Innovative trachoma survey methods to justify MDA and surgical services in large administrative districts

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By

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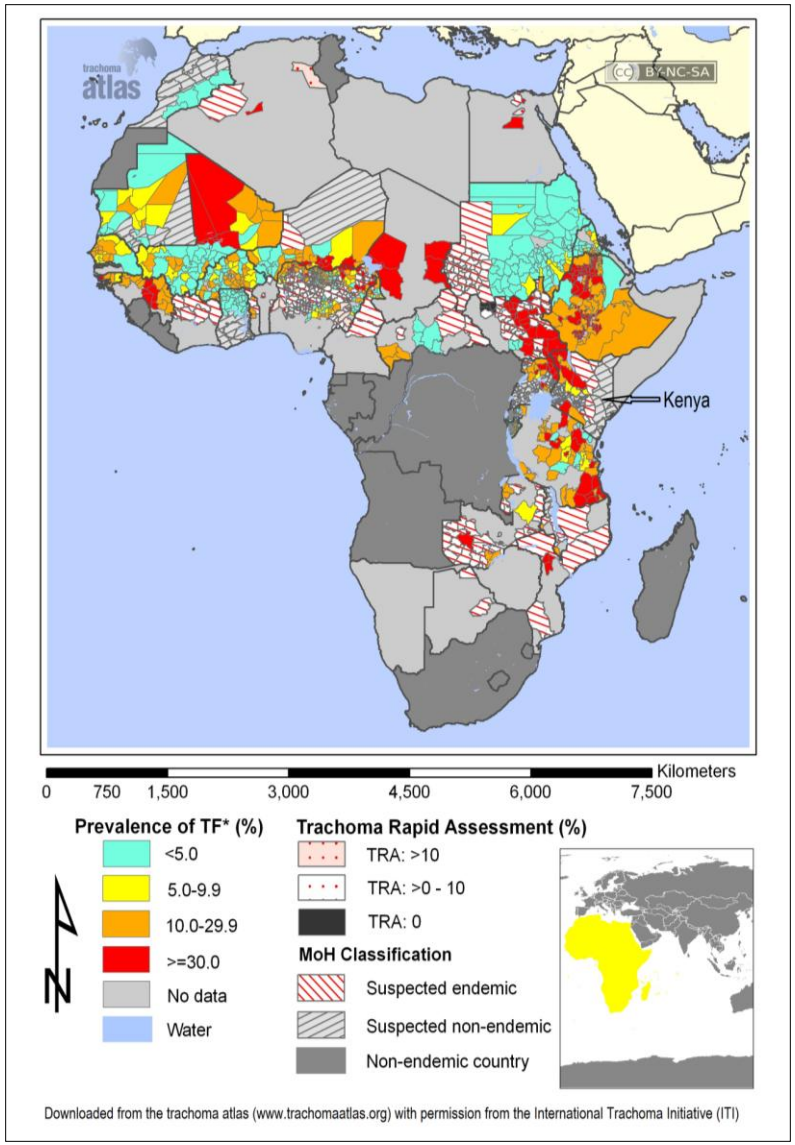
Trachoma

- The leading infectious cause of blindness in the world with 1.2 million blind.
- Found in communities with poor hygiene (clustered disease)
- Epidemiological survey mandatory prior to intervention
- Active infection mainly found in children. Blindness in adults.
- Women are affected more than men.

The African trachoma belt



Has 72% of the total population with trachoma.

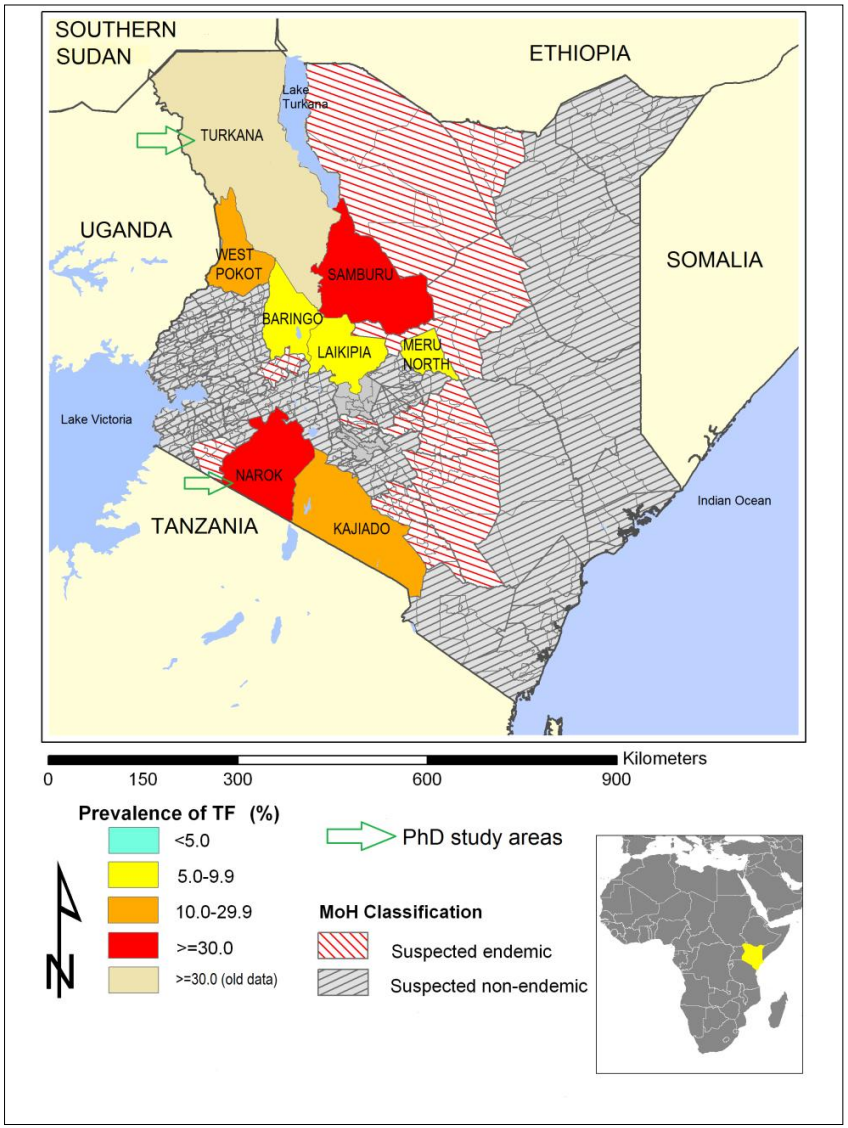
Trachoma belt includes the:

1. Sahel (East -West)

2. Great Rift Valley (North-South)

Download free trachoma maps from the trachoma atlas at: www.trachomaatlas.com

Kenya trachoma map (prior to this study)



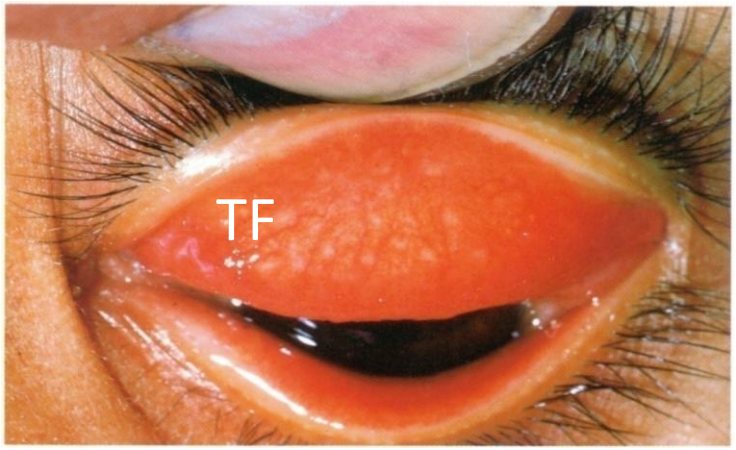
Trachoma is found in the arid areas in the Rift Valley and Eastern Kenya regions:

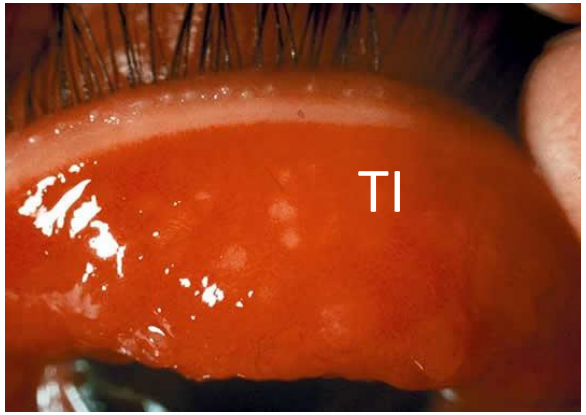
- Remote and marginalised
- Nomadic communities
- Insecurity
- Refugee camps: Kakuma and Daadab

Diagnosis

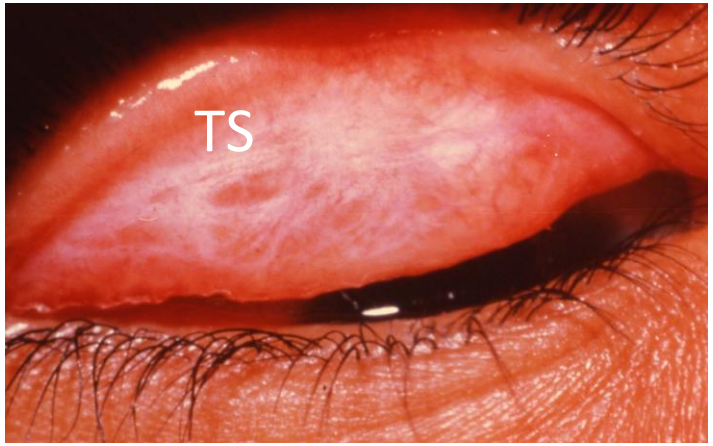
- Trachoma is caused by the bacterium Chlamydia trachomatis.
- In surveys, laboratory testing to determine the ***prevalence of infection*** is not mandatory because it is expansive.
- Instead, the WHO simplified clinical grading is used to determine the ***prevalence of disease***.
- All policy guidelines and Ultimate Interventions Goals (UIGs) are based on prevalence of disease.

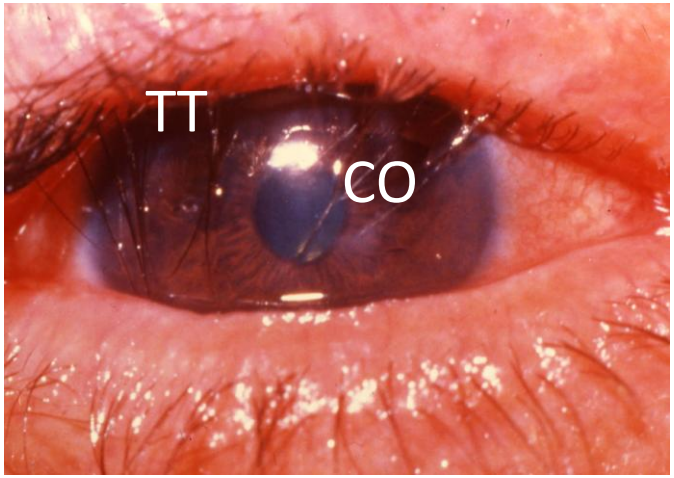
Simplified WHO trachoma grading





Active trachoma (highly infectious) mainly occurs in children





Blindness in adults: Females > Males

Trachoma Control

The WHO recommends the “SAFE strategy”:

- **S =** Surgery for trichiasis/entropion
- **A =** Antibiotics for active disease (azithromycin/TEO)
- **F&E =** Facial cleanliness, and Environmental improvement .

Monitoring indicators:

- Prevalence of TT for the S component
- Prevalence of TF for the AFE components

WHO MDA guidelines

- Trachoma intervention unit = normal administrative district for health care management (approximately 100,000 people).
- Threshold for mass drug administration (MDA): 10% ***prevalence*** of active trachoma (TF) in children 1-9 years old.
- If prevalence 10% to <30% treat whole population annually for 3 years then re-survey.
- If ≥30% administer the mass treatment for 5 years.

NB: 2.62 million doses administered in Kenya annually (2013)

Problem statement (TF surveys)

- In 2010, the population of trachoma-endemic administrative districts in Kenya was 80,000 to 1,000,000 people per district.
- In large districts (>200,000 people) survey clusters widely spaced.
- As a result, some endemic areas were missed e.g. in Baringo, and Laikipia districts (risk of cross-border infection).
- Some non-endemic areas were included in MDA e.g. in Narok and Kajiado districts (wastage of resources).

Problem statement (TT surveys)

- The recommended lower age limit for TT surveys is 15 years.
- Large samples are needed because prevalence TT is usually low in young adults.
- Researchers usually lower the precision of TT surveys (wider confidence interval) than for TF surveys.
- Usually (not always), a trachoma prevalence survey comprises of both a TT a TF survey.

Previous surveys conducted in Kenya

District	Children 1-9 yrs		Adults ≥15 yrs	
	Total examined	Prevalence of TF	Total examined	Prevalence of TT
1. Samburu	1,250	**35.0%**	1,368	**6.0%**
2. Narok	1,348	**30.5%**	1,376	**2.3%**
3. Kajiado	1,182	**28.1%**	1,414	**3.3%**
4. West Pokot	1,142	**26.6%**	1,324	**5.7%**
5. Laikipia	1,017	**9.5%**	1,225	**1.1%**
6. Meru North	880	**8.1%**	1,131	**1.0%**
7. Baringo	1,180	**6.4%**	1,432	**5.8%**

Prevalence of TF is usually higher than TT

Research question and objectives

Question:

- How can one conduct an effective and efficient trachoma prevalence survey in a large administrative district?

Objectives were to develop an:

- Effective TF survey method to identify the areas that require mass antibiotic treatment.

- Efficient TT survey method, where TF and TT surveys are completed within the same time period.

Activities for objective 1

- Developed the Trachoma Survey by Segment (TSS) method and tested in:

  - A large hyper-endemic district (Turkana, 533,837 people).

  - A large meso-endemic with clustered trachoma (Narok , 576,388 people).

- Calculated the cost of a trachoma survey and MDA using the new and standard survey methods.

The TSS survey method

- Divided district into geographical areas (segments) with 100,000-200,000 people each.
- Surveyed each segment as a separate "***trachoma district***".
- Non-endemic segments excluded from MDA: the "segment knock-out" survey method for large endemic districts.
- Other settings: small administrative districts can be surveyed as single segments or merged into segments.

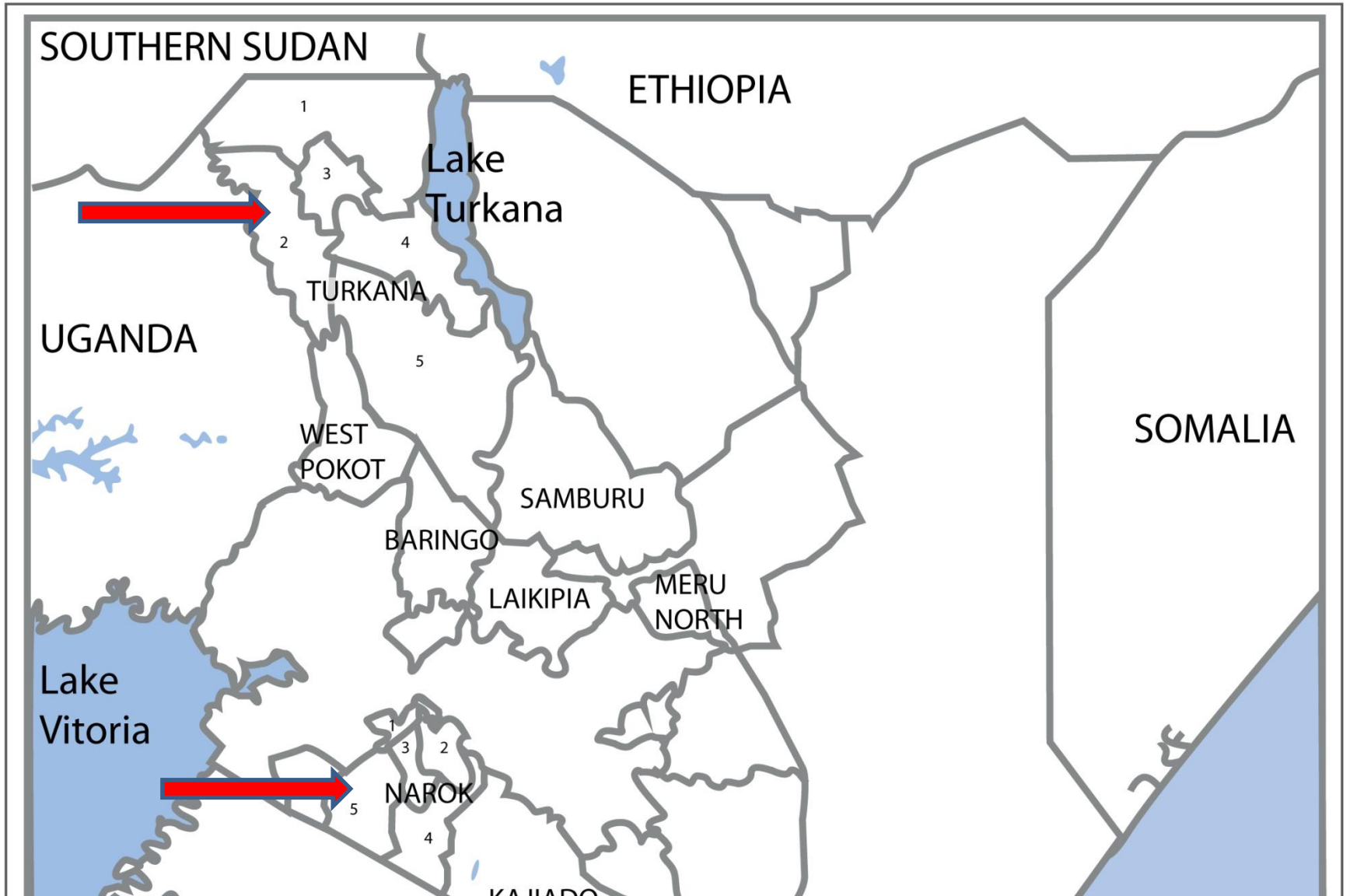
Pre-survey risk assessment

- Done to minimize mixing of non-endemic and endemic areas in the same survey segment.
- Developed a simplified trachoma risk assessment form
- Five parameters used: availability of water, time taken to fetch water and main social economic activity, poverty level.
- Each parameter had 1 to 4 points (total scores 5 to 20 points).
- Communities with similar risk scores aggregated in a segment.

Sample size and examination

- Minimum sample was 800 children and 600 adults per segment.
- Total 4,000 children and 3,000 adults per administrative district.
- Cluster size: 40 children per cluster and 30 adults per cluster.
- Data collected by 4 experienced trachoma graders with high inter-observer agreement.
- Clinical examinations conducted at the households.

The surveyed segments



Risk scores for Turkana district

Segments	Total risk score
1. Northern	19
2. Western	18
3. Kakuma refugee camp	9
4. Central	15
5. Southern	18
TURKANA	19

Total trachoma risk score: minimum = 5 and maximum = 20

Risk scores for Narok district

Segment	Total risk score
1. North Western	14
2. North Eastern	14
3. Central	17
4. South Eastern	18
5. South Western	18
NAROK	17

Total trachoma risk score: minimum = 5 and maximum = 20

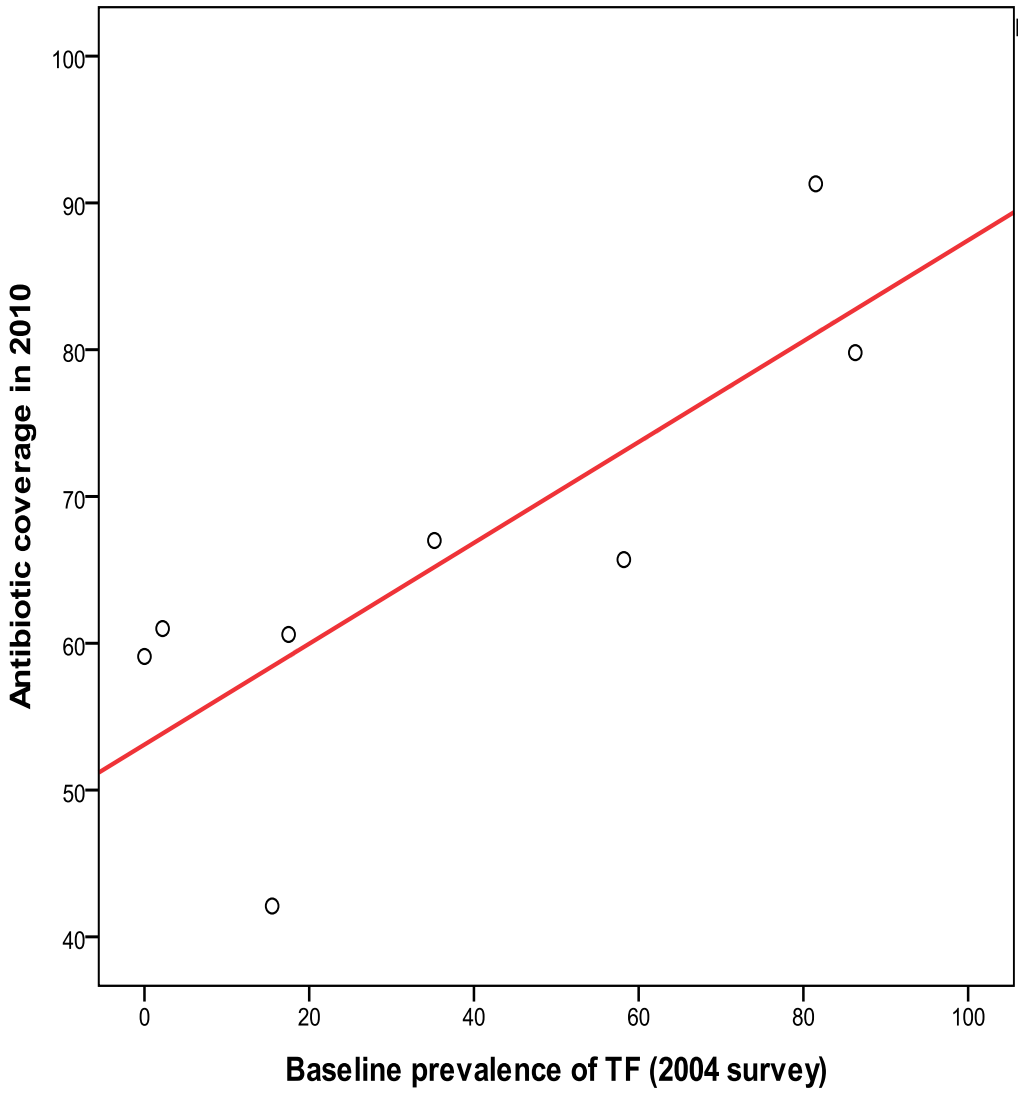
Prevalence of TF in Turkana

Survey segments (5 per district)	Number of clusters surveyed	Children age 1-9 years examined	% with TF	95% CI	Need for mass treatment
1. Western Turkana	23	914	67.6	(55.7-79.4)	5 years
2. Northern Turkana	21	829	46.4	(36.9-56.0)	5 years
3. Southern Turkana	21	823	31.2	(24.2-38.3)	5 years
4. Central Turkana	20	795	20.5	(11.1-29.9)	3 years
5. Refugee camp	15	601	14.0	(3.6-24.3)	3 years
TURKANA DISTRICT	**100**	**3,962**	**38.0**	**(32.2-43.9)**	**5 years**

Prevalence of TF in Narok

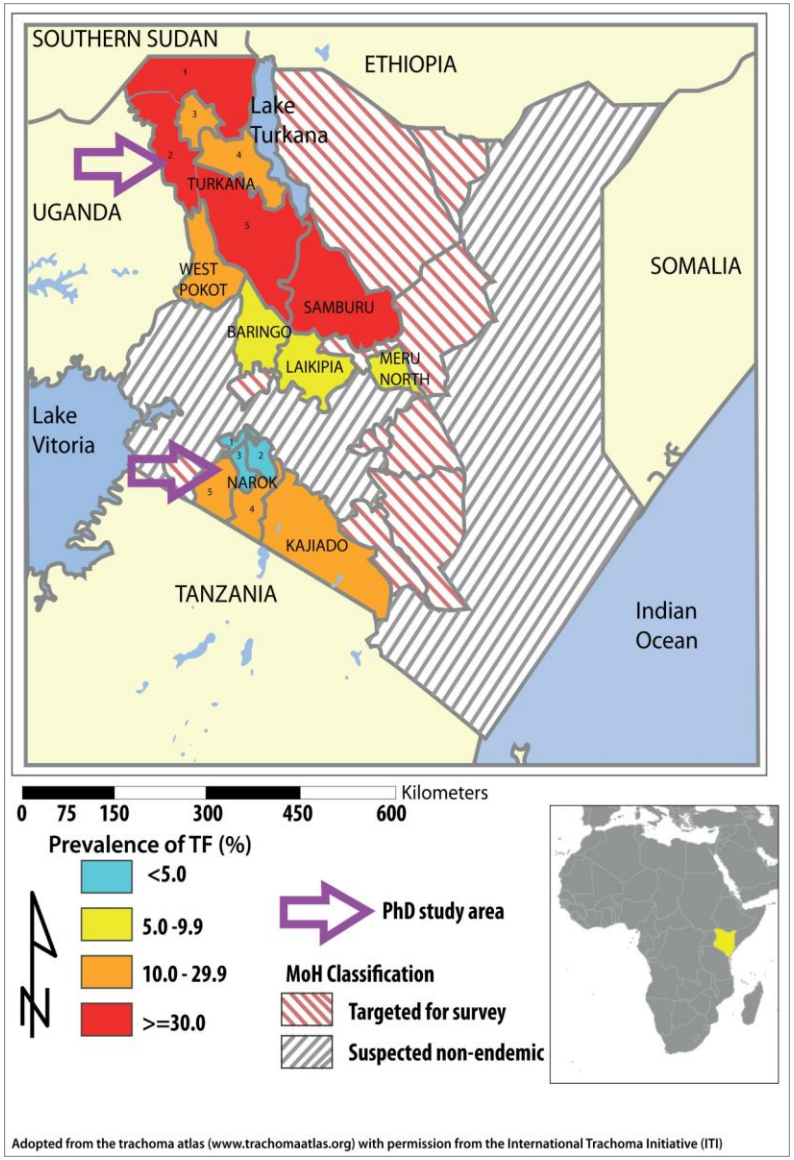
Survey segments (5 per district)	Number of clusters surveyed	Children age 1-9 years examined	% with TF	95% CI	Need for mass treatment
1. South Western	20	799	26.7	(18.7-34.6)	3 years
2. South Eastern	20	800	21.6	(15.4-27.8)	3 years
3. Central	20	800	4.3	(2.2-6.3)	Not needed
4. North Eastern	20	800	2.1	(0.0-4.5)	Not needed
5. North Western	20	799	0.4	(0.0-0.9)	Not needed
NAROK DISTRICT	**100**	**3,998**	**11.0**	**(8.0-14.0)**	**3 years**

Correlation between baseline prevalence and MDA coverage in Narok



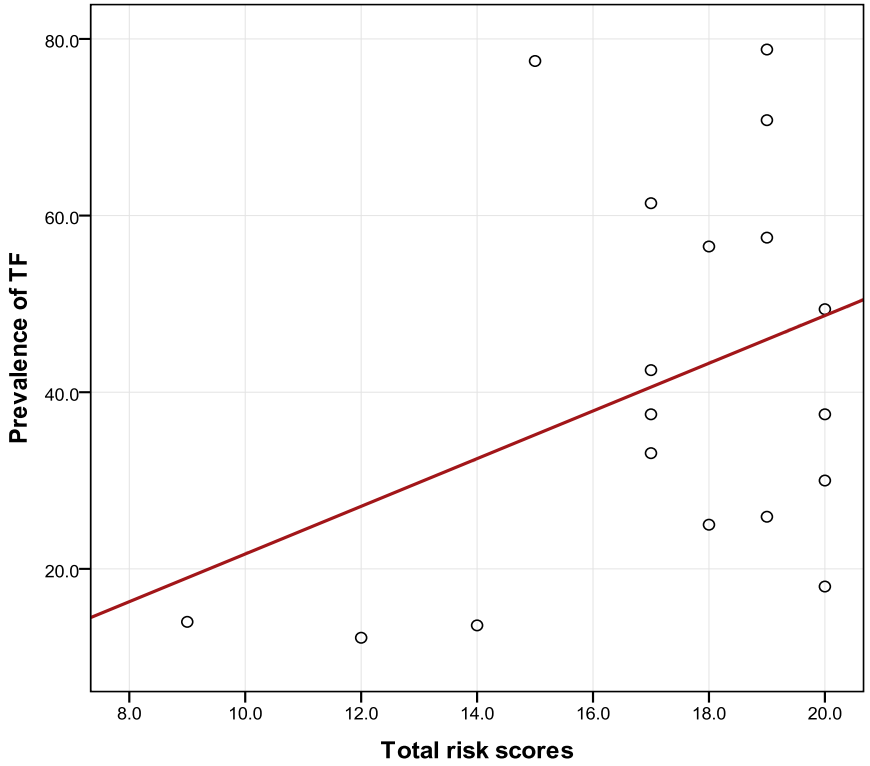
(r= 0.81, p= 0.02)

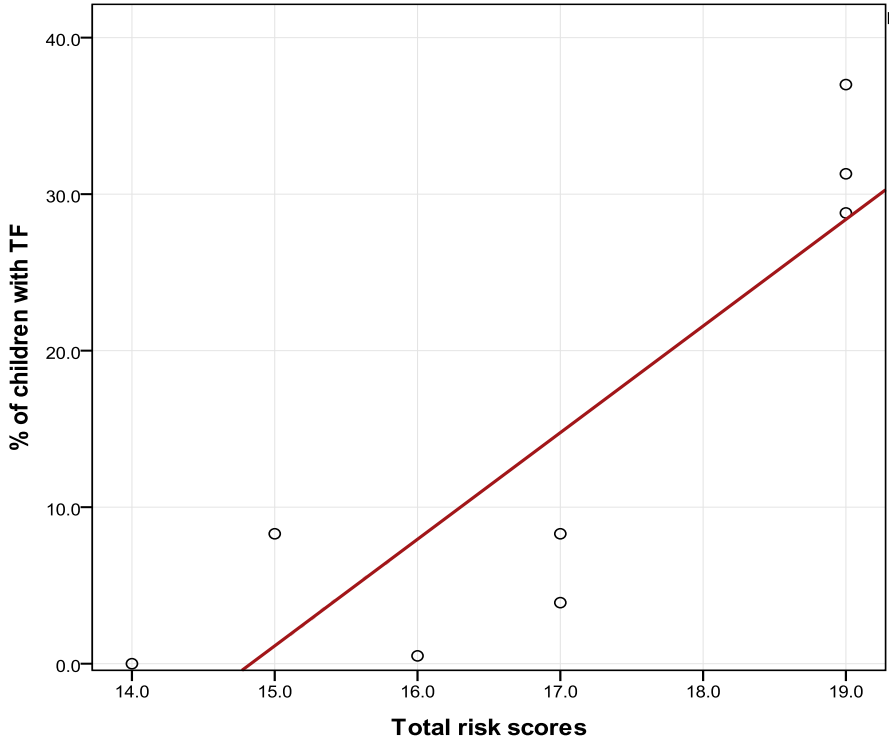
Kenya TF map after the study (2010)



Correlation: TF and total risk scores

Turkana = 18 divisions, Narok = 8 divisions





Turkana (r= 0.78, p= 0.12)

Narok (r= 0.87, p= <0.01)

TT40 survey method

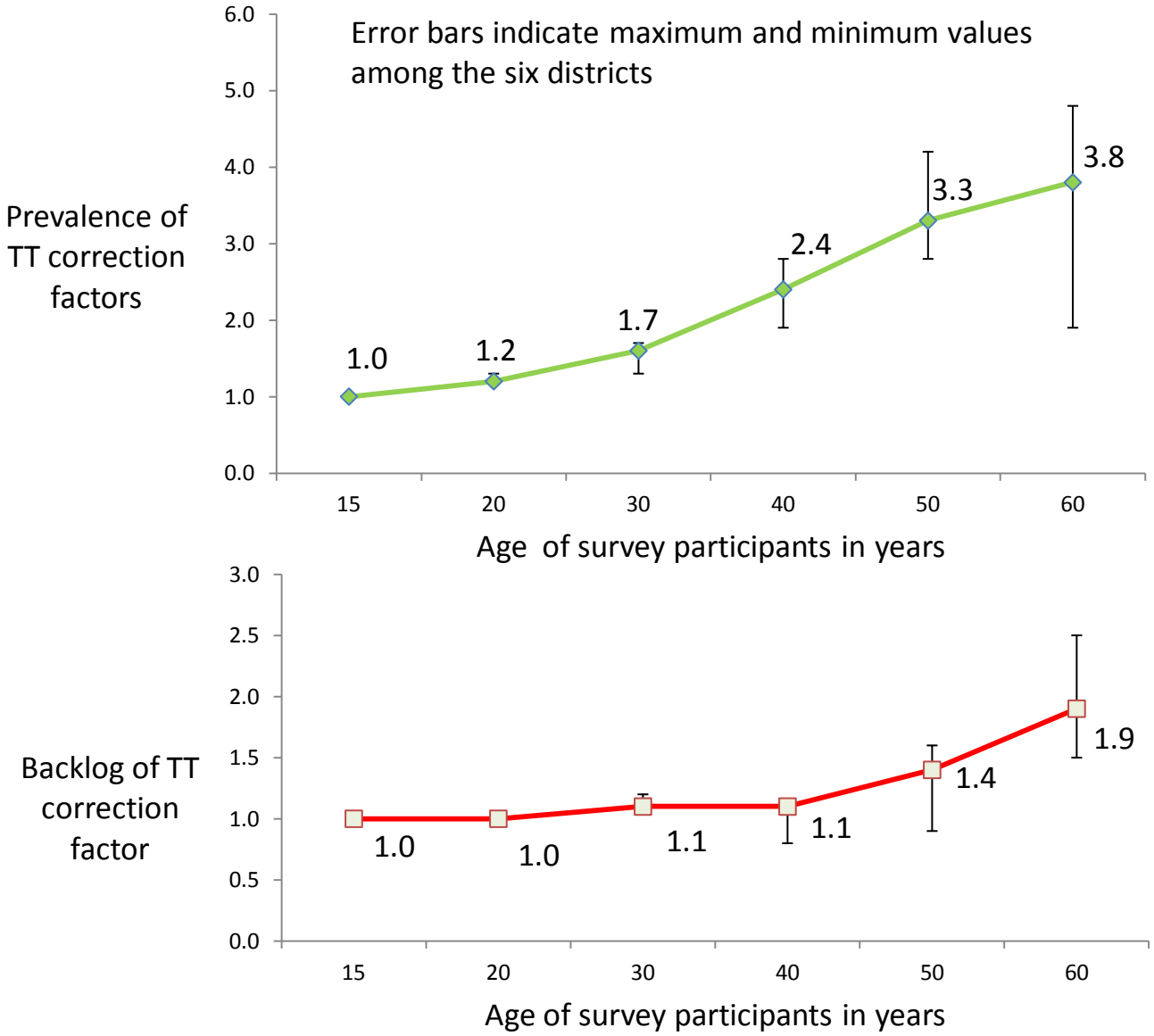
- Data from previous TT surveys were re-analysed to calculate the optimum lower age limit and correction factors.
- The TT40 survey method developed , where individuals aged ≥40 years were recruited for TT surveys.
- TT4O survey has a smaller sample size than a “TT15”. Same precision as for a TSS.
- Correction factor of is 1.1 required to extrapolate the total backlog of TT.

Re-analysis of data sets for previous TT surveys

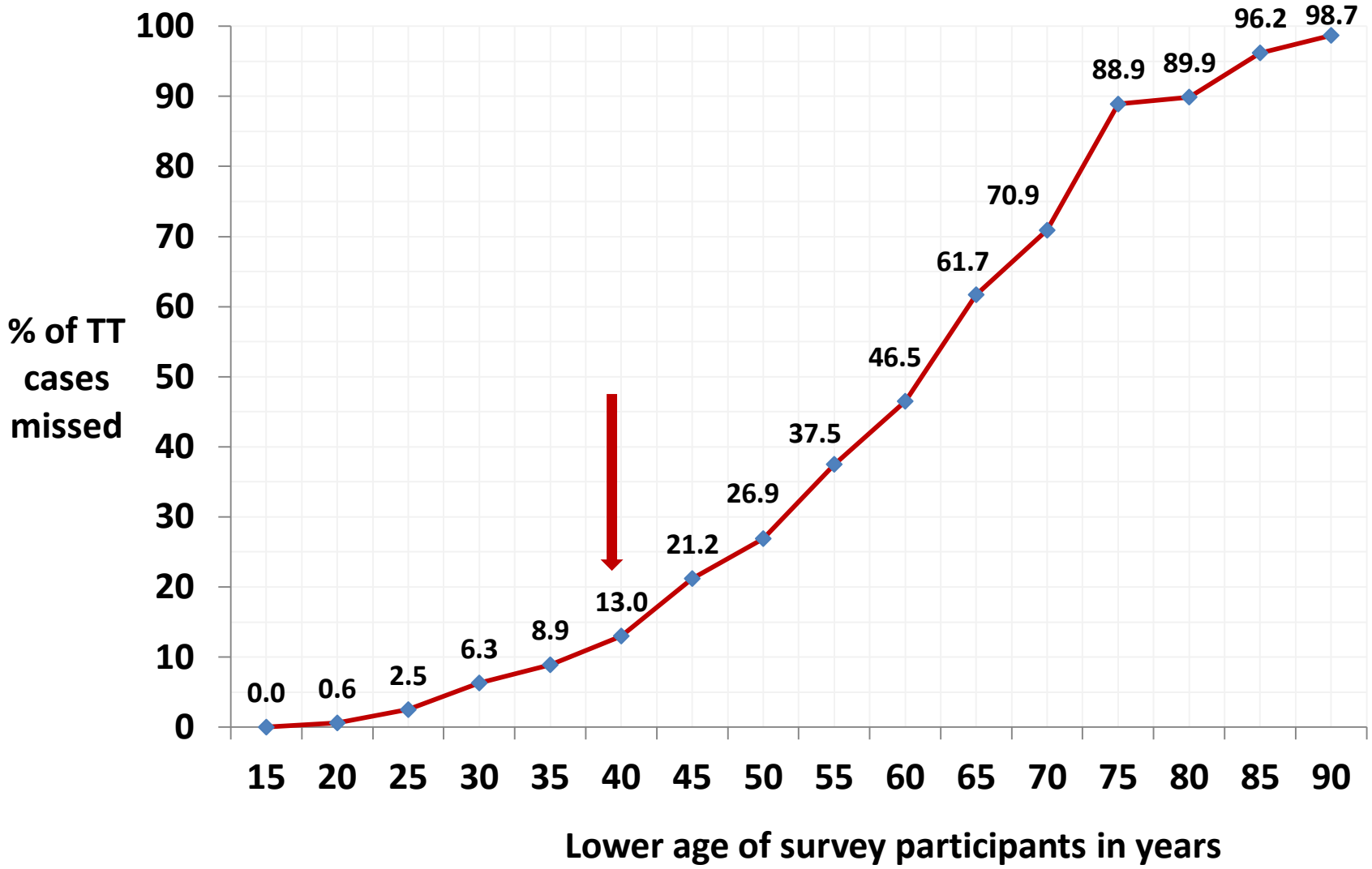
Age of subjects (years)	Total examined (6 districts)	TT cases (% of total)	Backlog correction factor*	Prevalence of TT (%)	Prevalence correction factor^
≥60	1,111	169 (53.5)	1.9	15.2	3.8
≥50	1,775	231 (73.1)	1.4	13.0	3.3
≥40	**2,925**	**275 (87.0)**	**1.1**	**9.4**	**2.4**
≥30	4,450	296 (93.7)	1.1	6.7	1.7
≥20	6,795	314 (99.4)	1.0	4.6	1.2
≥15#	**7,944**	**316 (100)**	**1.0**	**4.0**	**1.0**

*Number of TT cases for age ≥15 years was divided by that for a specified age limit
^Prevalence for a specified age limit was divided by that for age ≥15 years
#Age cut-off of ≥15 years is the standard for TT survey

Correction factors for the six districts



% of TT cases likely to be missed



“TT40” survey results

Variable	Turkana district	Narok district
Population ≥40 years	69,365	71,860
Prevalence of TT (≥40 years)	7.8%	2.9%
Backlog in people ≥40 years	**5,410**	**2,084**
Backlog correction factor	1.1	1.1
Backlog in total population	**5,952**	**2,292**

Prevalence of TT in women was higher than in men

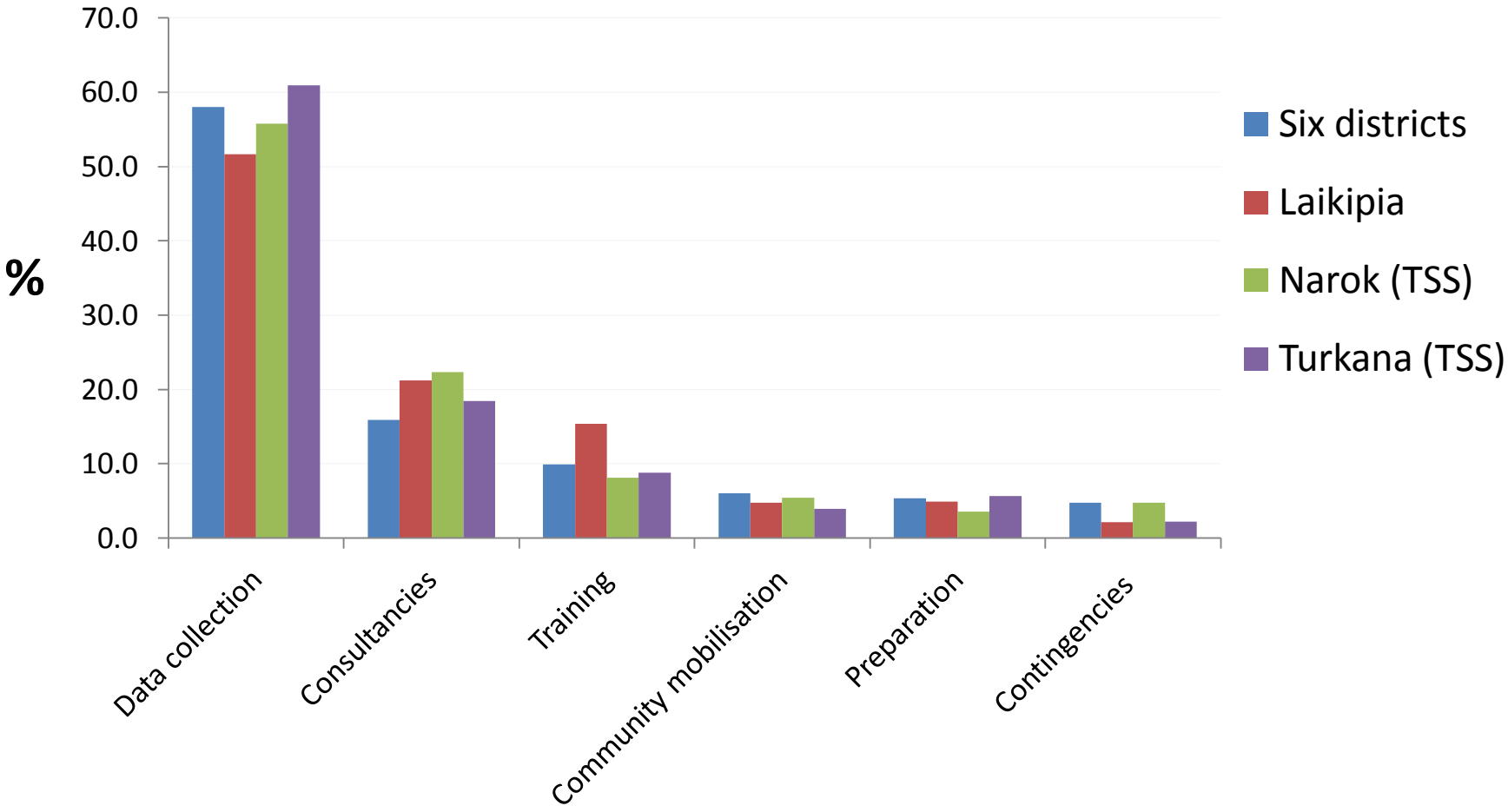
Limitations

- The population age structure and the natural history of TT may vary in different communities.
- In hyper-endemic communities TT may occur in young people.
- Conversely, in communities where active trachoma has been eliminated TT is usually found in old people.

Incremental costs of surveys

Variables	Surveys			
	Six districts (2004)	Laikipia (2007)	Turkana (2010)	Narok (2010)
Money spent (US$)	94,361	23,587	40,610	31,917
Number of administrative districts	6	1	1	1
Cost per administrative district ($)	**15,726**	**23,587**	**40,610**	**31,917**
Number of survey segments	1	1	5	5
Cost per segment ($)	**15,727**	**23,587**	**8,122**	**6,383**
Number of clusters per segment/district	20	20	20	20
Cost per cluster ($)	**786**	**1,179**	**406**	**319**

Survey cost items(% of the total cost)

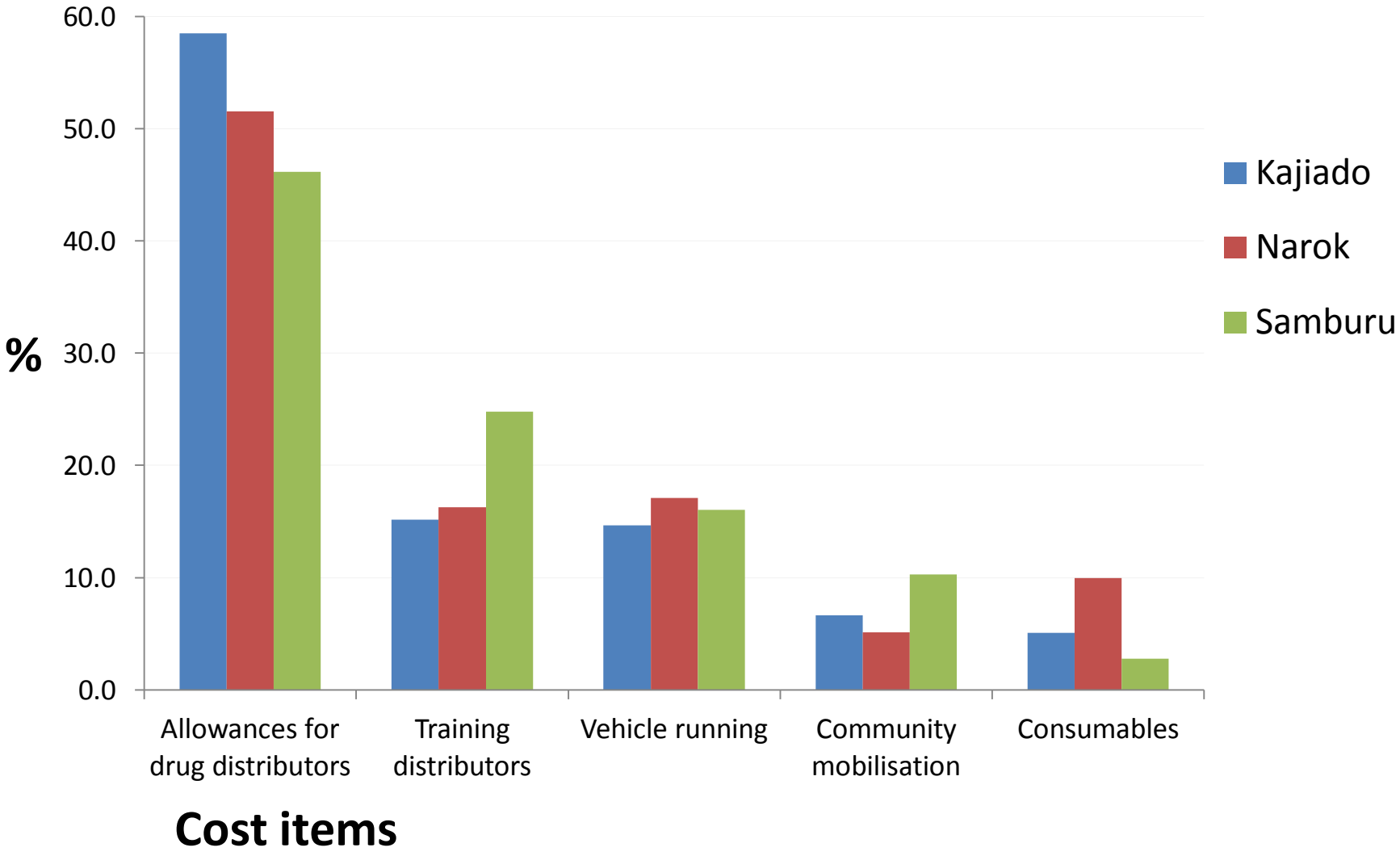


Cost items for a trachoma survey

Incremental cost of MDA (2009)

Variable	**Districts**		
	Kajiado	Narok	Samburu
Annual project costs ($)	103,393	96,705	61,386
Number of people treated	508,254	376,989	145,375
Cost per person treated ($)	**0.20**	**0.26**	**0.42**
Cost per person treated x 3 year ($)	**0.60**	**0.78**	**1.26**

MDA cost items (% of the total cost)



Cost comparison for the initial 3 years (US$)

Item	Turkana	Narok
Standard survey and MDA	701,541	316,240
"TSS" and MDA	713,264	128,813
Money saved	**-11,705 (1.7%)**	**168,275 (53.2%)**

- Impact assessment surveys needed to justify stoppage of MDA after 3 years

Conclusions

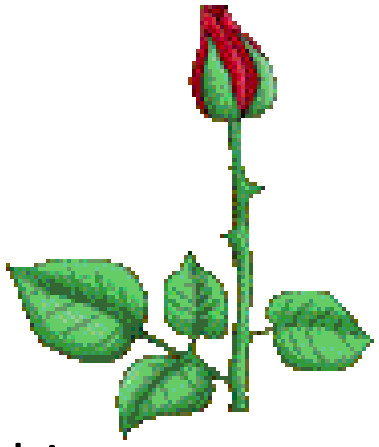
- The “TSS” is an effective trachoma survey method to indentify the areas that need MDA.
- In hyper-endemic districts, either the TSS or standard survey method can be used to justify short term (3 years) MDA.
- In meso-endemic district a TSS reduces the cost of MDA.
- A “TT40” survey, with correction factors, is an efficient method to determine the backlog of people with TT.

Contribution to policy

- The new methods were adopted by the Government of Kenya.
- In 2010, the WHO revised the population unit for trachoma surveys as advocated in this study.
- Study findings used to update the world trachoma atlas
- Roll-out supported by the Fred Hollows Foundation and Sightsavers. Baseline surveys completed in 2012.

TSS roll-out (segments are numbered)	Children 1-9 years		Need for MDA
	Number	% with TF	
Turkana district	**3,962**	**38.0**	**5 years**
1. Western Turkana	914	**67.6**	5 years
2. Northern Turkana	829	46.4	5 years
3. Southern Turkana	823	31.2	5 years
4. Central Turkana	795	20.5	3 years
5. Refugee camp	601	14.0	3 years
E/Pokot district	**1,200**	**34.3**	**5 years**
1. East Pokot	1,200	34.3	5 years
Narok district	**3,998**	**11.0**	**3 years**
1. South Western	799	26.7	3 years
2. South Eastern	800	21.6	3 years
3. Central	800	4.3	Not needed
4. North Eastern	800	2.1	Not needed
5. North Western	799	**0.4**	Not needed
Transmara district	**1,600**	**10.6**	**3 years**
1. South Western	800	18.3	3 years
2.North Eastern	800	2.9	Not needed
Upper Eastern Kenya region	**2,400**	**9.2**	**Not needed**
1. Marsabit	800	14.1	3 years
2. Isiolo	800	8.9	Not needed
3. Moyale	800	4.6	Not needed

AKNOWLEDGEMENT



- Government of Kenya and local communities
- University of Melbourne/CERA/University of Nairobi
- NGO partners: EU, OEU, AMREF, Sightsavers, FHF, Spanish Volunteer Eye Doctors, UNHCR, IRC…..
- Survey teams
- Profs. Jill, Richard and Mwanthi