WORLD HEALTH ORGANIZATION
STRATEGIC AND TECHNICAL ADVISORY GROUP
FOR NEGLECTED TROPICAL DISEASES

WORKING GROUP ON MONITORING AND EVALUATION

DESIGN PARAMETERS FOR POPULATION-BASED TRACHOMA PREVALENCE SURVEYS

World Health Organization

Design parameters for population-based trachoma prevalence surveys

Strategic and Technical Advisory Group for Neglected Tropical Diseases
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WHO/HTM/NTD/PCT/2018.07

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Acknowledgements

This document was prepared by Anthony W. Solomon, Colin K. Macleod, Rebecca M. Flueckiger, Tawfik Al-Khatib, Hoda Y. Atta, Robin L. Bailey, Ana Bakhtiari, Mathieu Bangert, Paul Courtright, Michael Dejene, Philip Downs, Emma M. Harding-Esch, Richard Hayes, Mohamed Jamsheed, John Kaldor, Biruck Kebede, Thomas M. Lietman, David C. W. Mabey, Caleb Mpyet, Beatriz Muñoz, Nebiyu Negussu, Jeremiah Ngondi, Nicholas Olobio, Travis Porco, Rachel Pullan, Babar Qureshi, Maria Rebollo, Kristen Renneker, Serge Resnikoff, Martha Saboya, Oumer Shafi, Oliver Sokana, Sheila K. West, Rebecca Willis, Aya Yajima and Gretchen A. Stevens.

About this document

This document presents (i) the principles important to the design of trachoma prevalence surveys conducted after interventions intended to eliminate the disease as a public health problem, and (ii) WHO recommendations for their implementation. The intended audience is technical units of health ministries of trachoma-endemic countries and their supporting partners.

1. Background

1.1 Trachoma results from infection with particular strains *(1)* of the bacterium *Chlamydia trachomatis*, causing blindness in the world's poorest people *(2)*. In 1996, a World Health Organization (WHO) Alliance was established to support elimination of the disease as a public health problem[1] by 2020 *(3)*. Decisions on where and how to implement the "SAFE" (surgery, antibiotics, facial cleanliness, environmental improvement) strategy for elimination *(4)* and on whether or not elimination has been achieved *(5)* rely on estimates of the prevalence of disease.

1.2 The gold-standard approach for estimating disease prevalence is a population-based prevalence survey (PBPS), adequately powered for the disease of interest. In an effort to stretch scarce resources, since 1996, various cheaper and cruder methods have been designed to assess the burden of trachoma and the potential need for interventions against it, including trachoma rapid assessment *(6)*, acceptance sampling trachoma rapid assessment *(7)* and integrated threshold mapping *(8, 9)*. Each of these methods has epidemiological drawbacks accompanying its lower cost *(10–12)*. Robust prevalence estimates are important for programmes wishing to establish whether mass drug administration of antibiotics should begin [at baseline survey *(4)*] or could be safely discontinued [at impact survey *(13)*], or to determine whether the disease has recrudesced beyond elimination thresholds after cessation of antibiotic mass drug administration [at pre-validation surveillance survey[2] *(13)*]. PBPSs are used to generate such estimates and are usually performed through cluster sampling.

1.3 Baseline surveys have now been mostly completed in suspected trachoma-endemic populations worldwide using a highly standardized PBPS approach *(14)* consistent with recommendations previously published by WHO *(4)*. The current document provides WHO recommendations, with justification, for undertaking impact and surveillance surveys. The unprecedented recent expansion of the global trachoma programme *(15, 16)*, which anticipates a parallel, trailing acceleration in demand for impact and surveillance surveys, warrants urgent dissemination of these recommendations.

2. Methods

2.1 In developing these recommendations, several resources have been employed. First, existing WHO guidance on trachoma prevalence surveys was reviewed using electronic and manual searches of WHO publications on trachoma located, respectively, on the WHO website and in the personal collections of those preparing this document. Second, basic statistical principles were applied to calculate sample size requirements for various epidemiological scenarios.

2.2 To help parameterize the sample size calculations, use was made of the survey experience acquired from 2012 to 2016 within the Global Trachoma Mapping Project (GTMP) *(14, 17–45)* and the Tropical Data service *(46)*, which has supported national programmes to complete trachoma prevalence surveys since the completion of the GTMP.

[1] "Elimination as a public health problem" is hereinafter referred to as "elimination".
[2] "Pre-validation surveillance surveys" are hereinafter referred to as "surveillance surveys".

3. General approach to trachoma prevalence surveys

3.1 Since 1956 *(4, 47–49)*, WHO has recommended the use of PBPSs *(4, 47-49)* to estimate the burden of disease in trachoma-endemic populations and that the techniques used "should be as uniform as possible" *(48)*.

3.2 Data to determine the need or otherwise for implementation of the SAFE strategy are ideally collected at district level *(50)*[1]. It is recommended that districts consist of population units of 100 000–250 000 people *(49)*. Although at baseline, population units larger than districts can be surveyed in order to generate evidence to start a trachoma programme *(49)*, district-level surveys should be undertaken at the impact and surveillance survey stages *(13)*. Because use of the term "district" can create difficulties in contexts where it has a political history or where it is currently employed to describe administrative divisions encompassing populations much larger or smaller than 100 000–250 000 people, this document refers to the population unit being surveyed as an "evaluation unit" (EU).

4. Sample size required to reliably estimate active trachoma prevalence

4.1 In impact and surveillance surveys, the most critical question to be answered is whether the EU-level prevalence of trachomatous inflammation—follicular (TF) *(51)* in 1–9-year-olds is < 5%: that is, whether the active trachoma prevalence threshold for eliminating the disease has been achieved *(5)*. In 2010, the 3rd Global Scientific Meeting on Trachoma concluded that this question was best addressed by powering surveys to detect a TF prevalence of 4% with absolute precision of ± 2% *(49)*.

4.2 A recent study *(52)* reviewed data from 261 PBPSs conducted in Ethiopia, Malawi and Nigeria during 2012–2016 with GTMP support. For surveys in which the prevalence of TF in 1–9-year-olds was shown to be 2–6%, the 75th centile of (actual individual-survey) design effects (from smallest to biggest) was 2.63. Using this design effect and the "single population proportion for precision" formula, without referencing the underlying population size of the EU *(53)*, to estimate with 95% confidence an expected TF prevalence of 4% with absolute precision of 2% would require an estimated 970 children aged 1–9 years per survey.

4.3 The median number of 1–9-year-olds examined per first-stage cluster (*m*) influences the

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