WHO's mandate is to provide technical leadership and coordination to the international efforts aiming to eliminate trachoma as a public health problem. The recommended elimination strategy, known as "SAFE", was adopted by WHO in 1996, and is a combination of interventions implemented as an integrated approach. SAFE is an acronym for:

- **S**urgery for *trachomatous trichiasis*
- **A**ntibiotics to clear ocular *C. trachomatis* infection
- **F**acial cleanliness to reduce transmission of ocular *C. trachomatis*
- **E**nvironmental improvement, particularly improved access to water and sanitation.

The summaries on this page have **not been categorized** into any of these strategies.

Titles included in this document:

1. The Global Trachoma Mapping Project: Methodology of a 34-Country Population-Based Study.
2. Cross-Sectional Surveys of the Prevalence of Follicular Trachoma and Trichiasis in The Gambia: Has Elimination Been Reached?
3. Elimination of trachoma as a public health problem in Ghana: Providing evidence through a pre-validation survey
4. Operational adaptations of the trachoma pre-validation surveillance strategy employed in Ghana: a qualitative assessment of successes and challenges
5. The global burden of trichiasis in 2016

1. **The Global Trachoma Mapping Project: Methodology of a 34-Country Population-Based Study.**

Solomon AW, Pavluck AL, Courtright P, Aboe A, Adamu L, Alemayehu W, Alemu M, Alexander ND, Kello AB, Bero B, Brooker SJ, Chu BK, Dejene M, Emerson PM, Flueckiger RM, Gadisa S, Gass K, Gebre T, Habtamu Z, Harvey E, Haslam D, King JD, Mesurier RL, Lewallen S, Lietman TM, MacArthur C, Mariotti SP, Massey A, Mathieu E, Mekasha A, Millar T, Mpyet C, Muñoz BE, Ngondi J, Ogden S, Pearce J, Sarah V, Sisay A, Smith JL, Taylor HR, Thomson J, West SK, Willis R, Bush S, Haddad D, Foster A.
Ophthalmic Epidemiol. 2015 Jun;22(3):214-25. doi: 10.3109/09286586.2015.1037401.

Note: This article can be downloaded free of charge. Alternatively, you can request a copy from Petra Adams at trachoma@kcco.net

Author's summary: "Mapping is a critical first stage of trachoma elimination, because trachoma programs determine the need for interventions based on population-level prevalence of disease. The geographical burden of trachoma has only been partially assessed: from 1987 to the beginning of 2012, population-based surveys mapped trachoma in 1,115 districts worldwide, with data thought to be required from at least another 1,238 suspected endemic districts to complete the global picture. Funded by the United Kingdom's Department for International Development, the Global Trachoma Mapping Project (GTMP) was commissioned on 23 July 2012, with the aim of mapping all remaining suspected trachoma endemic districts by the end of March 2015. A developmental pilot was undertaken in Ethiopia in October 2012, and field operations commenced on 17 December 2012.

The GTMP is constructed as a series of administratively separate projects with a common methodology, generally operating at national level. In each evaluation unit, a population-based prevalence survey is undertaken with the primary aim of estimating the prevalence of "trachomatous inflammation-follicular" (TF) in 1-9 year-old children, and a secondary aim of estimating the prevalence of "trachomatous trichiasis" (TT) in adults aged 15 years and above. Household-level data on water and sanitation are also collected. All data are entered into a purpose-built app on Android smartphones and stored in a high security Cloud-based server, then reviewed and analysed online via a password protected web interface. All data are owned by respective ministries of health.

The GTMP approach is unique not just because it is fully funded to complete trachoma mapping worldwide. The project emphasizes quality at scale in a way that no other project has attempted. Approaches to identifying where to map and not map, framing of evaluation units, budgeting, survey design, field team training, supervision, data entry, data storage, data cleaning, data analysis, data approval and data publication are all standardised and quality checked. The GTMP is a landmark investigation in the fight against trachoma, and as far as we are aware, has no precedent in the history of field-based epidemiology for any disease."

2. **Cross-Sectional Surveys of the Prevalence of Follicular Trachoma and Trichiasis in The Gambia: Has Elimination Been Reached?**

Sarah E. Burr, Ansumana Sillah, Anselme S. Sanou, Anita C. Wadagni, John Hart, Emma M. Harding-Esch, Sarjo Kanyi, Robin L. Bailey

PLoS Negl Trop Dis 2016, 10(9):e0004906.

The Gambia's National Eye Health Programme (NEHP) has implemented all facets of the World Health Organization (WHO)-recommended SAFE strategy for trachoma elimination including surgery to correct trachomatous trichiasis (TT), mass drug administration (MDA) with antibiotics, promotion of facial cleanliness and environmental improvement. In 2011, following completion of a programme of MDA with azithromycin, the NEHP began three years of rolling surveys to determine the prevalence of both trachomatous inflammation—follicular (TF) and TT in the country, with a view to determining whether WHO's criteria for elimination had been reached.

Three cross-sectional surveys were conducted annually in each of nine surveillance zones. Each zone was of similar size, with a population of 60,000 to 90,000, once urban settlements were excluded, as per WHO recommendations. Trachoma grading was carried out according to WHO's simplified trachoma grading system. At each of the three annual surveys and in each surveillance zone, the prevalence of TF in children aged 1 to 9 years was less than the 5% threshold advised by the WHO, suggesting elimination has been reached. The prevalence of TT in adults greater than 14 years varied amongst the surveillance zones ranging from 0 to 1.7%. Using data held in TT registries at dedicated eye health units across the country, the prevalence of unknown TT cases was estimated at 0.15% total population, indicating more work is needed to meet the elimination criteria of less than 0.1% in the total population. This would be aided by a more robust system of documenting TT cases identified and operated on by the NEHP.

3. **Elimination of trachoma as a public health problem in Ghana: Providing evidence through a pre-validation survey.**

Debrah, O., et al. (2017). PLoS Negl Trop Dis 11(12): e0006099."

Author synopsis

Following years of implementing the SAFE strategy, previously trachoma endemic countries are eligible for validation of elimination of trachoma as a public health problem, provided enough evidence can be provided to support the claim that the elimination criteria have been met. This includes, in each formerly-endemic district, a TF prevalence in 1–9-year-olds below the 5%

elimination threshold sustained for at least two years in the absence of antibiotic mass drug administration; and a TT prevalence in adults <0.2%.

Ghana achieved the threshold for elimination of active trachoma in 2008 and implemented surveillance activities, which included community- and school-based screening for TT and TF in previously trachoma-endemic districts, from 2011 until 2014. In 2015-2016, the country conducted repeat district-level population-based surveys to ensure that the elimination threshold attained in 2008 had been sustained.

TF prevalence in children aged 1-9 years was below the elimination target of 5% in all surveyed districts, while the TT prevalence in those aged ≥15 years of less than 0.2% was achieved in all districts except one. Yendi district had not attained the elimination threshold for TT. The Ghana Trachoma Programme then went on to conduct a house-to-house TT case search in Yendi and provided TT surgery and other management as needed. The data from this exercise were used to demonstrate that the TT elimination target had been met. Based on this evidence, Ghana subsequently submitted a dossier to WHO. On 13th June 2018, WHO acknowledged Ghana's success in eliminating trachoma as a public health problem.

The methodologies described in this paper are likely to be instructive for other programmes. Buy-in and support of funding partners must be sought early. While selecting communities based on probability-proportional-to-size sampling has epidemiological advantages in ensuring that all villages and communities had an equal chance of being selected, an important challenge was the selection of communities that were sometimes hard to access. The roads to many of these communities were in bad condition, and in some cases only footpaths and bicycle trails were available. The nature of the roads also increased the travel time to and from the communities, with field teams reporting up to 3 hours of travel time before getting access to some communities. This, coupled with security challenges, meant that survey teams had limited time to recruit survey participants and collect samples. Another implementation challenge related to the management of large field teams. There were a total of 13 teams; each team consisting of a grader, a nurse, a recorder and a driver. Managing a team of 52 individuals for four months, arranging for accommodations, vehicles, and providing consumables and supplies, was a major logistical challenge.

While the study primarily was focused on measuring the prevalence of TF and TT, it also enabled morbidity management through identification of TT cases. Arrangements were subsequently made for all TT cases identified to be provided with surgery, clearing the remaining backlog in Yendi.

In conclusion, the pre-validation surveillance surveys and house-to-house TT case search in Yendi served to provide evidence that the Ghana Trachoma Programme had achieved the prevalence targets for elimination. Being one of the first countries to have undertaken this kind of evidence gathering, we are happy to share the experience with other countries working on the end game of trachoma elimination.

4. **Operational adaptations of the trachoma pre-validation surveillance strategy employed in Ghana: a qualitative assessment of successes and challenges**

Infect Dis Poverty 2019; 8(1):78. DOI:10.1186/s40249-019-0585-x.
Senyonjo, L., Aboe, A., Bailey, R., Agyemang, D., Marfo, B., Wanye, S., Schmidt, E., Addy, J. Blanchet, K.

Author synopsis

As an increasing number of countries progress towards elimination of trachoma as a public health problem, it is important to not only consider the optimal methodology for providing evidence of elimination but also to share country experiences in the operationalisation of pre-validation surveillance systems. This paper outlines and reviews (using in-depth interviews with Ghana Health Service personnel and a documents review) the Ghana experience as they rolled out their pre-validation surveillance strategy between 2011 and 2016.

During the operationalisation of the Ghana surveillance plan, there were a number of adaptations made when compared to the then-current WHO recommendations (published in 2008). These adaptations are outlined below, along with a brief summary of the successes achieved and challenges encountered:

(i) Passive surveillance (utilising data collected through the existing health system) for active trachoma. To find people with trachomatous inflammation—follicular (TF), Ghana used a definition of a person with a red eye that was later verified as having TF by an ophthalmic nurse. There were issues with case identification and verification, challenges in implementation coverage (not all health workers or community volunteers were trained, because training everyone would have been too expensive) and a non-specific reporting structure (HMIS does not differentiate between a report of active trachoma or trichiasis and a suspected or a verified case). This hampered effectiveness and efficiency. It would be better to focus resources on strengthening passive surveillance for trachomatous trichiasis (TT) alone.

(ii) Monitoring of a limited number of randomly selected sites (communities or primary schools) per district per year as part of the on-going active surveillance of TF and TT. Selecting so few sites would be unlikely to be able to identify recrudescence in a timely manner, unless by luck. On-going active surveillance through sentinel sites is no longer the WHO recommendation; the previously-recommended approach (as used in Ghana) would not be recommended to others by Ghana. There could be more utility in monitoring of sentinel sites if selection was guided by known risk factors, perhaps infection and antibody data.

(iii) Targeted trichiasis door-to-door case searches, led by ophthalmic nurses, was carried out across all geographic areas where an evaluation unit had failed to meet TT elimination thresholds. This is an effective methodology to identify and manage trichiasis cases and provide TT backlog estimates but is resource intensive. Further efforts are needed to refine the targeting of such an approach, perhaps focusing on rural areas furthest from static eye care centres.

(iv) A buddy system was set up between ophthalmic nurses to support technical skills in an elimination setting where loss of diagnostic and surgical skills is a concern. However, the strategy did not take into account the loss of proficiency within experienced personnel, especially important for surgical skills. A roving team of trichiasis surgeons that manage all trichiasis cases across a region, maintaining skills and core competencies with the aid of HEAD START may be

more beneficial than allowing all surgeons to continue operating in a context of very small numbers of surgeries per year.
Ghana developed a comprehensive surveillance system that exceeded the (now superseded) WHO recommendations, but issues with sensitivity and specificity likely led to an inefficient use of resources. There is a need to evaluate improved targeted surveillance strategies for identification of recrudescence and trichiasis case searches. Strategies must address the contextual changes that arise as a result of transmission decline, such as a loss of surgical skills.

5. The global burden of trichiasis in 2016

PLoS Negl Trop Dis 13(11): e0007835. https://doi.org/10.1371/journal.pntd.0007835

Flueckiger RM, Courtright P, Abdala M, Abdou A, Abdulnafea Z, Al-Khatib TK, et al.

Author synopsis

Through high-quality surgery on the eyelid it is possible to reduce the number of people with trachomatous trichiasis (TT). Accurate estimates of the number of persons with TT (the TT backlog) and their geographical distribution are needed in order to effectively plan resource allocation for surgery and other necessary services. In 2009, using data published up to July 2007, Mariotti *et al.* estimated the global TT backlog to be 8.2 million people. In 2012, WHO collected and collated provisional 2011 country reports, and published an updated figure for the global TT backlog of 7.3 million people. From December 2012 to January 2016, the Global Trachoma Mapping Project (GTMP) sought to systematically complete the global trachoma map, by undertaking standardised baseline prevalence surveys in all suspected endemic districts globally. GTMP analyses included stratifying trichiasis prevalence estimates against national population pyramids to partially account for demographic differences between those examined and the national averages. There are now high-quality data available for most suspected-endemic areas that were previously unsurveyed. The availability of these data served as a catalyst to generate a new estimate of the global trichiasis backlog. This paper describes the methods used and provides an updated TT backlog estimate for 2016.

The previous global estimates were updated using the best available data, according to the following hierarchy. (1) Where GTMP data were available, age- and gender- stratified survey-level trichiasis prevalence estimates for adults aged 15 years and older were used. (2) Where population-based prevalence surveys (PBPSs) had been done without the support of the GTMP, de-identified individual-level raw survey data were requested from national health ministries. Where those data were provided by 1 March 2016, the same age- and gender-stratification as was used in the GTMP were applied. (3) Where PBPSs had been done but raw data were not available, survey-level prevalence estimates (whether stratified by age and gender or not) were obtained from country programs. When data had not been stratified, estimates were multiplied by the mean adjustment factor for districts in which age- and gender- stratification was possible. (4) If prevalence estimates were not available, previous estimates were identified through desk reviews and communications with country programs. If there was adequate

evidence to revise the estimates, new estimates were used; otherwise, the Mariotti *et al.*'s 2009 estimates were retained.

Through including the most recent data, adjusting older datasets by age and gender, and obtaining current local expert assessment of available data, the global TT backlog estimate reduces to 2.8 million (95% CI 1.1–5.2 million) in 2016. The updated estimate reduced to zero cases in twelve countries, namely: Angola, Botswana, Burundi, Congo, Fiji, Gambia, Iraq, Islamic Republic of Iran, Morocco, Mexico, Namibia, and Nauru. 61% of the backlog is composed of people who live in sub-Saharan Africa. To reduce TT prevalence in each district of each endemic country to < 0.2% in adults aged 15 years and older, which is the defined elimination threshold for TT, at least 2.0 million people will need to have their TT appropriately managed. Uncertainty remains around these estimates, of course: the limitations of the analyses are outlined in the discussion of the paper.