estimates, combined with their knowledge of the local context in which they operate, to more accurately plan and budget for the endgame of trachoma elimination. Additional research conducted in a similar method would be helpful to the global trachoma community, as trachoma programs operate in a variety of contexts and with varying levels of in-country resources.

Chen et al. included 29 observations from 8 countries. RTI International currently has an unpublished study that includes over 100 TIS in 5 countries. Both rely on data provided by local program managers or on budgeted costs, each with its own potential set of issues. Self-reported data in any context is prone to issues with validity, and financial reporting from NGOs is not exempt from these concerns [62]. The primary responsibility of in-country staff is the daily work necessary to execute the various components of trachoma programming. Asking already-busy staff to parse through detailed lists of financial expenditures in order to report on past activities is a burdensome request that does not directly provide immediate programmatic benefit or relief from existing responsibilities. Without an accounting system and practices that would cleanly identify TIS costs, respondents are likely to accidentally exclude portions of the overall cost of a survey in order to respond in an efficient (if not incomplete) manner. The Carter Center's Quickbooks system did not include a specific class for TIS surveys, which necessitated a time-consuming line by line review of the more than 37,000 lines of expenses that were incurred in Ethiopia during the time period of this study, resulting in a per-cluster estimate of $753 [IQR $670 - $854].

The use of budgeted amounts as the final expenditure for a given survey would only be useful if the budget were accurate and appropriate to the context in question. As any program manager knows, project budgets and actuals often are significantly different. Reporting budgeted numbers in place of actual expenditures introduces bias.

I strongly recommend a thorough line-by-line review and coding of the expenses generated by a program to improve the accuracy of the estimate of the cost of any given activity. Although this requires that field financial staff clearly and consistently capture information that describes the costs, it can help reduce omissions that might be present as a result of coding errors (e.g. trachoma surveys incorrectly charged to a schistosomiasis class in Quickbooks). It also removes potential bias that budget-based estimates of costs would introduce, as budgets are often set with unrealistic goals or expectations that do not match the on the ground conditions.

The $753 per cluster estimate found in this analysis is higher than previous estimates. A meta-analysis of MDA-costing papers showed that more in-depth costing studies tended to report higher MDA delivery costs [63]. Although that paper warns that a standardized tool for cost data collection is necessary to truly enable comparison between studies, we can still extrapolate imperfect estimates to the global scale to provide insight.

In 2011, Chen et al. found $84 per cluster for their single observation in Amhara, which is $239.55 per cluster when normalized to 2016 USD using the GDP deflator. The Global Trachoma Mapping Project estimated a per cluster cost of $692, inclusive of headquarters costs, for mapping trachoma in 1,546 districts across 17 countries [61]. The ICTC estimated that 559 districts needed impact surveys, and that each district would cost approximately $7,500, or $4,192,500 to conduct the necessary rounds of TIS in all districts [50]. Using costs derived from this thesis, we would estimate a total expenditure of $8,226,419 for 2 rounds of TIS in 559 districts, at a similar 9.78 clusters per district rate. There is currently a movement by the WHO and by various governments to increase the number of clusters per district to 30 clusters per district. Using the estimated $753 per cluster cost roughly triples the total cost of surveys, to $25,246,286 in total, for 2 rounds of TIS in 559 districts using 30 clusters at $753 per cluster. That amount is more than the total worldwide cost of all trichiasis surgeries over a three-year period of time (185,000 surgeries in 2015 at an estimated $40 each). In order to meet the targets for the elimination of trachoma as a public health problem, each endemic district must submit evidence from TIS. With limited resources, program managers and donors will have to carefully determine what level of their time, energy and funding will go to support TIS.

IV. Appendices

Table 2 Resized: Trachoma Impact Surveys Costs, Amhara, Ethiopia, 2012-2016

Survey Round	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8	All Surveys
Location of Survey	East Amhara	West Amhara	East Amhara	West Amhara	East Amhara	West Amhara	East Amhara	West Amhara	West and East Amhara
Date of Survey	Dec - Jan 2013	June - July 2013	Jan 2014	June 2014	Feb 2015	Oct 2015	Dec - Jan 2016	Aug - Nov 2016	Dec 2012 - Nov 2016
Clusters	317	359	270	119	99	248	128	288	1,828
Districts	29	41	33	5	10	26	13	30	187
Cost Per Cluster	$ 724	$ 658	$ 745	$ 598	$ 705	$ 925	$ 793	$ 874	$ 753
Cost Per District	$ 7,915	$ 5,764	$ 6,097	$ 14,242	$ 6,975	$ 8,821	$ 7,803	$ 8,390	$ 8,251
Total Cost, Training	$ 31,087	$ 20,019	$ 33,913	$ 8,326	$ 13,669	$ 24,982	$ 14,872	$ 33,613	$ 180,482
Total Cost, Field Work	$198,131	$215,988	$167,072	$ 62,785	$ 56,005	$203,994	$ 86,411	$217,398	$ 1,207,784
Total Cost, Processing	$ 322	$ 331	$ 225	$ 99	$ 74	$ 360	$ 162	$ 675	$ 2,249
Training: Per Cluster Cost	$ 98	$ 56	$ 126	$ 70	$ 138	$ 101	$ 116	$ 117	$ 103
Field Work: Per Cluster Cost	$ 625	$ 602	$ 619	$ 528	$ 566	$ 823	$ 675	$ 755	$ 649
Processing: Per Cluster Cost	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 2	$ 1

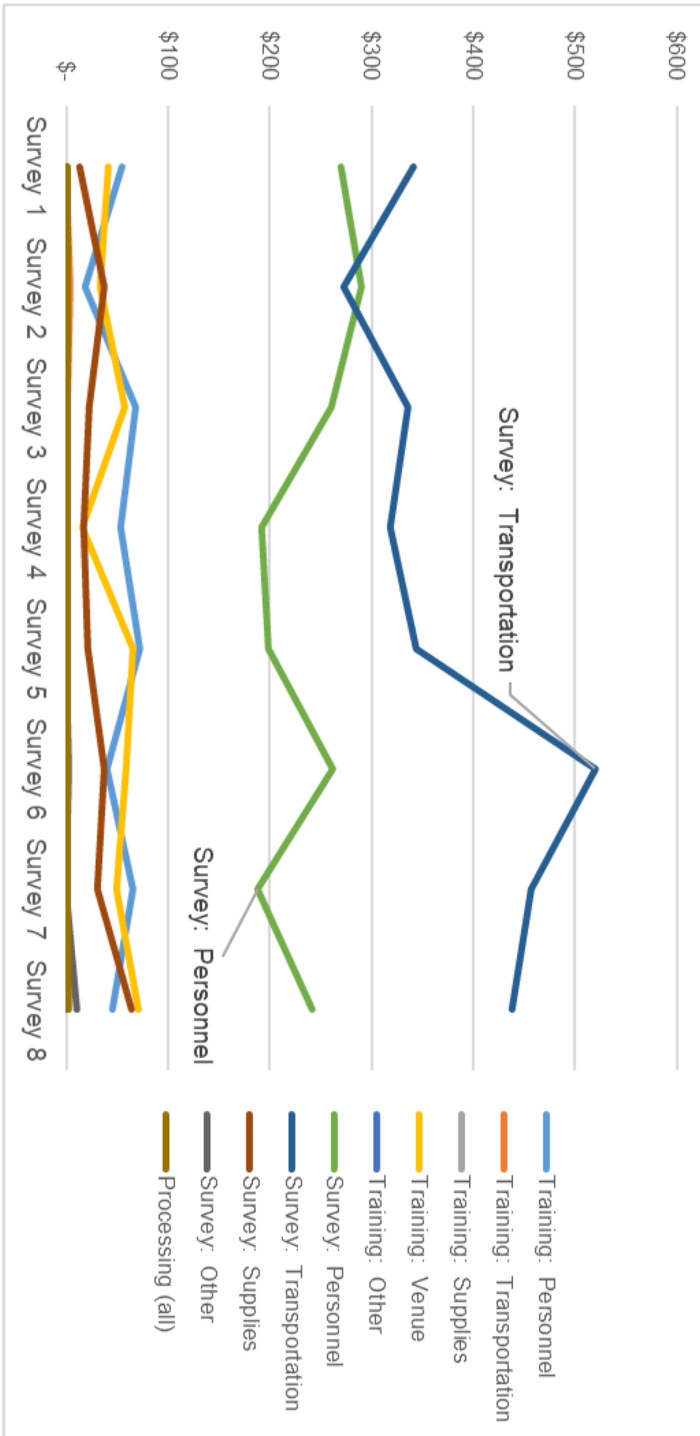
Table 3 Resized: Total Costs of Trachoma Impact Surveys by Activity and Input, Amhara, Ethiopia, 2012-2016

Survey Round	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8
Location of Survey	East Amhara	West Amhara	East Amhara	West Amhara	East Amhara	West Amhara	East Amhara	West Amhara
Date of Survey	Dec - Jan 2013	June - July 2013	Jan 2014	June 2014	Feb 2015	Oct 2015	Dec - Jan 2016	Aug - Nov 2016
Clusters	317	359	270	119	99	248	128	288
# of Districts	29	41	33	5	10	26	13	30
Training								
Personnel	$ 17,383	$ 6,660	$ 18,332	$ 6,397	$ 7,178	$ 9,950	$ 8,459	$ 13,070
Transportation	$ -	$ 1,263	$ 141	$ -	$ -	$ -	$ -	$ -
Supplies	$ 413	$ 209	$ -	$ -	$ -	$ 338	$ -	$ -
Venue Rental	$ 13,291	$ 11,887	$ 15,440	$ 1,928	$ 6,492	$ 14,695	$ 6,413	$ 20,543
Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Field Work								
Personnel	$ 85,523	$ 104,463	$ 70,264	$ 22,796	$ 19,734	$ 65,015	$ 24,109	$ 69,602
Transportation	$ 108,245	$ 97,839	$ 90,732	$ 37,915	$ 34,117	$ 128,913	$ 58,446	$ 126,066
Supplies	$ 4,296	$ 13,686	$ 6,075	$ 2,075	$ 2,137	$ 9,402	$ 3,856	$ 18,594
Other	$ 68	$ -	$ -	$ -	$ 17	$ 664	$ -	$ 3,137
Processing								
Personnel	$ 322	$ 331	$ 225	$ 99	$ 74	$ 360	$ 162	$ 675

Table 4 Resized: Costs by Activity and Input as Proportion of All Costs, by Trachoma Impact Survey, Amhara, Ethiopia, 2012-2016

	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	Survey 8	All Rounds - Median [IQR]
Training	**13.5%**	**8.5%**	**16.9%**	**11.7%**	**19.6%**	**10.9%**	**14.7%**	**13.4%**	**13.4% [11.1 - 16.3]**
Personnel	*55.9%*	*33.3%*	*54.1%*	*76.8%*	*52.5%*	*39.8%*	*56.9%*	*38.9%*	**53.3%**
Transportation	*0.0%*	*6.3%*	*0.4%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	**0.0%**
Supplies	*1.3%*	*1.0%*	*0.0%*	*0.0%*	*0.0%*	*1.4%*	*0.0%*	*0.0%*	**0.0%**
Venue Rental	*42.8%*	*59.4%*	*45.5%*	*23.2%*	*47.5%*	*58.8%*	*43.1%*	*61.1%*	**46.5%**
Field Work	**86.3%**	**91.4%**	**83.0%**	**88.2%**	**80.3%**	**88.9%**	**85.2%**	**86.4%**	**86.3% [83.6 - 88.8]**
Personnel	*43.2%*	*48.4%*	*42.1%*	*36.3%*	*35.2%*	*31.9%*	*27.9%*	*32.0%*	**35.8%**
Transportation	*54.6%*	*45.3%*	*54.3%*	*60.4%*	*60.9%*	*63.2%*	*67.6%*	*58.0%*	**59.2%**
Supplies	*2.2%*	*6.3%*	*3.6%*	*3.3%*	*3.8%*	*4.6%*	*4.5%*	*8.6%*	**4.1%**
Other	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.3%*	*0.0%*	*1.4%*	**0.0%**
Processing	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.2%**	**0.2%**	**0.3%**	**0.1% [0.1 - 0.2]**
Personnel	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	**100.0%**

Fig 3 Resized: Per Cluster Costs by Input/Category, in 2016$ for 8 Rounds of Trachoma Impact Surveys, Amhara, Ethiopia, 2012-2016



Institutional Review Board exemption letter

EMORY UNIVERSITY | Institutional Review Board

June 27, 2017

Randall Slaven
Peace, Health, and Education Programs
The Carter Center

RE: Determination: No IRB Review Required
eIRB#: IRB00095481
Title: ***Accurate Analysis of Cost of Conducting Population-Based Prevalence Surveys for a Trachoma Elimination Program in Amhara, Ethiopia***
PI: Randall Slaven

Dear Randall:

Thank you for requesting a determination from our office about the above-referenced project. Based on our review of the materials you provided, we have determined that it does not require IRB review because it does not meet the definition of "research" with human subjects or "clinical investigation" as set forth in Emory policies and procedures and federal rules, if applicable. Specifically, in this project, you will clean, categorize, and analyze transaction level cost information from the Carter Center's Trachoma Program in Amhara, Ethiopia. You will ask the field offices directly for an estimation of the amount of time they spent on a given survey, and will use this response to calculate the approximate cost of staff time that should be added as a direct result of the survey execution. This study is not designed to produce generalizable results.

Please note that this determination does not mean that you cannot publish the results. This determination could be affected by substantive changes in the study design, subject populations, or identifiability of data. If the project changes in any substantive way, please contact our office for clarification.

Thank you for consulting the IRB.

Sincerely,

Sam Roberts, BA
Research Protocol Analyst, Sr.

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