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Controlling Blinding Trachoma in the Egyptian Delta: Integrating Clinical, Epidemiological and Anthropological Understandings

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Trachoma is a leading cause of preventable blindness in the world. The disease is hyperendemic in rural Egypt, where more than 75% of children show signs of having had at least one episode of infectious trachoma during the first year of life. Earlier anthropological and epidemiological observations suggested that trachoma prevalence would decrease if children had their faces washed with soap and water at least once each day. We conducted a community-based intervention to increase face washing in order to control trachoma. In this paper we describe the overall design of this intervention trial and discuss how we integrated anthropological methods and ethnographic data into the design of this successful multi-disciplinary, cross-cultural project to prevent trachoma.

Trachoma is among the most prevalent infectious eye diseases in the world. In 2000 it was responsible for an estimated 6.75 million cases of blindness, or 15% of all cases of blindness in the world (World Health Organization 2004, p. 4). Active trachoma is largely a disease of children, yet its sequelae are mainly seen in adults. Because the villages in the rural Egyptian Delta have a preponderance of children already exposed to trachoma, one estimate is that by 2020 the number of blind in the Egyptian Delta will be 868,000, a crude blindness rate of 3.2% (Courtright *et al.* 1989, p. 539).

When eye problems are recognized in Egyptian Delta villages the treatment options are selected by the villagers who use a decision calculus that incorporates indigenous

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beliefs about eye disease. In these villages parents rarely perceive the need for trachoma treatment unless there is a severe episode of purulent bacterial conjunctivitis or corneal ulceration. Moreover, in the local beliefs about eye disease the trachomatous conjunctivitis of childhood is not linked with the occurrence of painful, inturned eyelashes in adult life (Lane 1987; Lane *et al.* 1993; Mikhail *et al.* 1989).

Researchers have long suggested that social factors affect the prevalence of trachoma and have suggested increased face washing and latrine use as protective. Research conducted in the Egyptian Delta in 1985 and 1987 provided some systematic evidence that (1) face washing of children with soap and water and (2) latrine ownership are associated with lower rates of trachoma in endemic areas and may thus protect young children from severe or moderate intensity trachoma (Courtright *et al.* 1991; Lane 1987). This understanding is now part of the SAFE (Surgery, Antibiotics, Facial Cleanliness, Environmental Change) strategy for the possible elimination of trachoma (World Health Organization 2004, p. 45)

The development of the SAFE strategy was based on a variety of evidence (see, Emerson *et al.* 2000; West *et al.* 1991; West *et al.* 1995). This paper describes one aspect of a research program that contributed to that evidence base (see, Dawson *et al.* 1993, Dawson *et al.* 1997; Rubinstein *et al.* 1992). In this paper we have three largely descriptive goals. First, we describe briefly the overall design of this intervention trial. Second, we discuss one way in which we have integrated anthropology into the design of a multi-disciplinary, cross-cultural project to prevent trachoma. Finally, we report some of the results of the intervention, and comment on how integrating anthropological methods and ethnographic understanding helped it succeed. Before doing this, however, we briefly review the nature of infectious trachoma in the Egyptian Delta.

Trachoma in the Egyptian Delta

Trachoma is a chronic inflammatory infection of the conjunctiva of the eye caused by *Chlamydia trachomatis* (Schachter & Dawson 1978). Ophthalmologists understand trachoma to involve several stages of increasing severity. An early acute phase—trachomatous inflammation–follicular (TF)—includes redness of the conjunctiva and some follicles on the underside of the eyelid. Clinically more severe trachomatous inflammation—intense (TI) is characterized by severe thickening of the conjunctiva and many follicles. When these infectious phases resolve they result in varying degrees of scarring of the upper eyelid, called trachomatous scarring (TS). Trachomatous trichiasis (TT) results when scarring is severe enough to shrink the inside of the eyelid, turning it in upon itself, and pulling the lashes towards the cornea. These lashes, which have the tensile strength of steel, mechanically abrade the cornea, causing corneal opacity (CO) and blindness in some individuals.

Prior trachoma infection confers little immunity against reinfection. The severity of scarring, and the subsequent likelihood of blindness, appears to be an outcome of the duration and severity of inflammatory eye disease, and scarring may increase with reinfection (Grayston & Kuo 1985; West *et al.* 2001). The disease appears to spread

through a variety of forms of personal contact that involve the transfer of ocular secretions from infected persons to healthy individuals. Various studies have suggested that vectors for the spread of the disease include hands, the sharing of towels, wash water, bedding, or flies that seek and feed on the purulent secretions associated with active infection (Marx 1988, 1989).

In the Egyptian Delta there is a high rate of active, infectious trachoma among children. A long-term collaboration between researchers from the University of California, San Francisco and the University of Alexandria has sought ways to control the disease there. In 1985 and 1987 this group conducted a population-based study of trachoma point prevalence in two villages in the Delta region of Egypt, about 40 kilometers outside of Alexandria. In connection with this work, a health ethnography also was conducted in one of the study villages (Lane 1987).

The population of these villages had a preponderance of children. Twenty-five per cent were less than 6 years of age, 50% less than 16, and only 10% of the population was over 50 years of age. The study found that in these villages 75% of infants had ocular infection with the causative agent *Chlamydia trachomatis* at some time during the first year of life. One-third had trachomatous inflammatory disease by age 2 years, and about 60% of those ages 3 and 4 also had trachomatous inflammatory disease. The rates of inflammatory disease declined progressively, so that by age 14 rates of active trachoma were less than 5%, a level found throughout adult life (Courtright *et al.* 1989, p. 537; Habib *et al.* 1985). In rural Egypt affected children typically experience prolonged periods of inflammatory trachoma probably due to reinfection. The episodes of disease and their visually damaging sequela are regarded as part of 'normal' experience (Lane *et al.* 1993).

A Behavioral Intervention for Trachoma Control: General Design Considerations

A behavioral intervention to control trachoma had to meet three constraints. First, any reduction of the risk for active trachoma had to be attributable to the specific effect of the intervention. Second, in the intervention village, a face washing intervention should reduce risk for active trachoma by one-third to one-half. Third, the intervention must be done at a village-wide level.[1]

Following a survey of the Governorate, we selected four study villages. The selection was based on geographic and administrative separation (there was no overlap between the village schools or mosques or markets, and they were far enough apart to rule out casual interaction between villagers), evidence that each had a sufficient number of children age 10 years and younger to meet sample size requirements, and apparent equity in socio-environmental characteristics, such as water supply and housing stock. The four villages selected were randomly designated as the Pilot Village, the Intervention Village, the Hawthorne Village, and the Secular Control. Their functions in the study design are as follows.

The Pilot Village (Gamileya)[2] was reserved for pilot studies and standardization trials for all questionnaires, clinical examinations and observational instruments. The Intervention Village (El Youni) was the subject of a health education campaign to

increase the number of times per day that young children in the village have their faces washed with soap and water.

In order to evaluate the specific effects of the face washing intervention it is necessary to control for the general effect of providing any health intervention to the village (for a discussion of the 'Hawthorne effect', see, Homans 1963). Therefore, a second health intervention, focusing on nutrition—which would have no effect on trachoma status in the village—strictly parallel to the face washing intervention in effort and attention given to the village was conducted in the Hawthorne Village (Abu Hafla).

Finally, in order to account for changes in the prevalence of trachoma in the area over time, in the Secular Control Village (Kafr) all surveys and clinical examinations were carried out, but no special health education intervention was conducted.

Study Components

Every data collection procedure relies on a particular way of organizing and interpreting data while discounting other possible approaches. Since Campbell and Fiske (1959) published their now classic article on the use of the 'multitrait–multimethod matrix', it has become a standard methodological prescription that in order to achieve internal and external validity in our studies—especially in qualitative studies—it is important to use multiple data collection methods, preferably multiple times. This cross-checking helps to ensure a level of confidence in our results that would otherwise be lacking (Naroll & Cohen 1970; Pelto & Pelto 1978; Scrimshaw & Hurtado 1987; Werner & Schoepfle 1987a,b).

Since Campbell and Fiske (1959), the importance of using multiple methods with multiple iterations has been refined and elaborated depending upon the problem being investigated, and has been discussed under a variety of labels, including: 'convergent validation' (LeVine 1981); 'minimal inclusion' (Rubinstein *et al.* 1984); or simply methodological pluralism (Miles & Huberman 1984). The importance of methodological triangulation is well acknowledged. In sociomedical research, the best form of triangulation uses information from several levels of analysis (Rubinstein *et al.* 2000). In the intervention trial reported here we achieved triangulation by integrating anthropological, clinical, and epidemiological methods.

The research team's epidemiologists and anthropologists carried out a door-to-door survey of each village. During this survey the male head of each household was asked to respond to a survey instrument seeking socio-environmental and socio-economic information. The female head of each household with children aged 10 years or younger was asked to respond to an epidemiological questionnaire, described in detail below. The questionnaire was designed based on the results of the earlier health ethnography conducted by our team and it was structured following ethnographic elicitation techniques, and focused on beliefs and practices relating to eye disease. The results of this survey were used to design the face washing intervention and to provide baseline information about eye-related knowledge in the village.

No single ethnomedical category glosses to the Western nosological category of trachoma. Rather, each of the 'stages' of trachoma is seen as a separate disease with

distinct etiologies and treatments. The ethnomedical categories are largely descriptive of changes in the appearance and feeling of the eyes (see Lane 1987, pp. 137–141). There is no one-to-one correspondence between ethnomedical terms and Western diagnosis. Several of these overlap, however, and gloss roughly as follows: TF and TI ↔ *lahmia* (roughly meaning 'meaty'), TS ↔ *bitshak* (roughly, 'a feeling of sand under the upper lid, after exposure to drafts'), TT ↔ *sha'ra* ('eyelashes turning inward'), *gifn makfi* (meaning, 'the eyelid is severely turned inward'), and CO ↔ *nuqta bayda* (meaning, 'white spot'). Knowledge of eye disease generally, and of the ethnomedical categories we associate with trachoma, is not widespread among villagers. Nor do they readily know the Egyptian Arabic term for trachoma, *ramad hubaybi*. In the initial survey for the intervention only one mother of 261 interviewed offered *ramad hubaybi* in response to the 'mini tour question' about eye problems, and slightly fewer than 9% of mothers interviewed knew the term when it was offered to them.

In order to provide a cross-check on the self reports made by mothers in response to the questionnaire, face washing and related behaviors were observed in a subsample of 15 households in El Youni (the Intervention Village) and in Abu Hafla (the Hawthorne village). The time allocation observation method was used by a trained observer who spent six hours in each of the 30 households.

Following the surveys and observation, a team of ophthalmologists conducted clinical examinations for trachoma status of all children aged 10 years and younger. Observations were made to determine if the child had nasal discharge or flies adhering to his/her face at the time of the exam. Following the examination of all children aged 10 and younger, a sample of 15 'trachoma families' was selected in El Youni and Abu Hafla. These 'family studies' were intended to provide a check on the distribution of the disease relative to age in the village populations. In these families, an anthropologist carried out structured observation studies during the course of randomly selected days.

Taken together the census, demographic, behavioral, clinical, and microbiological data gathered in advance of the intervention provided baseline information about the villages in which the trial was conducted and informed the final design of the intervention. Each of these components was repeated following the intervention in order to provide post-test evaluation of the trial.

Intervention Design

Content of health education messages. Patterns of hygiene and disease in the villages of the Egyptian Delta are culturally patterned and distinct from those of the metropolitan center. Thus, the intervention was community-based. The intervention team included local village health workers, and was designed to draw on local forms of entertainment and education. These community health workers (CHW) were recruited from the community itself. They were women in their early twenties. The health education messages were developed in collaboration with the local leaders. The messages built on ethno-ecological beliefs about the causes, preventability, and

possible cures for eye disease. Translated from the colloquial Egyptian Arabic, the primary message and five secondary messages in the intervention were:

Primary:

(1) Eye disease can be prevented by washing children's faces with soap and water at least once each day.

Secondary:

(2) Washing children's faces with soap and water removes germs which can infect the eyes.
(3) Eye disease can be reduced by always using latrines or burying human feces.
(4) Eye disease can be reduced by burning or burying refuse such as food scraps and peelings from fruits and vegetables.
(5) A dirty towel can carry infection from one child's eyes to the eyes of another child.
(6) Anything that touches eyes, including hands, can spread eye infections.

In addition to these specific health education messages, the intervention trial sought to convey general information about eye health and eye care.

Delivery of the messages. The intervention used a variety of methods to communicate the health education messages. The methods used fit with local beliefs and customs, and used a variety of communicative channels in order to create a system rich in information redundancy. Hence, the redundancy was reinforced through the use of multiple media with complimentary structures and varying ranges of action. This system was intended to be a 'noise-combating' or 'error-correcting' means of communicating the health education messages (Cherry 1980, pp. 186–188).

At the most focused level, the community health workers (CHW) distributed soap biweekly to each child in each household having children aged 10 and younger. Soap distribution also provided an opportunity for CHWs to talk to children about eye care.

Approximately 80% of mothers interviewed at the start of the trial said that it is important to wash children's faces and hands with soap and water, and roughly 18% volunteered that face washing could prevent eye diseases. Thus in introducing face washing with soap and water we sought to build on extant beliefs and practices in the community. When introducing change into a community success is much more probable if that change builds on extant beliefs and behaviors by restructuring the understanding of their importance and positive payoff (Drucker 1991). Our intervention trial did not seek to introduce entirely new or foreign concepts to the village.

Health education messages and eye health information was delivered to female heads of households with young children by house-to-house visits from CHW. CHWs discussed the importance of face washing to prevent trachoma. They used a variety of visual aids to educate mothers about the causes and consequences of eye disease, they demonstrated effective face washing, and they observed eye problems.

During the first two months of the intervention families were visited once each week. After this they were visited biweekly.

The next broadest medium for the messages was focus group discussions held (a) incidental to vaccination days at the health clinic, (b) at the village mosque, (c) at schools, and (d) through formal and informal village organizations.

We placed health education posters advocating and explaining the need for face washing or proper nutrition as appropriate for the village prominently throughout each village. In Egypt there is a very well developed genre of movie billboard painting (Atia 1992). The health education posters were painted in this style, and were periodically moved to different locations within the villages as a means of keeping the villagers from accommodating to them. Some posters were used by the local health workers during house-to-house visits.

A 'trachoma song' was written and set to music. This song incorporated both the face washing messages and general information about the causes and treatment of eye disease. The trachoma song was taught to village children and recorded on audio cassette by the children in the village, the appropriate professional musicians having been brought to the village to provide instrumental back up. This song was then replayed at various village functions and children were periodically asked to sing it during informal gatherings with CHWs.

Puppet shows (*arragoz*) are a traditional form of entertainment in Egypt. These shows, much like Punch and Judy shows, often retell traditional tales and have also been a form of political resistance (Lane 1895, pp. 385–386). An *arragoz* focusing on eye health and face washing was prepared and performed in El Youni; a folkloric *arragoz* was performed in Abu Hafla.

Finally, at the end of the intervention a village-wide 'eye health' festival was held in El Youni and a nutrition festival held in Abu Hafla. At these festivals the songs, puppet shows, and other educationally oriented demonstrations were held.

The face washing and nutrition interventions began one month after the completion of the clinical eye examinations and continued for ten months until May 1992.

Anthropology, Epidemiology and Trachoma in Egypt

The health ethnography conducted earlier (Lane 1987) showed that young children who had their faces washed with soap and water at least once a day had a greatly reduced risk of severe or moderate intensity trachoma. It was this observation from the health ethnography that led to our intervention, but the ethnographic findings were taken only as suggestive and required systematic confirmation. The value of integrating anthropological research into the project was well acknowledged by all members of our research team. The difficulty in doing so, however, was that the study design for this project called for our research to be conducted in four widely dispersed villages.

One of the most common ways in which researchers try to combine anthropological and epidemiological research is to use a period of small-scale, intensive, ethnographic research to discover the social and cultural parameters within

which the epidemiological research must fit. In this case the ethnographic results are treated as though they can henceforth be applied to the community under study and are also treated as characterizing geographically close social groups. Especially when the epidemiological study that follows involves other, different communities this assumption often assumes incorrectly that cultures are homogeneous and stable and that once described, the patterns stay intact. The ethnographic characterization of patterns of behavior, belief and interaction can be useful if they are strictly anchored in specific circumstances. It is misguided however to treat such characterizations as stable and unchanging in any significant degree as this commits the 'Fallacy of detachable cultural descriptions' (Rubinstein 1992). Our challenge, then, was to find a way to integrate anthropological approaches into an essentially broad, survey-based, quasi-experimental study.[3]

Integrating Anthropology and Epidemiology

We wanted to gather sociocultural data that could be compared with those collected in the detailed health ethnography so that we would know in what ways the new villages were similar to or different from our 1985–1987 study villages. We also wanted this information to guide the development of the interventions. We gathered census and environmental information using relatively standard forms.

In order to explore the cultural materials we developed a novel ethno-epidemiological research instrument and a structured observational scheme. In general, our strategy was to incorporate into a Knowledge, Attitude, and Practice (KAP) questionnaire a modified version of the ethnoscientific approach to ethnographic interviewing (Spradley 1979; Werner & Schoepfle 1987b). We incorporated into our study a set of structured household observations designed to assess the reliability of the data gathered through the KAPs (Figure 1).

The earlier health ethnography had described the range of ethnomedical beliefs about eye health and eye care, and it drew heavily on interviews with traditional healers and key informant interviews. The ethno-epidemiological survey instrument allowed us to describe the distribution of eye-health beliefs among the villagers in the intervention.

Specifically, we sought to be sure that beliefs about eye diseases, their recognition and treatment in the four new study villages would be discovered and taken into account in our intervention, both as a baseline assessment and as an aid in program planning. To do this we used a limited number of ethnoscience question-types to seek information, which was then recorded on a form that included the results of the cultural findings of the earlier study.

Thus, for example, the interview begins with a Guided Mini-Tour Question (Spradley 1979), 'What kinds of disease can happen to your eyes?' The questionnaire form lists as possible responses the universe of answers as derived from Lane's health ethnography, and provides space for additional responses.

The interview then moves through a number of other kinds of ethnographic questions, including other 'Descriptive Questions' and 'Structural Questions' that seek information about a variety of relationships and domain characteristics.

1. What kinds of problems can happen to your eyes? (Check all mentioned on & on all 3 sheets)	TRACHOMA CONTROL IN EGYPT -- KAP SURVEY Respondent: _____ Researcher: _____ Date: _____ 2. WHAT CAUSES: _____?																				
	√	√	√	God	Fly	Evil E	Age	Cry	Dust	Heat	Sweat	Injury	Smoke	Cold	No Wash	Wash Bad	Catch	Noth	DK	OT	1
Gifn Makfi (1.)																					2
Hamra (2.)																					3
Dam'ah (3.)																					4
Ramad (4.)																					5
Ramad Hubaybi (5.)																					6
Suda' (6.)																					7
Shaqqa (7.)																					8
Sha'ra (8.)																					9
Lahmiyya (9.)																					10
Tarfa (10.)																					11
Nuqta Bayda (11.)																					12
Ayn War ma (12.)																					13
Others: (13.)																					14
(14.)																					

Figure 1 KAP Interview Questionnaire

TRACHOMA CONTROL IN EGYPT -- KAP SURVEY Respondent:_____ Researcher: _____ Date: _____																					
1. What kinds of problems can happen to your eyes? (Check all mentioned on & on all 3 sheets)					3. IS____ A PROB IN THIS VILLAGE			4. WHO GETS _____ ?					5. IF YOU TREAT _____ WHERE DO DO YOU GO?								
		√	√	√	Yes	No	DK	Pre-sch	Sch-Age	Adol	Adult	Elder	T H	G. MD	P. MD	Home	Wash	N T	D K	Other	
Gifn Makfi	(1.)																				1
Hamra	(2.)																				2
Dam'ah	(3.)																				3
Ramad	(4.)																				4
Ramad Hubaybi	(5.)																				5
Suda'	(6.)																				6
Shaqqa	(7.)																				7
Sha'ra	(8.)																				8
Lahmiyya	(9.)																				9
Tarfa	(10.)																				10
Nuqta Bayda	(11.)																				11
Ayn Wares	(12.)																				12
Others:	(13.)																				13
	(14.)																				14

Figure 1 Continued

TRACHOMA CONTROL IN EGYPT -- KAP SURVEY

Respondent: _____ Researcher: _____ Date: _____

1. What kinds of diseases or problems can happen to your eyes? (Check all mentioned on & on all 3 sheets)				6. IF YOU DO NOT TREAT _____WHAT HAPPENS?					7. CAN _____ BE PREVENTED?			7. HOW CAN _____ BE PREVENTED?									
Gifn Makfi (1.)	√	√	√	Blind	Worse	Sane	DK	Other	Yes	No	DK	Herbs	Kuhl	Prov	Amulet	Biomed	Wash	N Wash	D K	O T	1
Hamra (2.)																					2
Dam'ah (3.)																					3
Ramad (4.)																					4
Ramad Hubaybi (5.)																					5
Suda' (6.)																					6
Shaqqa (7.)																					7
Sha'ra (8.)																					8
Lahmiyya (9.)																					9
Tarfa (10.)																					10
Nuqta Bayda (11.)																					11
Ayn Warmes (12.)																					12
Others: (13.)																					13
(14.)																					14

Figure 1 Continued

TRACHOMA CONTROL IN EGYPT -- KAP SURVEY

Respondent: _____ Researcher: _____ Date: _____

	A. Who Washes the Children's: _____								B. How Often?	C. With What?			Observations
	Me	Grandm	Aunt	Old Sibs	Child	No one	DK	Other	X's Daily	Water	Soap & Water	Other	
9. Hands													
10. Face													

11. CHILDREN SHOULD WAS MORE, LESS OR THE SAME AS ADULTS

MORE		THE SAME		LESS	
	They get dirty often		They grow up - wash like adults		Hard to keep children clean - they get dirty often
	More susceptible to disease		Other		Protect against Evil Eye
	Don't Know				They can catch cold easier than adults
	Other				I don't /caretaker doesn't have time
					Don't know
					Other

12. Have you ever heard of Ramad Hubaybi?	YES	NO

Figure 1 Continued

Further, following Spradley's advice about the process of ethnographic interviewing, the questionnaire is arranged and interviewers trained so as to capitalize on opportunities for repeating and restating questions, and when appropriate for the expression of interest in and ignorance of the understanding of the villagers.

The interview was administered to mothers of children aged 10 and younger by a team consisting of Egyptian epidemiologists working together with their US medical anthropological colleagues. While it would not be possible to develop from this questionnaire a complete domain analysis, the information collected in it allows us to monitor for intracultural variations in beliefs, behaviors, and ethnomedical knowledge among villagers and between villages.

Face washing and related behaviors were observed in a sub-sample of 15 households in El Youni and 15 households in Abu Hafla using the time allocation observation method by a researcher fluent in Egyptian colloquial Arabic and trained in the observation technique. This researcher spent six hours in each of the 30 households.

Finally, as in other epidemiological work that has drawn on ethnographic information, we were able to refine our environmental survey so that it targeted features of village life to which we might otherwise have been insensitive. For example, although many village houses have latrines, it is often the case that the rooms that contain these latrines are used for other purposes, like storage. It was the health ethnography that identified this pattern and accounted for it by reference to local beliefs about the likelihood that small children will fall into the latrine, the difficulty of manually draining them, or less often of fear of *jnun* (spirits) endangering any one who uses the latrine. Because of this information we were able to fit our environmental survey more appropriately to our research sites.[4]

Household and Behavioral Factors and Trachoma

The villages in the intervention trial—Kafr, Abu Hafla, and El Youni—are widely dispersed in the Beheira Governorate which lies to the south of Alexandria. They are an average of 30 kilometers outside of the city of Alexandria. The initial approach to all of the villages is via the agricultural highway, but all of the villages must be reached by traversing dirt roads, which in the winter rainy season are sometimes impassable, except on foot or donkey. The study design allowed for collecting the KAP data in only two villages—Abu Hafla and El Youni—and results relating to that aspect of the study are restricted to those villages alone.

At the time of the study, these three villages had a combined population of 3485 individuals, 1697 female and 1788 male. Although the oldest individual in these villages was reported to be 90 years of age, the population is generally heavily weighted to those under the age of 15 (see Figure 2).

Because the survey was the first part of an intervention trial intended to reduce disease in children aged 10 and younger, our clinical examinations were largely restricted to this younger group. The sample, therefore, includes all children aged ten and younger in three villages, resulting in a total sample size of 973.[5]

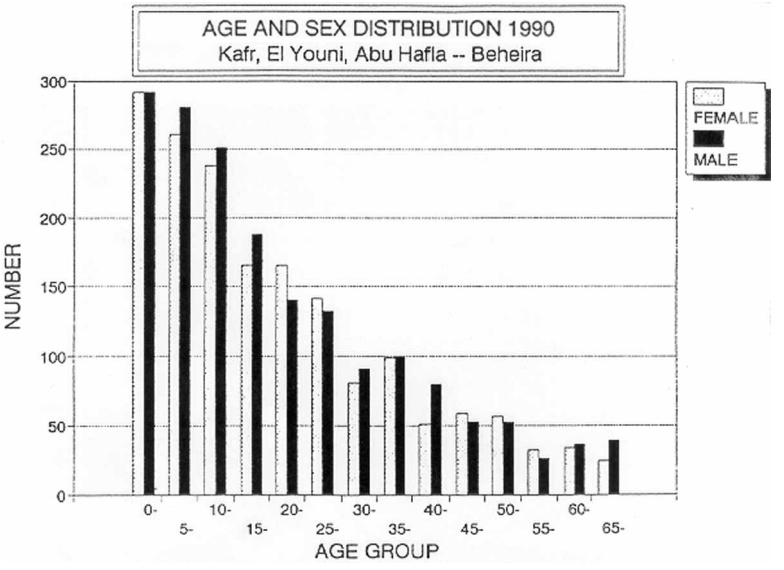

Figure 2 Age and Sex Population Distribution

Prior to clinical examination our team had collected (1) a census of each village (including information about the composition of the household, and personal attributes of its members), (2) the household environmental survey had been completed (including presumed risk factors for trachoma, such as; the physical characteristics of dwelling, the availability and source of water supply, the availability and use of latrines, general sanitation in household like the handling of animal manure and refuse, and indicators of socioeconomic status), (3) the KAP interview was completed in two villages, as were the (4) behavioral observations.

At the time of the clinical examinations further observations were made about the presence or absence of flies and nasal discharge on the child's face. Clinical examinations were made by a team of Egyptian and American ophthalmologists who made external examinations of both of the children's eyes using a 2.5× loupe and took DFA swabs for microbiologic evaluation. The project achieved good interrater agreement, which was documented at the start of examinations. Thereafter once during the examination of every 100 children the examiners compared their scoring of and reached consensus on five cases.

Distribution of Disease

All of the villages had a high point prevalence of active trachoma among children aged 10 years and younger, for a combined prevalence of 31.3%. Trachoma is not randomly distributed within villages. Rather the burden of disease is heaviest on young children and women, and it seems to cluster in households, as is often noted in the literature. We adjusted our sample size to account for this phenomenon, and our multivariate statistical analyses adjust for it as well.

Hygiene risk factors for trachoma. The biomedical literature about trachoma suggests that one way the disease is spread is through the sharing of ocular secretions. This literature, and our earlier studies in the Egyptian Delta, suggested that a number of hygiene factors play a role in the spread of trachoma. Of the many that we examined, only two had clear associations with active trachoma—flies on a child's face and nasal discharge on a child's face at the time of the examination, with relative risks of 1.62 and 1.43 respectively, post intervention (Table 1).

Face washing is expected to be protective for trachoma. In contrast to studies done elsewhere (e.g. Taylor *et al.* 1989), in our earlier studies in the Egyptian Delta we found that washing with water alone was not protective for trachoma. Based on the data from our behavioral observations, *we again found that washing with water alone provided no protective effect.*

Household risk factors for trachoma. When we undertook this research, we expected to find an association between a number of household factors and active trachoma. In our multivariate analyses two have clear relationships to active trachoma—both of which may relate to the transmission of disease by house flies: a soil floor in the house and an animal room in the house, having odds ratios of 1.98 and 1.56 respectively. Two others, a dung pile near the house and father's working as a farmer have odds ratios of 1.56 and 1.40, respectively. Neither of these factors is statistically significant but they are close enough to be suggestive (Table 2).

Villagers in the Egyptian Delta have several sources of water—canals, public taps, and water supplied by trucks. We expected that the availability of water and its source might be related to disease status, but it was not.

Household protective factors for trachoma. There were empirical and theoretical reasons to suppose that a number of household factors would prove protective for active trachoma. In our multivariate analyses we have found that as the health

Table 1 Hygiene Factors affecting Trachoma, Beheira, Egypt 1991

Exposure	Relative risk	CI
Flies on face*	1.62	$1.29 < RR < 2.02$
Nasal discharge*	1.43	$1.16 < RR < 1.76$
Face washed with water only**	2.17	$0.48 < RR < 9.71$

*$N = 919$; **$N = 90$.

Table 2 Household Risk Factors associated with Active Trachoma, Beheira, Egypt 1991

Expected risk factors	Odds ratio	*p*-value
Soil floor	1.98	0.001*
Animal room in house	1.56	0.017*
Dung pile near house	1.56	0.054
Father's occupation—farmer	1.40	0.058

Note: Odds ratios derived from logistic regression model accounting for household clustering of disease.

Table 3 Household Protective Factors associated with Active Trachoma, Beheira, Egypt 1991

Expected protective factors	Odds ratio	*p*-value
Latrine use	0.68	0.031*
Mother's education level	0.92	0.711
Volunteered one or more ethnomedical terms for a stage of trachoma	1.04	0.814
Heard of Egyptian biomedical term for trachoma	1.06	0.814
Age	0.94	0.018*

Note: Odds ratios derived from logistic regression model accounting for household clustering of disease.

ethnography suggested, having a latrine available for use (not simply in the household) was protective for active trachoma, having a statistically significant odds ratio of 0.68 (Table 3).

The health ethnography suggested that specialized ethnomedical knowledge about eye disease is not widespread among villagers. Rather, traditional healers had specialized knowledge and non-practitioners had less. Nonetheless, we hypothesized that because most health promoting activities take place in the context of the household, that a mother's (1) active ethnomedical knowledge, (2) her recognition of the Egyptian biomedical term for trachoma, or (3) her general level of education might be protective factors. None of these were significant in our analysis.

Conclusion

In this project we designed research instruments and procedures and intervention messages that built on ethnographic understandings of trachoma in Egyptian Delta Villages and incorporated ethnographic methodological commitments into our work. Did the intervention work?

Following the intervention children in El Youni (the intervention village) had a significantly lower risk for active disease than did the children in Abu Hafla (the Hawthorne village). A logistic regression analysis yielded a statistically significant odds ratio of 0.63 for that comparison, meaning that the face washing intervention had reduced the El Youni children's risk by about a third and that this reduction was due specifically to our intervention.

How did this happen? Our behavioral observations and ethno-epidemiological survey instruments allow us to reach some understanding of the dynamics underlying this change. From the structured observations, we know that Abu Hafla children had their faces washed no more frequently after the intervention than they did prior to it. In El Youni, however, there was a small, but statistically significant, increase in face washing of 9%.

Also, we observed differences in mothers' specific beliefs about face washing. Prior to the intervention there was not a statistically significant difference between mothers in Abu Hafla and El Youni offering that children should have their faces washed with soap and water. Yet, following the intervention there was a difference of about 10%

between the villages, and an even greater difference in whether they offered that a child's face should be washed more or less than thrice per day.

There was a similar shift in mothers in the two villages volunteering *ramad hubaybi* as an eye problem. Prior to the intervention in response to the mini-tour question 'what kinds of problems can happen to the eye?' *ramad hubabyi* was volunteered only once in 261 interviews. Following the intervention, it was volunteered 130 times, all in El Youni, and not at all in Abu Hafla.

In sum, using the ethno-epidemiological instrument and structure observations we are able to show that the success of the intervention resulted from small changes in behavior patterns, slightly larger changes in the distribution of specific beliefs, and still larger changes in general knowledge about eye disease. Integrating anthropological methods and ethnographic understanding into the study and intervention designs was very productive. Yet, this particular design leaves many questions unanswered.[6]

For instance, what do mothers who changed their behavior as a result of the intervention think about that change? What differentiates them from mothers whose behavior did not change? Although the villages are relatively homogeneous in ecological factors and in social class markers, are there differences that significantly effect who responds to the intervention? Of the multiple strategies used during the intervention were some methods of communication relatively more effective than others, and in what circumstances?

These questions are important and unanswered by this study, which is a first step in what must be an iterative process (Rubinstein *et al.* 1984). Whether the changes in behavioral and knowledge patterns persist requires longitudinal follow-up. Understanding how men and women and children living in the village experience the different aspects of the intervention and how they relate them to their systems of knowledge and belief requires another round of research, a round that will again call for a research design that combines anthropological and epidemiological understandings.

Integrating anthropological and epidemiological research techniques with clinical understanding is a continuing challenge. The most obvious path to such integration, the inclusion in research projects of time and support for lengthy and detailed periods of ethnographic study, is not always practical. In such situations, like our present intervention study of blinding trachoma in the Egyptian Delta, other solutions must be found. In this paper we have described an approach that combines an epidemiological research instrument with the substantive, structural and processual concerns of ethnographic research. This allowed us to develop a culturally appropriate intervention that succeeded in altering the risk of disease in the village studied.

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Notes

[1] In Egypt the word for village (*Qareeya*) denotes a relatively large administrative unit. Our work is actually carried out in communities known as hamlets (*'isba*). For convenience, and for consistency with earlier reports of our research, we call the communities in which we worked 'villages' and the larger administrative divisions 'mother-villages'.

[2] The village names used in this article are fictional, but consistent with names reported in the literature for villages studied by our group in the past.

[3] One of the anonymous reviewers for this journal noted that this paper moves between 'hard core science on the one hand and qualitative anthropological methodology on the other', and suggested that we adopt a single voice in presenting this material. We do not do this because what this paper is demonstrating—an experiment in integrating three forms of research (clinical, epidemiological and ethnographic)—means that adopting a single voice would do damage to the description of the project. The reality of this kind of collaboration is, we believe, that there will be multiple voices. Adopting a single voice about what happened would mislead the reader.

[4] There are a number of additional questions that can be explored concerning the results obtained in this study. These include questions about the wider meaning of face washing, soap use and eye disease, and questions about gender relations and the interaction of the intervention with the moral and social worlds in the village. Also questions about the long term effect of the intervention, the wider relevance of blindness in social life and differences between the treatment of eye disease between rural and urban areas. Most of these questions were beyond the scope of this study's design. However, a number of them are addressed in other publications by our research team (see, e.g. Lane 1987; Lane & Millar 1987; Courtright 1988; Mikhail *et al*. 1989; Courtright *et al*. 1991; Lane *et al*. 1993).

[5] Because not all data were collected on all individuals, the sample sizes for the analyses that follow vary. In addition, in some instances data are missing for particular questions. However, except for the behavioral observations, where the sample size is 90 children, the results reported here generally derive from samples of 900 or more individuals.

[6] The following questions concerning the efficacy of specific intervention techniques are important. But, such a comparative evaluation was not part of our study design and resources were not available for doing so. While important for the design of future studies, we do not have the data to answer them now.

References

Atia, T. (1992) 'Seduction by billboard', *Al-Ahram Weekly*, Cairo, p. 11.

Campbell, D. T. & Fiske, D. W. (1959) 'Convergent and discriminant validation by multitrat–multimethod matrix', *Psychological Bulletin*, vol. 56, pp. 81–105.

Cherry, C. (1980) *On Human Communication: A Review, a Survey and a Criticism*, MIT Press, Cambridge, MA.

Courtright, P. (1988) 'Household clustering of trachoma and its role in the analysis of risk factors', Ph.D. Dissertation, University of California, Berkeley, CA.

Courtright, P., Sheppard, J., Lane, S. D., Sadek, A., Schachter, J. & Dawson, C. R. (1991) 'Latrine ownership as a protective factor in inflammatory trachoma in Egypt', *British Journal of Ophthalmology*, vol. 75, pp. 322–325.

Courtright, P., Sheppard, J., Schachter, J., Said, M. E. & Dawson, C. R. (1989) 'Trachoma and blindness in the Nile Delta: current patterns and projections for the future in the rural Egyptian population', *British Journal of Ophthalmology*, vol. 73, pp. 536–540.

Dawson, C. R., Sallam, S. A., Sheta, A., Rubinstein, R. A., Washton, H. & Schachter, J. (1993) 'Trachoma treatment with oral Azithromycin or topical Tetracycline', *Investigative Ophthalmology and Visual Science*, vol. 34, p. 1324.

Dawson, C. R., Schachter, J., Sallam, S. A., Sheta, A., Rubinstein, R. A. & Washton, H. (1997) 'A comparison of oral Azithromycin with topical Oxytetracycline/Polymyxin for the treatment of trachoma in children', *Clinical Infectious Diseases*, vol. 24, pp. 363–368.

Drucker, P. F. (1991) 'Don't change corporate culture—use it!', *Wallstreet Journal—Europe*.

Emerson, P. M., Cairncross, S., Bailey, R. L. & Mabey, D. C. (2000) 'Review of the evidence base for the "F" and "E" components of the SAFE strategy for trachoma control', *Tropical Medicine and International Health*, vol. 5, pp. 515–527.

Grayston, J. T. & Kuo, C. (1985) 'Importance of reinfection in the pathogenesis of trachoma', *Reviews of Infectious Disease*, vol. 7, pp. 717–725.

Habib, M., Morgan, S., El-Almay, M., Shehab, A., Mostafa, M. S. & Barsioum, I. S. (1985) 'Prevalence of trachoma in school children in a village in the Qalyub area of Egypt', in *Proceedings of the International Congress for Infectious Diseases, Cairo, 20–24 April*, Edizioni Luigi Pozzi, Rome.

Homans, G. C. (1963 [1941]) 'The Western Electric researches' in *People and Productivity*, ed. R. A. Sutermeister, McGraw Hill, New York, pp. 61–69.

Lane, E. W. (1895) *An Account of the Manners and Customs of the Modern Egyptians. Written in Egypt During the Years 1833–1835*, Livres de France, Cairo, Egypt.

Lane, S. D. (1987) 'A biocultural study of trachoma in an Egyptian hamlet', Ph.D. dissertation, University of California, San Francisco and Berkeley.

Lane, S. D., Mikhail, B., Rezian, A., Courtright, P., Marx, R. & Dawson, C. R. (1993) 'Sociocultural aspects of blindness in an Egyptian Delta hamlet: visual impairment versus visual disability', *Medical Anthropology*, vol. 15, pp. 245–260.

Lane, S. D. & Millar, M. I. (1987) 'The "Hierarchy of Resort" reexamined: status and class differentials as determinants of therapy for eye disease in the Egyptian Delta', *Urban Anthropology*, vol. 16, pp. 151–182.

LeVine, R. A. (1981) 'Knowledge and fallibility in anthropological field research' in *Scientific Inquiry and the Social Sciences. A Volume in Honor of Donald T. Campbell*, eds M. B. Brewer & B. E. Collins, Jossey-Bass, San Francisco, CA, pp. 172–193.

Marx, R. (1988) 'Sociomedical aspects of trachoma', *Acta Ophthalmologica*, vol. 66, pp. 1–63.

Marx, R. (1989) 'Social factors and trachoma: a review of the literature', *Social Science and Medicine*, vol. 29, pp. 23–34.

Mikhail, B., Rezian, A., Lane, S. D. & Courtright, P. (1989) 'Beliefs about eye disease and trachoma in an Egyptian Delta hamlet', *Bulletin of the High Institute of Public Health*, vol. 19, pp. 915–931.

Miles, M. G. & Huberman, A. M. (1984) *Qualitative Data Analysis. A Sourcebook of New Methods*, Sage, Beverley Hills, CA.

Naroll, R. & Cohen, R. (eds) (1970) *A Handbook of Method in Cultural Anthropology*, Natural History Press, Garden City, NY.

Pelto, P. J. & Pelto, G. H. (1978) *Anthropological Research. The Structure of Inquiry*, Cambridge University Press, Cambridge, UK.

Rubinstein, R. A. (1992) 'Culture and negotiation' in *The Struggle for Peace: Israelis and Palestinians*, eds E. Fernea & M. E. Hocking, University of Texas Press, Austin, TX, pp. 116–129.

Rubinstein, R. A., Laughlin, C. D. & McManus, J. (1984) *Science as Cognitive Process. Toward an Empirical Philosophy of Science*, University of Pennsylvania Press, Philadelphia, PA.

Rubinstein, R. A., Sallam, S. A., Sheta, A., Schachter, J. & Dawson, C. R. (1992) 'Microenvironmental facotrs affecting the prevalence of blinding trachoma in the Egyptian Delta', *Investigative Ophthalmology and Visual Science*, vol. 33, p. 1324.

Rubinstein, R. A., Scrimshaw, S. & Morrissey, S. (2000) 'Classification and process in sociomedical understanding: towards a multilevel view of sociomedical methodology' in *Handbook of Social Studies in Health and Medicine*, eds G. Albrecht, R. Fitzpatrick & S. Scrimshaw, Sage, London, pp. 36–49.

Schachter, J. & Dawson, C. R. (1978) *Human Chlamydial Infections*, PSG Publishing Group, Littleton, MA.

Scrimshaw, S. & Hurtado, E. (1987) *Rapid Assessment Procedures for Nutrition and Primary Health Care. Anthropological Approaches to Improving Programme Effectiveness*, University of California Los Angeles, Latin America Center, Los Angeles, CA.

Spradley, J. (1979) *The Ethnographic Interview*, Holt, Rinehart and Winston, New York.

Taylor, H., West, S., Mmbaga, B., Katala, S., Turner, V., Lynch, M., Muñoz, B. & Rapoza, P. A. (1989) 'Hygiene factors and increased risk of trachoma in central Tanzania', *Archives of Ophthalmology*, vol. 107, pp. 1821–1825.

Werner, O. & Schoepfle, G. M. (1987a) *Systematic Fieldwork. Ethnographic Analysis and Data Mangement*, Sage, Newbury Park, CA.

Werner, O. & Schoepfle, G. M. (1987b) *Systematic Fieldwork. Foundations of Ethnographic Interviewing*, Sage, Newbury Park, CA.

West, S., Congdon, N., Katala, S. & Mele, L. (1991) 'Facial cleanliness and risk of trachoma in families', *Archives of Ophthalmology*, vol. 109, pp. 855–887.

West, S., Muñoz, B., Lynch, M., Kayongoya, A., Chilangwa, Z., Mmbaga, B. & Taylor, H. (1995) 'Impact of face-washing on trachoma in Kongwa, Tanzania', *Lancet*, vol. 345, pp. 155–158.

West, S., Muñoz, B., Mkocha, H., Hsieh, Y. & Lynch, M. (2001) 'Progression of active trachoma to scarring in a cohort of Tanzanian children', *Opthalmic Epidemiology*, vol. 8, pp. 137–144.

World Health Organization (2004) *Developing an Action Plan to Prevent Blindness at National, Provincial and District Levels, Version 2*, World Health Organization and International Agency for the Prevention of Blindness, Geneva.