

THE PREVALENCE AND PATTERN OF TRACHOMA IN MERU NORTH DISTRICT-
KENYA

UNIVERSITY OF NAIROBI
MEDICAL LIBRARY

BY

DR. GIDEON N.K. MAKAU.

2005

University of NAIROBI Library



0391744 0

A DISSERTATION IN PART FULFILLMENT FOR THE DEGREE OF MASTER OF
MEDICINE (OPHTHALMOLOGY) AT THE UNIVERSITY OF NAIROBI.

Declaration

This is my own original work and has not been presented for a degree in any other university.

Signed:



Date

19/03/2006.

Dr. Gideon N. K. Makau

Mb. Chb. University Of Nairobi.

Approval

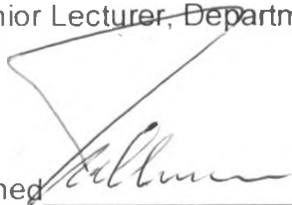
This dissertation has been submitted to the ethical committee with our approval as university supervisors.

Signed  Date 21/03/06

Dr. Dunera Ilako

M.B.Chb.(Nairobi), M.Med., (Nairobi),

Senior Lecturer, Department Of Ophthalmology, University Of Nairobi.

Signed  Date 21/03/06

Dr. K. H. Martin Kollmann

M.B.Chb(Goettingen), M.D., (Goettingen), d.trop.med.¶sitol., (Hamburg), M.
.med.opth., (Munich),

Senior Lecturer, Department Of Ophthalmology, University Of Nairobi

Signed  Date 12/04/2006

Dr. Jefitha Karimurio

M.B.Chb. (Nairobi), M.Med., (Nairobi), M. Sc., (London),

Lecturer, Department Of Ophthalmology, University Of Nairobi.

Dedication

This dissertation is affectionately dedicated to my dear wife Minoo, my son Teddy and my ever curious daughter Makena who were a source of encouragement throughout the masters' course.

Contents	Page
1. Title-----	1
2. Declaration-----	3
3. Approval-----	4
4. Dedication-----	5
5. Contents-----	6
6. List of abbreviations-----	8
7. Acknowledgement -----	10
8. Summary-----	11
9. Introduction-----	14
10. Brief on study area -----	16
11. Review of literature-----	18
12. Rationale-----	26
13. Study objectives-----	27
14. Methodology and materials-----	28
15. Results-demographic data-----	38
16. Results-prevalence data-----	43
17. Risk Factors-----	69
18. Safe in Meru north district-----	85

19. Discussion-----	90
20. Study limitations-----	98
21. Recommendations-----	101
22. References-----	105
23. Appendices-----	109

List of Abbreviations

AMREF	African Medical and Research Foundation
CBM	Christoffel Blinden Mission
CO	Corneal Opacity
DHMT	District Health management Team
GET 2020	Global Eradication of Trachoma by year 2002
GOK	Government of Kenya
IEF	International Eye Foundation
KSB	Kenya Society for the Blind
Kms	Kilometers
MOH	Ministry of Health
MTC	Medical training college
NGO	Non Governmental Organisation
SAFE	Surgery, Antibiotics, Facial Cleanliness and Environmental sanitation
TF	Trachomatous Follicles
TI	Intense Trachomatous Inflammation
TS	Trachomatous Conjunctival Scarring
TT	Trachomatous Trichiasis
SSI	Sight Savers International

SPARK	sponsorship for the Poor in Adaptive Rehabilitative Kingship
TEO	Tetracycline Eye Ointment
UON	University of Nairobi
WHO	World Health Organisation
VA	Visual Acuity

Acknowledgements

I would like to thank all those who were involved in one way or another in this study. The following people and groups, however, deserve special mention. Dr. Ilako, Karimurio, and Kollmann for their patience and continued support through out the program.

The local people of Meru North District who allowed me in to their homes and opened their lives to me. The local leaders both civic and administrative, who made it possible to have a smooth function during my brief visits in their areas.

All collaborators who include UON-department of ophthalmology, AMREF, ITI, KSB, SSI, MTC, GOK and Local healthcare providers without whom this study would not have been possible. Of special note are those people who accompanied me to the field for data collection. Mr. Kathuri, the District Public Health Officer (DPHO) contribution was very vital. His understanding of the whole district and his target men on the ground helped me a great deal.

Mr. Njeru, the Chief Clinical Officer Meru Central, had a great experience in trachoma and his contribution was an asset. The understanding and the support of my family during this crucial period proved vital and very necessary.

Summary

To determine the prevalence and pattern of Trachoma in Meru north district, a community based study was conducted. Meru North, which was formally known as Nyambene, is one of the thirteen districts that make up Eastern Province. It borders Meru Central District to the west and Tharaka District to the south. To the northeast is Isiolo District while Tana River and Mwingi Districts border the district to the south-eastern side.

A community based cross sectional observation study was conducted in two phases; from 5th to 15th July 2004 and 13th to 22nd June 2005. Twenty sub locations were selected using systematic sampling method. The 1999 population and household census volume 1 was used as the sampling frame. The predetermined sample was distributed proportionately among the selected clusters.

WHO grades clinical presentation of trachoma as follows; Trachomatous inflammation with follicles (TF), Intense Trachomatous inflammation (TI), Trachomatous Conjunctival scarring (TS), Trachomatous Trichiasis (TT) and Corneal Opacity due to Trachoma (CO).

The target population was children aged 1-9 years and adults equal or above 15 years. For TF we needed to examine at least 780 children and for TT we needed at least 990 adults in the district. The sample coverage for both age groups was above 100% thus

the 95% confidence interval was achieved. The overall active trachoma prevalence in children aged 1-9 years in Meru North District was 8.1 % (70/880) with six sub locations having prevalence of 5% and above.

The grazing Agro-economic zone which occupies the drier part of the district had the highest prevalence of TF (14.2%) in the children aged 1-9 years. Boys had slightly more TF (4.5%) than girls (4.0%). The prevalence of TI was lower than that of TF in the District (5%), and all the sub locations. The prevalence of TT in Meru North District was 1 % (11/1131). Majority of these cases were from the drier grazing zone. Only females were afflicted by TT. The prevalence of CO in adults in the district was 0.4 % (4/1131) indicating the burden of Trachoma caused blindness in the community. Only females were afflicted by CO. There was no CO in children aged 1-9 years.

Female adults were almost three times more afflicted by TS (prevalence 6.3%) than males (prevalence 2.2%). The minimum prevalence criteria to determine whether Trachoma is a public health problem is District TF prevalence $\geq 10\%$ and TT prevalence $\geq 1\%$ and Sub location (clusters) TF prevalence $\geq 5\%$ and TT prevalence $\geq 1\%$.

The presented data imply that Active trachoma is a public health problem in some Sub locations and therefore need for intervention as per the WHO recommendations. The

prevalence of TT in the District was 1 % (11/1131). This is the threshold set by the WHO for TT as a public health problem and therefore mass surgical intervention is necessary.

There was a close association between dirty faces and Trachoma since the Agro-economic zone with the highest number of children with dirty faces (48%) had the highest prevalence of TF (14%). It was noted that 97% of children had fewer or no face seeking flies at all. Water accessibility is not a problem. Ninety-eight percent (98%) of the sampled households got their water from storage water tanks or piped water. Toilet use was over 90%.

Essentially there were no exposed human faeces in the study area. Only 11 % (45/424) of the households dispose their solid waste more than 20 meters from their houses. Animals are mainly kept less than 20 meters from the house 283/320 (88%).

UNIVERSITY OF NAIROBI
MEDICAL LIBRARY

1. Introduction

Trachoma is an ancient scourge, described in the Egyptian Ebers papyrus in 1900 BC. The disease was endemic in Europe, North America and northern Asia but it regressed and disappeared with the improvement of living standards following industrialization and economic development¹.

The disease is one of the most common causes of preventable blindness in parts of the developing world where conditions both environmental and geographical limit care and access.²

The disease is found mainly in remote rural areas of most African countries, in some Eastern Mediterranean countries, and in parts of central and South America. Trachoma is also endemic in several Asian countries, but there is lack of up to date information from some highly populated countries, including China and India³

About 150 million people in 48 countries of the world are afflicted by Trachoma, 6 million of these being blind or at risk of visually disabling complications.⁴

The severity of Trachoma and thus the extent of its blinding potential vary from region to region and community to community. In Kenya, Trachoma is reported to be endemic in areas of the Rift Valley and Eastern provinces. A blindness survey conducted by the International Eye Foundation (IEF) (1981) showed that blindness prevalence in Kenya

was 0.7%. The main causes being cataracts (43%), Trachoma (16%) and glaucoma (9%), making trachoma the second leading cause of preventable blindness. In this survey the prevalence of trichomatous follicles[TF] and trichomatous inflammation[TI] in Meru north was 62% and 28% respectively.³⁴ A current national Trachoma survey done in 2004 shows that the prevalence of trichomatous follicles[TF] has reduced to a mere 8.1%.³⁵

There have been no specific or vertical programs in trachoma control at the national level. The Kenya Ophthalmic Program incorporates the control of trachoma within its Primary Eye Care activities but the success or failure of such a program has been difficult to evaluate.⁴ This is partly due lack of data on the magnitude of trachoma infection in endemic areas and because the specific objectives for trachoma control are still not sufficiently developed. However, in 1997 the National Trachoma Control project was commenced in Kenya with the assistance from Hellen Keller International/ Edna McConnell Clark Foundation through AMREF and KSB with a target of controlling trachoma by the year 2005⁴.

A new global initiative for elimination of blinding trachoma by the year 2020 was launched in 1997. This is based on the **SAFE** strategy which combines **Surgery, Antibiotics, Facial cleanliness and Environmental improvement**^{1,4}.

2. Brief on study area

Meru North, which was formally known as Nyambene, is one of the thirteen districts that make up Eastern Province. It borders Meru Central District to the west and Tharaka District to the south. To the northeast is Isiolo District while Tana River and Mwingi Districts border the district to the south-eastern side.

The district has fifteen administrative divisions, which are further sub-divided into fifty-six locations and one hundred and thirty nine sub-locations (including the Meru National Park)³⁶.

The district has a total area of 3,942.3 km² and a population of 604,050 as per the 1999 National Census.³⁷ A national annual growth rate of 2.76% puts the population now at 693,435 people.³⁶ The female-male ratio for the population is 1.00:0.94 in favor of females.

The general topography of the district is characterized by volcanic hills, ranges and plateaus. The slopes are very steep and rocky especially to the eastern side. The plateau runs south to north from Mt. Kenya to Nyambeni Hills. There are many permanent rivers which drain into the Uaso Nyiro river to the north and into River Tana to the southeast.

The northern and eastern parts of the district do not have permanent surface water resources and shallow wells and a few existing boreholes run by self-help groups and

local churches are the main water source. Livestock keeping is the predominant activity although drought resistant crops such as millet and sorghum are grown in these areas. People within Maua municipality and other townships are served with piped water.

The rainfall pattern is bi-modal with the long rains coming from March to May and the short rains, October to December. Rainfall ranges from 1,250-2,514mm in the windward side and 380-1000mm in the leeward side annually.

The upper areas have friable clay soils, which are deep in most areas and are suitable for Miraa, coffee and tea growing while in lower areas, soils are sandy and generally poor quality, suitable only for drought resistant crops and grazing. The district can largely be divided into three Agro-Economic zones namely; Miraa growing, coffee/tea growing and Grazing zones.³⁶ An Agro-economic zone is an area which shares a common agricultural interest. The district is served by 41 health facilities. These include: 3 hospitals(1 Government,2 Mission),1 Sub-district hospital(Government), 5 Health centers(Government),21 Dispensaries(14 Government,5 Mission,2 Private),6 Private clinics and 5 Private Nursing homes³⁶.

3. Review Of Literature

3.1 Background

The name trachoma (rough) is derived from a Greek word for “rough” and “swelling”, which describe the tarsal conjunctiva .The specific aetiological agent is *Chlamydia trachomatis* serotypes A, B and C⁵. Serotypes D-K are sexually transmitted and can produce keratoconjunctivitis that is often indistinguishable from the endemic trachoma. This type of eye disease is however common in industrialized communities and is a common cause of ophthalmia neonatorum⁴.Chlamydia trachomatis is a surrogate intracellular organism attacking the epithelial cells of the conjunctiva and other relevant sites.

3.2 Pathophysiology

The evolution of the disease typically occurs in two stages, which are separated by several years or often decades;

- *Inflammatory [active] trachoma*, diagnosed most often in children; in many settings, girls tend to have frequent and more severe active disease than boys.

- *Cicatricial or scarring trachoma*, generally found in adults and leading to the development of trichiasis. This is often found 3-4 times more commonly in women than in men^{3,6}.

In some cases, the trachomatous process may resolve with little or no visible trace; in others repeated infections possibly associated with hypersensitive reaction, may retard spontaneous healing.^{6,7} The primary infection is self-limiting and does not cause much public health concern.

Recurrent infections with *Chlamydia trachomatis* and supra infections by other bacteria result in cell mediated and humoral response causing severe intense inflammatory conjunctivitis.

The re-infection over many years with inflammatory response and secondary bacterial infection result in scarring of the conjunctiva and, decrease in tear function. In hyper-endemic areas this starts appearing among older children and young adults¹¹.

The scarring when severe causes lid margin distortion (entropion) leading to trichiasis.

Trichiasis causes intolerable discomfort and a constant abrasion of the cornea.

Ulceration and secondary bacterial infections results in corneal opacity. The critical stromal scarring and its blinding effect increase with advance in age to be seen commonly in older adults.⁵

3.3 *Epidemiology*

3.3.1 Geographical Distribution

At present Trachoma is a major public health problem in drier geographical regions of the world. Within a community there may be striking differences, between families, in the prevalence and severity of the disease. These variations appear to be intimately related to environmental and behavioral factors.^{5, 12, 13, 14, 15, 16}

There is a close relation between a high prevalence of Trachoma and the poor socioeconomic status of a family. Within the same community, trachoma has been found to be prevalent in families where the head of the household is poorly educated.^{17,}

18, 19

3.3.2 Risk factors and Transmission of Trachoma

The established risk factors can be summarized at a glance as:

Six d's: dry, dusty, dirty, dung, discharge, density (over crowding) and five

f's: flies, faeces, faces, fingers, formities.

Reservoir

In hyper endemic areas where active disease is prevalent, children, who constitute a larger proportion of the population are the chief reservoirs in the community. In these

communities, children are infected by the age of 1 to 2 years. They are also more prone to infections because of their nasal discharge and dirty faces.^{6, 20, 21, 22}

No animal reservoir has yet been identified, and non-ocular sites of infection do not appear important in Trachoma epidemiology.

a) *Overcrowding*

Public Health Service studies in the United States of America showed that Trachoma was associated with overcrowded living conditions. People who lived in little cabin homes had more severe infections than their immediate neighbors who were not crowded. This was due to sharing of beds, beddings, towel and wash-basin. This is why trachoma was referred to as a "family disease" not because it was hereditary, but rather because it was more likely to be spread within a family than to contacts outside the home.^{18, 23 24, 25, 26}

b) *Routes of Transmission*

The presence of young children in the homestead and overcrowding are important risk factors.^{5, 24, 26}

Transmission of the disease is by the following methods;

- Eye-seeking flies.

- Direct or indirect contact with infected materials e.g. beddings, towels, clothing e.t.c
- Direct spread from one eye to the other by fingers.

3.3.3 Illiteracy

Lack of education, including health education, is associated with an increased risk of trachoma in communities. This is especially recognized in relation to inadequate education amongst mothers. Illiterate economically poor communities are at greater risk of trachoma as their lifestyle is characterized by a deprived social status.^{4, 31}

3.3.4 Water and personal hygiene:

The time taken to collect water from the primary water source is significant in affecting the prevalence rate of Trachoma within a community. That is, the longer it takes to walk and transport water to the family home, the greater the possibility of trachoma within that home.^{4, 27}

It is believed that increase in water availability results in more frequent use for hygiene purposes.²⁷ Increased frequencies of laundry and face washing have been proposed as some of the mechanism.^{28,29,30}

Provision of a good water supply may therefore be an important intervention in reducing the prevalence of trachoma in a community. Improvement of personal hygiene within the family should be encouraged for it will considerably influence the transmission of infection by reducing acute and chronic inflammation, which over 10-20 years can cause scarring of the eyelids and cornea, with consequent blindness.^{28, 29}

3.3.5 Garbage disposal, toilets, livestock, and flies

Garbage, rotten vegetables and other decaying wastes attracts flies because of some odours that emanate from certain foods. The flies use these areas as breeding sites. In warm climates fly larvae may leave the waste containers after only 3-4 days from the time the eggs are laid.^{29, 30} Flies have been associated with trachoma for more than 400 years.³²

It is often stated in literature that flies are important vectors of trachoma, but the evidence for and against this view has been anecdotal. Forsey and Darougar showed in 1981 that it was possible to re-isolate *Chlamydia trachomatis* from flies 30 minutes after feeding them on heavily infected yolk sac preparations, thus demonstrating that transmission by this route is feasible. A pilot study done in Gambia in 1999 showed that reduction of the population of eye seeking flies by 90% resulted in a fall of the prevalence rate of active trachoma by 61% after 3 months. More than 90% of flies identified on the faces of children were *musca sorbens*, the bazaar or filth fly. *Musca*

sorbens breeds in exposed human faeces, but not in latrines, suggesting that encouraging the use of latrines could prove a sustainable method of controlling trachoma transmission by flies.^{1, 30, and 33}

It has been suggested that the association between livestock and Trachoma is on the basis that livestock encourage flies and flies transmit trachoma³³. Livestock dung poorly tended or spilt milk and urine act as an attraction to flies.³⁰

3.3.6 Other significant factors

Smoke from a cooking fire, dust, traditional treatments and other eye infections cause the eye to be red and sore so the person rubs and further irritates and infects the eye. An arid or semi-arid climate is windy and produces dust at the driest times of the year. These conditions further irritate the eyes, leaving them more vulnerable to infection from trachoma.

4. Rationale

- A district survey in which the University of Nairobi was a key player and in which the ophthalmology department was involved has just been concluded. The prevalence of Trichomatous Follicles [TF] was 8.1% and that of Trichomatous Trichiasis[TT] 1.0%.³⁵ This is an enamors drop from the figures the International Eye Foundation found in their survey in 1981.³⁴ The principle researcher analyzed the survey data and collected additional information necessary for the implementation of the SAFE strategy .
- The analysis will provide baseline data on trends and pattern of Trachoma by agro economic zones of Meru North District. Such data is necessary in establishing Trachoma as a public health concern in these zones and for prioritization for targeted community intervention.
- The survey will provide data necessary for future reference or evaluation of trachoma in the study area.
- The data will be important in implementation of SAFE strategy and thus eradication of trachoma.

3. Study Objectives

1. To determine the pattern and prevalence of trachoma in Meru North district, Kenya.
2. To determine risk factors and their frequency.
3. To analyze the available resources for SAFE.

6: Methodology and materials

6.1 Study Design

This was a community-based cross-sectional observation study.

6.2 Sampling Method

The WHO standard protocol for Trachoma survey was followed. Twenty sub locations were selected using systematic sampling method. The 1999 population and household census volume 1 was used as the sampling frame. The predetermined sample was distributed proportionately among the selected clusters. In every cluster a minimum of three villages was randomly selected. All the villages were selected if a cluster had ≤ 3 villages. The cluster sample was proportionately distributed among the selected villages. The number of households to be selected in a village was estimated by dividing the number of adults by two. It was assumed that there were on average two (2) adults per household. The households were then randomly selected and occupants who fulfilled the survey criteria enumerated and examined.

Random selection method was applied in case there was need to pick an extra village or households in order to achieve the minimum sample size. The information on distribution of the risk factors was obtained from the public health officers, household heads/adults, village elders and both by interviews and observations made by the study team.

6.3 Study Area

The study was conducted in Meru North district, Eastern Province, Kenya (map – appendix).

6.4 Study Period:

The study was done in two phases:

- Phase one from 5 to 15 July 2004.
- Phase two from 13 to 22 June 2005

6.5 Study Population

Children aged 1-9 years and adults equal or above 15 years in the sampled sub locations³⁸.

6.6 Sample Size³⁸.

$$\text{Formulae } n = Z^2_{1-\alpha} P (1-P)/d^2$$

P=anticipated population prevalence

$$Z^2_{1-\alpha} = 1.96$$

d=absolute precision (10-20%) =5 percent points (on either side)

A design effect of 4 for TF in children aged 1-9 yrs and 2 for TT in adults' ≥ 15 yrs were adopted as required by ITI.

Sampling details

- Children 1-9 yrs: Prevalence of TF=15%, Precision \pm 5%, Design effect=4
- Adults ≥ 15 yrs: Prevalence of TT=3%, Precision \pm 1.5%, Design effect=2
- Confidence level for all samples above=95%

Accommodated 10% non response:

1. For TF we needed to examine 780 children in the district
2. For TT we needed to examine 990 adults in the district

6.7 *Scoring/ Staging Systems*

Diagnosis was made and scored/ staged as per the simplified WHO classification and recorded on a pre-designed household trachoma score sheet. All the five (5) stages of

trachoma were scored and recorded. Active trachoma by WHO recommendation is represented by TF only.

6.8 *Case Definition*

Individual with any stage of trachoma.

6.9 *Inclusion Criteria*

All persons living in the sampled household, and who consented, were included.

6.10 *Exclusion Criteria*

Any person who declined consent was excluded.

6.11 *Materials Used*

- A formulated questionnaire
- Pens and clipboards
- Torches/ spotlights with batteries and spare bulbs
- Gloves
- Magnifying lens X2.5 magnification.
- Tetracycline eye ointment (1%)
- Flourescein stain drops
- 75% alcohol soaked cotton swabs
- Topical and local anaesthetic drops

- A manual camera-kodak
- Snellen V/A Chart
- TT registers
- Trachoma grading cards
- PC-unit with printer, accessories consumables, and stationery
- Statistical software-Microsoft Office Excel 2000, SPSS 10.1 and Stat view version 4.57 all for windows

6.12 Collaborations

Support from other eye care providers was solicited. The collaborators included:

- AMREF
- ITI
- KSB
- SPARK
- SSI
- Pfizer Pharmaceutical company
- Local healthcare providers (MOH health units and CBHC)
- Guides/ enumerators

- Local administrators
- Village elders

6.13 *Study Resources*

AMREF and the UON provided grants.

6.14 *Training Examiners and Pretest of Data Collections Tools*

The principal researcher was a member of a national trachoma survey team. A pre-survey workshop was convened to prepare the survey team for data collection.

The workshop objectives were;

- To train the survey team on the Ultimate Intervention Goals for Trachoma control and the Standardized Trachoma Survey methods.
- To standardize survey team members on the simplified WHO Trachoma Grading by conducting reliability tests using the standard WHO slides and in the field during pretest.
- To pretest data collection tools
- To gain experience on logistical issues

The examiners were drawn from MOH, AMREF, UON and KMTC. These were health workers with wide experience in trachoma diagnosis and control, and environmental

assessment. Lectures on trachoma clinical presentation; simplified WHO grading, control and standardized survey protocol were given by experts from ITI and UON.

The ability of the participants to grade trachoma was then tested using a set of 30 standard WHO grading slides ⁽⁵⁾. The test was repeated several times during the workshop, until all the participants were able to score over 90% on the reliability test. They were then tested practically in the field during the pretest of data collection tools. All the participants were able to follow the standard survey protocol and recognize all the grades of trachoma.

A statistician from AMREF assisted in the development of survey data collection tools, selection of survey clusters and gave practical instruction in the field. Bisil, a sub-location (cluster) in Kajjado district, was selected for pretest. The pretest results revealed high prevalence of trachoma, low literacy levels, poor access to health facilities, high fly density on children's faces and poor environmental sanitation.

6.14 *Ethical Considerations*

❖ *Community consent:*

Community verbal consent to conduct the study was obtained from local administrative and community elders.

❖ *Permission to examine:*

Verbal permission for individual examination was sought and obtained at every household and from each individual.

❖ *Confidentiality of the patient's record:*

Any medical information obtained from any individual was treated with utmost confidentiality. The names of the patients in the analysis data files were replaced by coded serial numbers.

❖ *All medications used are registered in Kenya.*

❖ *Adequate treatment and referral was recommended and initiated for any condition warranted.*

6.17 Reporting

The minimum prevalence criteria to determine whether Trachoma is a public health problem were as follows ³⁸.

- District TF prevalence $\geq 10\%$ and TT prevalence $\geq 1\%$.
- Sub location (clusters) TF prevalence $\geq 5\%$ and TT prevalence $\geq 1\%$.

RESULTS

A) Demographic Data

Table 1:
Sample Coverage of Children Aged 1-9 Yrs.

PREDETERMINED SAMPLE SIZE	NUMBER OF CHILDREN EXAMINED AGED 1 - 9 YRS.
780	880

Table 2:
Sample Coverage of Adults ≥ 15 Yrs

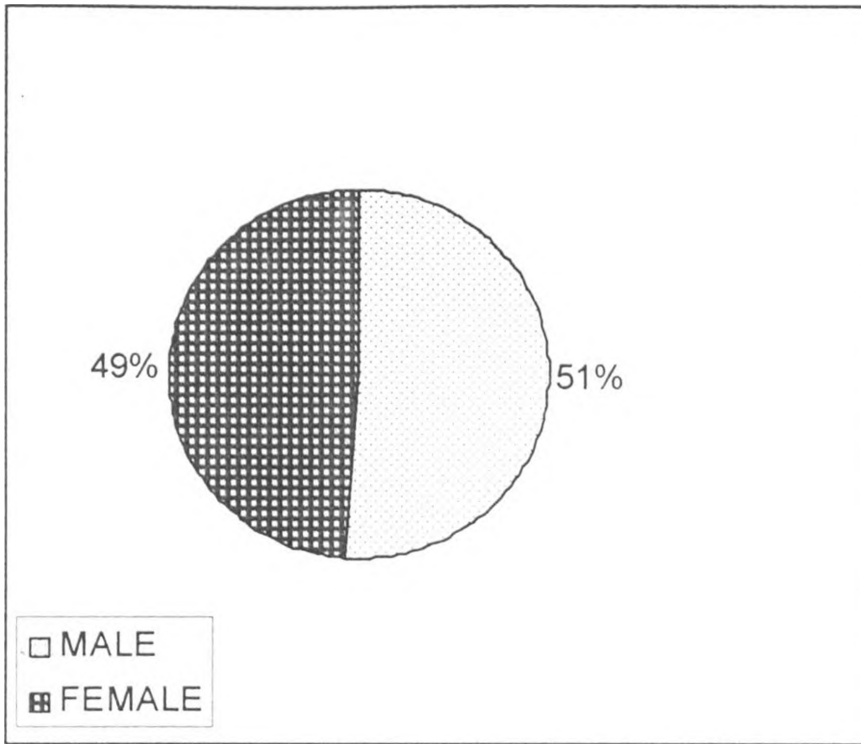
PREDETERMINED SAMPLE SIZE	NUMBER OF ADULTS EXAMINED
990	1131

In both age groups sample coverage was over 100%

Table 3:
 Distribution of Study Population in Children Aged 1-9 Yrs by Sex, Sub Location and District
 N=880

SUB LOCATION	SEX		TOTAL
	MALE	FEMALE	
Antuambui	40	39	79
Baibariu	22	18	40
Auki	28	15	43
Liburu	33	39	72
Amungenti	21	25	46
Thaicu	12	12	24
Ngundune	28	37	65
Ruungu	19	12	31
Amunju	3	7	10
Kithaene	16	20	36
Anjalu	22	12	34
Kitheo	24	24	48
Anjuki	53	43	96
Nianiri	15	14	29
Mbaranga	39	35	74
Kibulini	10	21	31
Kunene	20	23	43
Lanyiru	2	1	3
Igarii	27	20	47
Ametho	8	13	21
DISTRICT	452	428	880

Figure 1: Sex Distribution-Children
N=880



The sex distribution of the children who were examined was equal.

Table 4:
Distribution of Sampled Population in Adults by Sex
Sub Location and District

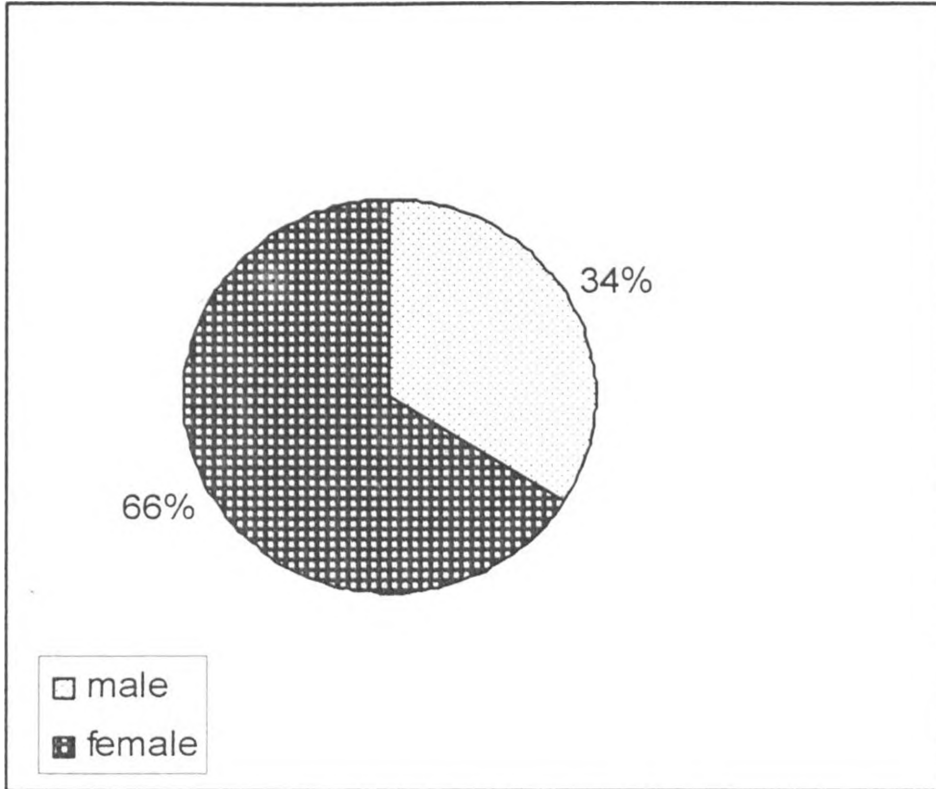
n=1131

SUB LOCATION	SEX		TOTAL
	MALE	FEMALE	
Antuambui	25	82	107
Baibariu	10	33	43
Auki	17	30	47
Liburu	17	42	59
Amungenti	17	28	45
Thaicu	20	25	45
Ngundune	47	56	103
Ruungu	14	29	43
Amunju	10	16	26
Kithaene	8	15	23
Anjalu	20	45	65
Kitheo	22	32	54
Anjuki	33	70	103
Nianiri	16	39	55
Mbaranga	27	54	81
Kibulini	22	39	61
Kunene	25	46	71
Lanyiru	5	1	6
Igarii	20	45	65
Ametho	18	15	33
DISTRICT	387	744	1131

Due to their population density and distribution some sub locations had a very small sample e.g. Lanyiru which had a total sample of six adults.

UNIVERSITY OF NAIROBI
MEDICAL LIBRARY

Figure 2: Sex Distribution –Adults
N=1131



Females were more than men (1.9:1)

B) Prevalence Data

Table 5:
Prevalence of TF in Children Aged 1-9 Yrs in the Sub Locations

N=880

SUB LOCATION	POPULATION EXAMINED	CASES OF TF (1-9yrs)	PREVALENCE (%)	95% C.I
Antuambui	109	30	27.6	13.1 - 48.1
Baibariu	42	3	4.8	0.14 - 41.7
Auki	43	1	2.3	0.18 - 35.6
liburu	62	1	1.6	0.12 - 26.9
Amungeti	48	2	4.2	0.0 - 35.4
Thaicu	26	3	8.3	0.0 - 53.7
Ngundune	48	3	6.3	0.12 - 37.9
Ruungu	36	5	13.9	1.20 - 52.1
Amunju	19	9	47.4	9.9 - 87.6
Kithaene	16	0	0.0	0.0- 60.4
Kitheo	29	1	3.4	0.26-46.7
Anjalu	48	15	29.2	10.1-62.8
Anjuki	89	0	0.0	0.0-18.32
Niariri	33	0	0.0	0.0- 41.1
Mbaranga	68	3	4.4	0.09- 8.9
Kibuline	36	0	0.0	0.0- 3.7
Kunene	52	1	1.9	0.14- 3.1
Lanyiru	3	0	0.0	0.0- 9.8
igarii	50	0	0.0	0.0- 2.9
Ametho	23	0	0.0	0.0- 5.0
DISTRICT	880	71	8.1	4.88 -12.6

TF (Active Trachoma) is not a public health problem at district (prevalence

8.1%). However it is a public health problem in the following six (6) sub locations:

Amunju 47.4%, Anjalu 29.2%, Antuambui 27.6%, Ruungu 13.9%, Thaicu 8.3% and

Ngundune 6.3%.

Three sub locations namely Amunju (47.4%), Anjalu (29.2%) and Antuambui (27.6%)

had more than a quarter of the sampled population with active trachoma.

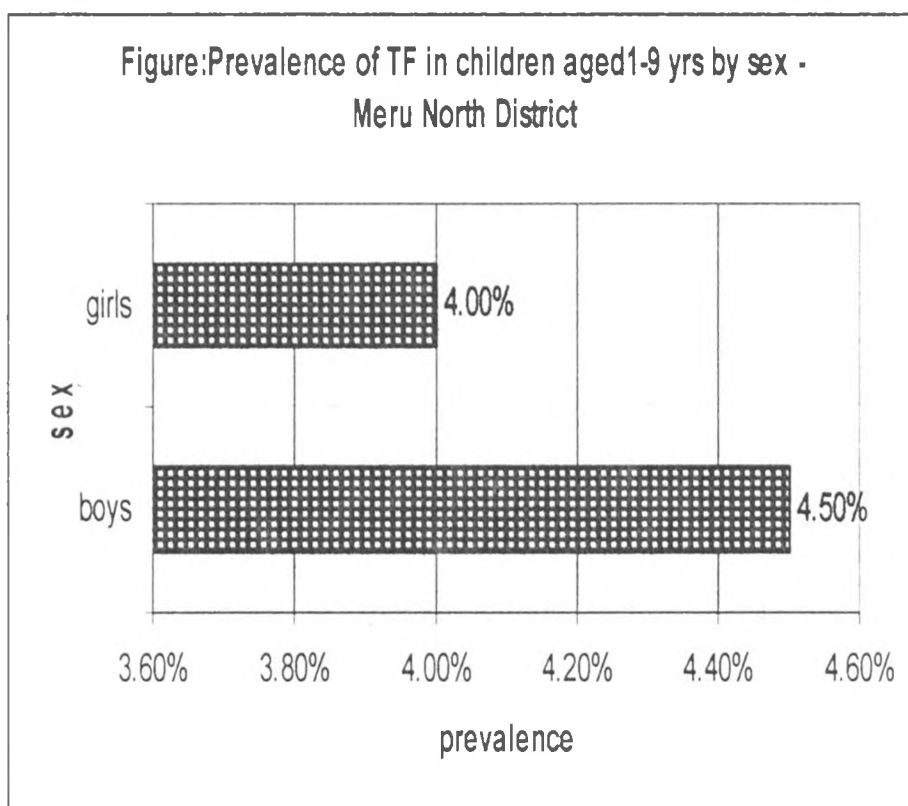
Table 6:
Prevalence of TF in Children Aged 1-9 Yrs by Sex and, Sub Location.

SUB LOCATION	POPULATION EXAMINED	CASES Of TF		PREVALENCE (%)
		Male	Female	
Antuambui	109	Male	15	13.8
		Female	15	13.8
Baibariu	42	Male	1	2.4
		Female	1	2.4
Auki	43	Male	0	0.0
		Female	1	2.3
liburu	62	Male	1	1.6
		Female	0	0.0
Amungeti	48	Male	1	2.1
		Female	1	2.1
Thaicu	26	Male	0	0.0
		Female	2	7.7
Ngundune	48	Male	1	2.1
		Female	2	4.2
Ruungu	36	Male	3	8.3
		Female	2	5.6
Amunju	19	Male	6	31.6
		Female	3	15.9
Kitnaene	16	Male	0	0.0
		Female	0	0.0
Kitheo	29	Male	0	0.0
		Female	1	3.4
Anjalu	48	Male	9	18.8
		Female	6	12.5
Anjuki	89	Male	0	0.0
		Female	0	0.0
Niariri	31	Male	0	0.0
		Female	0	0.0
Mbaranga	68	Male	2	2.9
		Female	1	1.5
Kibuline	36	Male	0	0.0
		Female	0	0.0
Kunene	52	Male	1	1.9
		Female	0	0.0
Lanyiru	3	Male	0	0.0
		Female	0	0.0
Igari	50	Male	0	0.0
		Female	0	0.0

Ametno	23	Male	0	0.0
		Female	0	0.0
DISTRICT	880	Male	40	4.5
		Female	35	4.0

FIGURE 4: Prevalence of TF in children

n = 880



Boys had more TF (4.5%) than girls (4.0%).

($p=0.656$ thus statistically not significant)

Table 7:
Prevalence of TF in Children Aged 1-9 Yrs by Agro-Economic Zones.

N=880

AGRO-ECONOMIC ZONE	SUB-LOCATION	POPULATION EXAMINED	CASES OF TF	PREVALENCE (%)
GRAZING	Antuambui	109	30	14.1
	Anjalu	48	15	
	Baibariu	42	3	
	Lanjiru	3	0	
	Mbaranga	68	3	
	Niariri	31	0	
	Liburu	62	1	
	Ruungu	36	5	
	TOTAL	399	57	
MIRAA	Kitheo	29	1	11.1
	Thaicu	26	2	
	Auki	43	1	
	Amunju	19	9	
		TOTAL	117	
TEA/COFFEE	Kibulini	36	0	1.7
	Kunene	52	1	
	Anjuki	89	0	
	Ametho	23	0	
	Igarii	50	0	
	Kithaene	16	0	
	Ngundune	48	3	
	Amungenti	48	2	
	TOTAL	362	6	

The grazing agro-economic zone had the highest prevalence of TF (14.2%) followed by the Miraa zone.

Table 8:
Prevalence of TI in Children Aged 1-9 Yrs by Sub Locations.

N=880

SUB LOCATION	POPULATION EXAMINED	CASES OF TI	PREVALENCE (%)
Antuambui	109	20	18.3
Baibariu	42	1	2.4
Auki	43	0	0.0
liburu	62	0	0.0
Amungeti	48	0	0.0
Thaicu	26	2	8.3
Ngundune	48	3	6.3
Ruungu	36	0	0.0
Amunju	19	2	10.5
Kithaene	16	0	0.0
Kitheo	29	0	0.0
Anjalu	48	15	29.2
Anjuki	89	0	0.0
Niariri B	31	0	0.0
Mbaranga	68	0	0.0
Kibuline	36	0	0.0
Kunene	52	1	1.9
Lanyiru	3	0	0.0
Igarii	50	0	0.0
Ametho	23	0	0.0
DISTRICT	880	44	5

The were 5 sub locations with TI prevalence of 5% and above.

Table 9:

Prevalence of TI in Children Aged 1-9 Yrs by Sex, Sub Location and District

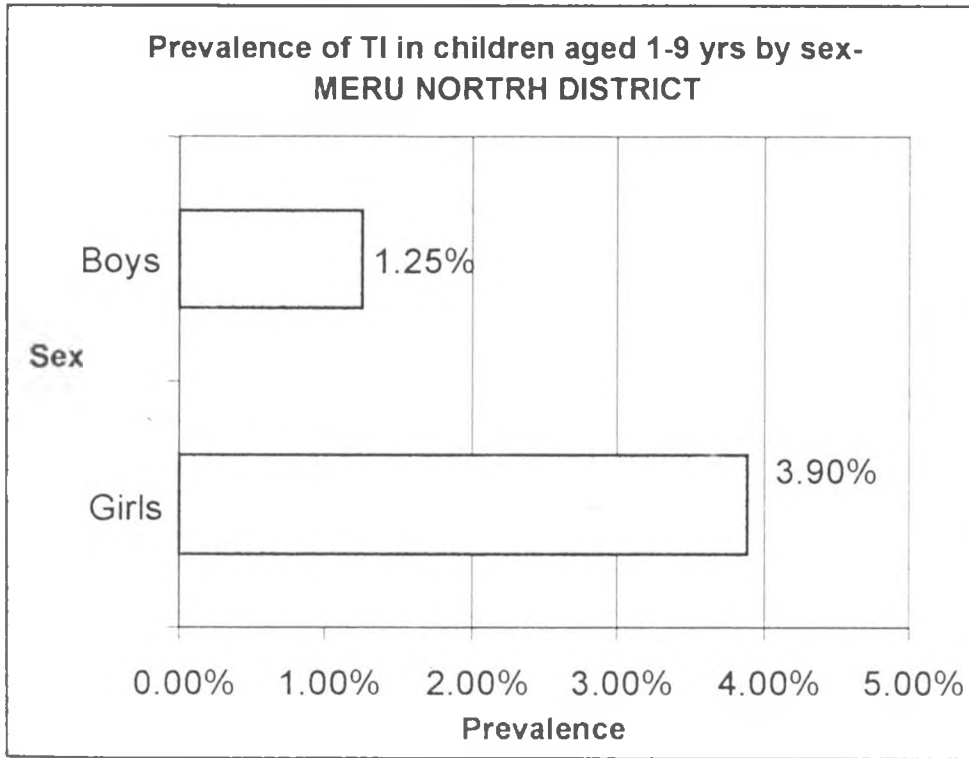
N=880

SUB LOCATION	POPULATION EXAMINED	CASES OF TI	PREVALENCE (%)
Antuambui	109	Male 6	5.5
		Female 15	13.8
Baibariu	42	Male 0	0.0
		Female 1	2.4
Auki	43	Male 0	0.0
		Female 0	0.0
liburu	62	Male 0	0.0
		Female 0	0.0
Amungeti	48	Male 0	0.0
		Female 0	0.0
Thaicu	26	Male 0	0.0
		Female 2	7.7
Ngundune	48	Male 1	2.1
		Female 2	4.2
Ruungu	36	Male 0	0.0
		Female 0	0.0
Amunju	19	Male 0	0.0
		Female 2	10.5
Kithaene	16	Male 0	0.0
		Female 0	0.0
Kitheo	29	Male 0	0.0
		Female 0	0.0
Anjalu	48	Male 4	8.3
		Female 11	23
Anjuki	89	Male 0	0.0
		Female 0	0.0
Niariri	31	Male 0B	0.0
		Female 0	0.0
Mbaranga	68	Male 0	0.0
		Female 0	0.0
Kibuline	36	Male 0	0.0
		Female 0	0.0
Kunene	52	Male 0	0.0
		Female 1	1.9
Lanyiru	3	Male 0	0.0
		Female 0	0.0
Igarii	50	Male 0	0.0
		Female 0	0.0
Ametho	23	Male 0	0.0
		Female 0	0.0

DISTRICT	880	Male	11	1.25
		Female	34	3.9

FIGURE 6: Prevalence of TI in children

n=880



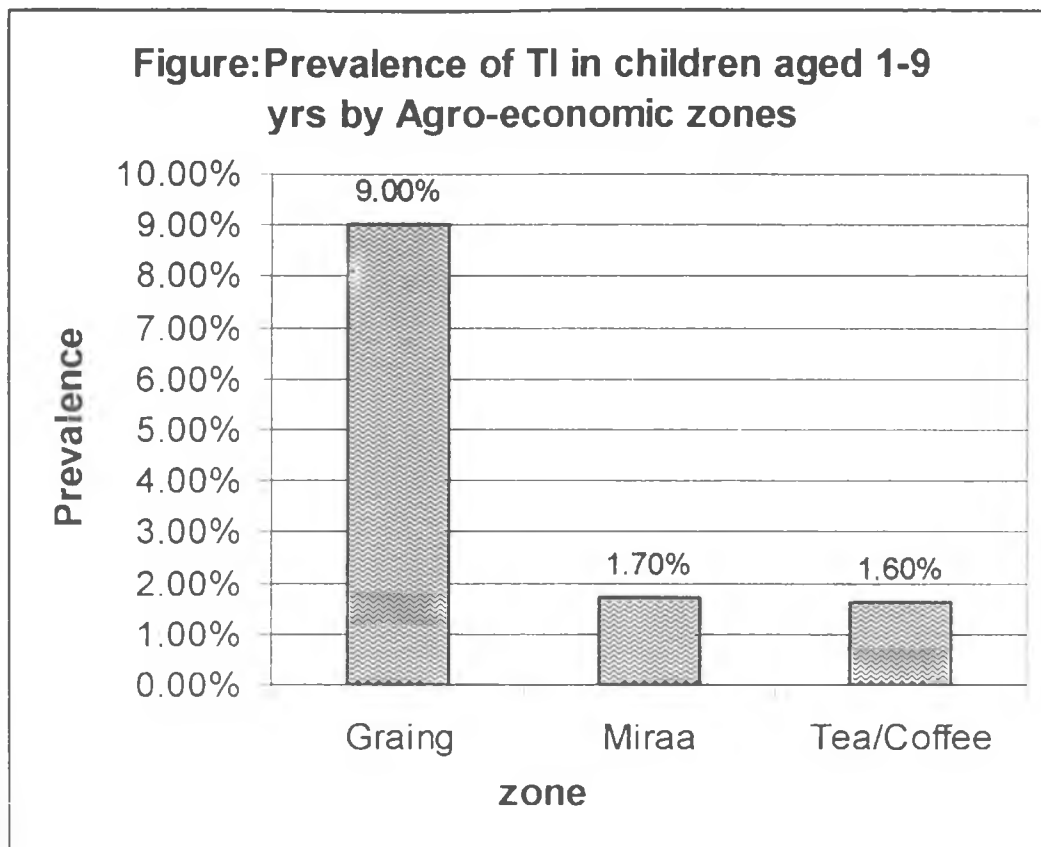
Girls had more TI (3.9%) than boys (1.25%)-p=14.08.

Table 10:
Prevalence of TI in Children Aged 1-9 Yrs by Agro-Economic Zones.

N=880

AGRO-ECONOMIC ZONE	SUB-LOCATION	POPULATION EXAMINED	CASES OF TI	PREVALENCE (%)
GRAZING	Antuambui	109	20	9.0
	Anjalu	48	15	
	Baibariu	42	1	
	Lanjiru	3	0	
	Mbaranga	68	0	
	Niariri	31	0	
	Liburu	62	0	
	Ruungu	36	0	
	TOTAL	399	36	
MIRAA	Kitheo	29	0	1.7
	Thaicu	26	2	
	Auki	43	0	
	Amunju	19	0	
	TOTAL	117	2	
TEA/COFFEE	Kibulini	36	0	1.6
	Kunene	52	1	
	Anjuki	89	0	
	Ametho	23	0	
	Igarii	50	0	
	Kithaene	16	2	
	Ngundune	48	3	
	Amungenti	48	0	
	TOTAL	362	6	

FIGURE 7: Prevalence of TI in children by Agro-economic zones
n=880



Grazing zone had the highest prevalence of TI followed by Miraa zone.

TS AND TT IN CHILDREN AGED 1-9 YRS

TS was found in two children; one aged 4 yrs in the right eye and another 3 yrs in both eyes.

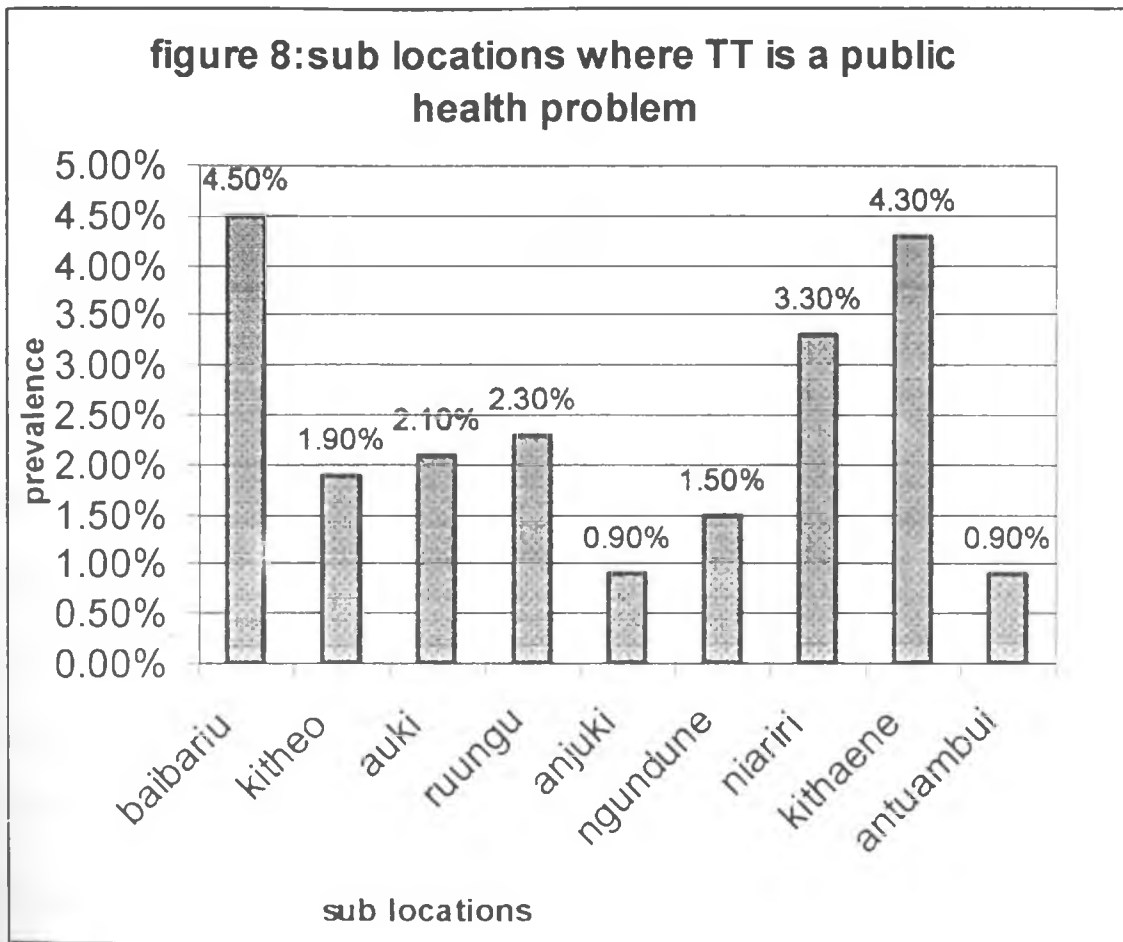
One child aged 5 yrs had TT in the right eye. No children aged 1-9 yrs were found to have CO.

Table 11:
Prevalence of TT in Adults by Sub Locations

N=1131

SUB LOCATION	POPULATION EXAMINED	CASES TT	PREVALENCE (%)	95% C.I
Antuambui	111	1	0.9	0.0 -9.5
Baibariu	44	2	4.5	0.24-24.9
Auki	48	1	2.1	0.0-20.2
liburu	60	0	0.0	0.0-14.1
Amungeti	45	0	0.0	0.0-18.1
Thaicu	45	0	0.0	0.0-18.1
Ngundune	67	1	1.5	0.0-15.1
Ruungu	43	1	2.3	0.0-22.2
Amunju	26	0	0.0	0.0-28.3
Kithaene	23	1	4.3	0.0-36.5
Kitheo	52	1	1.9	0.0-18.9
Anjalu	68	0	0.0	0.0-12.6
Anjuki	110	1	0.9	0.0-9.6
Niariri	60	2	3.3	0.17-19.1
Mbaranga	85	0	0.0	0.0-10.3
Kibuline	61	0	0.0	0.0-13.9
Kunene	76	0	0.0	0.0-11.4
Lanyiru	2	0	0.0	0.0-94.5
Igarii	70	0	0.0	0.0-12.3
Ametho	33	0	0.0	0.0-23.5
DISTRICT	1131	11	1.0	0.37-2.29

FIGURE 9: Sub locations with TT as a public health problem
n=1131



TT IS a public health problem in Meru North District (1.0% prevalence) and the following sub locations: Baibariu 4.5%, Kithaene 4.3%, Niariri 3.3%, Ruungu 2.3%, Auki 2.1%, Kitheo 1.9%, Ngundune 1.5%, Anjuki 0.9% and Antuambui 0.9%.

Baibariu and Niariri are in the drier Agro-economic zone which had very high prevalence's of TF and TI.

Table 12:
Prevalence of TT in Adults by Sex, Sub Location and District

N=1131

SUB LOCATION	POPULATION EXAMINED	CASES TT	PREVALENCE (%)
Antuambui	111	Male 0	0.0
		Female 2	1.8
Baibariu	44	Male 0	0.0
		Female 2	4.5
Auki	48	Male 0	0.0
		Female 1	2.0
liburu	60	Male 0	0.0
		Female 0	0.0
Amungeti	45	Male 0	0.0
		Female 0	0.0
Thaicu	45	Male 0	0.0
		Female 0	0.0
Ngundune	67	Male 0	0.0
		Female 1	1.5
Ruungu	43	Male 0	0.0
		Female 1	2.3
Amunju	26	Male 0	0.0
		Female 0	0.0
Kithaene	23	Male 0	0.0
		Female 1	4.3
Kitheo	52	Male 0	0.0
		Female 1	1.9
Anjalu	68	Male 0	0.0
		Female 0	0.0
Anjuki	110	Male 0	0.9
		Female 1	0.0
Niariri	60	Male 0	0.0
		Female 2	3.3
Mbaranga	85	Male 0	0.0
		Female 0	0.0
Kibuline	61	Male 0	0.0
		Female 0	0.0
Kunene	76	Male 0	0.0
		Female 0	0.0
Lanyiru	2	Male 0	0.0
		Female 0	0.0
lgarii	70	Male 0	0.0
		Female 0	0.0
Ametho		Male 0	0.0

	33	Female	0	0.0
DISTRICT	1131	Male	0	0.0
		Female	11	1.0

All the cases of TT in all sub locations were found in females.

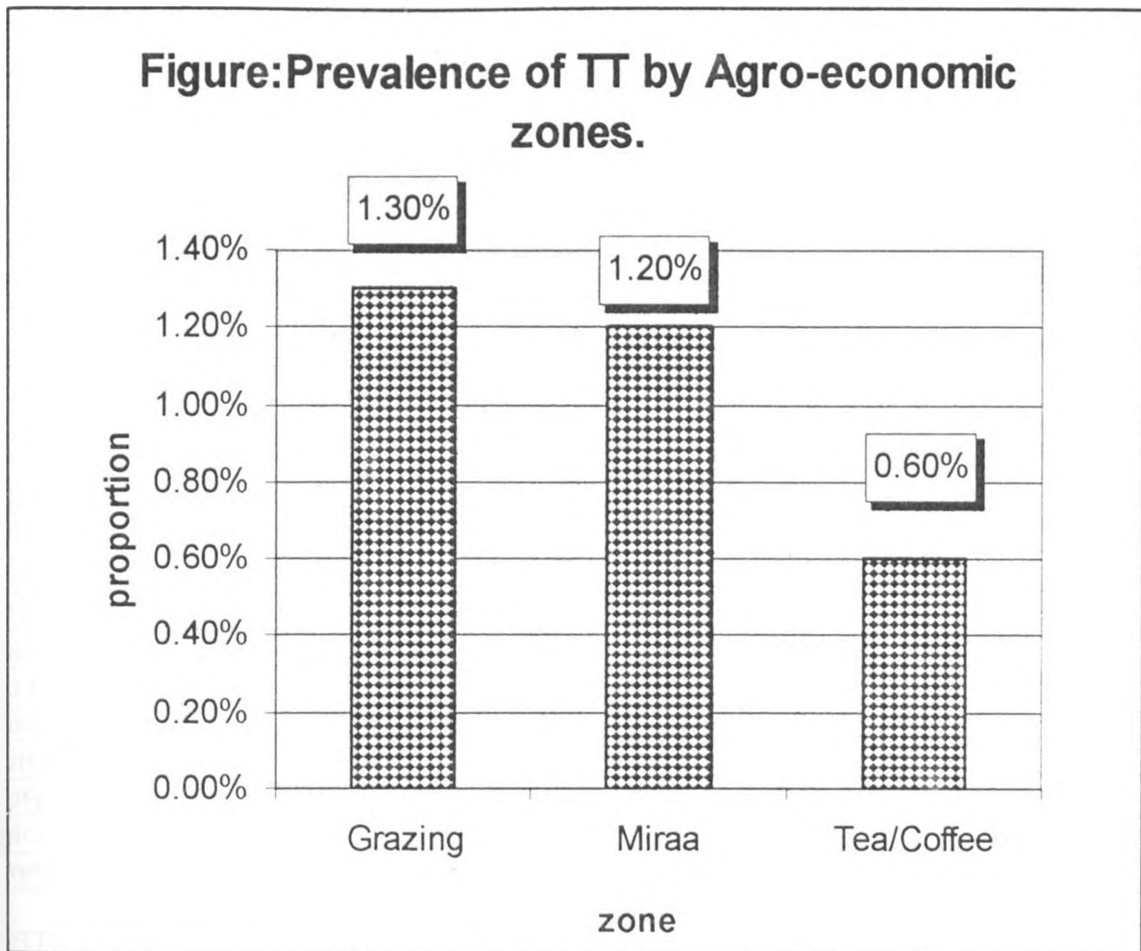
Prevalence of TT in Adults by Agro-Economic Zones

N=1131

AGRO-ECONOMIC ZONE	SUB-LOCATION	POPULATION EXAMINED	CASES OF TT	PREVALENCE (%)
GRAZING	Antuambui	111	1	
	Anjalu	68	0	
	Baibariu	44	2	
	Lanjiru	2	0	
	Mbaranga	85	0	
	Niariri	60	2	
	Liburu	60	0	
	Ruungu	44	1	
	TOTAL	474	6	1.3
MIRAA	Kitheo	52	1	
	Thaicu	46	0	
	Auki	48	1	
	Amunju	26	0	
	TOTAL	172	2	1.2
TEA/COFFEE	Kibulini	61	0	
	Kunene	76	0	
	Anjuki	110	1	
	Ametho	33	0	
	Igarii	70	0	
	Kithaene	23	1	
	Ngundune	67	1	
	Amungenti	45	0	
	TOTAL	485	3	0.6

FIGURE 10: Prevalence of TT by Agro-economic zones

N=1131



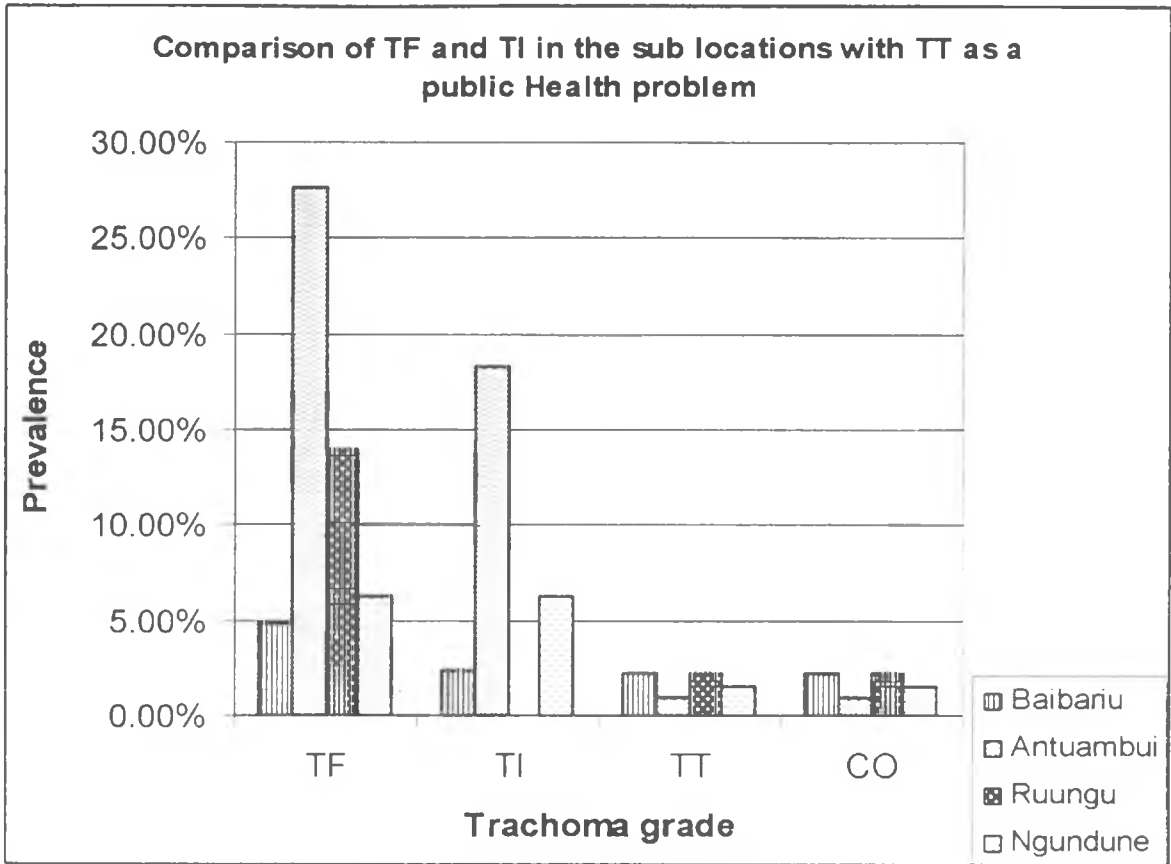
TT is most prevalent in the Grazing zone (prevalence 1.7%). All the zones show that Trachoma has been an endemic problem in the past in the district.

TABLE 14:
Prevalence of Co by Sub Locations

N=1131

SUB LOCATION	POPULATION EXAMINED	CASES OF CO	PREVALENCE (%)
Antuambui	111	1	0.9
Baibariu	44	1	2.3
Auki	48	0	0.0
liburu	60	0	0.0
Amungeti	45	0	0.0
Thaicu	45	0	0.0
Ngundune	67	1	1.5
Ruungu	43	1	2.3
Amunju	26	0	0.0
Kithaene	23	0	0.0
Kitheo	52	0	0.0
Anjalu	68	0	0.0
Anjuki	110	0	0.0
Niariri	60	0	0.0
Mbaranga	85	0	0.0
Kibuline	61	0	0.0
Kunene	76	0	0.0
Lanyiru	2	0	0.0
Igarii	70	0	0.0
Ametho	33	0	0.0
DISTRICT	1131	4	0.4

FIGURE 11: Comparison between TF, TI AND TT in sub locations with TT as a public health problem n=1131



There were four (4) sub locations where the prevalence of CO was 1% and above.

They are:

Baibariu, Ruungu and Antuambui are sub locations in the drier and poorer part of Meru North District and there is a trend of high childhood infections with significant complicated potentially blinding Trachoma.

The prevalence of CO among those with TT was 36.4%.

Only females had CO.

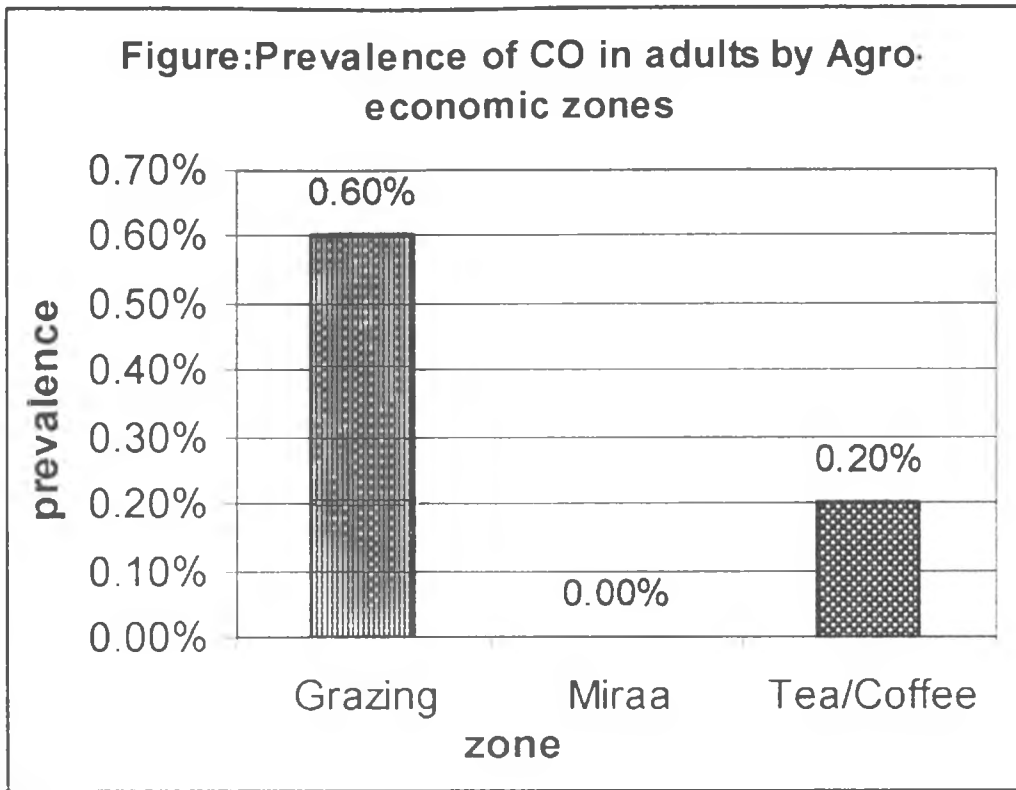
Table 15:
Prevalence of CO in Adults by Agro-Economic Zones

N=1131

AGRO-ECONOMIC ZONE	SUB-LOCATION	POPULATION EXAMINED	CASES OF CO	PREVALENCE (%)
GRAZING	Antuambui	111	1	0.6
	Anjalu	68	0	
	Baibariu	44	1	
	Lanjiru	2	0	
	Mbaranga	85	0	
	Niariri	60	0	
	Liburu	60	0	
	Ruungu	44	1	
	TOTAL	474	2	
MIRAA	Kitheo	52	0	0.0
	Thaicu	46	0	
	Auki	48	0	
	Amunju	26	0	
	TOTAL	172	0	
TEA/COFFEE	Kibulini	61	0	0.2
	Kunene	76	0	
	Anjuki	110	0	
	Ametho	33	0	
	Igarii	70	0	
	Kithaene	23	0	
	Ngundune	67	1	
	Amungenti	45	0	
	TOTAL	485	1	

FIGURE 12: Prevalence of CO by agro economic zones

N=1131



CO is most prevalent in the Grazing zone (prevalence 0.6%).

Table 16:
Prevalence of TS in Adults by Sub Locations

N=1131

SUB LOCATION	POPULATION EXAMINED	CASES OF TS	PREVALENCE (%)
Antuambui	111	28	25.2
Baibariu	44	4	9.1
Auki	48	3	6.25
liburu	60	7	11.7
Amungeti	45	3	6.7
Thaicu	45	0	0.0
Ngundune	67	1	1.5
Ruungu	43	0	0.0
Amunju	26	0	0.0
Kithaene	23	2	8.7
Kitheo	52	1	1.9
Anjalu	68	17	25
Anjuki	110	5	5.5
Niariri	60	3	5
Mbaranga	85	11	12.9
Kibuline	61	4	6.6
Kunene	76	9	11.8
Lanyiru	2	0	0.0
Igarii	70	0	0.0
Ametho	33	1	3
DISTRICT	1131	99	8.8

The prevalence of TS in the district was 8.8%.

Antuambui and Anjalu sub locations had the highest prevalence of TS (25.2% and 25% respectively).

Table 17:

Prevalence of TS in Adults by Sex, Sub Location and District

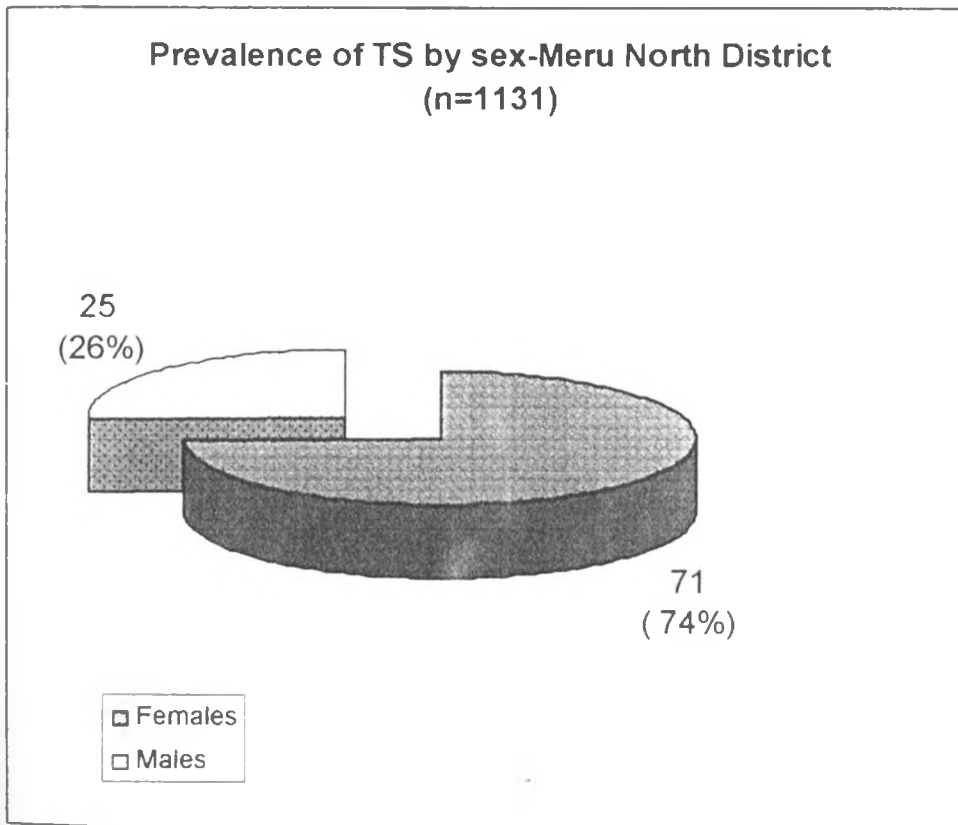
N1131

SUB LOCATION	POPULATION EXAMINED	CASES TS	PREVALENCE (%)
Antuambui	111	Male 5	4.5
		Female 23	20.7
Baibariu	44	Male 1	2.3
		Female 3	6.8
Auki	48	Male 0	0.0
		Female 3	6.25
liburu	60	Male 0	0.0
		Female 6	10
Amungeti	45	Male 0	0.0
		Female 3	6.7
Thaicu	45	Male 0	0.0
		Female 0	0.0
Ngundune	67	Male 0	0.0
		Female 1	1.5
Ruungu	43	Male 0	0.0
		Female 0	0.0
Amunju	26	Male 0	0.0
		Female 0	0.0
Kithaene	23	Male 2	8.7
		Female 0	0.0
Kitheo	52	Male 1	1.9
		Female 0	0.0
Anjalu	68	Male 5	7.4
		Female 12	17.6
Anjuki	110	Male 1	0.9
		Female 4	3.6
Niariri	60	Male 1	1.7
		Female 2	3.3
Mbaranga	85	Male 4	4.7
		Female 7	8.2
Kibuline	61	Male 2	3.3
		Female 2	3.3
Kunene	76	Male 2	2.6
		Female 5	6.6
Lanyiru	2	Male 0	0.0
		Female 0	0.0
Igari	70	Male 0	0.0
		Female 0	0.0
Ametho		Male 1	3.0

	33	Female	0	0.0
DISTRICT	1131	Male	25	2.2
		Female	71	6.3

FIGURE 13: Prevalence of TS in the District

N=1131



Females were almost three times (6.3%) afflicted by TS than males (2.2%)

-p=3.12.

TF AND TI IN ADULTS

TF was found in seven (7) adults (prevalence 0.6%) who were all females aged between 17-38 years.

TI affected twenty two (22) adults (prevalence 1.9%). Fifteen (68%) of these were females.

All these adults were found in homesteads which had children afflicted with the Active disease. Female adults tend to get active trachoma because they spend a lot of their time at home with the children who harbor the active disease form.

FACTORS

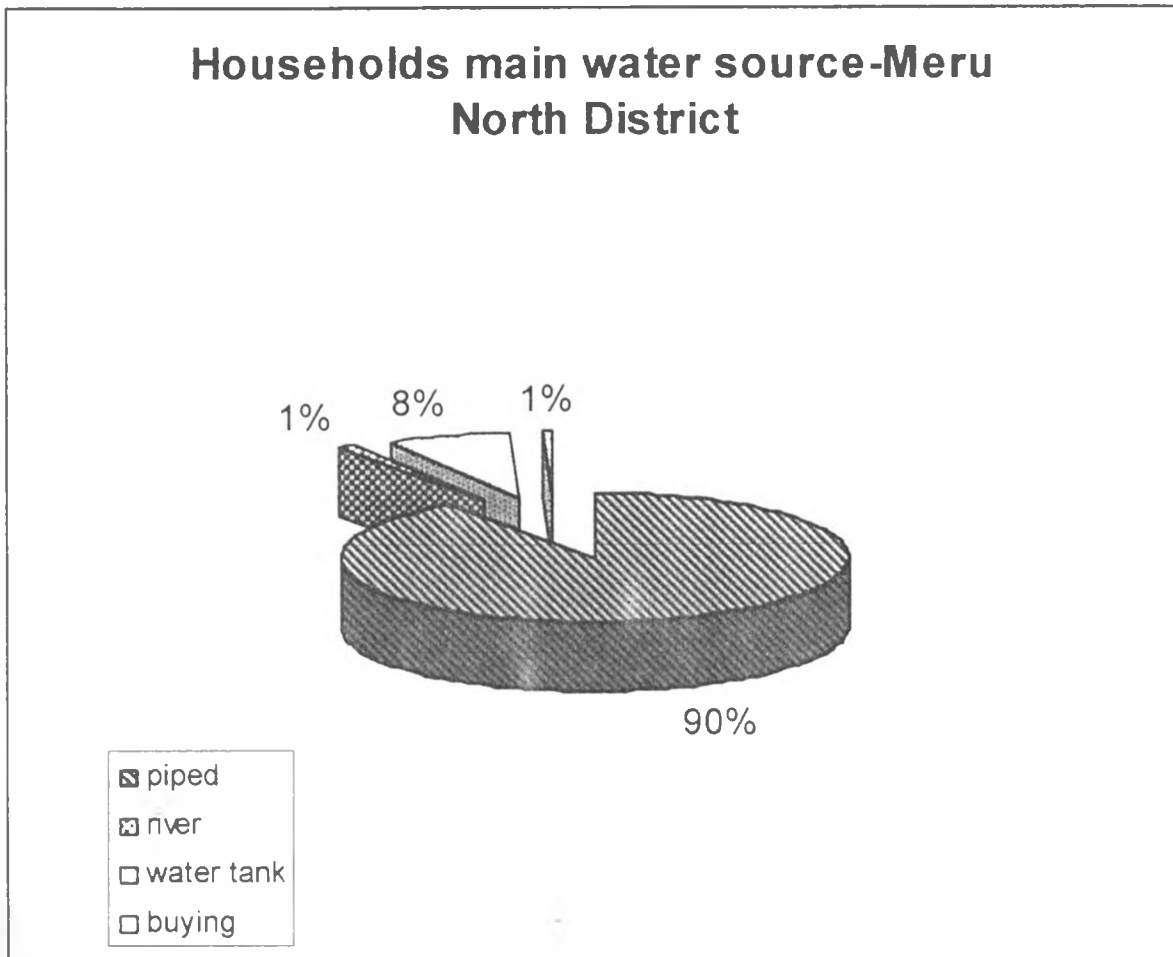
Water

A) Water Source

Household's Main Source of Water

Figure 14: Households main water source-District

N=144

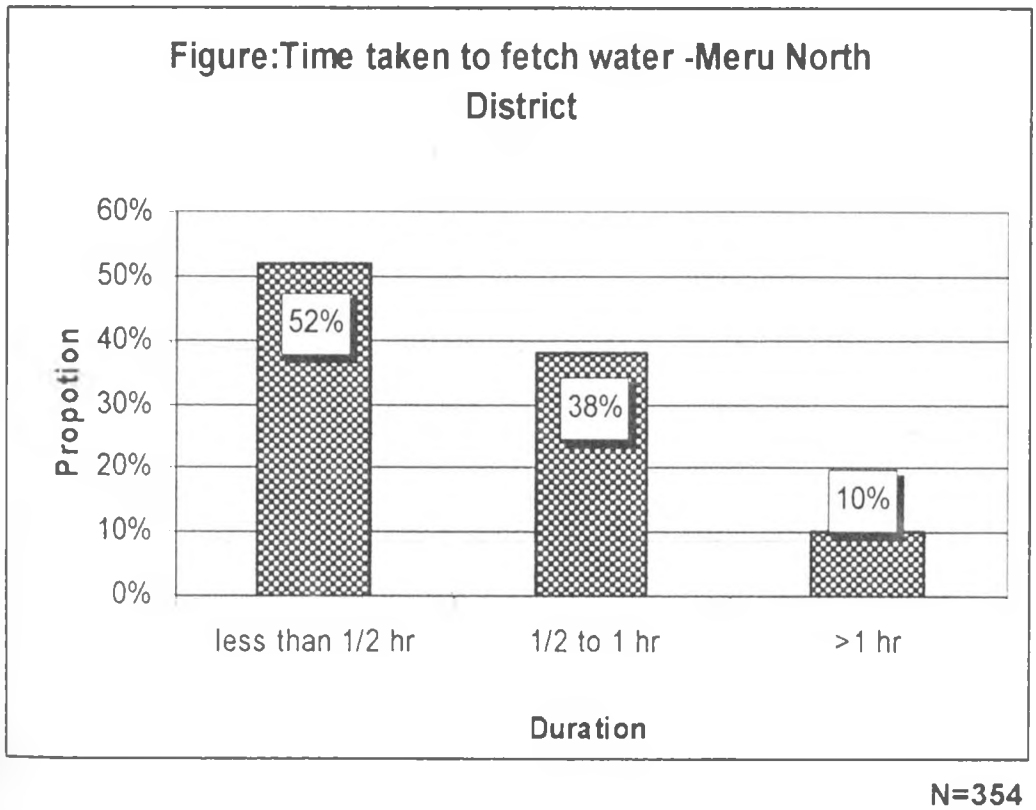


Piped water and storage water tanks are the main sources of water in the District. There was no difference between the respondents' answers and the team's observation, regarding the source of water.

B) Water Fetching

Subjective Reporting On Duration for Fetching Water in Meru North District and the Sub Locations

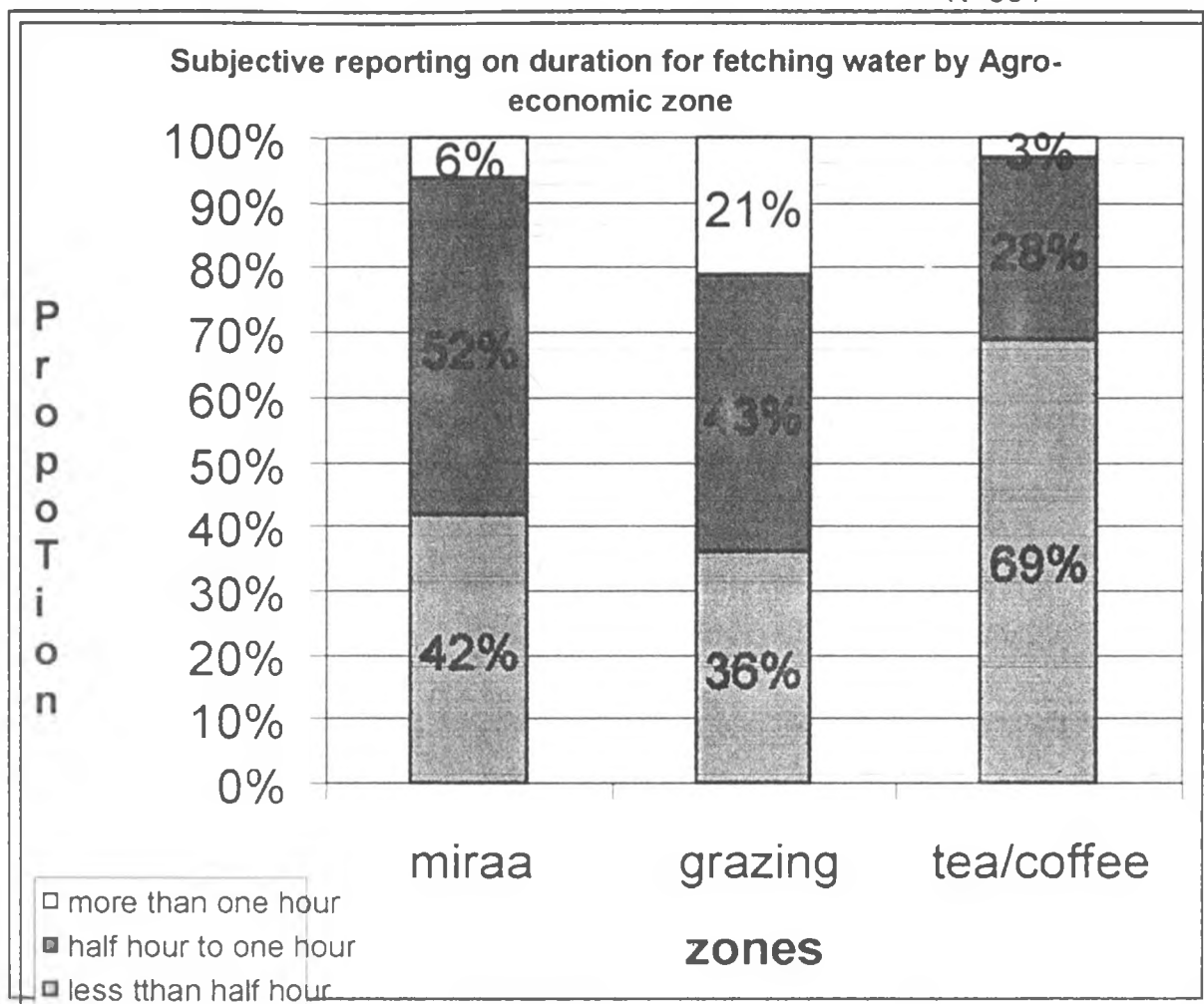
Figure 15: Time taken to fetch water-District



There are communal water fetching points thus most of the time was spend queuing waiting for everyone's fetching tum rather than the distance to the water point.

FIGURE 16:
Subjective Reporting On Duration for Fetching Water in Meru North District by Agro-
Economic Zones

N=354

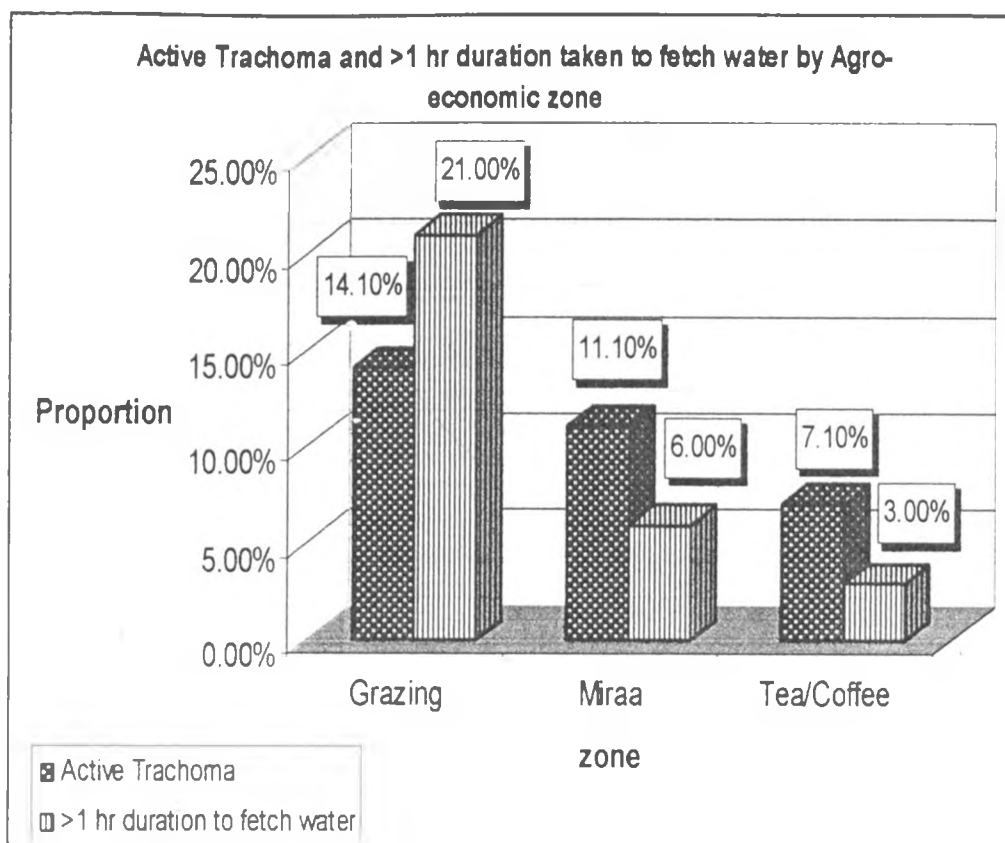


The duration taken to fetch water in the district is mainly less than half an hour (52%).

About 10% of the population in the District takes more than one hour to fetch water.

The grazing zone has the highest proportion (21%) of fetching water duration of more than one hour. This implies that water is scarce in this region thus Trachoma should be high as show by the data.

Figure 17: Comparison between Trachoma and >1 hr duration in fetching water.



There is a close relationship between the time it takes to fetch water and Active Trachoma such that longer the duration, the higher the prevalence as shown in the grazing zone.

Functional Toilet

Table 18:

HOMES		Anjuki	Nairiri	mbaranga	kibuline	kunene	ametho
WITH FUNCTIONAL TOILET	YES	74	27	43	35	49	24
	NO	6	9	4	1	4	0
TOTAL		80 (100%)	36	47 (100%)	36 (100%)	53 (100%)	24 (100%)

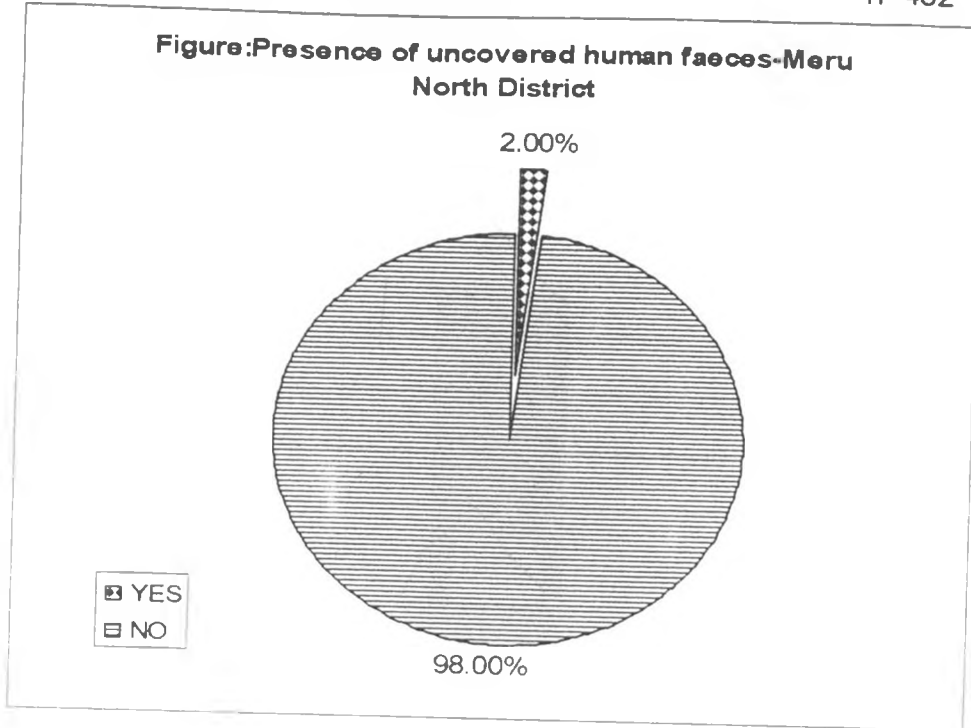
HOMES		lanyiru	Igarii	Antuambui	liburu	anjalu	TOTAL
WITH FUNCTIONAL TOILET	YES	27	19	48	16	25	387 (91%)
	NO	3	1	4	1	6	39 (9%)
TOTAL		30 (100%)	20 (100%)	52 (100%)	17 (100%)	31 (100%)	426 (100%)

Toilet use in the district is over 90%. The survey team noted that the model of the toilet differed according to the Agro-economic zone.

The Tea/coffee region had clean VIP toilets some with covers where as Miraa and grazing zones had majority of the wooden or paper toilets.

Figure 18: Uncovered Human Faeces

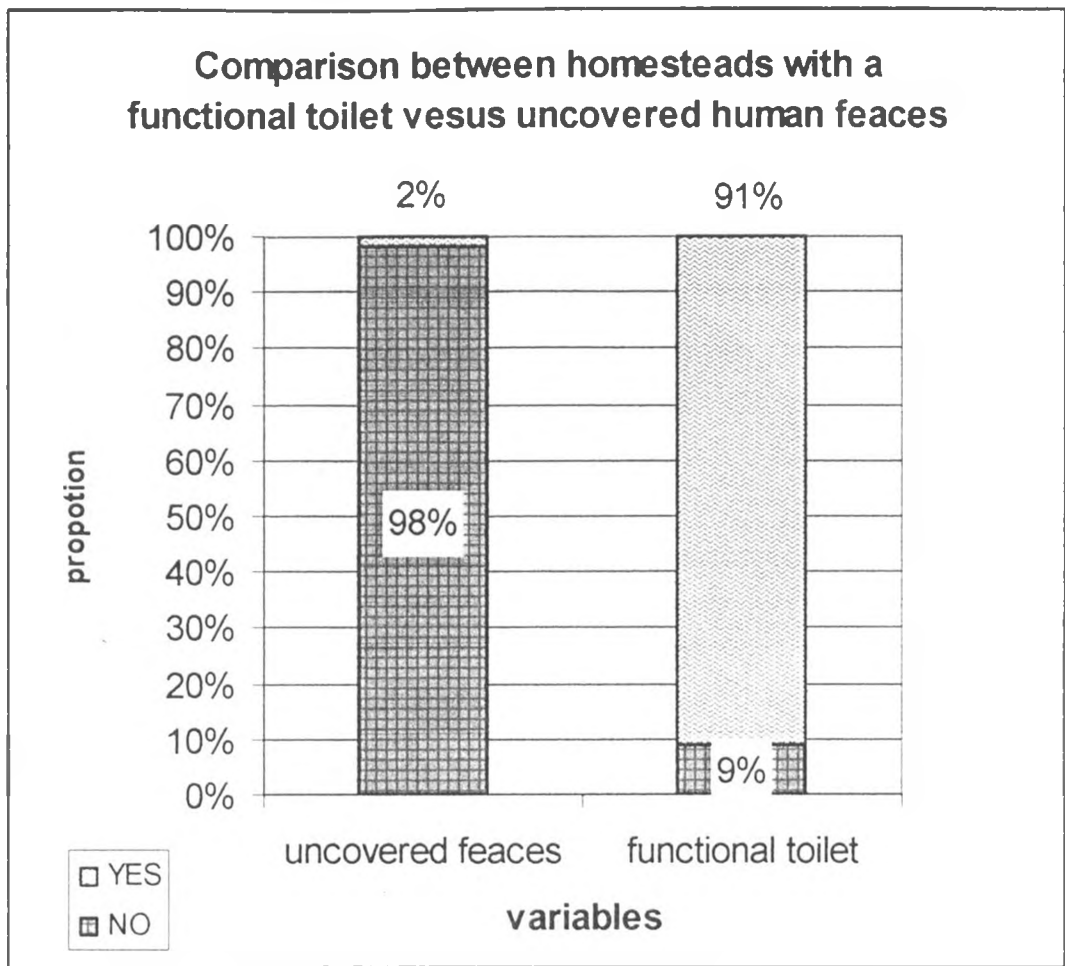
n=432



Essentially there were no exposed human faeces in the study area.

Figure 19

: Comparison between availability of a functional toilet and uncovered human faeces

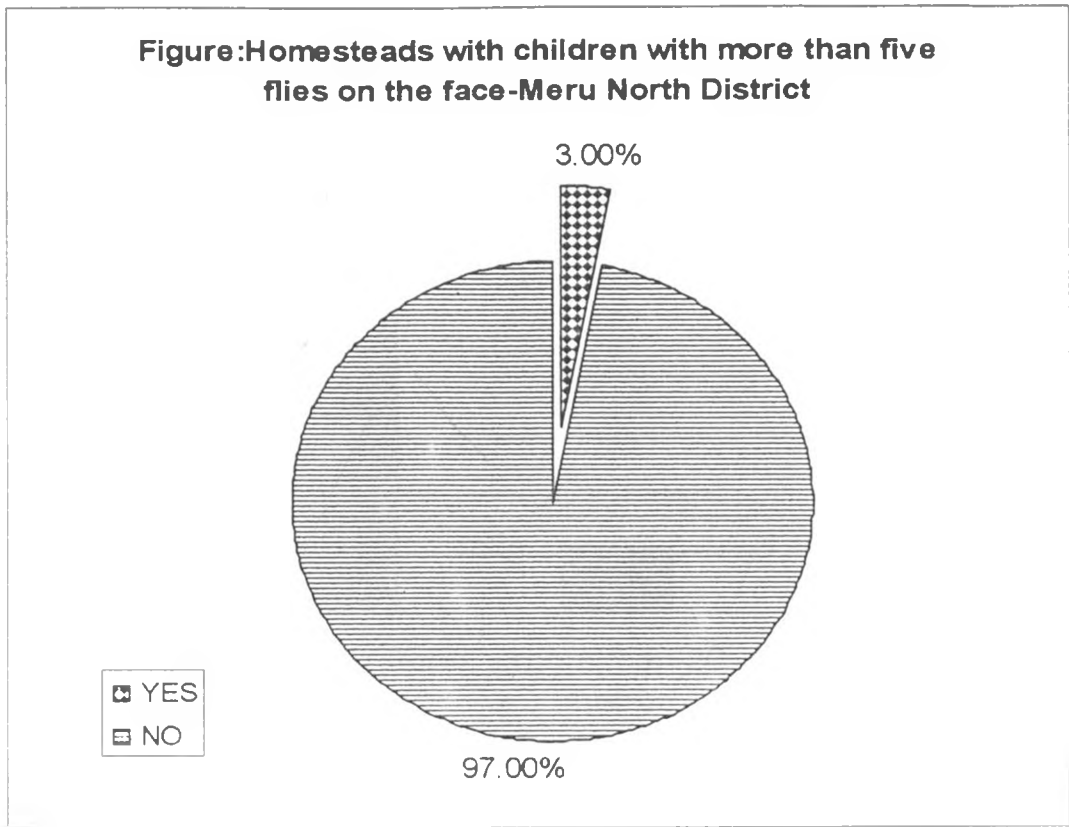


The presence of a functional toilet is inversely proportional to the availability of exposed human faeces thus toilets are actually used.

Figure 20:

FLIES (face seeking)

N=412

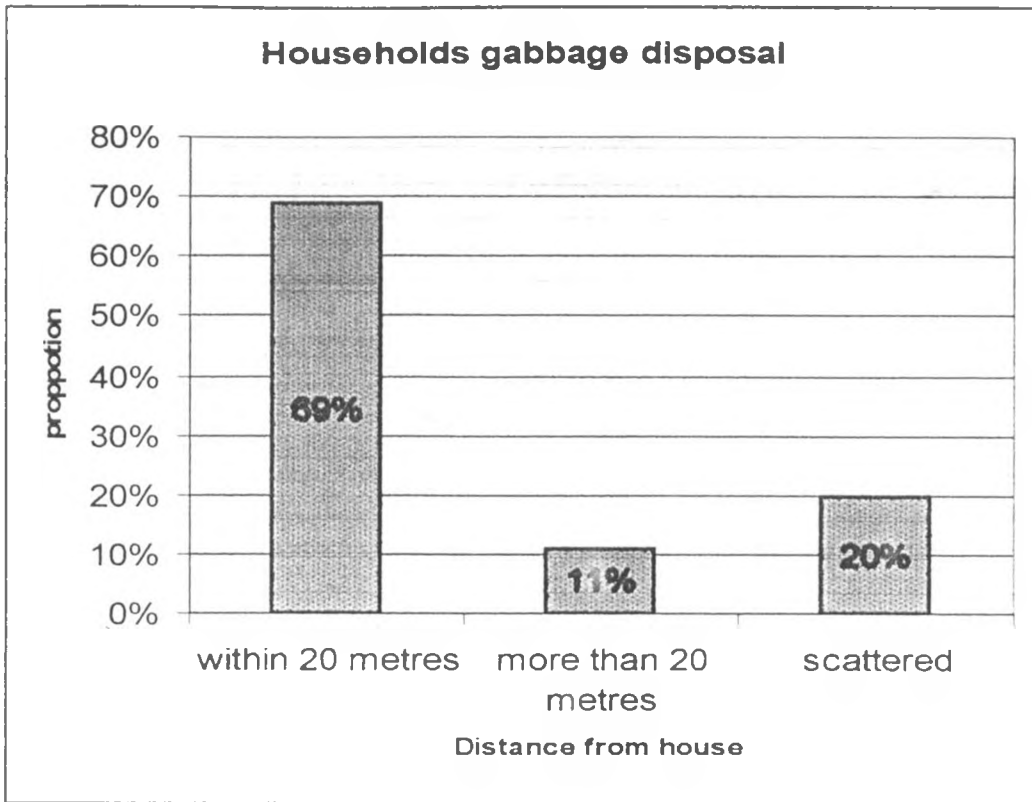


Essentially there were very few homesteads with children with more than five flies on the face. Almost all (97%) had fewer or no face seeking flies at all.

Figure 21:

GARBAGE DISPOSAL

N=424



Only 11 % (45/424) of the households dispose there solid waste more than 20meters from their houses. Those who did not have a proper waste disposal site said they burnt the waste but this did not concur with the observations of the survey team. The waste disposal problem was evenly distributed among all the homesteads in all the agro-economic zones.

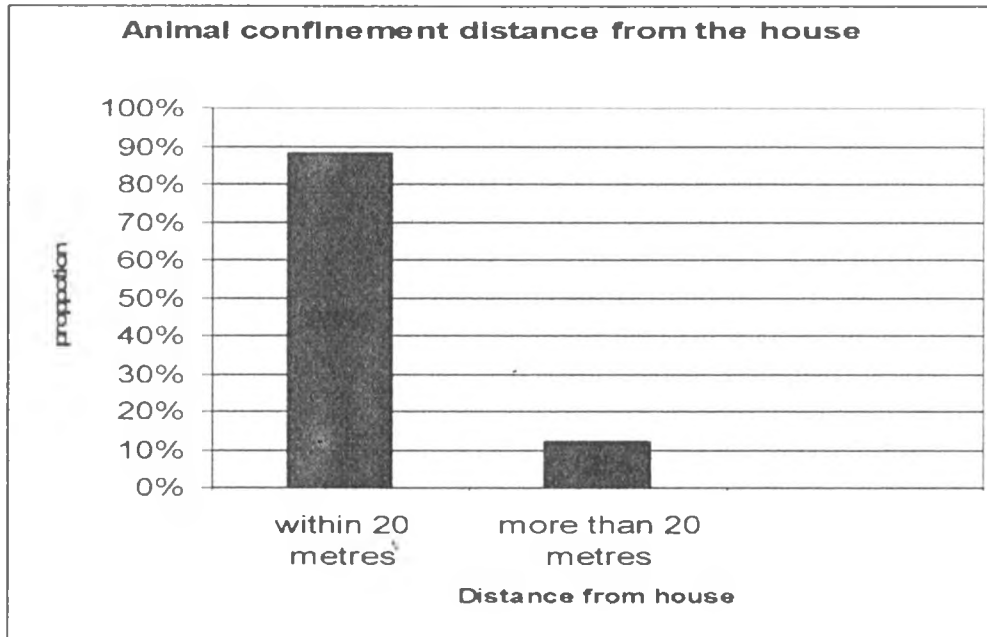
ANIMALS CONFINEMENT'S DISTANCE FROM THE HOUSE

Table 19:

ANIMAL CONFINEMENT DISTANCE	Anjuki	Nairiri	mbaranga	kibuline	kunene	lanyiru
LESS THAN 20 METRES	64	24	45	30	39	18
MORE THAN 20 METRES	7	6	0	4	6	5
TOTAL	71 (100%)	30 (100%)	45 (100%)	34 (100%)	45 (100%)	23 (100%)

ANIMAL CONFINEMENT DISTANCE	Ametho	Igarii	Antuambui	TOTAL
LESS THAN 20 METRES	27	13	23	283 (88%)
MORE THAN 20 METRES	4	4	1	37 (12%)
TOTAL	31 (100%)	17 (100%)	24 (100%)	320 (100%)

Figure 22: Animal confinement distance from the house



Essentially animals are kept less than 20 meters from the house 283/320 (88%).

Some homesteads especially in the Miraa zone did not keep animals at all. Trachoma was found in some of these non-keeping animal homesteads thus the animals might not have been the risk factor.

The pig was a common domesticated animal in the Tea/coffee zone but there was no striking presence of Active Trachoma in these homesteads.

Most of the animals were enclosed in inexpensive wooden bomas (sheds). There were no animals kept in the house in the entire zones in whatever season.

FACIAL HYGIENE

Table 20:
Facial hygiene by sub location

n=608

SUB LOCATION	CLEAN FACE		
	YES	NO	TOTAL
Antuambui	37 (63%)	22 (37%)	59 (100%)
Baibariu	2 (17%)	10 (83%)	12 (100%)
Auki	8 (47%)	9 (53%)	17 (100%)
liburu	15 (48%)	16 (52%)	31 (100%)
Amungeti	22 (65%)	12 (35%)	34 (100%)
Thaicu	23 (85%)	4 (15%)	27 (100%)
Ngundune	25 (58%)	18 (42%)	43 (100%)
Ruungu	15 (40%)	22 (60%)	37 (100%)
Amunju	10 (63%)	6 (37%)	16 (100%)
Kithaene	1 (20%)	4 (80%)	5 (100%)
Kitheo	20 (69%)	9 (31%)	29 (100%)
Anjalu	20 (44%)	26 (56%)	46 (100%)
Anjuki	36 (62%)	22 (38%)	58 (100%)
Niariri	16 (62%)	10 (38%)	26 (100%)
Mbaranga	31 (65%)	17 (35%)	48 (100%)
Kibuline	15 (54%)	13 (45%)	28 (100%)
Kunene	23 (72%)	9 (28%)	32 (100%)
Igarii	27 (75%)	9 (25%)	36 (100%)
Ametho	11 (46%)	13 (54%)	24 (100%)
DISTRICT	357 (59%)	251 (41%)	608 (100%)

About 60 % (n=608) of the children examined had clean faces.

Table 21:
Facial hygiene by agro-economic zones

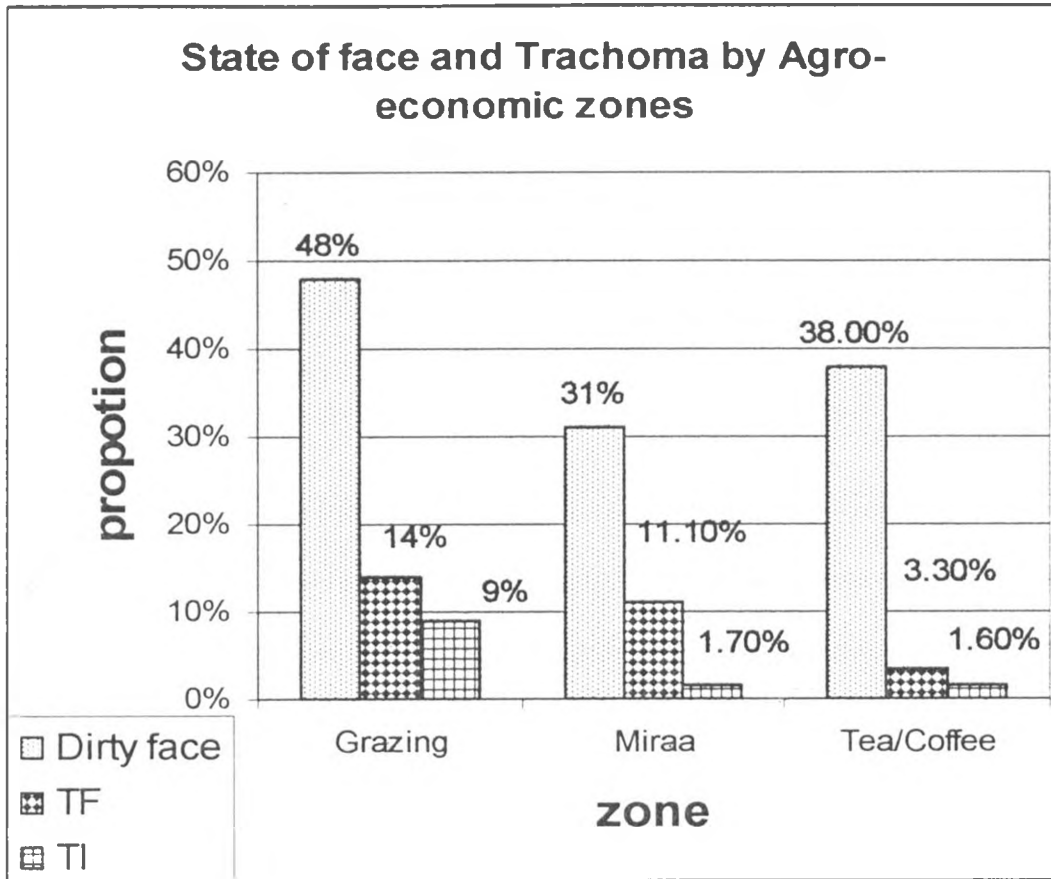
	SUB LOCATION	CLEAN FACE		
		YES	NO	TOTAL
GRAZING	Antuambui	37 (63%)	22 (37%)	59 (100%)
	Baibariu	2 (17%)	10 (83%)	12 (100%)
	Anjalu	20 (44%)	26 (56%)	46 (100%)
	Niariri	16 (62%)	10 (38%)	26 (100%)
	Mbaranga	31 (65%)	17 (35%)	48 (100%)
	liburu	15 (48%)	16 (52%)	31 (100%)
	Ruungu	15 (40%)	22 (60%)	37 (100%)
	TOTAL	136 (52%)	123 (48%)	259 (100%)
TEA/ COFFEE	Kibuline	15 (54%)	13 (45%)	28 (100%)
	Kunene	23 (72%)	9 (28%)	32 (100%)
	Igarii	27 (75%)	9 (25%)	36 (100%)
	Ametho	11 (46%)	13 (54%)	24 (100%)
	Amungeti	22 (65%)	12 (35%)	34 (100%)
	Ngundune	25 (58%)	18 (42%)	43 (100%)
	Kithaene	1 (20%)	4 (80%)	5 (100%)
	Anjuki	36 (62%)	22 (38%)	58 (100%)
	TOTAL	160 (62%)	100 (38%)	260 (100%)
MIRAA	Auki	8 (47%)	9 (53%)	17 (100%)
	Thaicu	23 (85%)	4 (15%)	27 (100%)
	Amunju	10 (63%)	6 (37%)	16 (100%)
	Kitheo	20 (69%)	9 (31%)	29 (100%)
	TOTAL	61 (69%)	28 (31%)	89 (100%)

About two thirds (2/3) of the children examined in the Miraa and Tea/Coffee zones had clean faces. This is in contrast to the Grazing zone which had an equal number of children with dirty faces as those with clean ones.

Boys had cleaner faces (58%) than girls (42%).

STATE OF THE FACE AND TRACHOMA IN CHILDREN AGED 1-9 YRS BY AGRO-ECONOMIC ZONES

Figure 23:
State of the face and Trachoma



There is a close correlation between unclean faces and the prevalence of Active trachoma. The grazing zone had a remarkable higher number of children with dirty faces and highest prevalence's of TF and TI.

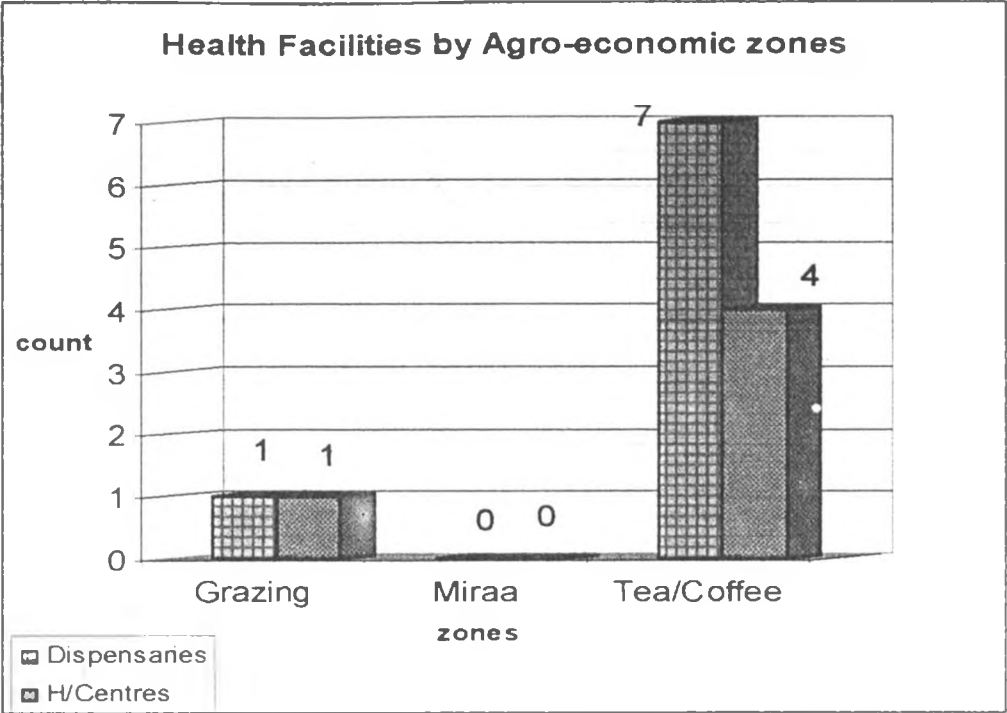
HEALTH FACILITIES

There were eight(8) dispensaries and three(3) Health centers according to the response the survey team got from the elders/administrative offices who were respondent's of the village identification form.

Anjuki sub location had four dispensaries and this was the highest number per sub location where the study was carried out. Amungenti and Antuambui had one dispensary each while Kunene had two.

Kunene and Antambui were the only sub locations which had a dispensary and a Health centre while Kibulini had two Health centres. Based on the survey responses of the interviewee, almost all the members of the household reported to seek eye treatment at the available Health Units when in need.

Figure 24:



Majority of the Health facilities 11/13 (85%) were in the Tea/Coffee zone while Miraa zone had none. The Tea/Coffee zone has the lion share of the health facilities and this is reflected by the lower prevalence's of all the grades of Trachoma.

SAFE IN MERU NORTH DISTRICT

Meru North District (Nyambene or Maua) is one of the districts created recently not more than ten years ago. Therefore infrastructure is still being developed e.g. construction and expansion of the District Hospital. This district was carved from Meru Central District.

HEALTH FACILITIES

Hospitals

There are three main hospitals; the government district hospital and two private mission hospitals. The district hospital and Maua Methodist hospitals are in Igembe central division which is in the tea/coffee zone. Tigania Mission hospital is in Tigania North division, in the grazing zone.

Sub District Hospitals

The only one is government and is in Tigania west division, in the drier grazing zone.

Health Centres

These are five in total, all government and they are; Laare health centre in Laare division, Mutuati health centre in Mutuati division, Kangeta health centre in Igembe North division, Mbeu health centre in Uringu division and Akachu health centre in Igembe south division.

Dispensaries

They are twenty one in number majority government sponsored

Private Clinics

There are a total of 164 clinics but only six are registered. Of the registered ones only one is run by a doctor, another is run by a registered nurse and the rest by clinical officers. Five of these registered clinics are within Maua town which is in Igembe central division.

The people who work in these clinics do not know what Trachoma is and thus cannot diagnose it.

Infrastructure and Equipments

Only the Methodist mission hospital has an equipped eye theatre with a microscope but they don't carry out trichiasis surgery due to lack of a surgeon and equipments.

The district hospital has a small theatre which they share with the dental clinic. No slit lamp, magnifiers or epilation forceps. Only one incomplete trichiasis surgical kit is available.

Human Resource

There are only three eye care workers. One an Ophthalmic clinical officer cataract surgeon (OCO/CS) who is based at the district hospital. He was trained in the year 2004.

There are two ophthalmic nurses, one at the district hospital and the other at Maua mission hospital. The two hospitals are in Maua town in Igembe central division. The nurses are Kikuyu Eye Hospital graduates.

There are forty three public health technicians to serve the 139 sublocations. Majority of them are working within the town leaving very few to go to the field and especially the drier part of the district where trachoma is a public health problem.

Trachoma Patients

There were only seven (7) patients with trachoma seen at the district hospital in the last one year. The grade of trachoma in these patients was not indicated. The small number was attributed to the fact that there are no more outreaches being contacted since KSB withdrew the car that was being used until 2003.

At the health centres, dispensaries and private clinics the diagnosis of trachoma is very poor owing to the absence of eye care workers. There are only two groups of eye

disease at this level; eye infections or cataract. Laare health center, the busiest, sees an average of 100 eye patients per month.

The Maua Methodist hospital saw 23 patients with trichiasis in the last one year. All these were referred to Meru central district hospital for TPR (tarsal plate rotation surgery)

Surgery

The only person trained to do trichiasis surgery is the OCO/CS. There has never been a training seminar in the district on this important interventional procedure. In 1998/99 there was a team of surgeons from Nairobi which performed mass trichiasis surgeries at the Kangeta health centre. This was an initiative to try to reduce the burden of blinding Trachoma in this region. Since then, no other such activity has been held in the District.

No mobile clinics or surgical outreaches contacted in the district since the eye department lacks means of transport. There is only one incomplete trichiasis surgical set which the OCO/CS uses. No slit lamp or an epilation forceps. Only two patients with trichiasis have been operated in the last one year; one in the district hospital and the other at Methodist hospital.

SPARK (in Meru central district) has come in handy for they have eye care workers in the field in the areas of Meru north district where trachoma is endemic. The difficult

cases are reassessed by an ophthalmic nurse who goes around. If there are patients identified with trichiasis they are transported free of charge to be reevaluated by an OCO/CS. Bilamellar surgery is then done at the SPARK hospital.

Medication

Only TEO is the anti trachoma agent at all the hospitals visited. The quantity supplied was said to be small and not enough. The concept of using oral medication to treat trachoma is new in this region.

Personal and Environmental Hygiene

PHAST (Participatory Hygiene and Sanitation Transformation) program is in place in all the primary schools and enforced by the public health team. To improve environmental sanitation, digging of refuse pits or incineration of solid waste is encouraged.

Use of pit latrines for human waste disposal is reinforced by the public health team. SIDA (Swedish International Development Agency) had a latrine digging program but they left in 2000. Currently there is no NGO with such a program.

UNIVERSITY OF NAIROBI
MEDICAL LIBRARY

DISCUSSION

The aim of this study and any other community –based survey is to estimate with reasonable precision the occurrence of disease in the target population. In this survey sample coverage was above 100% for both children aged 1-9 years and adults above 15 years of age. Thus the 95% confidence interval was achieved.

It was difficult to follow the children to their respective schools. Men were also a problem to find especially in the Miraa and grazing zones as they were out attending to the Miraa business and animals respectively.

Prevalence of trachoma

The overall active trachoma prevalence in children aged 1-9 years in Meru North District was 8.1 % (70/880) with six sub locations having prevalence of 5% and above .These included:

Amunju	47.4%
Anjalu	29.2%
Antuambui	27.6%
Ruungu	13.9
Thaicu	8.3%
Ngundune	6.3%

Thus active trachoma is a public health problem in these sub locations. And therefore there is need for intervention as per the WHO recommendations; that mass treatment is required if TF prevalence at the sub location level is equal or above 5%.

It is worth to note that active trachoma in this age group is not a public health problem in the District (prevalence 8.1%).

Boys had slightly more TF (4.5%) than girls (4.0%) although this was not statistically significant (P-value 0.656). The grazing Agro-economic zone which occupies the drier part of the district and neighboring Isiolo to the north and Mwingi to the southeast had the highest prevalence of TF (14.2%) in the children aged 1-9 years.

TF was found in seven (7) adults (prevalence 0.6%) who were all females aged between 17-38 years. They were all found in homesteads which had children afflicted with the active disease. Five of them had the disease in both eyes. Female adults tend to get active trachoma because they spend a lot of their time at home with the children who harbor the active disease form.¹⁰

The prevalence of TI was lower than that of TF in the District (5%) and all the sub locations. TI has many confounders and its prevalence was expected to be higher than that of TF.

The prevalence of TT in Meru North District was 1 % (11/1131). This is the threshold set by the WHO for TT as a public health problem. Therefore mass surgical intervention is

necessary in the district. Nine sub locations had remarkable high prevalence's and priority would be given to them. Majorities were from the drier grazing zone and they included:

Baibariu	4.5%
Kithaene	4.3%
Niariri	3.3%
Ruungu	2.3%
Auki	2.1%
Kitheo	1.9%
Ngundune	1.5%
Anjuki	0.9%
Antuambui	0.9%

The Miraa zone had a TT prevalence of 1.2% but no corresponding high CO prevalence. This could be because the SPARK community eye care workers are based in this region thus the absence of this grade of Trachoma during the survey period.

TT was only found in females. This is because of the repeated acute attacks due to their close proximity to the children which in turn leads to tarsal scarring thus entropion and trichiasis. One child aged 5 years had TT in one eye. Community based health care workers (CBHC) can be educated to identify cases of TT and encourage them to go for surgery.

Operations could not be carried out in the field during the survey due to some technicalities such as sterilization. The patients with TT were referred to the District Hospital for TPR (Tarsal plate rotation).

The prevalence of CO in adults in the district was 0.4 % (4/1131) indicating the burden of Trachoma caused blindness in the community. Only females were afflicted by CO. Two of the four CO cases were from the grazing Agro-economic zone. There was no CO in children aged 1-9 years.

Female adults were almost three times more afflicted by TS (prevalence 6.3%) than males (prevalence 2.2%).

RISK FACTORS

Facial hygiene and Trachoma

About 60 % of the children examined had clean faces. The grazing zone had an equal number of children with dirty face as those with clean ones. There was a close association between dirty faces and Trachoma since the Agro-economic zone with the highest number of children with dirty faces (48%) had the highest prevalence of TF (14%). The dirty faces attract face seeking flies which transmit the active disease. Transmission by dirty fingers and fomites e.g. towels is common when the faces are unclean. It was noted that if children were not going to school they didn't bother to wash their face.

Water availability

Piped water and storage water tanks (98%) are the main sources of water in the District. Water is not a problem in the district and thus the low prevalence of Active trachoma.

A few homestead in the drier zone which had the highest prevalence's of TF and TI got their water from rivers while some bought from vendors. Availability of water is an important determinant of personal hygiene. This, however, is not automatic for we observed children with dirty faces in the zones where water is abundant.

More than half of the sampled homesteads took less than half an hour to fetch water and only 10% took more than an hour. The grazing zone has the highest proportion (21%) of fetching water duration of more than one hour. This implies that water is scarce in this region thus Trachoma should be high as shown by the data. There is a close relationship between the time it takes to fetch water and Active Trachoma such that the longer the duration, the higher the prevalence of the disease.

There are communal water fetching points thus most of the time was spend queuing waiting for everyone's fetching turn rather than the distance to the water point.

The Catholic Church is currently undertaking a water provision program in the drier areas of the district. It is therefore hoped that this will help in the reduction of Trachoma burden in these area.

Toilets

Toilet use was over 90%. A few homesteads in the drier grazing zone had no toilets. The availability of bushes where the locals could deposit their waste and the hot sun which dried the excreta as soon as it was deposited came in handy in this zone.

The survey team noted that the model of the toilet differed according to the Agro-economic zone. The Tea/coffee region had clean VIP toilets some with covers whereas Miraa and grazing zones had poor quality ones.

Generally most of the pit latrines are shallow due to a high water table. Maua town has a very poor drainage system because of this reason.

Uncovered human faeces

Essentially there were no exposed human faeces in the study area. The survey team did not note a striking presence of dogs which are used as “mobile toilets” in other regions where Trachoma is endemic. The availability of a functional toilet was inversely proportional to the presence of exposed human faeces. This also plays an important role in the fly density for the *musca sorbens* prefers to lay its eggs on the human excreta.

Solid waste disposal

Only 11 % (45/424) of the households dispose their solid waste more than 20 meters from their houses. Those who did not have a proper waste disposal site said they burnt the waste. This however did not concur with the observations of the survey team during the survey period. Thus, this could have been said to impress the examiners.

Co-habitation with animals

Essentially animals are kept less than 20 meters from the house 283/320 (88%).

Some homesteads did not keep animals at all. Trachoma was found in some of these non-keeping animal homesteads thus the animals might not have been the risk factor.

Zero grazing is practiced in the wet regions of the district. The pig was a common domesticated animal in the Tea/coffee zone but there was no striking presence of Active Trachoma in these homesteads.

Most of the animals were enclosed in inexpensive wooden bomas (sheds). There were no animals kept in the house in whatever season.

Face seeking flies

Essentially there were very few homesteads with children with more than five flies on the face. Almost all (97%) had fewer or no face seeking flies at all. The low fly density could be attributed to the absence of uncovered human faeces where the vector deposits its eggs. The high incidence of clean faces also contributed to the lower frequency of the face seeking flies.

STUDY LIMITATIONS

Men were not at home

They were mainly found in the small market centers where they idle as they chew miraa. They wanted to be examined there before giving us the go ahead to examine their families. This is reflected by the low percentage of adult males examined as compared to females.

Unpredictable weather

It rained on several occasions in some regions thus facial hygiene might have been greatly enhanced during these occasions. Some parents washed their children's faces prior to examination when word went round that this was one of the things we were examining.

Free medication

Some people only wanted the free medication (TEO) while others wanted to be bribed before being examined. Males were the major culprits and some denied us consent not just to examine them, but also their wives and children. Other households were randomly selected when we encountered this problem.

Hostility

In some areas especially where there was local brew, we faced resistance. In such households the males would decline to be examined. We later learnt that it was because our guides were either the sub-chief or local headmen who signify the local administration.

Schools

It is worth to mention that the study was not done over the holidays. Attempts were made to trace those children to their schools if they belonged to the sampled households. This led to disruption of the schools learning program and examining other children and even some teachers, thus further delays.

Study difficulties

Rough terrain

Nyambene hills are very many and steep and some households were difficult to access. A functional four wheel drive car was essential but the vehicle I used was old, front wheel drive and constantly broke.

Poor roads

This coupled with the bad terrain made the survey a nightmare.

Time wasting

Understanding of this important exercise in some homes took a lot of explaining and thus time. This led to working until very late to cover the required target for that day. The fact that we were tracing the children to their respective schools or come back to their homes in the evening after they came from school lead to a lot of time wasting also.

Flies

Flies would sometimes land on the examiners faces destructing and slowing the examination. The worry of transporting Trachoma back home was real especially among the males. This led to overuse of the methylated spirit swabs in our possession.

RECOMMENDATIONS

Steps must be taken to tackle the challenges that face the fight against Trachoma in this District if blindness as a result of this disease is to be reduced. SAFE is a WHO strategy to eradicate Trachoma by the year 2020. The same efforts are shared by GET/VISION 2020.

Antibiotics

Mass treatment with antibiotics is recommended in the following sub locations as an intervention measure;

Sub location	prevalence of TF
• Amunju	47.4%
• Anjalu	29.2%
• Antuambui	27.6%
• Ruungu	13.9
• Thaicu	8.3%

- TEO is used in all eye infections as identified in the study. To treat Active Trachoma effectively topical application is required for at least six weeks. This raises a lot of questions on compliance.
- The WHO recommendation of use of Azithromycin as a single dose will improve the compliance in the sub locations where Active Trachoma is a public health problem.

Surgery

- TT is a public health problem in the district and therefore an immediate surgical intervention is required.
- Community eye care workers need to be trained to recognize cases of TT early and to advise the patients to go for surgical intervention(TPR-Bilamellar is recommended)
- More Surgical equipments (kits) should be provided.

Facial hygiene

- PHAST (Participatory Hygiene and Sanitation Transformation) program is in place in all the primary schools and enforced by the public health team. This should be encouraged.
- The free primary school will further help in the fight against Trachoma and therefore the government should not relent in its efforts to provide it especially in this region.
- Water should be provided to schools and homesteads in the drier part of the district.
- Trachoma should be included as one of the health education topics in the schools in the District.

Environmental sanitation

- Digging of refuse pits or incineration of solid waste should be encouraged.
- Use of pit latrines for human waste disposal should be reinforced by either the government or an NGO.

- Animals should be enclosed at least 20 meters away from the houses.

Community participation

- Efforts should be made to involve the community in the fight against Trachoma. This can be done through the local administration.

Continuous Medical Education (CME)

- CME should be held regularly for public healthcare and eye care workers.

Research/further studies

- The prevalence of Trachoma in the remaining sub locations especially in the drier areas should be determined..
- A study should be carried out in the districts surrounding Meru North District especially to the north and south east.

- Evaluation surveys to determine the pattern of Trachoma should be carried out regularly.

REFERENCES

1. Robin Baily, David Mabey. Eradication of trachoma worldwide, *BJO* 1999 Vol.11 Pg 1261-1263
2. Dr. Ibrahim Matende Thesis. The prevalence of trachoma in Shompole location, Kajiado district-2003
3. A.D. Negrel, H.R. Taylor, S. West, Guidelines for the Rapid Assessment for Blinding Trachoma 2001 Pg. 1-4
4. International trachoma initiative, Community Eye Health. 1999 Pg. 1-42
5. Dawson. C .R., Jones B.R., Tarizzo M.L. Guide to trachoma control. 1981
6. Jones BR; The prevention of Blindness from Trachoma. *Trans Ophthalmos Soc UK* 95;16-33, 1975
7. Al-Rifai KM; Trachoma through history. *Int Ophthalmos* 12;9-14, 1988
8. Grayston JT, Wang S.P, Yeh L-J, et al. Importance of reinfection in the pathogenesis of trachoma. *Rev Infect dis* 1985;7;717-25.
9. Mabey DCW, Baily RL, Hurtin YJF. The epidemiology and pathogenesis of trachoma. *Re Med Microbiol* 1992;3:112-9.
10. MacCallan A.F. *Trachoma* .London, Butterworth, 1936 Pg 8-26
11. Dowson, C.R., Jones B.R and Darougar S. Blinding and non-blinding trachoma: assessment of intensity of upper tarsal inflammatory disease and disabling lesions. *Bulleting of the WHO*, 52:279-282 -1975
12. Jones B.R. Changing concepts of TRACHOMA AND ITS CONTROL. Transactions of the ophthalmological society, UK 100, 25-29.

13. Ne'grel D.A. and Prost A [1989] Water, Trachoma and conjunctivitis. *Bulleting of the WHO* 67,9-20.
14. Wilson J.M. and JUNGNER, G. The principles and practice of screening for disease. WHO, 1968 [Public health papers NO.34]
15. World Health Organization/UNICEF. Alma-Ata 1978: Primary health care. Report of the International Conference on Primary health care, Alma-Ata, USSR, 6-12, September, GENEVA, 1978.
16. WHO Technical Report series, NO.518, 1973 [The prevention of blindness: report of a WHO Study Group].
17. Siniscal A.A. Trachoma in Missouri. *Arch Ophthalmol* 42:422-37, 1955
18. Stieren E. Trachoma. A social disease. *Penn Med J* 12:377-81, 1908
19. Stucky J.A.: Trachoma among the natives of the mountains of eastern Kentucky. *JAMA* 61:116-24, 1913.
20. Hallows F.C. Community based action for the control of Trachoma. *Rev Infect Dis* 1985;7:777-82.
21. Sutter E.E, Ballard R.C. Community participation in the control of trachoma in Gazankulu. *Soc Sci Med* 1983;17:1813-7.
22. Dowson C.R., Schachter J, Sallam S, *et al.* A comparison of oral azithromycin with topical oxytetracycline/polymyxin for the treatment of trachoma in children. *Clin Infect Dis* 1997;24:363-8.
23. Shannen K. Allen, and Richard D. Semba. The Trachoma "MENACE" in the United States, 1897-1960. *Survey of Ophthalmology* vol.47, NO.5. 2002. Pg500-8.

24. Baily C: Trachoma survey of its prevalence in the mountain sections of east Tennessee and northern Georgia. Pub Health Rep 29:2417-33, 1914.
25. Prince A.E; Trachoma and the tin wash-basin. Med Surg Reporter 62:195-6, 1890
26. Wilson R.P; Trachoma: A selection of personal Observations and Experiences. Giza Memorial Ophthalmic Laboratory, Report No.14. Cairo, The Laboratory, 1939-1944, Pg24-25.
27. WHO Technical Report series, No330, 1966 [Fourth WHO Scientific Group on Trachoma research: report].
28. Primary Health Care Level management of Trachoma. WHO, 1993, pg 1-42.
29. Harris C.M: Trachoma and some facts concerning its existence in western Pennsylvania. Outlook Blind 4:113-5, 1910.
30. S.P. Mariotti and A. Pruss. The safe strategy. Preventing trachoma. Geneva 2000. Pg.24-36.
31. Murray N.L: Trachoma in South Africa's Afr J Cli Sci 4; 119-203, 1958.
32. Duke-Elder S. Conjunctival diseases. Diseases of the outer eye Part 1. Kimpton, London, 1965: pp 260-299.
33. Emerson P , Lindsay SW, Walraven GEL, *et al*. Effect of fly control on trachoma and diarrhoea. *Lancet*. 1999;353:1401
34. International Eye foundation .Experiences of the Kenya rural blindness prevention project 1981.
35. National Trachoma survey '2004.
36. Meru North District Development Plan. 2002-2008. Ministry of Finance & Planning.
37. 1999 National Census Report, Central Beaureau of Statistics,

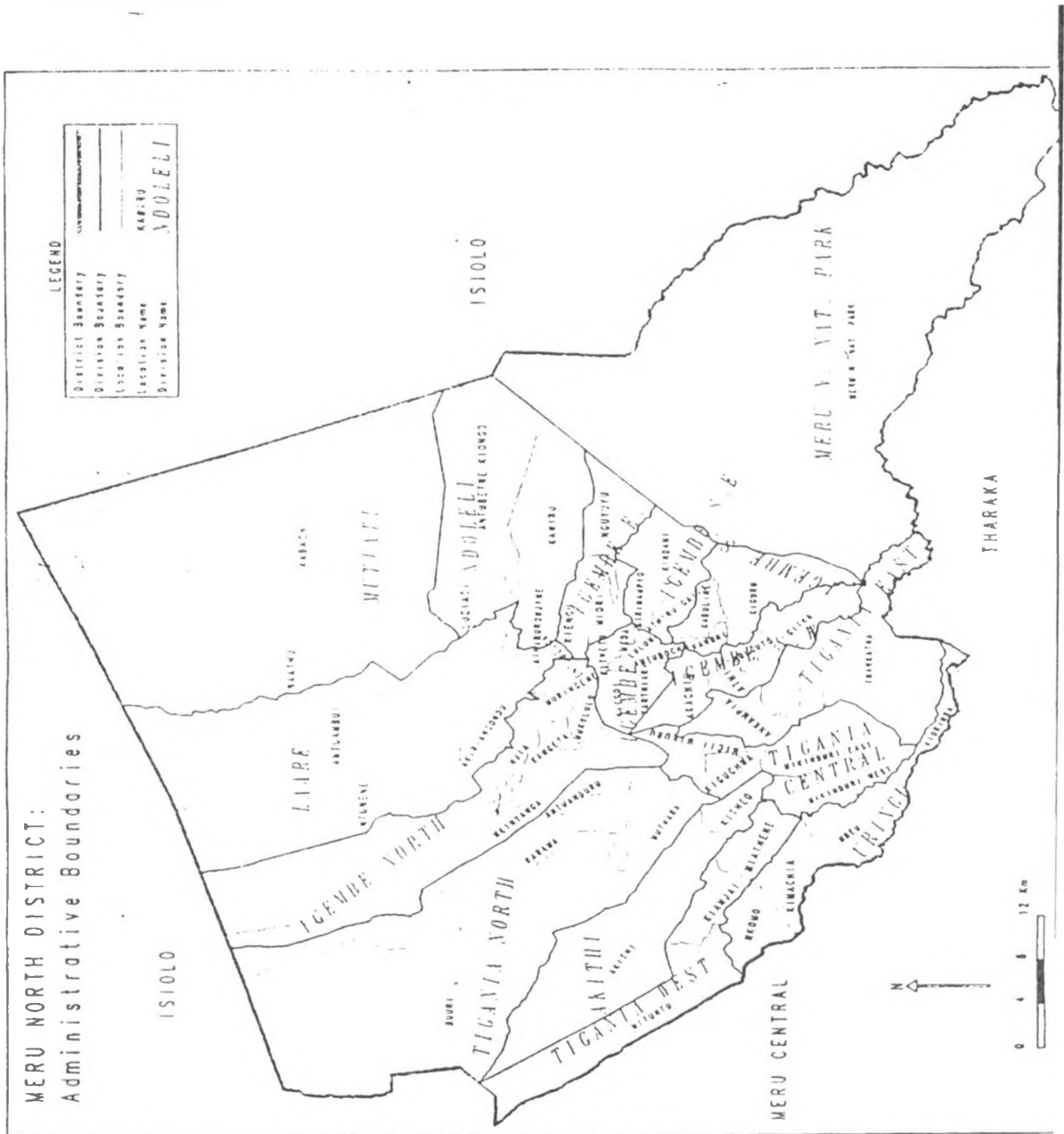
38. iti sapling manual.

APPENDICES

APPENDIX 1

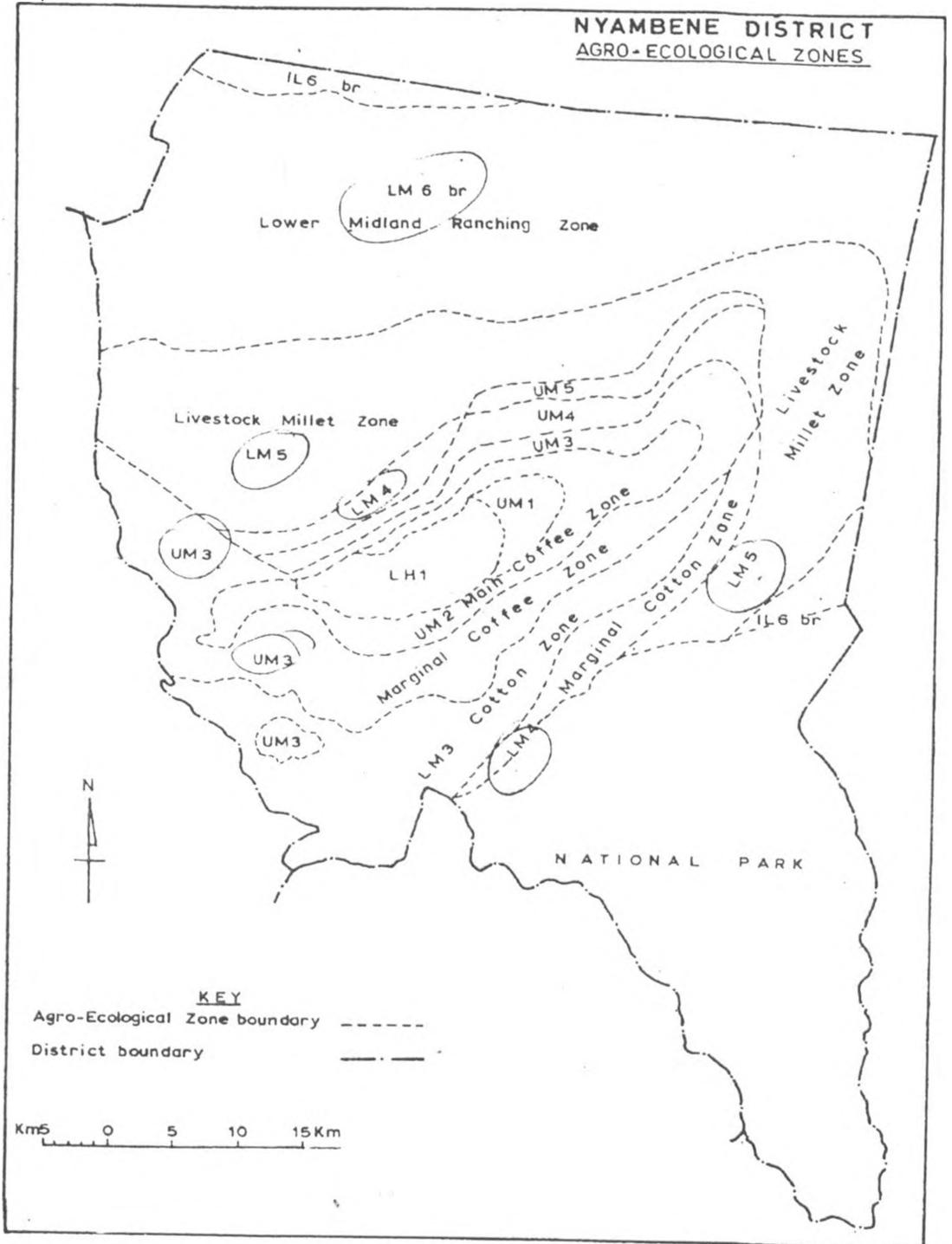
STUDY AREA MAP

Meru North District



AGRO-CONOMIC ZONES

Map No. 3



Prepared by DRSRS

TRACHOMA GRADING CARD

- Each eye must be examined and assessed separately.
- Use binocular loupes (x 2.5) and adequate lighting (either daylight or a torch).
- Signs must be clearly seen in order to be considered present.

The eyelids and cornea are observed first for inturned eyelashes and any corneal opacity. The upper eyelid is then turned over (everted) to examine the conjunctiva over the stiffer part of the upper lid (tarsal conjunctiva).

The normal conjunctiva is pink, smooth, thin and transparent. Over the whole area of the tarsal conjunctiva there are normally large deep-lying blood vessels that run vertically.

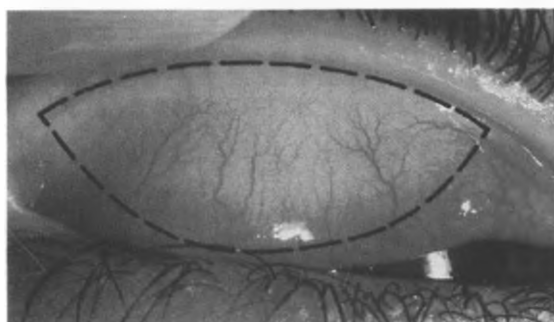
TRACHOMATOUS INFLAMMATION – FOLLICULAR (TF): the presence of five or more follicles in the upper tarsal conjunctiva.

Follicles are round swellings that are paler than the surrounding conjunctiva, appearing white, grey or yellow. Follicles must be at least 0.5mm in diameter, i.e., at least as large as the dots shown below, to be considered.

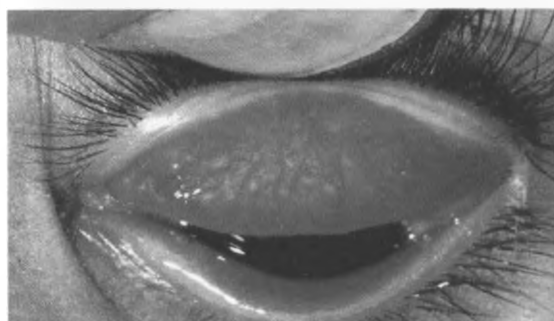


TRACHOMATOUS INFLAMMATION – INTENSE (TI): pronounced inflammatory thickening of the tarsal conjunctiva that obscures more than half of the normal deep tarsal vessels.

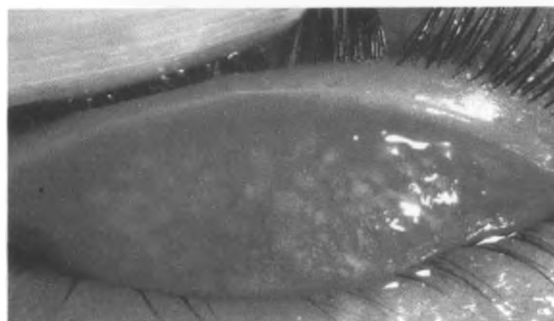
The tarsal conjunctiva appears red, rough and thickened. There are usually numerous follicles, which may be partially or totally covered by the thickened conjunctiva.



Normal tarsal conjunctiva (x 2 magnification).
The dotted line shows the area to be examined.



Trachomatous inflammation – follicular (TF).



Trachomatous inflammation – follicular and intense (TF + TI).

Side 2

TRACHOMATOUS SCARRING (TS): the presence of scarring in the tarsal conjunctiva.

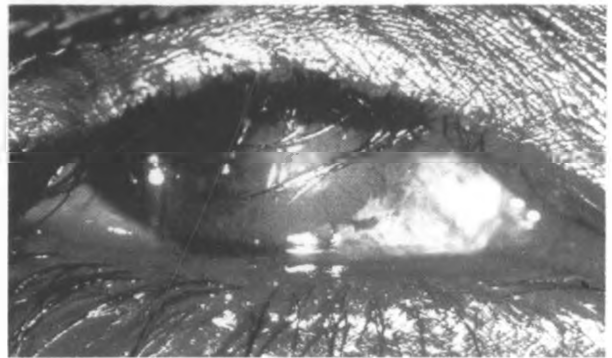
Scars are easily visible as white lines, bands, or sheets in the tarsal conjunctiva. They are glistening and fibrous in appearance. Scarring, especially diffuse fibrosis, may obscure the tarsal blood vessels.



Trachomatous scarring (TS)

TRACHOMATOUS TRICHIASIS (TT): at least one eyelash rubs on the eyeball.

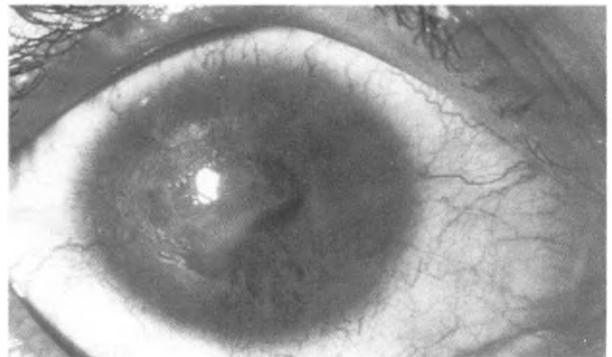
Evidence of recent removal of inturned eyelashes should also be graded as trichiasis.



Trachomatous trichiasis (TT)

CORNEAL OPACITY (CO): easily visible corneal opacity over the pupil.

The pupil margin is blurred viewed through the opacity. Such corneal opacities cause significant visual impairment (less than 6/18 or 0.3 vision), and therefore visual acuity should be measured if possible.

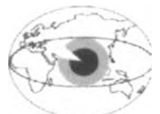


Corneal opacity (CO)

TF:– give topical treatment (e.g. tetracycline 1%).
TI:– give topical and consider systemic treatment.
TT:– refer for eyelid surgery.



**WORLD HEALTH ORGANIZATION
PREVENTION OF BLINDNESS AND DEAFNESS**



Support from the partners of the WHO Alliance for the Global Elimination of Trachoma is acknowledged.

PRINCIPAL RESEARCHER & CO-ORDINATOR

DR.GIDEON N. K. MAKAU

SUPERVISORS

Dr. Dunera Ilako

Dr. K. H.Martin Kollmann

Dr. Jefitha Karimurio

TEAM A

Michael Kathuri	District Public Health Officer (Team leader)
Linus Ndegwa	Lecturer KMTC
Guides/Enumerator Mr.Kinoti	Varies with Area Driver

TEAM B

Samuel Njeru	Ophthalmic Clinical Officer/Cataract Surgeon (Team leader)
Dr.Victor Njom	UON
Mr.mugambi	SPARK DRIVER
Guides/Enumerator	Varies with Area

STATISTICIAN

Antony Kamau AMREF

APPENDIX 4

QUESTIONNAIRE 1

Trachoma Village Identification Form

1. Location: _____ 2. Sub-Location:

3. Name of Assistant Chief: _____

4. Village: _____ 5. Name of Village Elder:

6. Date of visit: _____ 7. Name of
Examiner: _____

8. Estimated population of the village _____

9. Availability of the following facilities in the village:

<i>Facilities</i>	<i>Number</i>
9.1 Primary School	[]
9.2 Market/Trading Centre	[]
9.3 Health Facility by type (Tick)	[]
9.3.1 Dispensary	[]
9.3.2 Health Centre	[]
9.3.3 Others (specify)	[]

Other remarks

QUESTIONNAIRE 2

Trachoma Household Environment Assessment Form

1. Location: _____ 2. Sub – Location: _____

3. Village: _____
4. Household No. _____ 5. Name of Head of Household: _____

6. Date of visit: _____ 7. Name of Examiner: _____

Tick ✓ against each positive observation or response

Main water source

8. How long does it take to fetch water (to and fro)? (Ask) _____
Minutes

Comments [source] _____

Garbage Disposal

9. How far is the household garbage disposed? (Observe)
- | | |
|---------------------------------------|-----|
| 1. Within 20 meters from the house | [] |
| 2. More than 20 meters from the house | [] |
| 3. Scattered all over the compound | [] |

Comments _____

Latrine

10. Is there a functional latrine in the compound? (Observe)
- | | |
|--------|-----|
| 1. Yes | [] |
| 2. No | [] |
11. Is there uncovered human faeces in the compound? (Observe)
- | | |
|--------|-----|
| 1. Yes | [] |
| 2. No | [] |

Comments _____

Flies

12. Is there any child with more than five flies on the face? (Observe) []
1. Yes []
2. No []

Animals

13. Where are animals kept? (Observe) []
1. Less than 20 meters from the house []
2. More than 20 meters []
14. Are the animals enclosed? (Observe) []
1. Yes []
2. No (animals loiter all over the compound) []
15. Are animals ever kept in the house? (Ask) []
1. Yes []
2. No []

UNIVERSITY OF NAIROBI
MEDICAL LIBRARY

QUESTIONNAIRE 3

SAFE strategy evaluation form

RESPONDENT: DISTRICT HEALTH MANAGEMENT TEAM (DHMT)

1. Date of visit: _____

2. Name of Examiner: _____

Health facilities

Distribution of health facilities/division;

Health institution	D1	D2	D3	D4	D5	D6
District hospitals						
Sub-district hospitals						
Health centres						
Dispensaries						
Private clinics						

Human Resources

How many Eye workers are in this district?

Health facility	Ophthalmologists	Ophthalmic clinical officers/Cataract Surgeons	Ophthalmic clinical officers	Ophthalmic Nurses	Community Eye Care workers
District hospitals					
Sub-district hospitals					
Health centres					
Dispensaries					
Private clinics					

6. How many trachoma patients were seen in the District in the last 1 year?

Division	Number seen

Surgery

1. List personnel trained to do Trichiasis surgery?

Working station	Personnel

2. How many training seminars on trichiasis surgery have you held in the last 2 years?

3. Do you carry out Trichiasis surgical outreaches?

1. A. Yes []

2. b.No []

• If Yes,by whom? _____

• How often _____

Number operated in the last one year

Division	Number of patients operated

Antibiotics

5.Which anti-trachoma medications do you stock?[Tick]

_____ Zithromax

_____ TEO

_____ Others (specify)

Personal hygiene

6. Is there a school health education programme encouraging face washing?

3. A. Yes []

4. b.No []

If Yes, by whom? _____

Environmental hygiene

8. What type of community workers do you have? _____

10. To improve sanitation you encourage:[Tick]

- digging refuse pits _____
- incinerating waste _____
- use of latrines _____

11. Do you have a program to encourage digging of pit latrines?

5. A. Yes []

6. b.No []

12. Do you encourage the use of the following [Y/N]

- _____ fly traps
- _____ insecticides
- _____ netting/curtains on doors and windows
- _____ pit latrine lids/covers
- _____ proper waste disposal in market place

QUESTIONNAIRE 4
RURAL HEALTH FACILITIES FORM

RESPONDENT: _____

1. Date of visit: _____
2. Name of Examiner: _____
3. Name of Health centre/dispensary/Hospital _____

Staffing-

Discipline	Number
Ophthalmic clinical officers/Cataract surgeons	
Ophthalmic clinical officers	
Ophthalmic Nurses	
Community Eye care workers	
Public Health technicians	

Buildings/Equipment

Facility	Number
functional theatre	
functional clinic	
Loupes	
Epilation forceps	
Trichiasis surgery kit	

Outreaches

- Number/month _____
- Where are the operations carried out
 - A) Field []
 - B) Hospital []
- Sponsor:[Tick]
 - _____ GOK
 - _____ NGO
 - _____ Community
 - _____ Individual

QUESTIONNAIRE 5

Trachoma Grading

1. Location: _____ 2. Sub Location: _____
 3. Village: _____
 4. Household No. _____ 5. Name of Head of Household: _____

 6. Date of visit: _____ 7. Name of examiner: _____

Tick \checkmark against/fill appropriately.

Name	Age (Yrs)	Sex		#Educat	*Children's Faces		Trachoma grading 0 = None RE = 1, LE = 2, BE = 3					** VA for Adults with TT		Comments	
		M	F		Clean	Dirty	TF	TI	TS	TT	CO	RE	LE		

* For Adults N/A and ** for children N/A
 # Education level achieved: 0 = None, 1 = primary, 2 = Secondary, 3 = College
 * Clean face = No eye and/or nasal discharge on the face

APPENDIX 5

PLATES



PLATE 1: A Muraa tree.



PLATE 2: Miraa plantation



PLATE 3: Children fetching water.



PLATE 4: Children-dirty Faces



PLATE 5: Survey team visiting a school



PLATE 6: A toilet in miraa zone



PLATE 7: Survey team visiting a household



PLATE 8: Domesticated animals.



PLATE 9: Water tank



PLATE10: Idle men chewing miraa



PLATE 11: Tea plantation



PLATE 12: Examination of conjunctiva

UNIVERSITY OF NAIROBI
MEDICAL LIBRARY



PLATE 13: Careful conjunctival Examination