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## Prevalence of trachoma in the area councils of the Federal Capital Territory, Nigeria: results of six population-based surveys

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### ABSTRACT

**Purpose:** The World Health Organization's (WHO's) global trachoma elimination programme recommends mapping of trachoma at district level for planning of elimination activities in affected populations. This study aimed to provide data on trachoma prevalence for the Area Councils of Nigeria's Federal Capital Territory (FCT).

**Methods:** Using the Global Trachoma Mapping Project (GTMP) protocols, in March and April 2014, we conducted a population-based cross-sectional survey in each of the six Area Councils of FCT. Signs were defined based on the WHO simplified grading scheme.

**Results:** 98% to 100% of the targeted households were enrolled in each Area Council. The number of children aged 1–9 years examined per Area Council ranged from 867 to 1248. The number of persons aged ≥15 years examined ranged from 1302 to 1836. The age-adjusted prevalence of trachomatous inflammation—follicular in 1–9-year-olds was <5% in each Area Council. The age- and gender-adjusted prevalence of trichiasis in those aged ≥15 years ranged from 0.0% to 0.3%; two Area Councils (Gwagwalada and Kwali) had prevalences above the 0.2% elimination threshold. The proportion of households with access to improved latrines and water sources ranged from 17 to 90% and 39 to 85% respectively.

**Conclusions:** Gwagwalada and Kwali Area Councils need to perform more trichiasis surgeries to attain the trichiasis elimination prevalence target of 0.2% in persons aged ≥15 years. No Area Council requires mass antibiotic administration for the purposes of trachoma's elimination as a public health problem. All Area Councils need to accelerate provision of access to improved water sources and latrine facilities, to achieve universal coverage.

### KEYWORDS

Trachoma; trichiasis; water and sanitation; GET2020; SDGs; Global Trachoma Mapping Project

## Introduction

Trachoma, a neglected tropical disease,<sup>1</sup> is a chronic conjunctivitis caused by *Chlamydia trachomatis*, and the leading infectious cause of blindness. It accounted for 1.4–3% of the global burden of blindness in 2010.<sup>2,3</sup> To attain global elimination of trachoma by the year 2020 (GET2020), mapping of trachoma is required at district level in areas suspected of being endemic, in order to plan for the implementation of elimination activities.<sup>4</sup> Such prevalence data are also a useful advocacy tool for

engaging relevant stakeholders.<sup>5</sup> The Federal Capital Territory (FCT) of Nigeria had not previously been mapped for trachoma. It is located in the central part of the country and in 2011 had an estimated population of 2,238,751<sup>6</sup> living in six Area Councils (ACs).

This article reports the findings of the Global Trachoma Mapping Project (GTMP)<sup>7,8</sup> in FCT. The objectives of the study were to determine the prevalence of active (inflammatory) trachoma in children aged 1–9 years in each of the six ACs; to

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\*See Appendix.

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determine the prevalence of trichiasis in persons aged  $\geq 15$  years in each of the six ACs; and to assess the prevalence of household-level access to water and sanitation facilities in each of the six ACs.

## Subjects and methods

We conducted a population-based cross-sectional prevalence survey using the GTMP protocol (version 2)<sup>7</sup> in each AC. Fieldwork was conducted in the months of March and April 2014.

### Sample size

For each AC, as for evaluation units elsewhere in Nigeria, we estimated that a sample of 25 households in each of 25 clusters would facilitate assessment of 1019 children aged 1–9 years, allowing for non-response.<sup>7,9–14</sup>

### Ethical considerations

The ethics committee of the London School of Hygiene & Tropical Medicine (LSHTM) (reference 6319) and the National Health Research Ethics Committee of Nigeria (reference NHREC/01/01/2007) granted approval for the study. The FCT Health Services Department granted administrative permission. Consent of participants was obtained and documented in the LINKS Android smartphone app.<sup>7</sup> Trachoma graders cleaned their hands with an alcohol-based gel, between examination of successive persons. Subjects diagnosed with trichiasis were appropriately referred, and 1% tetracycline eye ointment was offered to those with conjunctivitis, including active trachoma.

### Sampling design

A two-stage cluster random sampling design was employed, with probability-proportional-to-size systematic selection used to identify 25 clusters in each AC. In each cluster, 25 households were selected using compact segment sampling. All residents of each selected household aged  $\geq 1$  year who had lived in the area for at least 6 months were enumerated. At each house, the head of the household or another appropriate adult household member was asked questions on access to water and sanitation, using GTMP protocols; the latrine, if present, was inspected.<sup>7</sup> Survey definitions were as described elsewhere.<sup>7</sup> Trachoma was graded using the WHO simplified grading scheme,<sup>15</sup> 2.5 $\times$  loupes, and sun- or torch-light.

## Data management

All collected data were directly entered into an Android phone via the LINKS app, and from there uploaded to the GTMP server. Data were then cleaned and analysed by the GTMP data manager (RW) to determine the prevalences of trachomatous inflammation—follicular (TF) and trachomatous inflammation—intense (TI) in children aged 1–9 years, and of trichiasis in persons aged  $\geq 15$  years. Prevalences of TF and TI were adjusted for age in 1-year age bands, while the prevalence of trichiasis was adjusted for gender and age in 5-year age bands. The trichiasis burden was calculated for each AC as the product of the trichiasis prevalence and the estimated number of resident persons aged  $\geq 15$  years, with the latter determined by multiplying the AC's total population estimate at last census by 0.598<sup>6</sup>. We calculated the confidence intervals for each LGA by bootstrapping, with replacement, 10,000 resamples of 25 clusters; using the adjusted cluster-level proportions of each sign to generate prevalence estimates for each resample; and fixing the 2.5th and 97.5th centiles of the distributions of estimates as the lower and upper confidence interval bounds, respectively.

## Results

The response rate for households surveyed ranged from 98% in Abaji to 100% in Abuja Municipal. The number of children aged 1–9 years examined per AC ranged from 867 in Gwagwalada to 1248 in Abaji. The number of persons aged  $\geq 15$  years examined ranged from 1302 in Bwari to 1836 in Abaji.

### Prevalence of trachoma

The age-adjusted prevalence of TF and TI in children aged 1–9 years and the age- and gender-adjusted prevalence of trichiasis in persons aged  $\geq 15$  years, are shown for each AC in Table 1. The prevalence of TF was  $< 5\%$  in each AC, while the prevalence of trichiasis was  $\geq 0.2\%$  only in Kwali (0.2%) and Gwagwalada (0.3%) (Figures 1 and 2).

### Prevalence of access to water and sanitation

Table 2 shows water and sanitation coverage in each AC. Residents of Kuje had the worst access to improved water sources (39% of households) and latrines (17% of households). For 28% of households in Abaji, the nearest improved or unimproved source of washing water to which they had access was further than one kilometer from the residence.

**Table 1.** Numbers of enumerated individuals examined, who refused examination or were absent, and adjusted trachoma prevalences, by Area Council, Federal Capital Territory, Nigeria, Global Trachoma Mapping Project, 2014. (TF = trachomatous inflammation—follicular; TI = trachomatous inflammation—intense).

Area Council	Estimated 2011 population	Examined (n)			Refused (n)			Absent (n)			Adjusted trachoma prevalence (%) (95% CI)			Trichiasis in ≥15-year-olds <sup>b</sup>
		1–9 year-olds	≥15-year-olds	1–9 year-olds	≥15-year-olds	1–9 year-olds	≥15-year-olds	1–9 year-olds	≥15-year-olds	TF in 1–9-year-olds <sup>a</sup>	TI in 1–9-year-olds <sup>a</sup>	TI in 1–9-year-olds <sup>a</sup>		
Abaji	93,359	1248	1836	28	19	8	149	0.5 (0.0, 1.3)	0.2 (0.0, 0.3)	0.0 (0.0, 0.1)	0.2 (0.0, 0.3)	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	
Abuja Municipal	1,235,877	975	1600	4	4	1	152	0.5 (0.1, 0.9)	0.3 (0.0, 0.7)	0.1 (0.0, 0.1)	0.3 (0.0, 0.7)	0.1 (0.0, 0.1)	0.1 (0.0, 0.1)	
Bwari	365,007	820	1302	27	25	21	347	0.1 (0.0, 0.4)	0.2 (0.0, 0.5)	0.1 (0.0, 0.2)	0.2 (0.0, 0.5)	0.1 (0.0, 0.2)	0.1 (0.0, 0.2)	
Gwagwalada	252,522	867	1430	9	6	4	221	0.5 (0.1, 1.2)	0.0 (0.0, 0.0)	0.3 (0.0, 0.7)	0.0 (0.0, 0.0)	0.3 (0.0, 0.7)	0.3 (0.0, 0.7)	
Kuje	154,796	1177	1786	28	18	46	239	0.2 (0.1, 0.5)	0.1 (0.0, 0.4)	0.1 (0.0, 0.2)	0.1 (0.0, 0.4)	0.1 (0.0, 0.2)	0.1 (0.0, 0.2)	
Kwali	137,190	838	1398	16	34	7	358	0.7 (0.1, 1.4)	0.0 (0.0, 0.0)	0.2 (0.1, 0.4)	0.0 (0.0, 0.0)	0.2 (0.1, 0.4)	0.2 (0.1, 0.4)	

<sup>a</sup>Adjusted by age in 1-year bands

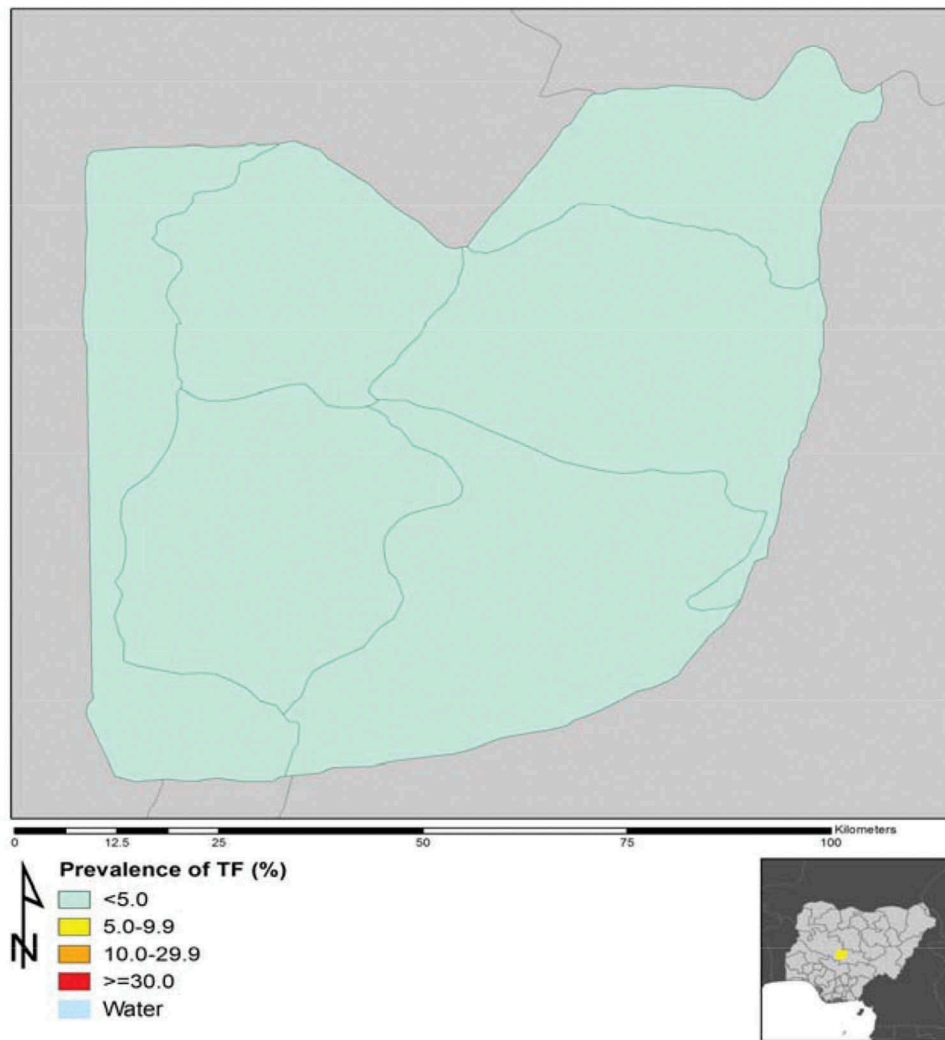
<sup>b</sup>Adjusted by age and gender in 5-year bands  
CI, confidence interval

## Discussion

The targeted sample size for determining the prevalence of TF was only obtained in two of the six AC-level surveys that we report here (Table 1), because the mean number of children resident per household was lower than anticipated on the basis of available census data. However, for each AC, the entirety of the 95% confidence interval for the TF prevalence estimate in 1–9-year-olds was well below the elimination threshold of 5%<sup>16</sup>, (Table 1), and point estimates for prevalence (rather than upper bounds of confidence intervals) are generally accepted to be the figures used for decision-making. We therefore feel justified in saying that we have demonstrated the absence of levels of active trachoma in Nigeria's FCT that would be considered significant to public health, and that no AC requires mass drug administration of antibiotics<sup>17</sup> for the purposes of eliminating active trachoma.

The urban and sub-urban nature of the FCT population, with its relatively high standard of living, may partly explain the paucity of active trachoma in these surveys. There also seems to be limited risk of infection being introduced from adjacent states: our findings in FCT are comparable to those from GTMP-supported surveys in neighboring Kaduna<sup>12</sup> and Niger<sup>13</sup> States, in which the majority of Local Government Areas (LGA) (including all those sharing borders with FCT) had TF prevalences contemporaneously estimated to be <5%. In Nasarawa State, which borders FCT to its east and south, surveys conducted in 2007–2008 generated TF prevalence estimates for 13 LGAs, eight of which were ≥5%, including four that were ≥10%.<sup>18</sup> However, the SAFE strategy<sup>19</sup> has subsequently been implemented where required in Nasarawa, and unpublished data suggest that TF prevalences there are now considerably lower than in 2007–2008. In short: in this part of Nigeria, active trachoma appears to be controlled or coming under control.

The trichiasis burden in FCT that we estimated was generally low. Though the confidence intervals of our prevalence estimates are quite wide, on the basis of our data, two of six ACs (Gwagwalada and Kwali) need to provide trichiasis surgical services to reach the elimination prevalence target of <0.2% unmanaged trichiasis in persons aged ≥15years.<sup>16</sup> In the absence of existing community-based trichiasis surgery services and with only one trained trichiasis surgeon in FCT, this will require a specific initiative. There is a need to train and certify at least two other trichiasis surgeons from the pool of eighteen ophthalmic nurses available in FCT. In addition to surgeon training and certification, FCT



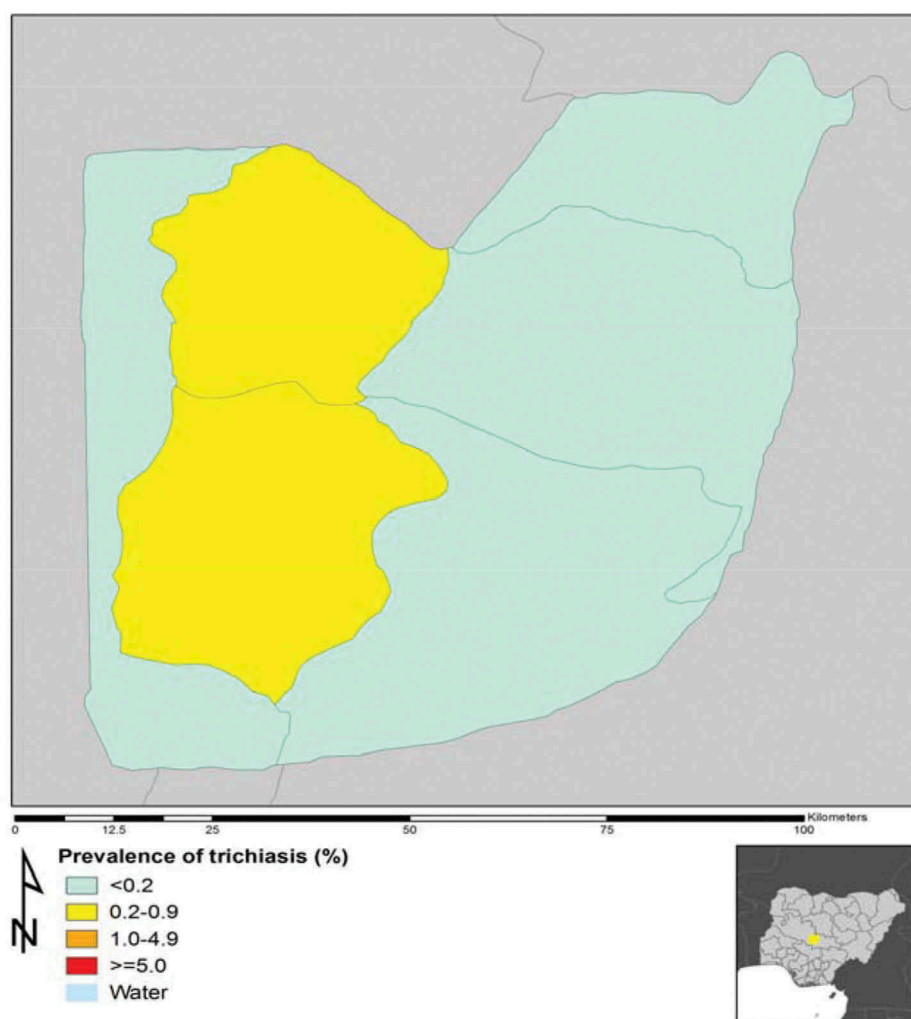
**Figure 1.** Prevalence of trichomatous inflammation-follicular (TF) in 1–9-year-old children, by Area Council, Federal Capital Territory, Nigeria, Global Trachoma Mapping Project, 2014.

Health Services and its partners should work with primary eye care workers to determine the most effective and efficient means of undertaking community-based screening, counselling and referral of trichiasis patients to certified surgeons.<sup>14,20–23</sup> A participatory planning meeting could be convened to review disease prevalence, service awareness and service utilization, leading on to the development of a collaborative plan to address the trichiasis burden.

Despite the relatively low prevalence of trachoma, our data highlight the fact that access to water and latrine facilities in and around Nigeria’s capital city is inadequate, such that even the residents of Abuja Municipal AC do not have 100% access to these basic services. Though the prevalence of access was highest in Abuja Municipal, the absolute number of households that still lack access to improved water sources or latrines was also highest there of any of the six ACs included in this study (Table 3). From a

percentage coverage point of view, Kuje AC lagged furthest behind the others, and particular attention will need to be paid towards improving services there.

It’s important to note that “access to an improved water source” and “access to a latrine” are relatively low bars to clear; the situation with respect to access to *safe and reliable services on the household premises* would be considerably worse. This presents a major challenge for attainment of the Sustainable Development Goals,<sup>24</sup> for which access to “safely managed” water and sanitation services is the target. Government institutions responsible for WASH should take the lead to convene periodic participatory planning for the sector, inclusive of all stakeholder groups. This should be driven by evidence, including consideration, for example, of the data presented here, in order to identify the most vulnerable people.<sup>25</sup> This may lead to delineation of sources



**Figure 2.** Prevalence of trichiasis in adults, by Area Council, Federal Capital Territory, Nigeria, Global Trachoma Mapping Project, 2014.

**Table 2.** Household-level water and sanitation coverage by Area Council, Federal Capital Territory, Nigeria, Global Trachoma Mapping Project, 2014.

Area Council	Households assessed (n)	Proportion of households (%)		
		Access to improved washing water source	Washing water source in yard or within 1km	Access to improved latrine
Abaji	611	44	72	39
Abuja Municipal	625	85	99	90
Bwari	617	77	85	76
Gwagwalada	621	70	84	56
Kuje	623	39	86	17
Kwali	624	71	84	23

of finance and community strengths that could promote household ownership and use of latrines, as well as exploration of roadblocks that hinder such a process.<sup>26</sup> It could also lead to consensus on how to target efforts and how to better coordinate those efforts amongst implementers. Alongside this work, water provision at community level may be promoted and supported.

This study has revealed that active trachoma is not a public health problem in FCT and that relatively few trichiasis surgeries are needed to attain the threshold prevalence for trichiasis elimination in each AC. There is a need to intensify efforts to improve sustainable access to safe water and sanitation, not only to ensure that active trachoma elimination will be maintained, but to meet human

**Table 3.** Recommended actions by Area Council, Federal Capital Territory, Nigeria, Global Trachoma Mapping Project, 2014.

Area Council	Regular households (n)	Households in need of improved water sources (n)	Households in need of latrines (n)	Trachiasis backlog	No. of individuals needing to be managed for trichiasis to achieve elimination prevalence <sup>a</sup> (n)	Antibiotic treatment for active trachoma.
Abaji	10,142	5,679	6,187	17	0	Routine health care
Abuja	179,674	26,951	17,967	443	0	Routine health care
Municipal						
Bwari	50,109	11,525	12,026	240	0	Routine health care
Gwagwalada	32,071	9,621	14,111	407	>155	Routine health care
Kuje	17,092	10,426	14,186	74	0	Routine health care
Kwali	14,504	4,206	11,168	180	>43	Routine health care

<sup>a</sup> Assuming no incident trichiasis

rights, and to prevent a range of other water-related health issues.

### Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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## Appendix

The Global Trachoma Mapping Project Investigators are: Agatha Aboe (1,11), Liknaw Adamu (4), Wondu Alemayehu (4,5), Membere Alemu (4), Neal D. E. Alexander (9), Ana Bakhtiari (2,9), Berhanu Bero (4), Simon J. Brooker (1,6), Simon Bush (7,8), Brian K. Chu (2,9), Paul Courtright (1,3,4,7,11), Michael Dejene (3), Paul M. Emerson (1,6,7), Rebecca M. Flueckiger (2), Allen Foster (1,7), Solomon Gadisa (4), Katherine Gass (6,9), Teshome Gebre (4), Zelalem Habtamu (4), Danny Haddad (1,6,7,8), Erik Harvey (1,6,10), Dominic Haslam (8), Khumbo Kalua (5), Amir B. Kello (4,5), Jonathan D. King (6,10,11), Richard Le Mesurier (4,7), Susan Lewallen (4,11), Thomas M. Lietman (10), Chad MacArthur (6,11), Colin Macleod (3,9), Silvio P. Mariotti (7,11), Anna Massey (8), Els Mathieu (6,11), Siobhain McCullagh (8), Addis Mekasha (4), Tom Millar (4,8), Caleb Mpyet (3,5), Beatriz Muñoz (6,9), Jeremiah Ngondi (1,3,6,11), Stephanie Ogden (6), Alex Pavluck (2,4,10), Joseph Pearce (10), Serge Resnikoff (1), Virginia Sarah (4), Boubacar Sarr (5), Alemayehu Sisay (4), Jennifer L. Smith (11), Anthony W. Solomon (1,2,3,4,5,6,7,8,9,10,11), Jo Thomson (4); Sheila K. West (1,10,11), Rebecca Willis (2,9).

Key: (1) Advisory Committee, (2) Information Technology, Geographical Information Systems, and Data Processing, (3) Epidemiological Support, (4) Ethiopia Pilot Team, (5) Master Grader Trainers, (6) Methodologies Working Group, (7) Prioritisation Working Group, (8) Proposal Development, Finances and Logistics, (9) Statistics and Data Analysis, (10) Tools Working Group, (11) Training Working Group.