Short Report: Comparing the Effectiveness of Shared versus Private Latrines in Preventing Trachoma in Rural Tanzania

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Abstract. Sharing latrines is common in sub-Saharan Africa with anecdotal accounts suggesting a link between water-, sanitation-, and hygiene-related disease and poorly maintained communal latrines. This study examines this link by assessing the association between shared latrines compared with private latrines and risk of trachoma. In 2007, as part of a larger case-control study, we conducted a sub-study on latrine sharing in 594 households (92 cases, 502 controls) in seven rural Tanzanian communities. Case households were defined by having a child with clinical signs of trachoma. Latrine use was associated with a decreased risk of trachoma and there was no difference in risk between households using shared compared with private latrines (adjusted odds ratio = 0.95 [95% confidence interval = 0.55–1.67]). This study emphasizes the need to promote latrine use, which can be facilitated through latrine sharing in resource scarce areas, for prevention of trachoma.

Understanding the relationship between sanitation practices and related diseases is important for developing effective strategies that address both access to sanitation and health outcomes.¹ Trachoma, the world's leading cause of preventable blindness,² is particularly suited to sanitation studies. The disease is transmitted both directly and through mechanical transport by eye-seeking flies that breed in feces, preferring those of human origin.^{3,4} Latrines allow for the safe removal of human feces from the environment, thereby eliminating fly breeding material and potentially blocking mechanical transmission.⁵

Latrine use is associated with a decreased risk of trachoma in various sub-Saharan African countries.^{6,7} However, the practice of latrine sharing and the effect on disease remains largely undocumented. Assessing latrine sharing and trachoma in sub-Saharan Africa is important given that an estimated 18% of individuals in the region use a shared latrine.⁸ The widespread use of shared latrines combined with a high prevalence of trachoma in the region⁹ provided the motivation to conduct this study. The objective is to compare the effectiveness of shared latrines to private latrines in preventing risk of trachoma in rural Tanzania. We examined households that share latrines as a single entity and grouped them into categories based on the number of households sharing latrines. We hypothesize that latrine sharing, especially when it involves many households, could lead to inadequate maintenance and overuse, thereby diminishing the association of latrines with decreased risk of trachoma.

Study area and household selection. The study was conducted in Kongwa District, a rural area located in Dodoma Region, central Tanzania. The District provided the opportunity to select case and control households based on the clinical status of children as determined by the Kongwa Trachoma Project (KTP). Conducted from 2006 to 2008, the focus of the KTP study was to study the prevalence of trachoma in children 1–5 years of age in villages enrolled in the Tanzania National Trachoma Control Program. The larger KTP study has been described in detail elsewhere.¹⁰ From

randomly selected households, one child, referred to as a sentinel child, was chosen for evaluation of clinical trachoma by trained KTP staff. Children were examined for having signs of trachomatous inflammation-follicular (TF) and/or trachomatous inflammation-intense (TI), hereafter referred to as active trachoma, based on the World Health Organization (WHO) simplified grading scheme.¹¹

The current study was carried out between June and November of 2007 in seven villages. It is a subset of a larger sanitation and trachoma study conducted in the same District.¹² In this sub-study, all households having a sentinel child with clinical signs of active trachoma were selected as case households. Control households were then randomly selected from the remaining KTP surveyed households until 90 households were chosen in each village. In total, 630 households were identified and 593 surveys were completed (92 cases and 501 controls) for a response rate of 94%.

Household health and sanitation survey. Trained local survey enumerators conducted an oral household survey in Kiswahili. Enumerators were masked to the disease status of the households and the specific objectives of the study to minimize interviewer bias. The primary independent variable of interest in this study concerned sanitation sharing practices of households that use latrines. Latrine use was based on where adults in the survey households most frequently defecate. All households where adults did not regularly use a latrine were classified as practicing open defecation and not included in this analysis. Information was also collected on other sanitation indicators and socio-demographic characteristics that could be potential confounders.

Four indicators were used to determine household wealth. These were ownership of a radio, bicycle, cellular phone, and iron sheet roof that completely covered the house. Weighted wealth scores for each household were calculated by principal components analysis (PCA).¹³ On the basis of the scree plot, the first two components were retained, which together account for 68% of the variance of wealth among all households within the study. The weights from these two components were used in the logistic regression analysis as outlined below.

Data analysis. Statistical analyses were conducted using SAS version 9.0 (SAS Institute Inc., Cary, NC). To control for potential confounders, multivariable models included all

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household socio-demographic and sanitation factors that were associated with case-control status at the 0.20 level. These included level of education achieved, household wealth, mean number of minutes spent gathering water, cattle ownership, presence of garbage pit, and number of children less than 10 years of age in the household. Logistic regression modeling was performed using generalized estimating equation (GEE) techniques (the GENMOD procedure in SAS) to account for clustering of household responses within villages.

Ethical clearance. Oral informed consent was obtained from all households that participated in the study. The protocol for the study was approved by the Tanzanian National Institute for Medical Research (NIMR), the Tanzanian Commission for Science and Technology (COSTECH), and the Yale University Human Investigation Committee (HIC). Local research clearance was granted by Kongwa District officials and village government committees.

The results indicate latrine sharing is common, and there is no significant difference between use of private and shared latrines on risk of trachoma as measured in small children (Table 1). Latrine sharing is practiced by 48.6% of cases and 47.0% of controls. Using a shared latrine, compared with a private facility, does not significantly alter risk of trachoma (adjusted odds ratio [OR] = 0.95 [95% confidence interval (CI): 0.55–1.67]). Of all latrine sharing households, the largest proportion shares a facility with just one neighboring household (20.0% cases, 23.7% controls). The maximum number of households sharing a latrine was nine. However, sharing among five or more households is rare (15 instances) and, therefore, these were grouped in the category of “four or more households sharing a latrine.” When we examined the association between the number of households sharing a latrine and trachoma, we did not find that an increase in the number of households sharing was associated with an increase in the odds of trachoma (Table 1). Although not the objective of this study, it is important to note that latrine use was high and, among all seven villages, 87.4% of households (76.1% cases, 89.4% controls) use latrines. Furthermore, latrine use was associated with a decreased risk of trachoma in small children (adjusted OR = 0.56 [95% CI: 0.32–0.98]).

Our results indicate that shared latrines provide as much protection compared with private latrines in regard to risk of trachoma. Furthermore, the number of households sharing a latrine does not significantly alter the association. This finding contradicts our hypothesis of a decreasing protective effect of latrines with an increasing number of households sharing a latrine.

We did not find evidence in this study to support accounts that compared with private latrines; shared latrines may be less effective in protecting against and even increase risk of disease. For example, in Ghana public latrines tend to be dirty and squalid and are believed to cause ill health,¹⁴ whereas in South Africa, government sponsored communal latrines often fall into disrepair.¹⁵ Even with four or more houses using the same facility, our study indicates that shared latrines were as protective as private latrines against risk of trachoma.

Our finding agrees with research in The Gambia that did not find a difference between private and shared latrines on risk of trachoma.¹⁶ The comparable effect may be the result of similar maintenance and quality of private and shared latrines in rural areas. This research and The Gambia study took place in rural African communities where, in contrast to urban areas, there is a greater sense of collective accountability that could serve to foster maintenance of both private and shared latrines.¹⁷ This may be especially true in Tanzania, where direct familial links among rural households are common and ideologies stressing the value of communalism are still strong in many villages. Even if differences in maintenance and quality exist between private and shared latrines, the key function of latrines in preventing trachoma may simply be removing feces and thus the breeding material of *Musca sorbens* from the environment.

In summary, this study provides new evidence on the value of shared latrines in preventing risk of trachoma. It also possibly suggests that in rural areas in sub-Saharan Africa, rather than embarking on expensive latrine programs that seek to provide facilities to every household, facilitating shared latrine use and maintenance within groups of nearby households may be a more effective use of limited sanitation and public health funds. Subsequently, once communities and households have the economic and technical capacity to build and maintain private latrines, additional facilities could be constructed. Achieving the global target for access to sanitation will depend on using local approaches, including latrine sharing, which in turn will contribute to the global elimination of blinding trachoma.

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TABLE 1
Association between latrine sharing and the risk of trachoma among latrine users*

Variable	Case number (%)†	Control number (%)	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)‡	P value
Latrine type						
Private latrine	36 (51.4)	238 (53.0)	1			
Shared latrine	34 (48.6)	211 (47.0)	1.05 (0.64–1.73)	0.84	0.95 (0.55–1.67)	0.86
Sanitation practice§						
Private latrine	36 (51.4)	238 (53.0)				
2 houses sharing	14 (20.0)	106 (23.7)	0.89 (0.47–1.70)	0.73	0.77 (0.37–1.56)	0.46
3 houses sharing	13 (18.6)	73 (16.2)	1.19 (0.75–1.90)	0.47	1.13 (0.74–1.73)	0.56
4 or more houses sharing a latrine	7 (10.0)	32 (7.1)	1.49 (0.60–3.2)	0.44	1.21 (0.52–2.8)	0.66

* All odds ratios (OR) are adjusted for clustering by village using the Genmod procedure.

† Refers to households with a child who has trachomatous inflammation-follicular (TF) or TF/trachomatous inflammation-intense (TI) as determined by the WHO Grading Scale (≥ 5 follicles).

‡ Adjusted for all significant variables where $P > 0.20$ (education, household wealth, time to access water, cattle ownership, presence of garbage pit, and number of children < 10 years of age in the household).

§ Percentages do not add to 100 because of rounding and missing survey responses.

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