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Distinguishing social and cultural features of cholera in urban and rural areas of Western Kenya: implications for public health

Erick Otieno Nyambedha^{1*}, Neisha Sundaram^{2,3}, Christian Schaetti^{2,3}, Lilian Akeyo¹,
Claire-Lise Chaignat⁴, Raymond Hutubessy⁵, Mitchell G. Weiss^{2,3}

¹Department of Sociology and Anthropology, Maseno University, Private Bag, Maseno, Kenya

²Department of Epidemiology and Public Health, Swiss Tropical and Public Health Institute, Socinstrasse 57, 4002 Basel, Switzerland

³University of Basel, Petersplatz 1, 4003 Basel, Switzerland

⁴Global Task Force on Cholera Control, World Health Organization, 20, avenue Appia, 1211 Geneva 27, Switzerland

⁵Initiative for Vaccine Research, World Health Organization, 20, avenue Appia, 1211 Geneva 27, Switzerland

Telephone numbers and email addresses:

*Corresponding author: +254 73 387 89 59 or 71 381 61 89,

erick.nyambedha@gmail.com or nyambedha@maseno.ac.ke

NS: +91 99 019 30 591, neisha.sundaram@unibas.ch

CS: +41 61 284 82 84, christian.schaetti@unibas.ch

LA: +254 72 167 05 52, akeyolilian@gmail.com

CLC: +41 22 791 39 14, chaignatc@who.int

RH: +41 22 791 32 53, hutubessyr@who.int

MGW: +41 61 284 82 84, mitchell-g.weiss@unibas.ch

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Abstract

Urban and rural areas have distinctive health problems, which require consideration. To examine socio-cultural features of cholera and its community context, a semi-structured explanatory model interview based on vignettes depicting typical clinical features of cholera was used to interview 379 urban and rural respondents in Western Kenya. Findings included common and distinctive urban and rural ideas about cholera, its prevention and treatment. The three most common perceived causes among urban and rural respondents collectively were drinking contaminated water, dirty environment and lack of latrines. Dirty environment, however, and flies were more prominent perceived causes among urban respondents. Rural respondents were less likely to identify additional symptoms and more likely to identify biomedically irrelevant perceived causes of cholera. Oral rehydration therapy was the most frequently reported home treatment. Health facilities were recommended unanimously at both sites. For prevention, rural respondents were more likely to suggest medicines, and urban respondents more likely to suggest health education and clean food. Findings indicate community priority, demand and potential effectiveness of enhanced efforts to control cholera in Western Kenya, and they suggest strategies that are particularly well-suited for control of [cholera in urban and rural areas](#).

Keywords: cholera; urban-rural comparison; cultural epidemiology; illness explanatory models; Western Kenya.

Background

Sub-Saharan Africa bears a large cholera burden due to high levels of poverty and limited access to adequate healthcare, safe water and sanitation facilities (Gaffga *et al.* 2007). In recent years, cholera outbreaks in sub-Saharan Africa have tended to be large and protracted (WHO 2010a). Repeated and severe cholera outbreaks suggest limitations in the current strategy of control and prevention (Bhattacharya *et al.* 2009). Notwithstanding the literature on cholera epidemics in the region (Birmingham *et al.* 1997, Acosta *et al.* 2001, Shikanga *et al.* 2009, Shultz *et al.* 2009), not many of these papers are concerned with socio-cultural features of cholera, and comparative study of urban and rural settings is lacking. Inasmuch as urban and rural communities and their health systems differ, such research is needed to guide effective cholera control.

Densely populated urban informal settlements in sub-Saharan Africa often lack adequate access to safe water and sanitation (Sclar *et al.* 2005). Residents of such settlements suffer inordinately from water-borne diseases like typhoid and cholera (Unger and Riley 2007), suggesting a distinctive set of health problems that an effective health system needs to acknowledge.

The profile and setting of health problems in rural areas differs from urban informal settlements, and these social contexts and cultural practices require consideration. For instance, studies in rural Africa show that communal events, such as funerals, may lead to cholera transmission (Gunnlaugsson *et al.* 1998, Shapiro *et al.* 1999). In 2010, more of the rural populations of sub-Saharan Africa lacked access to safe water (51%) than in urban areas (17%); fewer people in rural areas had access to adequate sanitation and therefore were more likely to defecate in the open than people in urban areas (WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation 2012).

Western Kenya, which has both urban informal settlements and rural areas, provides good prospects for distinguishing relevant features of urban and rural endemic cholera. Nyanza province is most severely affected by cholera (Feikin *et al.* 2010). The high burden of cholera in the province may be attributed to proximity to Lake Victoria, which is one of the main sources of contaminated water (Feikin *et al.* 2010). Other risk factors for cholera in the province include attending funerals and sharing meals with persons who have watery diarrhoea (Shapiro *et al.* 1999). This region was also destabilised by violence after the election in December 2007, which may have contributed to local outbreaks in 2008 and a large and prolonged nationwide outbreak of cholera in 2009. Shikanga *et al.* (2009) reported case-fatality rates (CFRs) as high as 11.4% in Nyanza in 2008. In the nationwide outbreak in 2009, more than 11,000 cases were reported to the World Health Organization (WHO) with an overall CFR of 2.31% (WHO 2010b). During cholera outbreaks cholera treatment centres providing free services are often organised as part of the response efforts.▬

This research was motivated by the premise that effective cholera prevention and control benefits from understanding community ideas about the meaning of cholera, which affect risk-related and help-seeking behaviour. Our study aimed to explain how differences in social organisation and how cultural features in urban and rural settings may affect cholera transmission, prevention and control. Related socio-cultural interests were presented in a complementary report from this fieldwork, identifying determinants of anticipated vaccine acceptance (Sundaram *et al.* 2012).

Methods

Study setting

This research was conducted in a selected area of urban and rural Nyanza province, Western Kenya. The urban site was Nyalenda A, located in the city of

Kisumu. The rural site was Kakum Kombewa, sub-location in Central Alego location, Boro division of Siaya district. Nyalenda A is a large, crowded informal settlement with an estimated population of 23,700 and a population density of 8,500/km² in 1999 (UN-Habitat 2006). It lacks an adequate water supply, sewerage system and health services. From our field observations, poor sanitation and food hygiene are notable at roadside kiosks. At the time of the study there were no health facilities run directly by the Ministry of Health in this community. However, two health facilities were operating: a dispensary owned by the Kisumu Municipal Council and a private clinic. Other health facilities are also available nearby; and the Kisumu District Hospital is located about 4-5 kilometres away and the New Nyanza Provincial General Hospital – now named Jaramogi Oginga Odinga Teaching and Referral Hospital – is located about 5-6 kilometres away.

The rural study site is less densely populated (270/km²) (Ministry of public health and sanitation 2009). The main water sources for the 3,700 inhabitants in Kakum Kombewa sub-location are streams and rivers; estimated latrine coverage at the time of the study was 73%, but about 24% in disrepair and rarely used (District public health office 2008). Some residents reportedly defecate in nearby bushes and sugar plantations. There was no health facility in Kakum Kombewa at the time of this study; and residents in need of health services were compelled to go to Siaya district hospital, 15 kilometres distant.

Instrumentation

Integrated quantitative and qualitative methods of cultural epidemiology used a locally adapted interview based on the framework of the explanatory model interview catalogue (EMIC) (Weiss 1997, Weiss 2001). Semi-structured EMIC interviews have been useful in clarifying illness-related experience, meaning and help-seeking behaviour among patients and the general population for a wide variety of health problems.

An EMIC interview for the general population was drafted in English for study of illness with essential features of cholera, based on previous research in Zanzibar (Schaetti *et al.* 2010). Public health professionals from urban and rural areas involved in cholera control provided input that informed development of the instrument and study design. After translation into local languages, Kiswahili and Dholuo, the interview was pilot-tested and refined. Interview questions focussed on an adult from the local area who was suffering from typical symptoms and history of cholera, portrayed in a clinical vignette presented at the outset (see text box). This vignette was developed from an instrument used in a previous study in Zanzibar, after revision and piloting for local comprehensibility. Sex and area of residence (urban or rural site) of the person in the vignette were matched with sex and site of the respondent to enhance the empathic connection and make the vignette more engaging.

The illness was described by its features, but not any local term for cholera, and respondents were asked to name the condition. They were also asked about associated symptoms and patterns of distress, and perceived causes, including biological, behaviour-related, social and traditional magico-religious causes. Respondents were asked to identify healthcare providers that would be appropriate to consult for treatment or help, including allopathic and traditional practitioners. Options for self-treatment and prevention were also considered.

Study design and sampling

This cross-sectional survey was conducted concurrently in the two study communities between March and May 2010. The population sample included adult residents, aged 18 years to mid-60s. Systematic probability sampling was carried out at the urban site based on a population estimate. Household lists were available through community health workers at the rural site. Specific households, proportional to the total number of households in each village, were identified through random selection

from these household lists. Only one willing individual per household was interviewed. The sample was stratified by site and sex. Calculation of the sample size was based on the non-parametric Wilcoxon test to compare prominence of variables for categories of distress, perceived causes, self-treatment, help-seeking and prevention between both sites (see calculation of prominence below) (Schaetti *et al.* 2009). At least 328 respondents were needed to detect differences in prominence with 80% power at a level of 95% significance. An additional ten percent were added as an adjustment for possible missing data. Further details on sampling are described elsewhere (Sundaram *et al.* 2012).

A ten-day training workshop on interviewing and data entry was held for the research teams. A total of 16 interviews were piloted over two days during the workshop and in the following week. Each team consisted of an interviewer who also coded response categories and a note-taker who wrote down narrative responses. Interviews were digitally voice-recorded for consenting respondents. Written narratives were translated into English and typed in a word processor by the research teams. To enhance the qualitative content, answers to selected questions were transcribed verbatim from voice recordings. Quantitative data were double-entered using Epi Info 3.5.1.

This study was approved by the Kenya Medical Research Institute and the WHO Research Ethics Review Committee. Interviews were conducted after obtaining written informed consent.

Approach to analysis

MAXQDA 10 was used for managing and analysing textual data. Automatic thematic coding used features of the software to link topics of questions to thematically coded content. Narratives were analysed using the quote matrix facility of MAXQDA for comparative, contextual, site-specific and gender-based analysis of the socio-cultural features of [cholera in](#) urban and rural [areaseholera](#).

Quantitative data were analysed using SAS 9.2 for comparing frequencies of reported categories. Mean prominence of response categories was computed based on whether a category was reported in response to an open-ended question without the interviewer prompting or naming the category (assigned value of 2), only after prompting (value of 1), and in any case taking into account whether the category was identified as superlative (e.g. most troubling category of distress, most important perceived cause, etc.) among all reported categories (additional value of 3) (Sundaram *et al.* 2012). Categories not reported were assigned a value of 0. This approach enabled urban-rural comparison considering not just the frequency of responses but also their prominence based on how they were reported.

Results

Sample characteristics

A randomly selected sample of 379 adult community residents (190 urban and 189 rural) was studied. The refusal rate (eligible persons approached who did not wish to be interviewed) was 18.7% at the urban site and 6.8% at the rural site. Rural respondents were on average older than urban respondents (median age 36.8 vs. 28.9 years, $p < 0.001$). Self-employment (i.e. having a small business, street vendors, trader or skilled labourer) was the most frequently reported occupation at the urban site, while agriculture predominated at the rural site. The urban sample was better educated. Economically, urban respondents were better off than rural respondents, reporting a higher personal monthly income (median KES 2500 urban vs. KES 1000 rural) and more likely to regard their household income as reliable and dependable. Further details of sample characteristics are available in Table 1 of Sundaram *et al.* (2012).

Identification and seriousness of illness described in cholera vignette

Approximately three-quarters of respondents at both sites identified the illness as cholera (72.6% urban and 77.8% rural, $p=0.28$), either by the English term *cholera* or the Kiswahili term *kipindupindu*. The remaining respondents identified the condition as either normal diarrhoea (12.6% urban, 7.9% rural, $p=0.18$) or some other illness (13.2% urban, 11.6% rural, $p=0.76$), or they were unable to identify the illness at all (1.1% urban, 2.1% rural, $p=0.45$).

The vast majority of respondents regarded the condition as very serious (91.6% urban, 91.0% rural, $p=0.86$) or moderately serious (7.9% both sites). There was no urban-rural variation in accounts of severity of the illness. The basis for perceived severity referred to weakness, need for treatment, contagiousness, and likelihood of fatality. No one said it was not serious. More respondents at the urban site, however, said the condition was likely to be fatal without treatment (60.0% urban, 39.7% rural, $p<0.001$). No one at either site reported the expectation of full recovery from the illness without treatment.

Vulnerability to illness described in cholera vignette

Respondents were asked who they considered more vulnerable to the illness: men or women; adults or children; and rich or poor people. If both options were regarded equally vulnerable, or if neither option was considered susceptible, 'neither' was coded (Table 1). The majority discounted any gender-based vulnerability, but more so in the rural area ($p<0.001$). More urban respondents identified women as more vulnerable ($p<0.001$). The vulnerability of women was explained with reference to contamination from housecleaning and childcare, caring for sick people, exposure to contaminated water or other causes. Men were considered less vulnerable because they spend more time at work places where the environment is cleaner. A distinctive idea of the rural site was that selling goods by women in open markets, which are dirty,

increased vulnerability. Urban but not rural respondents referred to poor personal hygiene of women.

A majority of urban respondents (67.9%) considered children to be more susceptible than adults. Children's vulnerability was explained by urban residents as a result of their not knowing how to take care of themselves. A 43-year-old man from the urban site stated, 'Children are more likely to get it, because they do not know a lot about cleanliness. They have no control. They may play with dirty water. While playing, they put anything they find in their mouth'. A majority of rural residents (39.2%) considered neither group particularly more vulnerable to the illness.

Economic differences were regarded as a more important perceived risk factor at the urban site than the rural site, where the poor were at greater risk than the rich. At both sites the poor were thought to be more vulnerable than the rich, with a significantly higher proportion of urban respondents reporting this difference ($p < 0.001$). The vulnerability of the poor was explained by their being compelled to live in a dirty environment, inability to exercise appropriate discretion about what they eat, limited access to safe water and less awareness of how to avoid such illnesses. A few respondents at both sites said the rich were more vulnerable, explaining that poor people are more accustomed to harsh conditions, which make them stronger. The rich, on the other hand, are more likely to get sick if they are exposed to the same conditions, and they also tend to eat refrigerated foods that may be spoiled.

Patterns of distress

'Weakness' was most prominent among physical symptoms, reported spontaneously more frequently than any other category in both sites (42.3% rural and 41.1% urban) and by more than 90% at both sites when probed responses were included, but without site-specific differences in prominence. Prominence takes into account the fraction spontaneously mentioned, percentage reported on probing for that

category and percentage identifying the symptom as most troubling in the comparison. Most troubling symptoms of cholera at both sites included frequent passing of stool (presented in the vignette), physical weakness, vomiting (presented in the vignette), unconsciousness and abdominal cramps. There were no site-specific or gender-specific differences in the narratives explaining how the respondents in the urban and rural sites described the physical features of cholera. ‘Loss of appetite’ was reported more frequently and with higher prominence at the urban site (total reported 94.2% urban and 88.4% rural; prominence 1.14 urban and 1.06 rural, $p=0.042$). ‘Abdominal pain’ was more frequent and more prominent at the rural site (total reported 79.9% rural and 61.1% urban; prominence 0.99 rural and 0.83 urban, $p=0.004$). ‘Stool frequency’ was a feature of the vignette, and it was therefore a given, rather than respondent-reported, symptom, but it was identified more frequently as the most important symptom at the urban site (47.4% urban and 15.3% rural, $p<0.001$). A small number at both sites could not identify a single most important symptom, and their responses were coded ‘cannot say’ (13.2% urban and 20.6% rural, $p=0.056$).

Financially, the illness appeared to be more distressing for urban residents; loss of family income (total reported 97.9% urban and 94.7% rural; prominence 2.94 urban and 2.31 rural, $p<0.001$) and illness-related costs were reported by significantly more urban residents (total reported 97.9% urban and 87.3% rural; prominence 1.51 urban and 1.28 rural, $p<0.001$).

Meanings and perceived causes

Perceived causes of cholera in both sites were similar, including ‘drinking contaminated water’, ‘dirty environment’ and ‘lack of latrines’. Environmental issues, particularly ‘dirty environment’ and ‘flies’ were more prominent among urban respondents, although the latter was reported by about 96% at each site (Table 2). The most prominent perceived cause at the urban site was ‘dirty environment’, and at the

rural site it was ‘drinking contaminated water’. ‘Flying toilets’ were a distinctive feature of the ‘dirty environment’ and life in the urban site. The term refers to the practice of passing stool in polythene bags, which are thrown into the open pathways of the informal settlements.

Environmental causes were frequent but less prominent for rural respondents, and they were explained differently. For rural respondents ‘dirty environment’ more likely referred to the open disposal of human stool in the bushes, on muddy and contaminated grounds and exposure in open air markets with high potential for spread of cholera. Rural residents explained how stool was passed in the open bush because pit latrines are unavailable in homes, and stool is washed into the river when it rains. Using such water from rivers and streams contaminated with human faeces was acknowledged as a cause of cholera. ‘Eating unprotected/spoiled food’ was the second most prominent perceived cause at the rural site. Narratives in the rural setting referred to poor food hygiene when food is served at funerals and other social gatherings.

‘Eating soil’ was more frequently identified as a perceived cause by men (67.6% men and 45.4% of women, with respective prominence of 0.68 men and 0.45 women, $p < 0.001$). Most men referred to the practice of eating soil as a possible cause for cholera mainly because they regard soil as dirty or filled with germs. [A 30-year-old](#) urban man (~~30~~) explained, ‘Eating soil can cause cholera because one may pick up soil where an infected person had deposited his stool’. It was clear in the accounts of some men that they associated the practice with women, ‘...the soil women eat, called *dodoa*. It depends whether it’s picked from the surface or dug further in the ground’ (urban man, [aged 26 years](#)). Although ‘dirty environment’ was reported by more than 95% of both men and women, it was more likely to be reported spontaneously and/or as the most important perceived cause by men (prominence 2.10 for men and 1.84 for women, $p = 0.043$). Site-specific gender differences were also notable. ‘Flies’ as a

perceived cause were reported in nearly equal numbers by men and women at the urban site, but more likely spontaneous and/or most important by women (prominence 1.28 for urban men and 1.42 for urban women, $p=0.044$). A 24-year-old urban woman explained how flies could cause cholera: 'Flies carry dirt with them from the toilets and drop it on food'.

One-fifth of the respondents reported causes other than the ones listed in the interview, with significantly more 'other' responses from the rural site. Furthermore, significantly more respondents from the rural site were unable to identify any causes at all or single out one in particular as the most important cause. These responses were coded as 'cannot say'.

Help-seeking

Accounts of help-seeking for the condition presented in the cholera vignette were classified among both home-based and outside treatment categories (Table 3). Respondents' qualitative descriptions of patterns of help-seeking were similar in both sites. Provision of oral rehydration therapy (ORT) was most prominent among reported home-based treatments. Four urban respondents, however, explained that ORT should only be done for children, and was not meant to for adults. Ideas about the benefits of ORT were diverse, and although a majority emphasised its value in rehydration, some other ideas suggested that it provided energy, increasing one's appetite, reducing germs in the stomach, stopping diarrhoea and vomiting, and increasing blood in the body. Drinking more water or liquids was recommended as frequently, followed by use of antibiotics or drugs. Tetracycline and flagyl were the most frequently mentioned antibiotics or drugs, available from pharmacies for self-treatment at home. These drugs were more frequently named in narratives at the urban site. Furthermore, spontaneously reported consumption of self-prescribed antibiotics or drugs for home treatment was mentioned significantly more at the urban site. Prayer was more prominent in urban

accounts, reported by about half of urban respondents and about a third of rural responses.

Among gender differences for self-help, men were more likely to recommend herbal treatments (41.1% of men and 25.8% of women, respective prominence 0.83 and 0.42, $p < 0.001$). Women were more likely to recommend using ORT (83.8% of men and 90.2% of women reporting, respective prominence 2.01 and 2.38, $p = 0.017$).

A health facility was unanimously recommended at both sites for help outside the home (Table 3). Use of informal help from a health worker or friend was more prominent in the rural site.

Ways of prevention

Respondents' ideas for preventing the illness described in the cholera vignette included using safe water, health education and safe disposal of stool as the three most prominent categories in decreasing order. Ensuring cleanliness and safety of food as a way to prevent cholera was significantly more prominent at the urban site ($p = 0.002$) (Table 4). 'Safe disposal of stool', however, was more prominent at the rural site ($p = 0.026$). Preventive drugs (e.g. antibiotics, antiparasitic drugs, or any others locally regarded as preventive drug) were a higher priority in the rural site. Although health education was reported by 98.9% at both sites, it was more prominent in urban accounts, where more people regarded it as the most important means of prevention. A 53-year-old rural female farmer explained why health education was important for prevention:

Health education should be brought even before drugs and vaccines so that people are educated at *barazas* (weekly public gatherings that are addressed by local government officers) and can change gradually. Some people are being forced to do things like building pit latrines, and they do it, but they do not use those pit latrines because they don't know why they are supposed to use them. But with health education, they will learn how and why to use them, and they will want to build more for themselves.

The prompt burial of people who die from cholera was mentioned in rural accounts, as was discouraging people from eating at funerals. Protection from magico-religious influences was acknowledged by a minority of respondents, more so in rural areas ($p < 0.001$), as a way of preventing illness depicted by the cholera vignette. At both urban and rural sites, magico-religious causes received the lowest frequency and prominence among all preventive measures that were considered.

Discussion

Our study highlights social and cultural features of cholera in an urban and a rural community of Western Kenya following the large [nationwide 2009 cholera outbreak of 2009](#). Despite public health interventions in both communities, which entailed health talks, intended to create awareness about various aspects of cholera – transmission, prevention and clinical presentations – features of the condition were understood differently in each site. This study considered illness-related aspects of cholera, with reference to community identified patterns of distress, perceived causes and help-seeking. It focussed on respondents' accounts of illness rather than the priority symptoms of the disease (Eisenberg 1977). Local features may reflect environmental, social and cultural settings; the quality of infrastructure, access to health services and information in urban and rural settings. Our study shows how urban and rural settings influence the perceived role of physical symptoms and the financial impact of the illness, perceived causes, preferred help-seeking and prevention strategies.

Although economically better off than their rural counterparts, urban residents were more troubled by loss of income from illness and the cost of treatment. Better economic opportunity and reliance on monetised transactions may explain why urban residents are more sensitive to income loss and effects of cholera on the ability to work and earn. Fewer livelihood opportunities without money are a feature of the more

monetised society of urban residents in informal settlements. A possible reason for the younger age profile among urban respondents compared to rural respondents, observed in our data, is that young people are more likely to migrate from rural to urban areas for livelihood opportunities, while older people may return to rural homesteads for retirement.

The condition described in the cholera vignette was identified and named as cholera by a majority of respondents at both sites. Perceived severity and fatality associated with the illness was also considerable. Although cholera was regarded as a serious illness by most respondents, higher perceived fatality by urban residents suggests greater perceived vulnerability. Urban residents also appeared more sensitive to the vulnerability of children and of women. Definite ideas acknowledging vulnerable segments of the population at the urban site were not supported at the rural site. This finding suggests that highlighting the benefits for women and children of interventions for cholera control at the urban site may be responsive to perceived needs and thereby promote community participation. That approach, however, may be less relevant at the rural site, where the community is more likely to regard everyone as equally vulnerable.

The finding that ‘dirty environment’ was the most prominent perceived cause at the urban site and ‘drinking contaminated water’ at the rural site suggest priorities arising from different local conditions. Urban residents must contend with filthy conditions, and ‘flying toilets’ are a common urban phenomenon. They represent an effort to adjust to the dilapidation and non-functional state of urban sewerage systems. In contrast, rural residents in areas that are relatively clean and green do not have to worry as much about the cleanliness of their surroundings. Absence of piped drinking water at the rural site, however, increases reliance on [surface](#) water sources [such as rivers, streams and lakes](#) that may be contaminated.

Eating soil, geophagy, was more frequently reported by men than women as a cause of the illness. Geophagy is a common practice in Western Kenya. Soil is eaten from the ground, termite mounds or walls of mud huts, and it is also sold on the street. People explain the practice in various ways (e.g. it tastes nice, is believed to alleviate nausea and may provide essential minerals) (Prince *et al.* 1999). Although the practice is usually associated with the behaviour of women and children, it may have been noted by male respondents because it is more shameful for men. Some men, however, explicitly associated this practice of *dodoa* with women, for whom it is relatively more acceptable. Other gender differences were notable for reported home-treatment priorities; men indicated less regard for ORT and more for herbal treatment than women.

The relevance of perceived vulnerability differentials in the urban area and possible implications for focussing interventions on groups perceived as vulnerable have been noted above. Our findings suggest additional practical implications from distinguishing social and cultural features of [cholera in urban and rural areas](#). More attention to food hygiene at funerals in rural areas is needed. Sanitary facilities and discouraging open defecation would help to prevent contamination of communal water supplies [that often rely on surface water sources in streams and rivers of rural areas](#), and this should be a priority for cholera control and prevention. Open defecation is also a problem in urban areas, where both health education and improved sanitary infrastructure are required. Several villages in the rural areas have been declared Open Defecation Free, which is a diarrhoeal disease control measure to avoid contamination of water with human faeces (Institute of Development Studies 2012). Such initiatives are lacking in urban areas, especially in informal settlements.

Unanimous preference for health facilities at both sites demonstrates trust in the health system and good prospects for effective public health action if there are resources

and political will to support it. Credibility of health policy in the community suggests opportunities for the positive impact of strengthening the health system. Better access and enhanced capacity of health facilities should be a goal for preventing mortality generally and by reducing the case fatality ratio for cholera. Community health workers, who are the preferred source of rural help-seeking, and other informal sources of help will benefit from training that increases timely access to care, and training that facilitates health education, which is valued in the community, especially the urban community.

Easier access to medicine shops and pharmacies explains more frequent spontaneous urban references to self-prescribed antibiotics. Efforts are needed to reduce urban reliance on these drugs and to regulate their sale. Explaining other ways to prevent cholera should reduce misuse of antibiotics, and should emphasise the value of rehydration through ORT for life-saving treatment. ORT as home-management of cholera appears to be more highly valued as an intervention for children, and better awareness of its value for adults should be an aim of information, education and communication.

Supernatural perceived causes were reported by a relatively small segment of the population. Although no differences distinguished rural and urban areas in the prominence of supernatural perceived causes of cholera, the nature of religious and spiritual priorities had some distinctive features. In rural areas, protection from the influence of supernatural forces was noted more frequently and more prominently for preventing cholera. Urban respondents were more likely to emphasise the value of prayer as a feature of self-treatment at home.

Other research in Nyanza province has also shown that high rates of rural cholera has been attributed to use of contaminated water from rivers, eating contaminated food, and sharing meals at funerals and communal parties (Shapiro *et al.*

1999, Shikanga *et al.* 2009). While these findings and ours indicate the need for better infrastructure and general development, specific interventions are also relevant for use in endemic areas, such as vaccines as an interim measure as development proceeds. The WHO (2010a) recommends oral cholera vaccines in endemic areas to complement classical prevention strategies (Mahamud *et al.* 2012). An effective vaccine strategy requires health system capacity for delivering a vaccine, and community regard for both the health system and the vaccine to motivate acceptance. Even though a cholera vaccine has not been available in the study communities, regard for vaccines was substantial, mentioned by 87.9% of all respondents. Although findings in this report focus on classical measures for cholera control, other findings from this study reported elsewhere have also identified cultural features of local cholera explanatory models that are likely to influence community vaccine acceptance in Kenya if it were to become available (Sundaram *et al.* 2012).

In summary, cultural concepts, perceived causes and preferred ways of treating and preventing cholera reflect the influence of urban and rural settings, and gender. Cholera is a well-known problem in both endemic study communities, identified by more than 75% of respondents. It is considered a serious illness with potentially fatal consequences, for which health education is desired and valued. Medical interventions are widely accepted and also valued. Findings indicate community priority, demand and potential effectiveness of enhanced efforts to control cholera in Western Kenya, and they suggest strategies that are particularly well-suited for control of urban and rural cholera.

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Table 1. Community perceptions of vulnerability to the illness for a cholera vignette in urban and rural Western Kenya, 2010.

	Urban site, n=190 %	Rural site, n=189 %	P value ^a
Sex			
Men more vulnerable	10.5	13.2	0.432
Women more vulnerable	35.3	13.8	<0.001
Neither more vulnerable	54.2	73.0	<0.001
Age			
Adults more vulnerable	17.4	27.5	0.020
Children more vulnerable	67.9	33.3	<0.001
Neither more vulnerable	14.7	39.2	<0.001
Social class			
Rich more vulnerable	2.1	3.7	0.380
Poor more vulnerable	60.5	43.9	0.001
Neither more vulnerable	37.4	52.4	0.004

^a Fisher's exact test used for comparison of responses between urban and rural sites. Bold represents $p \leq 0.05$.

Table 2. Perceived causes for a cholera vignette in urban and rural Western Kenya, 2010.

Category ^a	Urban site, n=190				Rural site, n=189				P value ^d
	How reported? ^b				How reported? ^b				
	Total reported %	Spontaneous %	Most important %	Mean prominence ^c	Total reported %	Spontaneous %	Most important %	Mean prominence ^c	
Ingestion	98.9	81.6	25.8	2.58	96.8	76.7	33.9	2.75	0.434
Drinking contaminated water	97.4	62.6	19.5	2.18	93.7	57.7	23.8	2.23	0.778
Eating unprotected/spoiled food	95.3	61.1	6.3	1.75	91.0	52.9	10.1	1.74	0.432
Eating forbidden food	11.6	0.5	0.0	0.12	14.8	0.0	0.0	0.15	0.365
Eating soil	60.0	0.0	0.0	0.60	52.4	0.0	0.0	0.52	0.136
Behaviour	97.4	29.5	3.2	1.37	96.3	31.7	7.9	1.52	0.245
Contact with contaminated water	55.8	4.7	1.1	0.64	63.0	6.9	1.6	0.75	0.115
Not washing hands	95.8	25.8	2.1	1.29	96.3	27.5	6.3	1.43	0.252
Environment	98.9	68.4	55.3	3.33	98.9	45.0	35.4	2.50	<0.001
Dirty environment	97.9	40.0	30.5	2.29	94.7	21.2	15.9	1.63	<0.001
Lack of latrines	96.3	24.2	23.7	1.92	95.2	23.3	15.9	1.66	0.125
Flies	96.3	35.8	1.1	1.35	95.8	18.5	3.7	1.25	0.004
Malaria	19.5	1.6	0.0	0.21	24.9	0.0	0.0	0.25	0.243
Worms	23.2	0.5	0.0	0.24	39.7	0.0	0.0	0.40	0.001
Magico-religious causes	22.6	0.5	0.5	0.25	25.4	0.0	2.1	0.32	0.498
Witchcraft	9.5	0.0	0.0	0.09	11.6	0.0	0.0	0.12	0.494
God's will	8.9	0.0	0.0	0.09	7.4	0.0	0.0	0.07	0.586
Violation of taboo/tradition	10.0	0.5	0.5	0.12	15.3	0.0	2.1	0.22	0.116
Miscellaneous	12.1	12.1	15.3	0.70	42.3	42.3	20.6	1.47	<0.001
Other causes ^e	10.0	10.0	2.6	0.28	30.7	30.7	2.6	0.69	<0.001
Cannot say	2.1	2.1	12.6	0.42	11.6	11.6	18.0	0.77	0.005

^a Symptoms analysed as groups (in bold) based on reported categories. Categories reported by less than 5% are not listed. Category order in the interview maintained.

^b Columns indicate the frequency of reported categories, percentage of responses that were reported spontaneously for each category, and the percentage of responses that identified the category as most important.

^c Mean prominence calculated from values assigned based on how the category was reported: where not reported=0, reported on being probed=1, reported spontaneously=2, identified as most troubling=3.

^d Wilcoxon test used for comparison of mean prominence between sites. Bold represents $p \leq 0.05$.

^e Includes contact with infected persons, unprotected sexual intercourse, cold weather, mosquitoes, breathing in contaminated air and eating cold food.

Table 3. Self-treatment at home and help-seeking outside home for a cholera vignette in urban and rural Western Kenya, 2010.

Category ^a	Urban site, n=190				Rural site, n=189				P value ^d
	How reported? ^b				How reported? ^b				
	Total reported %	Spontaneous %	Most helpful %	Mean Prominence ^c	Total reported %	Spontaneous %	Most helpful %	Mean Prominence ^c	
<i>Self-treatment at home</i>									
Drinking more water/liquids	87.9	46.3	19.5	1.93	91.0	42.9	24.3	2.07	0.493
Herbal treatment	30.0	13.2	5.8	0.61	36.5	12.7	4.8	0.63	0.292
Oral rehydration therapy ^e	84.2	31.6	36.8	2.26	89.9	30.2	31.2	2.14	0.759
Prayers	51.1	1.1	5.3	0.68	32.3	0.0	1.6	0.37	<0.001
Self-administered antibiotics/drugs	76.8	41.1	25.8	1.95	70.9	26.5	28.6	1.83	0.251
<i>Help-seeking outside home</i>									
Health facilities	100.0	100.0	95.8	4.87	100.0	99.5	88.4	4.65	0.005
Traditional healers	12.1	3.7	0.0	0.16	17.5	1.1	0.0	0.19	0.187
Pharmacy/over-the-counter drugs	55.3	4.2	0.5	0.61	63.0	6.9	3.2	0.79	0.072
Faith healers	15.8	2.1	0.5	0.19	21.2	1.6	1.6	0.28	0.183
Informal help from a health worker/friend	44.2	1.6	2.6	0.54	65.1	6.3	6.3	0.90	<0.001

^a Categories reported by less than 15% are not listed. Category order in the interview maintained.

^b Columns indicate the frequency of reported categories, percentage of responses that were reported spontaneously for each category, and the percentage of responses that identified the category as most helpful.

^c Mean prominence calculated from values assigned based on how the category was reported: where not reported=0, reported on being probed=1, reported spontaneously=2, identified as most troubling=3.

^d Wilcoxon test used for comparison of mean prominence between sites. Bold represents $p \leq 0.05$.

^e Includes ready-made oral rehydration solution packets and home-made fluids.

Table 4. Prevention methods for a cholera vignette in urban and rural Western Kenya, 2010.

Category ^a	Urban site, n=190				Rural site, n=189				P value ^d
	How reported? ^b				How reported? ^b				
	Total reported %	Spontaneous%	Most useful %	Mean Prominence ^c	Total reported %	Spontaneous%	Most useful %	Mean Prominence ^c	
Wash hands	96.8	31.1	2.6	1.36	96.8	31.2	5.8	1.46	0.653
Safe water	98.4	70.5	5.8	1.86	97.9	65.1	12.2	1.99	0.627
Clean/safe food	98.9	64.2	4.2	1.76	97.9	46.0	4.8	1.58	0.002
Safe disposal of garbage	98.4	41.6	4.2	1.53	97.4	46.0	8.5	1.69	0.257
Safe disposal of stool	97.4	51.1	5.8	1.66	98.4	56.1	13.8	1.96	0.026
Preventive drugs	86.3	4.7	4.7	1.05	91.5	5.8	7.4	1.20	0.049
Vaccines	86.8	1.6	10.0	1.18	88.9	1.1	6.9	1.11	0.695
Health education	98.9	2.1	42.1	2.27	98.9	4.8	15.9	1.51	<0.001
Protection from supernatural influence	7.4	0.0	0.5	0.09	21.7	0.5	0.0	0.22	<0.001
Other methods ^e	21.1	21.1	4.7	0.56	20.1	20.1	6.3	0.59	0.898

^a Categories reported by less than 5% are not listed. Category order in the interview maintained.

^b Columns indicate the frequency of reported categories, percentage of responses that were reported spontaneously for each category, and the percentage of responses that identified the category as most useful.

^c Mean prominence calculated from values assigned based on how the category was reported: where not reported=0, reported on being probed=1, reported spontaneously=2, identified as most troubling=3.

^d Wilcoxon test used for comparison of mean prominence between sites. Bold represents $p \leq 0.05$.

^e Includes maintaining personal hygiene, maintaining environmental cleanliness, usage of clean utensils and clothes, not eating at funerals, avoiding infected persons, protected sexual intercourse/abstinence, avoiding alcohol and avoiding geophagy.

Text box: Example of a clinical vignette for cholera used to introduce EMIC interviews among adults from the general community.

Male, rural

Otieno from Nduru, who is 40 years old, did not feel like going out to work one morning last week. All of a sudden he had to run to the latrine. He became more and more concerned after the second and third time of running to the latrine because he was passing lots of stool which looked like rice water. It was as if he were urinating instead of defecating. He also felt very miserable because he was vomiting terribly, and the muscles in his arms and legs were very painful.

Female, rural

Atieno from Nduru, who is 40 years old, did not feel like going out to the market one afternoon last week. All of a sudden she had to run to the latrine. She became more and more concerned after the second and third time of running to the latrine because she was passing lots of stool which looked like rice water. It was as if she were urinating instead of defecating. She also felt very miserable because she was vomiting terribly, and the muscles in her arms and legs were very painful.