

# Factors Associated with Reported Diarrhoea Episodes and Treatment-seeking in an Urban Slum of Kolkata, India

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## ABSTRACT

In an urban slum in eastern Kolkata, India, reported diarrhoea rates, healthcare-use patterns, and factors associated with reported diarrhoea episodes were studied as a part of a diarrhoea-surveillance project. Data were collected through a structured interview during a census and healthcare-use survey of an urban slum population in Kolkata. Several variables were analyzed, including (a) individual demographics, such as age and educational level, (b) household characteristics, such as number of household members, religious affiliation of the household head, building material, expenditure, water supply and sanitation, and (c) behaviour, such as hand-washing after defecation and healthcare use. Of 57,099 study subjects, 428 (0.7%) reported a diarrhoea episode sometime during the four weeks preceding the interview. The strongest independent factors for reporting a history of diarrhoea were having another household member with diarrhoea (adjusted odds ratio [OR]=3.8; 95% confidence interval [CI] 3.3-4.4) and age less than 60 months (adjusted OR=3.7; 95% CI 3.0-4.7). The first choice of treatment by the 428 subjects was as follows: 151 (35%) had self- or parent-treatment, 150 (35%) consulted a private allopathic practitioner, 70 (16%) went directly to a pharmacy, 29 (7%) visited a hospital, 14 (3%) a homoeopathic practitioner, 2 (0.5%) an ayurvedic practitioner, and 12 (3%) other traditional healers. The choices varied significantly with the age of patients and their religion. The findings increase the understanding of the factors and healthcare-use patterns associated with diarrhoea episodes and may assist in developing public-health messages and infrastructure in Kolkata.

**Key words:** Diarrhoea; Epidemiology; Healthcare use; Slums; India

## INTRODUCTION

An accurate understanding of healthcare use is needed to inform and implement appropriate policies. Several models have been developed to understand treatment preferences better but the one by Andersen is most

commonly used (1-3). In this model, factors determining the choices of healthcare providers include severity of disease, perceived vulnerability, socioeconomic factors, and education. The relative importance of individual factors varies considerably between settings.

Many studies have identified economic status as the most significant predictor of medical-care use. For example, Neumark *et al.* identified economic status as the determining factor for the number of visits to medical facilities (4). Inman *et al.* identified expenditure and time as the two most important constraints in using child health services (5). Other than financial considera-

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tions, severity and vulnerability of perceived disease are important triggers to initiate search for healthcare and may also influence the choice of health provider (6-8). Educational status could influence healthcare use, but studies have produced contradictory findings (9). For example, one study in Kerala, India, found a negative relationship between maternal education and care-seeking (10). In other settings, maternal education had a positive effect on healthcare use (4,11,12). The influence of gender of young patients on healthcare-seeking behaviour has been observed by many researchers in southern Asia (13). For example, gender was a significant predictor of treatment-seeking in Punjab (14). A study in Pune, Maharashtra state, found that significantly more boys than girls were treated by qualified healthcare professionals, significantly more money was spent on boys compared to girls, and parents were willing to travel a greater distance to have their sons treated compared to their daughters (15). Similarly, in Matlab, Bangladesh, physicians were consulted three times more often for male children (16). A recent study describing healthcare use of children aged less than five years in a rural community in West Bengal found that qualified health professionals were consulted more often and sooner for boys than for girls (17). Preferential treatment of sons becomes less marked from northern to southern India as the value of daughters increases (18).

In research studies, particularly for those that rely on passive surveillance, an understanding of healthcare use by the target population is crucial since differential healthcare-seeking behaviour could influence outcome. Active surveillance, that is visiting each individual or household in the target population at regular intervals to detect the disease episode of interest, could avoid this potential bias. However, for diarrhoeal disease research, an active surveillance may unnecessarily include trivial diarrhoea episodes. Furthermore, it may not be feasible to conduct an active surveillance for less-common outcomes, such as cholera, and an active surveillance for large populations is prohibitively expensive.

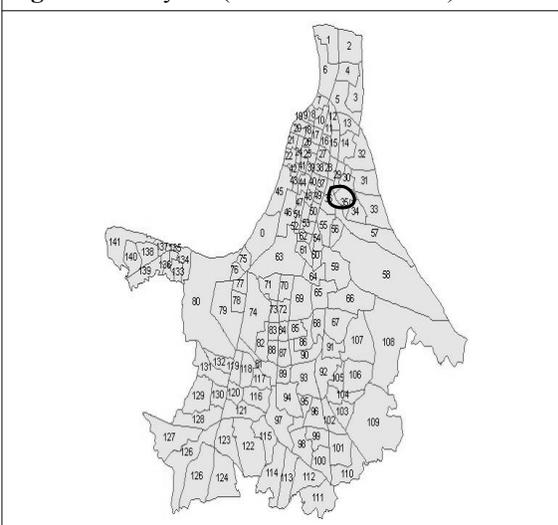
In preparation for a large surveillance project to estimate the disease burden of typhoid fever and cholera in an urban slum area in eastern Kolkata, we studied reported diarrhoea rates and factors associated with reported diarrhoea episodes. We also studied the local healthcare-use patterns and factors associated with the use of specific providers.

## MATERIALS AND METHODS

### Study area

Kolkata, previously known as Calcutta, has an area of approximately 187 km<sup>2</sup> and had a population of 4,580,544 in 2001. This congested urban area has an estimated population density of 24,760 persons per km<sup>2</sup>. Kolkata is divided into 141 administrative wards. In preparation for a cholera and typhoid fever surveillance project, a census and healthcare-use survey was conducted in a contiguous slum area encompassing most of Ward 29 and all of Ward 30 (Fig. 1). The results of the survey are presented in this report. This study site was chosen for its high number of cholera and typhoid fever cases, based on a review of addresses of patients admitted to the Infectious Disease Hospital, Kolkata.

**Fig. 1.** The study site (Ward 29 and Ward 30) in Kolkata



Houses in the geographic area now delineated as Ward 29 and Ward 30 first appeared in maps since 1856. At that time, the settlement was known as Narkeldanga, a poor area at the outskirts of Calcutta. While household members may have been replaced through death, birth, and migration, the outline of the area and many of its structures have remained unchanged since independence from Britain in 1947 (19). A brief period of immigration occurred during the East Bengal (now Bangladesh) partition from Pakistan. Consequently, some houses were divided-up to accommodate migrants from East Bengal.

Water supply and sanitation in the study area are inadequate. Several households residing in a premise share one or two latrine(s) and water tap(s). Most sewage is

collected in open drainage gutters, which tend to overflow during the rainy season, flooding adjacent homes.

### The healthcare system in Kolkata

In Kolkata, private medical practitioners, private nursing homes, 7 referral government hospitals, and traditional healers provide healthcare. Medical practitioners and clinics generally charge about US\$ 5-10 for a consultation. Severe adult cases of diarrhoea and other infectious diseases are referred to the Infectious Disease Hospital. Children with severe illness, whether of infectious or other aetiologies, are referred to the B.C. Roy Children's Hospital. In both these government hospitals, medical services are provided free of charge but patients sometimes pay for drugs, fluids, and food (for in-patients). Medication, including antibiotics, can be purchased (with prescription) in pharmacies and from other drug vendors, such as supermarkets and small stalls (without prescription).

### Data collection

Data used in this study were collected during a census conducted from January to March 2003, the dry, cold winter season. A de jure census was undertaken: all members living in a household for more than six months and planning to stay on in the household were included in the census. A household was defined as a family or number of families who cook together in one kitchen. Data were collected through a structured interview of a household member, preferably the household head. A team of male and female community health workers conducted interviews in the local language. The teams underwent intensive training how to conduct interviews prior to the start of research activities.

For each household, a structured survey form was used for collecting information on building material, expenditure, water supply, and health-related behaviour. Information was also collected to describe each household member in terms of sex, age, educational level, and whether the individual had had any diarrhoea episode during the preceding four weeks. The study did not assess whether individuals had had multiple episodes of diarrhoea. A diarrhoea episode was defined as three or more loose stools within 24 hours. If any diarrhoea episode was reported for a household member, information was collected regarding where the individual first sought treatment. The choices for healthcare included: whether a patient (a) stayed at home for self- or parent-treatment, (b) bought medications directly at a pharmacy, (c) visited a hospital for medical care, (d) consulted a private allopathic practitioner, (e) consulted

a homoeopathic practitioner, (f) consulted an ayurvedic practitioner, or (g) consulted other traditional healers. Allopathy refers to the conventional medical approach; homoeopathy is a system of complementary medicine using a single, extremely dilute remedy; and ayurvedic care is a traditional Hindu system of medicine using diet, herbal treatments, and yogic breathing.

### Data analysis

Data were double-entered in a FoxPro database (Microsoft Visual FoxPro 7.0, 2001, USA). Several variables were analyzed, including (a) individual demographics, such as age and educational level, (b) household characteristics, such as number of household members, religious affiliation of the household head, building material, expenditure, water supply and sanitation, and (c) behaviour, such as hand-washing after defecation and healthcare use. To evaluate the possible correlation between diarrhoea episodes and the above variables, unadjusted crude odds ratios (ORs) were calculated for individuals reported to have had a diarrhoea episode in the previous four weeks and compared to those of individuals without diarrhoea. This approach does not take into account that the risk of having a diarrhoea episode and a specific variable are likely to factor within a household. The odds ratios were, therefore, recalculated using generalized estimating equation (GEE), a generalization of usual logistic regression (20). The relationship between the outcome (diarrhoea/non-diarrhoea) and the explanatory variables was assessed by applying GEE of the binomial household to the data. The model was adjusted for age, religion, and ward, the variables which were independently associated with an increased risk for diarrhoea in univariate analysis. We used an exchangeable form for within-household correlation. Educational level was only included in analysis for individuals aged 15 years or older. Stata 7 (Stata Corporation, USA) was used for data analysis.

### Ethics

The Ethics Committee of the Indian Council of Medical Research and the Secretariat Committee for Research Involving Human Subjects of the World Health Organization, Geneva, Switzerland, approved the study.

## RESULTS

In total, the study census enumerated 57,099 individuals, of whom 30,858 (54%) were male. These individuals live in 10,960 households with a median of 5 (range 1-30)

individuals per household. The households are grouped into 1,500 premises with a median of 4 (range 1-488) households per premise. The median number of years families have lived in the same residence is 35 (range 1-100). About 87% of the houses were made of bricks (*pucca*), 12% of bricks combined with mud (*semi-pucca*), and 0.5% of mud (*katcha*). The median monthly household expenditure was 3,000 Indian Rupees (INR) or 67 US\$ per household (1 US\$=45 INR in 2002/3). The average number of rooms per household is 1.5.

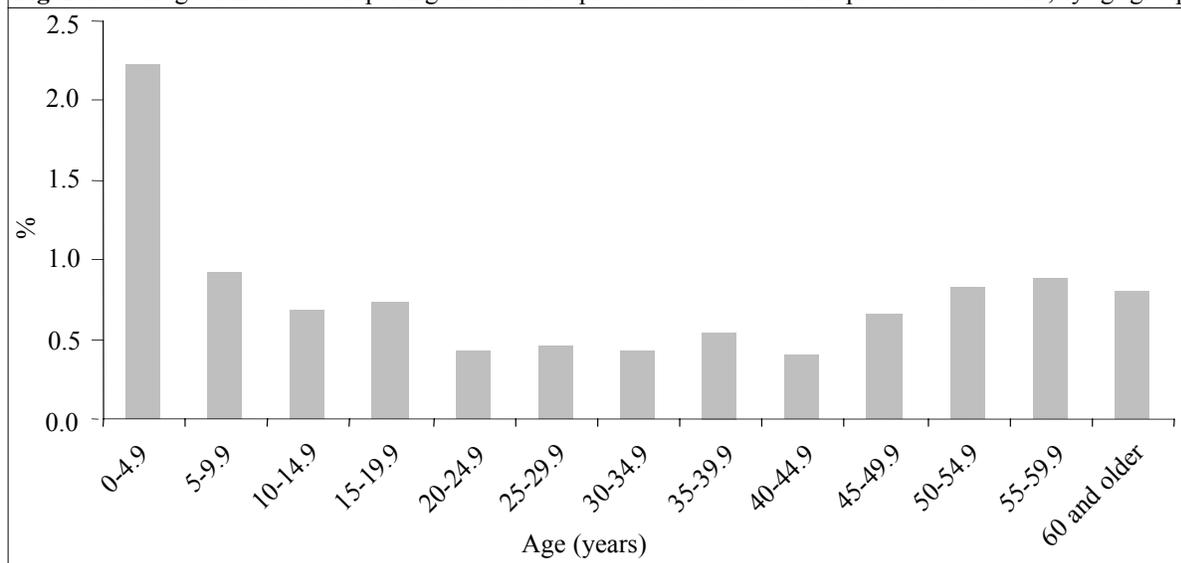
About 58% of the household heads described themselves as Hindu, 42% Muslim, and 0.2% other. Ninety-nine percent of the households in Ward 30 are Hindus compared to 32% in Ward 29. The average household saving per month was 246 INR in Hindu households compared to 105 INR in Muslim households ( $p<0.001$ ). All consumer goods included in the survey, namely refrigerator, television, motorbike, bicycle, radio, sewing machine, and telephone, were statistically significantly more frequently found in the Hindu households. Significant differences in water supply were observed between the Muslim and the Hindu community with 6,142 of 33,084 (19%) Hindus having an own tap in the household compared to 1,158 of 23,913 (5%) Muslims ( $p<0.001$ ).

Of the 57,099 individuals included in the census, 428 (0.7%) reported a history of diarrhoea sometime during the four weeks preceding the interview. There was no statistically significant difference in the frequency

of diarrhoea episodes between the sexes—241 (0.8%) males and 187 (0.7%) females reported a diarrhoea episode. The percentages of individuals reporting diarrhoea episodes by age group are shown in Figure 2. The strongest independent factors for reporting a history of diarrhoea were having another household member with diarrhoea, young age (under 60 months), Hindu religion, residing in Ward 29, living in a *semi-pucca* house, and household expenditure below 2,000 INR per month (crude and adjusted odds ratios with 95% confidence intervals are shown in the table).

The 428 individuals who had a diarrhoea episode in the four weeks preceding the interview or their parents/guardians were asked where they first sought treatment. One hundred fifty-one (35%) stayed at home (for self- or parent-treatment), 150 (35%) consulted a private allopathic practitioner, 70 (16%) went to a pharmacy, 29 (7%) visited a hospital, 14 (3%) a homoeopathic practitioner, 2 (0.5%) an ayurvedic practitioner, and 12 (3%) other traditional healers. The choices varied significantly with the age of patients and their religion/cultural group. Children, aged less than 60 months, with diarrhoea were preferentially brought to a private practitioner, whereas diarrhoea patients of older age groups treated themselves (Fig. 3a). Significant differences in treatment-seeking were observed between Hindus and Muslims (Fig. 3b). Muslims with diarrhoea significantly visited more frequently private practitioners compared to Hindus (crude OR 3.1; 95% CI 1.9-5.1; adjusted for age,

**Fig. 2.** Percentage of individuals reporting one or more episodes of diarrhoea in the previous four weeks, by age group



ward, and correlation within a household OR 6.0; 95% CI 3.6-10.2). The healthcare use of male and female diarrhoea patients was similar in all age groups (crude OR for use private practitioners: 0.8; 95% CI 0.5-1.2; adjusted for age, ward, and correlation within a household OR 0.8; 95% CI 0.6-1.1). Neither did the level of education achieved by the respondent appear to have a significant influence on the treatment choices (Fig. 3c). There were no significant differences in healthcare-use behaviour between household from higher and lower expenditure groups (Fig. 3d); a similar percentage of diarrhoea patients living in households from the highest quartile of expenditure (40/137, 29%) and patients from the lowest quartile of expenditure 35/106 (33%) did not seek treatment.

When asked what factors determined the choice of the healthcare provider, 7,149 (65%) of 10,959 respondents

chose severity of disease, 57% treatment cost, 53% reputation of care provider, 34% type of illness, 30% distance to the healthcare provider, and 6% expected waiting time.

## DISCUSSION

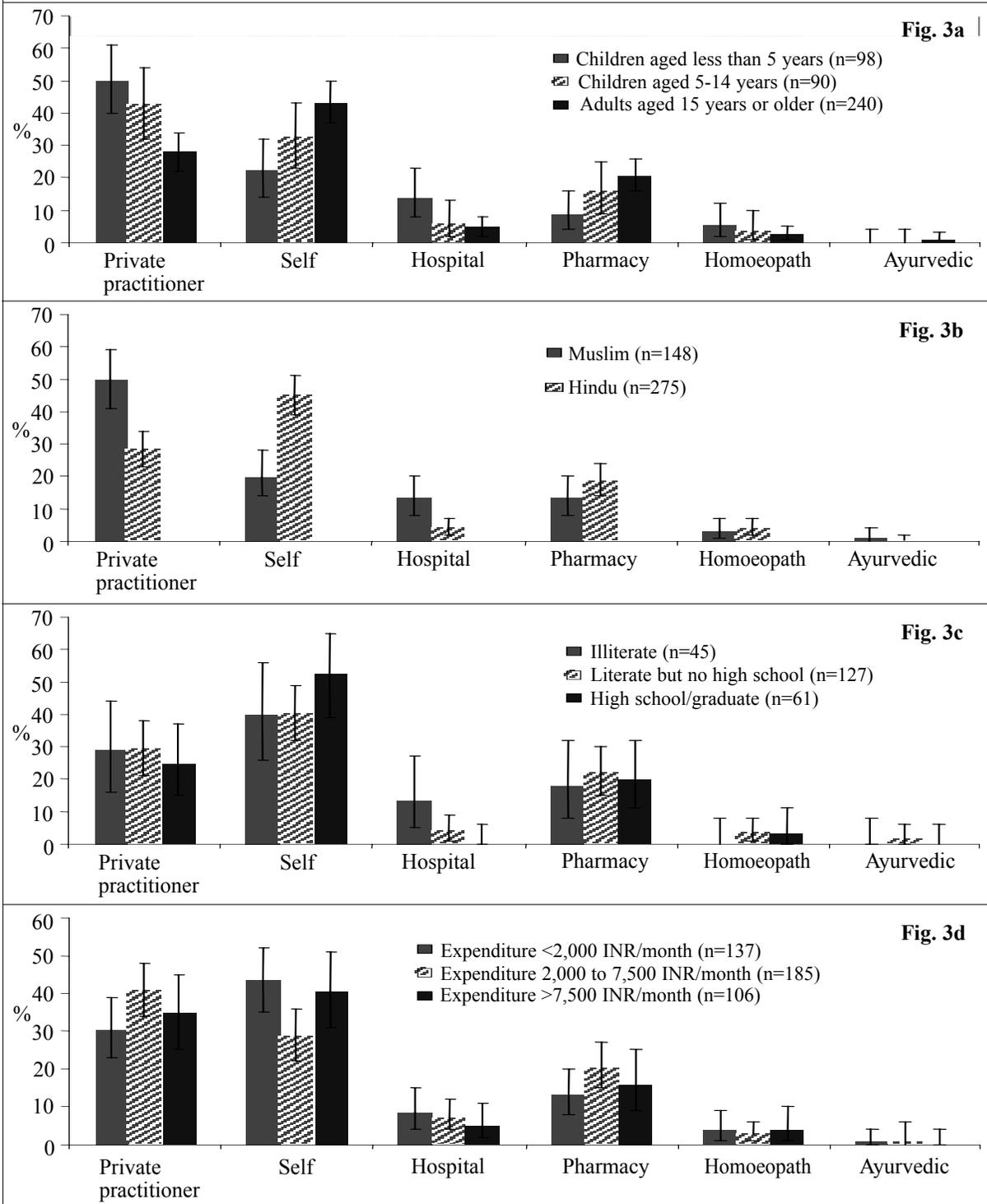
We found that the prevalence of diarrhoea in this impoverished urban area was very low; 2.2% of children aged less than five years and 0.6% of adults reported at least one diarrhoea episode during the preceding four weeks. The respondents were, however, interviewed during the winter season when rates of diarrhoeal diseases are expected to be at their lowest level (21). In addition, detection of diarrhoea cases depended on recall and collaboration of the respondents who might have forgotten diarrhoea episodes, might not be aware of diarrhoea episodes in the household, and might be reluctant to disclose gastrointestinal illnesses of household members.

**Table.** Comparison of reported diarrhoea by characteristics of individuals and households

Characteristics	Total number	Individuals with diarrhoea		Crude odds ratio (95% CI)	Adjusted odds ratio* (95% CI)
		No.	%		
Has no other household member with diarrhoea <sup>†</sup>	56,776	326	0.6	ref	ref
Has one or more other household member(s) with diarrhoea <sup>†</sup>	323	102	31.5	80 (61-103)	3.8 (3.3-4.4)
Those aged 60 months and older	52,710	330	0.6	ref	ref
Those aged less than 60 months	4,389	98	2.2	3.6 (2.9-4.6)	3.7 (3-4.7)
Muslim	23,913	148	0.6	ref	ref
Hindu	33,084	275	0.8	1.3 (1.1-1.6)	2.1 (1.7-2.6)
Living in a brick/ <i>pucca</i> house	49,867	314	0.6	ref	ref
Living in a semi- <i>pucca</i> or <i>katcha</i> house	7,232	114	1.6	2.5 (2-3.1)	1.6 (1.2-2.2)
Monthly household expenditure >INR 2,000	42,020	291	6.9	ref	ref
Monthly household expenditure <INR 2,000	15,079	137	0.9	1.3 (1.1-1.6)	1.3 (1-1.6)
Children <sup>‡</sup> make use of a toilet other than a latrine	2,450	45	1.8	ref	ref
Children <sup>‡</sup> make use of a latrine	1,939	53	2.7	1.5 (1-2.3)	1.5 (1-2.3)
Household members always wash hands after defecation	38,402	229	0.6	ref	ref
Household members do not always wash hands after defecation	18,697	199	1.1	1.8 (1.5-2.2)	1.3 (1-1.7)
Water from a communal tap	48,583	337	0.7	ref	ref
Water from a source other than a communal hand pump	8,516	91	1.1	1.6 (1.2-2)	1.3 (1-1.7)
Household does not own home	41,378	321	0.8	ref	ref
Household owns home	15,721	107	0.7	0.9 (0.7-1.1)	1 (0.8-1.3)
Literate adults**	32,144	192	0.6	ref	ref
Illiterate adults**	9,177	48	0.5	0.9 (0.6-1.2)	0.9 (0.7-1.2)
Living in Ward 29	35,271	316	0.9	ref	ref
Living in Ward 30	21,828	112	0.5	0.6 (0.4-0.7)	0.4 (0.3-0.5)

\* Adjusted for age, religion, ward, and correlation within households  
<sup>†</sup> A household member with diarrhoea in the previous four weeks  
<sup>‡</sup> Children aged less than 60 months  
\*\* Adults aged 15 years and over  
CI=Confidence interval

**Fig. 3a-d.** Healthcare provider selection by age group, religion, educational level (for those aged 15 years or older), and monthly household expenditure\*



\* Vertical bars indicate 95% confidence intervals

The most important factors for a reported episode of diarrhoea were a household member with diarrhoea and age under 60 months. Both the correlations have been observed in poor and better-off countries (22-25). Individuals residing in poorer structures were at a higher risk for diarrhoea episodes compared to individuals living in brick structures. This finding may be explained by the differences in hygienic conditions and practices in brick houses (26). We found a significant correlation in the type of water supply and the risk for a diarrhoea episode. Individuals who had to use a communal hand pump were at a higher risk for diarrhoea episodes compared to those residing in households with a communal tap. Perhaps, contamination more frequently happens during storage of collected water or individuals who had to fetch water from a distance probably used less for hand-washing, cleaning, and cooking, resulting in overall less-hygienic practices.

In this slum in Kolkata, as has been shown in Indonesia, Bangladesh, and Thailand, the residents in the poorest households, defined here as households with a monthly expenditure below 2,000 INR (US\$ 44) were at a higher risk for diarrhoea episodes (27-30). This finding illustrates the socioeconomic heterogeneity of the slums of Kolkata. Even in impoverished slums like Ward 29 and Ward 30, we found a risk gradient: diarrhoea episodes were more frequently found in the lowest expenditure group. However, the residents of Ward 29 and Ward 30 are not the poorest population of Kolkata; the most impoverished is the itinerant population who have no fixed abode and sleep on pavements.

Ownership of residence and consumer goods indicated that Muslims were poorer than Hindu households in this community. We found a higher reported prevalence of diarrhoea among the Hindu community compared to the Muslim community. The higher risk was independent of the number of children, the age of the population, the ward in which the household is located, monthly expenditure, water supply, and sanitation. Several variables in terms of hygiene practices were analyzed and failed to explain the differences in the prevalence of diarrhoea. A predisposition of cholera for Hindus compared to Muslims was observed by Glass *et al.* in a surveillance study in rural Bangladesh, which the authors believed to be related to an increased contact with water through their prime occupation of fishing (31). Although this occupation is not common in our study population, it is possible that other differences in behaviour not detected by the survey could predispose the Hindu community to diarrhoeal illness. It is also possible that the observed higher rates of diarrhoea in the Hindu

community could be biased by under-reporting of diarrhoeal diseases in the Muslim community. It has been suggested that the same term 'diarrhoea' has different meanings in the two communities. In the Hindu community, diarrhoea means a usually uncomplicated, self-resolving illness, while in the Muslim community diarrhoea has a much more ominous connotation implying a severe, life-threatening illness. More qualitative work is underway to explore these differences but perhaps no single explanation can account completely for the difference in the prevalence of diarrhoea.

Our survey indicated that consultation of a private practitioner and self-treatment were the most common treatment choices in the study areas. A major factor in the choice of a healthcare provider was the age of the patient; children were brought to professional healthcare providers, while adults treated themselves. The investment in time and money to treat children is perhaps best explained by the perceived higher vulnerability of children compared to adults. Another important factor in the choice of treatment was perceived severity of disease. Severity of disease was the most frequently-mentioned factor for the choice of a healthcare provider.

The study also found significant differences in the choices of treatment between the Muslim and the Hindu community. Independent of the age of the patient and the ward, the Muslim households preferentially visited private practitioners. In contrast, the Hindu households reported more frequently treating diarrhoea themselves. This finding may again be explained by the connotation of the word 'diarrhoea' in the Muslim community as a very severe illness requiring immediate medical care as discussed earlier.

Poverty did not appear to play a significant role in the reported treatment choices. For instance, residents in households with a monthly expenditure in the lowest quartile treated diarrhoea patients similar to households with expenditures in the top quartile. Neither did education play a major role, graduate and illiterate diarrhoea patients made overall similar treatment choices. Nor did we observe any differences in treatment choices according to the gender of the patient. The absence of discrimination based on gender may be related to the urban environment as previous studies which detected such discrimination were conducted in rural areas (14-16). A recent study detected gender differences in health-care-seeking in four rural villages, 10 km from Kolkata (17), which is probably explained by inaccessibility or far distance from healthcare providers in these settings.

How should we understand these differences in healthcare use? In this study, we found that host vulnerability (e.g. child vs adult) and religion or kinship were significantly related to the choice of healthcare, whereas socioeconomic status, education, and gender of the patient were not. When asked what factors determined the choice of a healthcare provider, severity of disease, cost of treatment, and reputation of care provider were cited as the most important reasons and which ultimately determine selection of treatment. In this urban slum, choices of treatment may seem wide but the one essential option, a government health centre, which is often the first referral point in a developing country is not available. The findings of our study increase our understanding about the factors and healthcare-use patterns associated with diarrhoea episodes and may assist in developing public-healthcare infrastructure in the area.

Since the study found that only 0.7% of the 57,099 people reported a history of diarrhoea during the four weeks preceding the interview, there could be a difference in responses of households who reported one or more diarrhoea case(s) compared to households who had diarrhoea episodes but did not report them. This potential limitation could only be overcome by asking each household what they would do for a hypothetical diarrhoea case. However, such an approach could have other, perhaps, more profound limitations.

The study results could have been influenced by several types of biases (10). Recall bias is possible because the data were generated primarily from interviews. Misclassification could occur if the respondent misrepresented what actually happened to create a more socially desirable impression, for example, by reporting that she/he took the child to an allopathic health centre. It could also occur if some respondents were better able to recognize disease than were others (for example, if better-educated mothers or families with higher economic status/social class are more able to recognize and report disease, the reported odds ratios are biased upwards). Other unidentified predictors or confounders regarding attitude and perceptions of people about healthcare-seeking behaviour are also possible.

In conclusion, the study describes several aspects of diarrhoea in a slum of Kolkata. Compared to other slums in Asia, this slum has little spatial or social mobility. The majority of the households have occupied the same dwellings since the independence from Britain. In contrast to other slums in Asia, frequently characterized

by highly dynamic populations, this area of Kolkata allows a unique opportunity for long-term observations, which is critical for a surveillance following public-health interventions. The study was conducted during the low season for diarrhoeal diseases. Despite the low prevalence of diarrhoea, the study could detect significant factors for diarrhoea, such as young age and an affected household member, which have been found in other sites. The study found the kinship association being part of the Muslim or Hindu community factors with the reported rates of diarrhoea and healthcare use. Several explanations for these observations have been suggested, but more qualitative work is required.

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