A Priority Research Agenda for GET2020

Session Date: Saturday, November 4

Session Time: 1:00pm – 4:00pm

Session Location: Loch Raven I

Session Description: With less than four years until 2020, there are vital operational research questions remaining that, if answered, may accelerate our progress towards achieving the global elimination targets for trachoma. This session will aim to consolidate the trachoma community's thinking around a harmonized list of trachoma research priorities by defining the key "game changers" to enable achievement of GET2020. Discussion will focus on NTD integration, antibiotics, trachoma elimination thresholds and surveillance, and surgery.

Session Chairs: Anthony Solomon, World Health Organization
Sheila West, Johns Hopkins Bloomberg School of Public Health

Session Rapporteurs: PJ Hooper, International Trachoma Initiative
Virginia Sarah, International Coalition for Trachoma Control

KEY DISCUSSION POINTS

Dr Solomon welcomed meeting participants and thanked them for their interest in this important priority setting exercise. He provided background to the Network of WHO Collaborating Centres for Trachoma, and noted both the preparatory work undertaken in the lead up to this session and the relevance of discussions undertaken in other sessions of the COR-NTD 2017 meeting.

In advance of this meeting, a detailed online survey about trachoma research priorities was sent to WHO GET2020 Alliance stakeholders (national programs in endemic countries, implementing partners, funders, and academic institutions). The purpose of the survey was to:

(i) review the existing list of operational research questions identified during the first two meetings of the Network of WHO Collaborating Centres (in 2015 (http://apps.who.int/iris/bitstream/10665/208889/1/9789241508964_eng.pdf?ua=1) and 2016 (http://apps.who.int/iris/handle/10665/258687)),

(ii) identify the ongoing relevance of these research questions, and
(iii) rank the key immediate priorities

Of note:

- None of the research questions were deemed 'no longer relevant'
- The top five priority research questions were ranked as:
  1) What approaches to the F&E components of SAFE lead to sustained changes in behaviour and access? Do these changes produce reductions in the prevalence of TF and/or ocular *Chlamydia trachomatis* (CT) infection?
  2) Are there specific population subsets that should be targeted for antibiotic treatments, rather than undertaking MDA?
  3) What are the major routes of transmission of ocular CT, and their behavioural determinants? Can contextually appropriate, targeted approaches be designed to interrupt them?
  4) How can surgery for trichiasis be optimized to maximize post-surgical outcomes?
  5) What causes re-emergence? Primary treatment failure? Persistent/latent infection? Local recrudescence? Re-introduction from outside? Are differences in local CT strains, or differences in the extent of strain diversity, involved?
- The first four of these priority questions identified to date are already being addressed in some way.
- **Limited funding continues to be the biggest obstacle to addressing prioritized research.**

Four presentations during the session highlighted particular challenges confronting the achievement of GET2020 goals, focusing on Surgery, Antibiotics, and trachoma elimination thresholds and surveillance. These encouraged lively discussions. OR questions important to the F&E components of the SAFE strategy were specifically not considered in this session, because a separate session of the meeting (breakout 1C) had been convened to address WASH and NTDs.

Additional research questions arising from discussions in this session are highlighted under each objective on pages 3-21 of this report.

RECOMMENDED NEXT STEPS

- DFID will continue to specifically encourage COR-NTD to send them more OR proposals pertaining to trachoma.
- USAID agreed to encourage national programs to identify implementation challenges and pursue timely OR where possible
- The trachoma OR community will continue to solicit interest from funders for identified research priorities
- The trachoma OR community will continue to use research data in strategic ways for advocacy and programmatic improvement
- Wherever possible, researchers will share knowledge and research findings whilst studies are underway
- This report will be circulated to the trachoma community and COR-NTD participants

– The prioritized list will be updated and actively promoted to potential funders by all stakeholders.

KNOWLEDGE GAPS IDENTIFIED

Activities for objective A1: To plan and undertake collaborative research on the facial cleanliness and environmental improvement components of the SAFE strategy

Questions that the activity should address (potential utility of answers)	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$)[1], possible funders	Nominated lead(s) to develop activity
1. At district/evaluation unit level, what are the water and sanitation correlates of high TF prevalence? (Hypothesis development for intervention studies)	Previous studies are of highly variable quality; explanatory variables, grading and survey design generally not standardized	Analysis of data from the GTMP, contributed by health ministries: resulting paper in press in PLoS NTDs	**20K** (WHO)	Emory (Freeman)
2. What approaches to the F&E components of SAFE have been used by trachoma elimination programmes? Are there any unpublished data on outcomes? (Hypothesis development for intervention studies)	To be determined through the activity; work is under way	Review of grey literature by graduate student; ICTC members were asked to provide reports on file, and liaised with in-country partners: resulting paper in press in PLoS NTDs	**26K** (WHO)	Emory (Freeman)
3. What are the major routes of transmission of ocular CT, and their behavioural determinants? Can contextually appropriate,	There is evidence that flies may be involved in transmission of ocular CT infection in some contexts; fingers and fomites are believed to also play a role, but evidence is limited	STRONGER-SAFE now underway (Ethiopia): (1) understand transmission – intensive observational studies, swab collection for PCR and CT sequencing; (2) interrupt transmission – small-scale pilot studies; (3) cluster randomized trials	**9000K** (rom Wellcome Trust)	LSHTM (Burton/Cairncross)

[1] For this table and those that follow **amounts in green text** are funds already secured; **amounts in yellow text** are funds that have been requested and are under active consideration by one or more funding agencies; and **amounts in red text** have not yet been formally requested.

targeted approaches be designed to interrupt them?				
4. What approaches to the F&E components of SAFE lead to sustained changes in behaviour and access? Do these changes produce reductions in the prevalence of TF and/or ocular CT infection? (Guideline development and programme planning)	Previous: 1. West et al, Lancet 1995 2. Emerson et al, Lancet 1999 3. Emerson et al, Lancet 2004 4. West et al, Lancet 2006 Ongoing: 1. LSHTM (Curtis) working on UNILEVER trial of school-based hygiene intervention, with trachoma as one of several end-points 2. FASTRAC study (Amhara, Ethiopia) 3. SWIFT–WUHA study (year 3 of 5)	Reprise the FASTRAC study: a CRT comparing antibiotic distribution alone with antibiotic distribution plus F&E (two sites, one of which should be Oromia, Ethiopia; the other selected from, e.g. Bijagos Islands, Guinea-Bissau; Karamoja, Uganda; and Amazonas, Colombia) Outcome measures: prevalence of TF, prevalence of ocular CT, prevalence of soil-transmitted helminths, growth markers, cost	**500K** from World Bank + **200K** by 3ie committed to FASTRAC; an additional **500K** required for PCR and final year data collection **4000K** for two additional sites Queen Elizabeth Diamond Jubilee Trust and DFID (?to fund implementation of F&E) NTD-SC/BMGF/ USAID/EDCTP (research funds)	Emory (Freeman/ McFarland) and UCSF (Keenan)
5. What are the optimal strategies for delivering F&E in populations where measuring impact on disease is difficult? (Guideline development and programme planning)	Limited	Work with 2–3 counties in which F&E is being implemented (as part of existing projects) to conduct a rigorous outcome evaluation; develop a consistent evaluation framework (tools, indicators) and pilot, revise and evaluate approaches to assess potential to change behaviour, with input from behavioural scientists	**400K** (concept note developed; funding source not yet identified)	Emory (Freeman)

Activities for objective A2: To plan and undertake collaborative research on the antibiotic component of the SAFE strategy, including research on co-administration of azithromycin with other drugs

Questions that the activity should address (potential utility of answers)	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$), possible funders	Nominated lead(s) to develop proposal
1. Does azithromycin coverage matter? If yes, how do we maximize demand, and optimally motivate distribution teams? (Guideline development and programme planning)	1. Harding-Esch et al, PLoS NTDs 2013 2. West et al, PLoS NTDs 2013 In programme practice, administrative coverage reports differ from coverage survey data; coverage appears to be highly dependent on the distributor; people's choice about participation seems to be more important than their availability; donors are often unwilling to pay for coverage surveys, so they are done infrequently Ongoing: "How do we maximize demand?" (LSHTM)	Consider whether coverage matters in the context of programme impact – do areas of low compliance become "hot spots" of infection?	For "Does coverage matter?", Dana Center has **15K** (internal seed funding) for work in Kongwa, United Republic of Tanzania (?still require an additional **10K**) LSHTM part-funded (**50K**) by Wellcome Trust, **138K** needed (?RTI)	Dana Center (West) LSHTM (Mtuy/Burton)
2. How should national programmes rapidly identify areas with poor coverage? (Guideline development and programme planning)	There is a significant literature on coverage estimation for various interventions Coverage Survey Tool (WHO) to be trialed for mass administration of azithromycin in Vanuatu.	Review previous approaches used to evaluate coverage in mass administration of azithromycin and other interventions The Vaccination Tracking System (VTS) allows real-time tracking of missed households and communities and may allow improved estimates of trachoma (or other NTD) MDA coverage; planning is now underway to test this methodology in Nigeria	No funding required for literature review **85K** provided by COR-NTD, FHF and Sightsavers for VTS testing	KCCO (Courtright) for literature review Sightsavers (Isiyaku) and Nigeria FMOH (Olobio) for VTS testing
3. Is co-administration of	1. Amsden et al, AJTMH 2007	Protocols now being finalized to conduct	**~400K**	LSHTM (Marks/McPherson)

	azithromycin + albendazole (or mebendazole) safe? Is co-administration of azithromycin + ivermectin + albendazole safe? (Guideline development and programme planning)	2. El-Tahtawy et al, PLoS NTDs 2008 3. Coulibaly et al, PLoS NTDs 2013 4. Trial of ivermectin +azithromycin in the Solomon Islands	randomized controlled non-inferiority studies in Ethiopia and Papua New Guinea, with intensive safety monitoring; to 8,000 participants will be included in each arm at both sites	ITI has funding available Progressing	
4.	Should specific population subsets be targeted for antibiotic treatment, rather than undertaking MDA? Should the target population for antibiotic MDA remain the same throughout the whole programme cycle, or should it change? Is treatment more effective or efficient (in terms of quantities of azithromycin and drug distribution costs) using an intensive antibiotic "attack phase" and then maintaining the gains made with less intensive intervention, rather than simply conducting routine annual treatment rounds? Do the answers to these questions depend on the baseline TF prevalence? (Guideline development and programme planning)	Previous: 1. TANA – treating children only had a similar effect to treating the entire population 2. Biannual versus annual treatment has been studied; very little evidence of advantage over annual treatment 3. Bijagos Islands study (LSHTM): 2nd treatment 1 week after 1st did not provide evidence to change current practice 4. In Niger, biannual treatment of children aged 0-12 years was non-inferior to annual mass treatment of all ages (Amza et al, CID 2017) Ongoing: 1. TANA2/ TIRET: A child-targeted treatment arm, compared with ongoing annual mass treatment and stopped treatment	Publish TANA2 and PRET-Niger studies comparing targeting to children versus other strategies, including annual treatment of the entire community; prepare a summary of relevant studies, which could be presented to decision-makers The "TESFA study" is a programme-embedded CRT for Amhara, Ethiopia, that will examine the effect of giving children two extra rounds of antibiotic treatment in quick succession after MDA of entire population; it is now fully funded Consider a CRT undertaken in the context of programmes to assess antibiotic-sparing, sustainable treatment strategies, including: i) a single mass treatment followed by treatment targeted to children only ii) targeting treatment to a subset of individuals—the minimal core group identified by an initial survey to be responsible for transmission in the community As a first step, form a committee to	No funding required for dissemination and summary of current results TESFA study in Amhara: **1200K** committed by ITI; **520K** committed by COR-NTD Subsequent CRTs would cost a minimum of **1000K** per site, unless substantial cost savings could occur in the context of an existing treatment programme and a simple trial design	UCSF (Lietman) Emory (Emerson/Callahan)

		address how to perform randomized trials in the context of existing programmes, at a reasonable cost		
5. What causes re-emergence? Primary treatment failure? Persistent/latent infection? Local recrudescence? Re-introduction from outside? (Hypothesis generation for intervention studies) Are differences in local CT strains, or differences in the extent of strain diversity, involved?	Modelling suggests that the efficacy of treatment is ~70%; treatment failures frequently occur in treatment of genital tract CT infections Ongoing: LSHTM (Last) funded to study re-emergence in Guinea-Bissau	Conduct longitudinal studies using sequencing in the United Republic of Tanzania (where many rounds of mass azithromycin treatment have been delivered in some places) – now underway – and in Guinea-Bissau	LSHTM: part of STRONGER-SAFE proposal (see objective A1, activity 3) For United Republic of Tanzania: **65K** provided by ITI; **60K** provided by NIH It would also be useful to study this in Oromia	LSHTM (Burton/Thomson) Dana Center (West/Quinn) ?
6. What is the optimal number of rounds of antibiotic distribution before conducting or repeating an impact survey? (Guideline development and programme planning)	Reliable data are limited, in part due to the previous lack of international standardization of grader training and survey design	Ongoing analyses of routine programmatic data collected using GTMP at baseline and standardized impact and surveillance survey protocols using certified graders.	Specific funds not needed	LSHTM (Harding-Esch)/ Emory (Willis)
7. Are individuals in endemic communities receiving an ideal therapeutic dose? (Guideline development and programme planning)	People aged ≥ 15 years receive 1 g; anyone aged < 15 years should receive 20 mg/kg, but evidence suggests they receive more than this; the height-based dosing algorithm is designed to minimize under-dosing Ongoing: 1. Data from Malawi suggest mean dose is ~29 mg/kg 2. Data from Vanuatu suggest	Collect data on height, weight, and dose received, in multiple countries; already completed in Malawi, Niger, and Tanzania as part of the MORDOR study Revise the algorithm for the next Zithromax® Program Managers Guide; this is now underway by ITI	**?Further funds needed** to collect anthropometric data	Emory (Emerson)

	mean dose is ~30 mg/kg			
8. What is the effect of azithromycin MDA on antimicrobial susceptibility patterns in non-target organisms? (Guideline development and programme planning)	The MORDOR study collected data to examine this as a secondary outcome; analysis pending			UCSF (Lietman)/ LSHTM (Burr)

Additional research questions arising from the breakout session discussions included:

1) Is trachoma an issue among marginalized populations? If yes, in such populations, could it be tackled in a coordinated manner with other NTDs?
2) What are the ancillary benefits of azithromycin MDA? (reduced child mortality, STIs, malaria, diarrhea, pneumonia, etc; this was partly explored through the MORDOR study, but additional research is needed)
3) Are there innovative strategies that could reduce the overall quantity of antibiotic used (e.g., different delivery mechanisms to reduce the quantity needed or accelerate the progress towards elimination)?
4) Does integrating NTD MDAs/co-administration impact disease-specific MDA coverage? Cost-effectiveness? Compliance?

Activities for objective A3: To plan and undertake collaborative research on elimination thresholds and surveillance for trachoma

Questions that the activity should address (potential utility of answers)	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$), possible funders	Nominated lead(s) to develop proposal
1. Do internally-displaced people, refugees, indigenous populations, persons in refugee camps, nomadic populations, prisoners have trachoma at prevalences indicating a public health problem? If yes, how do we best reach them with interventions? (Guideline development and programme planning)	Populations not overseen by UNHCR (generally internally-displaced people) are of greater potential concern than those living in established UNHCR camps; there are large refugee populations in the WHO Eastern Mediterranean Region; recent assessments in camps in Djibouti and Jordan reported zero trachoma Studies have been completed in: 1. Gambella, Ethiopia (RTI/LSHTM) 2. Sudan (LSHTM)	Tropical Data should continue to work towards supporting these assessments where possible; CDC and ITI are also interested in this issue	Funding needed; proposal for more work is in development	CDC (Martin)/ LSHTM (Harding-Esch)
2. The current TT elimination prevalence threshold is difficult to measure and use; would another measure (e.g. TT prevalence in those aged ≥ 40 years) be more reliable, and more easily interpretable? (Indicator development)	There is a considerable literature on TT and age; Muñoz et al, TMIH 1997 found that the incidence appeared to increase with age	Analysis of baseline survey data (GTMP) and impact survey data, followed by fieldwork to trial a prototype methodology, have both been completed; outcomes were presented at the April 2017 meeting of the M&E working group of WHO's NTD-STAG. Recommendations for undertaking TT-only surveys have been produced.	**36K** (Sightsavers/ Helen Keller International (HKI)'s USAID (MMDP grant)	LSHTM (Flueckiger)/ KCCO (Courtright)
3. What are the correct criteria (and terminology) to use for a TT case at the time of impact and surveillance surveys? Currently, individuals who have	WHO 2010 (Report of the 3rd Global Scientific Meeting on Trachoma)	Use impact and surveillance survey data in Eritrea, Nepal, United Republic of Tanzania, Viet Nam, ?others Explore possibility of linking students	Emory have a **7K** student travel grant; require a further **3K**	Clarify with Emory (Haddad) re-proposed work in Senegal and Uganda to investigate, at community level, what services or advice people

refused surgery, are listed for surgery but have not yet received it, or who have had surgery and now have post-operative TT ("recurrent cases") are all considered cases "known to the health system" and are not included in the backlog estimate (Indicator development and programme planning)		from developed and developing countries KCCO (Courtright)/Dana Center (West)/Emory (Haddad)/WHO (Solomon) agreed on a basic question set	Dana Center have secured **5K** from the Johns Hopkins University Dean's Office and **5K** from BMGF	with TT have previously been offered. Dana Center (West) sending an MD student to United Republic of Tanzania
4. The WHO simplified trachoma grading system is not designed to assess TT in impact surveys; what is the effect on the measured TT prevalence of recording the presence or absence of trachomatous scarring in all cases of trichiasis? How do we determine that trichiasis is trachomatous? (Guideline development, indicator development and programme planning)	Rajak et al, IOVS 2011	Some analyses have been undertaken; further work needed	**10K** (WHO)	KCCO (Lewallen)/ Dana Center (West)
5. How accurate is the prevalence of TT as assessed by trained antibiotic distributors? Could this be used as an alternative to dedicated TT surveys? (Guideline development)	Ongoing work in Kongwa, United Republic of Tanzania (Dana Center)	Compare TT prevalences determined by trained antibiotic distributors with TT prevalences determined by population-based prevalence surveys	**10K** in addition to partnership with the national programme and an NGO supporting an impact survey	Dana Center (West)
6. The elimination threshold for	There is an extensive literature	Collect data on TF, TI, CT infection and	The Trachoma	UCSF (Porco)/Emory

	active trachoma is a TF prevalence of < 5% in children aged 1–9 years, but the prevalence of CT infection is often much lower than this; what is TF really telling us about CT infection? (Indicator development)	on the disease/CT infection mismatch; recent publications on serology: 1. Goodhew et al, PLoS NTDs 2012 2. Liu et al, PLoS NTDs 2013 3. Goodhew et al, BMC Infect Diseases 2014 4. Martin et al, PLoS NTDs 2015 Ongoing: 1. Trachoma Alternative Indicators study (Emory) – see recent report of interim data review 2. Pacific Enigma study (LSHTM)	anti-CT antibodies in order to explore the relationship between them at individual and evaluation-unit levels; should include country and number of years of intervention as variables	Alternative Indicators study has **350K** support from BMGF through the NTD-SC The Pacific Enigma study has been funded by the Fred Hollows Foundation with support from ITI	(Emerson)/Dana Center (West)/LSHTM (Mabey) LSHTM (Mabey)
7.	The elimination threshold for active trachoma is a TF prevalence of < 5% in children aged 1–9 years, but the prevalence of CT infection is often much lower than this; is infection or disease more important in predicting the risk of future conjunctival scarring? (Indicator development)	Previous: 1. Risk of trachomatous conjunctival scarring is related to inflammatory scores rather than follicular scores (Dawson et al, ISHCI 1990) 2. West et al, Ophthal Epidemiol 2001 3. Wolle et al, Ophthalmol 2009 4. In individuals with established trachomatous conjunctival scarring, scarring progresses in the absence of ocular CT; progression is associated with episodes of conjunctival inflammation (Burton et al, PLoS NTDs, in press). Ongoing: cohort study in United Republic of Tanzania (600 children recruited)	Cohort study in the United Republic of Tanzania	**300K** (funded by Wellcome Trust)	LSHTM (Burton)
8.	What would be the impact on	GTMP systems used to	MSc project. Would need supervisor	**10K** (including	LSHTM (Harding-

	the estimated TF prevalence of having TF diagnoses confirmed by a supervisor? What would the cost–benefit be? Could a cell phone or tablet photograph be used for supervision?	photograph yaws lesions in the Solomon Islands	review of a random sample of 5% of "no-TF" eyes, too, otherwise the only consequence of involving supervisors would be to reduce or maintain the prevalence estimate	publication costs) LSHTM Trust Funds/WHO **20K** to support the photograph reading centre at UCSF	Esch/Butcher)/UCSF (Keenan) UCSF (Lietman)
9.	WHO recommends that impact surveys be done 6–12 months after the final round of 1–5 rounds of MDA; if TF prevalence is < 5% at this time point, what is the risk of TF recrudescence?	WHO 2014 (Technical consultation on trachoma surveillance)	Use data from existing datasets (PRET, ASANTE, TIRET) to assess TF and TI at 6 months and at 12 months to determine if 6 months simply measures the effect of the last MDA; involve BMGF-funding modelling consortium In the United Republic of Tanzania, resurvey communities with no disease every 6 months after MDA is discontinued	**10K** to compile datasets (research student required; a few months' work – has not advanced)	Dana Center (Muñoz)/ Emory (Callahan)

Additional research questions arising from the breakout session discussions included:

1) What is the value of measuring TI in a programmatic setting? *(longitudinal cohort studies may be needed)*
2) Should tests for CT infection be used in the programmatic setting? Is there a threshold prevalence of nucleic acid amplification test positivity below which re-emergence of infection is unlikely? Can we build laboratory capacity to ensure fast, high quality, accurate specimen processing?
3) Should anti-CT antibody tests be used in the programmatic setting? What are the appropriate seropositivity thresholds? What is the effect of MDA on seroreversion and seroconversion? What is the effect of time since MDA is stopped on seroreversion and seroconversion? What is the effect of other co-infections on the immune response to CT?
4) In high prevalence areas, when we remove antibiotic pressure, will we see recrudescence due to inadequate WASH improvements? *(longitudinal studies needed)*
5) Could we change the goal in high prevalence areas to interruption of transmission of ocular CT instead of elimination of trachoma as a public health problem?
6) What does recrudescence look like? Are we setting our elimination thresholds at the right levels to avoid reemergence? What are the most appropriate ways to conduct surveillance? *(partially covered through 'Stronger SAFE' study now underway)*

7) What should programmes do when a district repeatedly returns TF prevalence estimates at serial impact surveys of ≥5%? What should programmes do when a district returns a TF prevalence estimate of ≥5% at surveillance survey ? (*one study now underway in Tanzania in a district with TF >5% at surveillance survey – swabs and dried blood spots being collected)*

Activities for objective A4: To plan and undertake collaborative research on the surgery component of the SAFE strategy

Questions that the activity should address (potential utility of answers)	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$), possible funders	Nominated lead(s) to develop proposal
1. What is the relationship between the prevalence of TF and the prevalence of TT at presumed steady state? (Guideline and indicator development)	Most published data lack international grader standardization and do not use standardized survey or analysis protocols	Analysis of data from GTMP: will require health ministries to contribute their data – now under way	5K (publication cost) GTMP can support publication costs	LSHTM (Mabey)/ KCCO (Courtright)
2. What is the ratio of TT prevalence in women to TT prevalence in men? Does this change with overall prevalence? (Advocacy, indicator development and programme planning)	Previous 1. West et al, BJO 2004 2. Cromwell et al, TRSTMH 2009	Analysis of data from GTMP: will require health ministries to contribute their data – now under way	5K (plus 5K publication costs) GTMP can support publication costs	KCCO (Courtright)/ LSHTM (Mabey)
3. After, or in spite of, MDA, what causes scarring and trichiasis? (Indicator development)	In individuals with established trachomatous conjunctival scarring, scarring progresses in the absence of ocular CT; progression is associated with episodes of conjunctival inflammation (Burton et al, PLoS NTDs, in press)	Longitudinal studies of host gene expression, microbiota and anti-CT serological responses Now underway in a cohort in Tanzania	150K Proposal submitted by LSHTM to Medical Research Council but not funded Some funding from Wellcome Trust for Tanzania cohort	LSHTM (Holland)
4. How can surgery for trichiasis be optimized to maximize post-surgical outcomes? (Guideline development and programme planning)	Merbs et al, Ophthal Epidemiol 2015: lower post-operative scar height is associated with increased post-operative trichiasis 1 year after bilamellar tarsal rotation	A randomized controlled trial now underway to compare (n=4000)outcomes between 3mm bilamellar tarsal rotation (BLTR), 5mm BLTR, and Trabut	1500K (NIH)	Dana Center (Merbs)/UNC (Gower)

5. Is TT surgery uptake and refusal equitable between males and females? (Guideline development and programme planning)	Habte et al, Ophthal Epidemiol 2008: no difference (Ethiopia)	Programme data from Queen Elizabeth Diamond Jubilee Trust-supported, DFID-supported and USAID MMDP Project-supported programmes Will also add prospectively to the funded trial outlined in A4.4	**10K** Queen Elizabeth Diamond Jubilee Trust/DFID?	KCCO (Courtright)
6. How can case-finding and surgical uptake be made most effective and efficient? What is the value of integrated approaches (e.g. what additional eye health activities could be carried out at the same time as trachoma surveys or TT surgical services?) (Guideline development and programme planning)	Bowman et al, TMIH 2000	Vaupes, Colombia; United Republic of Tanzania Need input from health economists from the beginning Trials of different approaches to encouraging surgical uptake: e.g. house-to-house vs surgical camps vs current standard of care, examining uptake and costs (Burkina Faso, Ethiopia, Mali, Niger, Senegal, Sudan, United Republic of Tanzania)	**75K** HKI's USAID MMDP grant **75K** (to evaluate use of microfinance groups in United Republic of Tanzania) –?HKI's USAID MMDP grant	Wake Forest (Gower)/ LSHTM (Burton)/ Emory (Haddad) KCCO (Courtright)
7. Does providing good-quality epilation forceps to individuals with TT reduce uptake of surgery? (Guideline development and programme planning)	1. Rajak et al, PLoS Med 2011 2. Habtamu et al, PLoS NTDs 2015	Multi-centre individual randomized controlled trial Burkina Faso, Cameroon, Ethiopia, Kenya, Sudan HKI has done some work on this in Cameroon to date and is open to further exploring this issue	**75K** (HKI's USAID MMDP grant)	LSHTM (Burton)/ Emory (Haddad)/ KCCO (Courtright)/ Wake Forest (Gower)

Additional research questions arising from the breakout session discussions included:

1. How do we manage lower eyelid trichiasis?
2. How do we manage post-operative TT?
3. How do we ensure high quality training and supervision?

4. What are the risk factors for TT in children? How do we manage TT in children?
5. When a national program has reached both the TF and TT thresholds in a district, what is the incidence of new cases of TT in the district? How long do programs need to continue to do case finding?
6. What are the risk factors for surgeon attrition that are amenable to change? What should we do with surgeons that are no longer doing TT surgery to keep them engaged in future trachoma-related activities?

Activities for objective A5: To develop, and make accessible, quality-assured systems for measuring the prevalence of ocular CT infection, and of circulating anti-CT antibodies, for the purposes of research at programmatic scale

Activity	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$), possible funders	Nominated lead(s) to develop proposal
1. Assure the reliability and validity of regional systems for measuring the prevalence of ocular CT infection	There is an extensive literature on assessing ocular CT infection in trachoma, and multiple commercially-available assays	Train laboratory personnel in CT PCR in at least one laboratory in each WHO region for research and programme purposes; this could be coordinated with efforts being made within the onchocerciasis control community to establish laboratory capacity for entomological studies Produce manuals on the use of the Cepheid GeneXpert USAID could encourage tuberculosis programmes in some key countries to share USAID-funded GeneXpert equipment with trachoma elimination programmes	Dana Center has existing funds for and extensive experience in certifying laboratories for CT detection ITI received a donation of three GeneXpert II units (commercial value **500K**), two of which have in turn been donated to LSHTM and University of New South Wales; the third is on loan in Malawi	Dana Center (Gaydos/West) and Emory (Hooper)
2. Develop, and make accessible, quality-assured systems for measuring the prevalence of circulating anti-CT antibodies	1. Goodhew et al, PLoS NTDs 2012 2. Liu et al, PLoS NTDs 2013 3. Goodhew et al, BMC Infect Diseases 2014 4. Martin et al, PLoS NTDs 2015	Develop kits, with appropriate instructions, to enable laboratories to undertake ELISA or bead-based immunoassays for anti-CT antibodies, as well as a system of international quality assurance. A recombinant humanized antibody against Pgp3 should be commissioned. ELISA and a set of internal standards have now been developed. Training has been completed in Colombia, Ghana and Malawi, and is pending in Ethiopia.	**101K in FY15; 150K in FY16** (Primarily funded through an inter-agency agreement between USAID and CDC) Further funds to be requested from USAID for FY17	CDC (Martin)

Activities for objective B: To plan and undertake capacity building and training initiatives to support trachoma elimination programmes

Activity	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$), possible funders	Nominated lead(s) to develop proposal
1. Undertake a capacity assessment in all trachoma-endemic countries to determine capacity-building needs	Ad hoc	Electronic survey has been completed and results have been compiled for ~15 countries; these have been shared with the national programs and are now being shared with NGO partners	**10K** (ITI)	KCCO (MacArthur)/ WHO (Solomon)/ Emory (Sankar)
2. Make mannequin-based TT surgery training available to national programmes	HEAD-START Currently trying to change manufacturing process to increase production capacity, while maintaining quality; stock control and distribution systems need work	Training	**150–1000K** depending on scope; **500K** used for the purposes of providing summary calculations on this report HKI's USAID MMDP grant?	UNC (Gower)/ Dana Center (Merbs)
3. Build the capacity of national programmes to undertake routine audit of TT surgery outcomes	Limited; the Mali programme presented results of a pilot audit to the 2016 GET2020 meeting	Develop and introduce a training manual for audit, with oversight included as part of supervision activities	**75K** (HKI's USAID MMDP grant)	Emory (Haddad)
4. Build knowledge, understanding and practical skills relevant to trachoma elimination among district-level trachoma, prevention of blindness and neglected tropical disease programme managers	WHO Neglected Tropical Diseases Programme Managers' Training Course	Massive Open Online Course was launched on the FutureLearn platform in late 2016; three instances of the course have been run in English. Translations are planned.	**157K**	LSHTM (Burton/Patel)
5. Build understanding of and	Previous: KCCO leadership	3 x small group, face-to-face courses	**75K** (ITI)	KCCO (Courtright)

skills in leadership amongst national trachoma programme managers	training course, Cape Town, April 2015; Francophone training held in September 2017 in Senegal Additional trainings planned for 2018			
6. Provide members of GET2020 with periodic updates on research findings of immediate relevance to programmes	Trachoma Information Service has been revived		**3K** (ITI)	KCCO (Courtright)

Activities for objective C: To collaborate in the collection, collation and dissemination of information about trachoma elimination and reference substances relevant to trachoma elimination programmes

Activity	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$), possible funders	Nominated lead(s) to develop proposal
1. Draft, circulate and coordinate revisions to "Trachoma control: a guide for programme managers" to produce a second, updated edition	First edition	Coordinate a group to undertake the revision	**7K** required for printing and distribution can be met by WHO	WHO (Solomon)
2. Convene the second global scientific meeting on trichiasis	First global scientific meeting on trichiasis, Moshi, January 2012	Held in Cape Town, November 2015 – report in preparation	**90K** (Sightsavers + HKI's USAID MMDP grant)	KCCO (Courtright)
3. Refine the standard operating procedures on where to map and where not to map for trachoma	Current standard operating procedures developed by WHO/GTMP	Test the current standard operating procedures in Latin America	**20K**	Dana Center (West)/ WHO (Solomon)
4. Bank conjunctival swabs for CT whole genome sequencing by the Wellcome Trust Sanger Centre	Harris et al, Nat Genetics 2012	Opportunistic collection of conjunctival swabs from individuals with signs of active trachoma seen in surveys or research projects. Joint database	Incremental cost to collect swabs is small Cost of sequencing supported by the Wellcome Trust	LSHTM (Thomson)/ Dana Center (Quinn)
5. Maintain a library of validated antigens for use in anti-CT antibody studies	1. Lu et al, Invest Ophthalmol Vis Sci 2012 2. Goodhew et al, PLoS NTDs 2012 3. Martin et al, PLoS NTDs 2015	Joint database of antigens and constructs available	Cost for vector and antigen storage is minimal	CDC (Martin)/ LSHTM (Holland)

Activities for objective D: To help standardize the use of terminology and data about trachoma

Activity	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$), possible funders	Nominated lead(s) to develop proposal
1. Draft, circulate and coordinate revisions to a standard list of preferred terms and abbreviations relating to trachoma	None	Once agreed, the list will be maintained on the WHO trachoma website, and periodically updated as needed	Negligible	LSHTM (TBD)
2. Use and encourage the use of preferred terms and abbreviations relating to trachoma, and the latest data on trachoma prevalence and implementation activities, in all outputs	None	Use and encourage the use of preferred terms and abbreviations relating to trachoma, and the latest data on trachoma prevalence and implementation activities, in all WHOCC outputs (and in the course of peer review).	Negligible	All

Activities for objective E: To coordinate efforts towards research and development; capacity building and training; collection, collation and dissemination of information and reference substances; and standardized use of terminology and data.

Activity	Relevant previous and ongoing work	Suggested approach (potential locations)	Tentative cost (US$), possible funders	Nominated lead(s) to develop proposal
1. Coordinate efforts towards research and development; capacity building and training; collection, collation and dissemination of information and reference substances; and standardized use of terminology and data	Ad hoc	Appoint an academic with experience in trachoma (lecturer or senior lecturer level) to coordinate activities of the Network, and lead some activities; email, phone calls and teleconferences as required, plus face-to-face, annual meetings in conjunction with the meeting of the WHO Alliance for GET2020.	630K over four years (Task Force for Global Health/ Sightsavers/ Fred Hollows Foundation) – Emma Harding-Esch now in post.	LSHTM (Bailey)