

Community-based Cluster Surveys on Treatment Preferences for Diarrhoea, Severe Diarrhoea, and Dysentery in Children Aged Less Than Five Years in Two Districts of Ghana

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ABSTRACT

Hospital-based surveillance for severe diarrhoea has been recommended to assess the burden of disease due to rotavirus. However, information on healthcare-seeking patterns of residents in the hospital catchment area is needed first to obtain the burden of disease in the community using the hospital data. A community-based cluster survey was conducted in two districts of Ghana, each served by a single district hospital, to determine the prevalence of severe diarrhoea among and treatment preferences for children aged less than five years. Caretakers of 619 children in Tema, an urban district, and caretakers of 611 children in Akwapim South, a rural district, were interviewed. During the month preceding the survey, the prevalence of severe diarrhoea in children aged less than five years was similar in the two districts (13.6% urban and 12.9% rural), as was the proportion of mothers who sought care outside the home (69.0% urban and 70.9% rural). 48.8% of urban mothers of children with severe diarrhoea visited public/private clinics, 9.5% pharmacies, and 3.6% the district hospital. Whereas, 22.8% of rural mothers visited public/private clinics, 19.0% pharmacies, and 13.9% the district hospital. Results of the study suggest that rotavirus surveillance should be guided by community studies on healthcare-use patterns. Where hospital use is low for severe diarrhoea, rotavirus surveillance should include other health facilities.

Key words: Diarrhoea; Diarrhoea, Infantile; Surveillance; Cluster survey; Treatment preferences; Healthcare-seeking behaviour; Child health services; Ghana

INTRODUCTION

Diarrhoea, the third major cause of morbidity in children aged less than five years in Ghana (1), accounts for 15% of outpatient visits to health centres. The proportional rate of mortality due to diarrhoea is 10% in chil-

dren aged less than one year and 8% in children aged 1-5 year(s) (1). Mortality from diarrhoea is often due to dehydration, which needs to be properly managed to reduce high mortality rates. Education on the use of oral rehydration solution (ORS) for the treatment of diarrhoea in the home is encouraged. For severe diarrhoea, however, the healthcare system plays an important role in case management since this is a potentially life-threatening condition, which requires immediate treatment with intravenous and/or oral fluids (2).

Rotavirus infection is one of the important causes of severe diarrhoea in children throughout the world and

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is a leading cause of death in early childhood (3,4). The incidence of diarrhoea due to rotavirus is 0.035 per child-year in northern Ghana (5), occurring more commonly in the dry season (5-7). Improvements in sanitation and in food and water quality have failed to alter the incidence of rotavirus infection in many countries (8). Vaccines are considered to be the intervention most likely to prevent the disease, and a number of candidate rotavirus vaccines are undergoing clinical testing (8).

Care-seeking behaviours and treatments for children with diarrhoeal illnesses vary considerably between countries. Recent surveys suggest an increasing tendency to seek care for diarrhoea outside the home (9). Hospital-based surveillance of severe diarrhoea in children aged less than five years has been proposed to address the burden of rotavirus infection in communities. Likewise, passive hospital-based surveillance has been proposed for clinical trials to assess the protective efficacy of candidate rotavirus vaccines against severe diarrhoea.

Before initiating any hospital surveillance, it is important to determine hospital-use patterns among carers of children with severe diarrhoea in catchment areas. It is also important to understand the attitudes and practices of the population towards paediatric gastroenteritis and treatment preferences for diarrhoea in general. For this reason, the World Health Organization (WHO) has developed a new protocol for a community-based survey to assess the use of health services for children with gastroenteritis (10). To field-test this protocol, we conducted two surveys in Ghana—one in a rural district and one in an urban district. In each district, the purpose of the survey was to assess whether the district hospital would be a suitable site for passive surveillance of severe diarrhoea in children aged less than five years.

MATERIALS AND METHODS

The healthcare system

The healthcare system in Ghana has operated on primary healthcare concepts and strategies since the early 1980s. At Level A, the community level, trained community members and community health nurses screen patients and offer basic treatment. At Level B, the health centre, trained nurses and, sometimes, doctors offer treatment and preventive health services. At Level C, the district level, there is a hospital where doctors and nurses manage referred cases and offer tertiary care.

Financing of health services in Ghana has moved from the previously heavily-subsidised care to a situation where all patients pay for all services and drugs. Exemptions from such fees exist for special cases, the elderly, children aged less than five years, and antenatal care. However, many centres often ignore the exemption policy (11,12). The current trend is to shift to insurance systems for healthcare. The Ministry of Health has supported the diarrhoeal disease-treatment programme in Ghana for about 15 years, with ORS 'corners' in many health institutions where special attention was paid to children with diarrhoea. This programme is now fully integrated into the national services at all levels.

Study sites

Akwapim South district had a population of 120,500 in the 2000 national census (13). 2.7% of the population of the district are aged less than one year, and 15.1% are aged less than five years. Fifty-seven percent of the population live in the rural villages, and 43% live in the district capital or in towns with populations of 5,000 or greater. The residents are mostly farmers and traders. The district medical records indicate that the main causes of death among children are prematurity, malaria, anaemia, diarrhoea, respiratory tract infections, and meningitis. Public-sector health services in the district include Level A health workers and community nurses, five Level B facilities (one health post and four maternal child health clinics), and one Level C facility, a 120-bed district hospital. The district has three doctors and 77 nurses in the public-health system. Private-sector health services in the district include three private clinics and one mission clinic. 28.9% of inhabitants have access to pipe-borne water as the main source of drinking-water, and only 4.0% use flush toilet in the district.

Tema district, an industrial city, had a population of 511,459 in the 2000 census (13). 3.1% of its population are aged less than one year, and 18% are aged less than five years. Tema adjoins Accra, the capital city of Ghana. About 80% of the Tema residents live in housing estates, and the remaining live in small villages around the city. Most adult male population is employed in factories or work as traders. Public-sector health services at Level A include 182 health workers/community nurses, six Level B facilities, and one Level C district hospital with 335 beds. The district has 25 doctors and 265 nurses in the public-health system. Private-sector health services include four private hospitals and 12 private clinics. Four of the largest companies have private clinics

within their premises for their staff and families. Pipe-borne water is used by 88% of the people as their main source of drinking-water, and 26.2% use flush toilet.

Survey method

The two surveys were conducted to field-test a new WHO protocol (9). The survey design calls for a 30-cluster survey (14-16). The required sample size (600 children) is based on the following assumptions: (a) the prevalence of severe diarrhoea among children aged less than five years in the preceding month would be 30%; (b) 90% of mothers would bring children with severe diarrhoea to the hospital; (c) 5% precision; (d) 95% confidence level; and (e) a design effect of 2. The sampling frame consisted of all the villages or communities in each district; maps were available along with population data for each community, village, and town. Two-stage cluster sampling was applied. In the first stage, 30 clusters were selected proportionate to population for each study district. In the second stage, households were visited in each cluster, beginning with a randomly-selected household. The mother or another respondent was interviewed concerning children aged less than five years in the household. Where the caretaker was not at home, the interviewers were required to revisit the house at least three times. Interviews continued until 20 eligible children were recruited for each cluster. All the eligible children in the last household of each cluster were included in the sample.

In total, 10 interviewers and four supervisors were involved in the study. These included six medical residents, two social scientists, and six research assistants based in the Department of Community Health, Ghana Medical School. Ten days were spent at each site to collect data. The study was conducted in September 2002 in Tema and October 2002 in Akwapim South, both the periods being at the end of the rainy season. The local community health nurses assisted in locating the clusters and introducing the study interviewers to the community. The questionnaire was administered in the local languages (Twi and Ga); however, for some respondents, English was used.

Case definitions were established according to the WHO recommendations (17).

Diarrhoea was defined as more than three loose or watery stools in a 24-hour period, with or without blood in the stools. Dysentery was defined as diarrhoea with blood in the stools. Persistent diarrhoea was defined as diarrhoea, with or without blood, beginning acutely and

lasting at least 14 days. Severe diarrhoea was indicated in the study protocol as lasting less than 14 days and meeting one of the following three definitions: (1) more than three loose or watery stools in a 24-period with no blood and at least two of the following: lethargy/unconsciousness, sunken eyes, inability to drink or drinking poorly; or (2) local name for severe diarrhoea; or (3) diarrhoea for which the child received intravenous rehydration (7).

Questionnaire

The questionnaire, adapted from the WHO protocol (9), was pre-tested and modified for local conditions. The questionnaire covered information on the caretaker and household, age, and sex of children aged less than five years, and whether each child aged less than five years had had any episodes of diarrhoea within the previous month. If a child had experienced diarrhoea, details concerning the illness, including complications, treatment received, use of health facilities, and hospital admission, were collected. In addition, the caretakers of children who had not had diarrhoea in the month prior to the survey were asked hypothetical questions on where they would seek care if their child had diarrhoea, diarrhoea with moderate dehydration, or diarrhoea with severe dehydration.

Analysis

Survey data responses were keyed into a database. The data were analyzed using the SPSS software (version 10.0, 1994) to calculate percentages and confidence intervals (CIs) on the estimates.

Ethics

Written informed consent was obtained from each respondent. The study was approved by the Ethical Committee of the Ghana Medical School, Accra, and the Secretariat Committee for Research on Human Subjects, WHO, Geneva, Switzerland.

RESULTS

In Tema district, information was collected from 590 caretakers for 619 children aged less than five years. Of the 590 caretakers, 519 (88.0%) were mothers, 31 (5.3%) grandmothers, 25 (4.2%) aunts, seven (1.2%) fathers, and eight (1.4%) others, including sisters. In Akwapim South district, information was collected from 569 caretakers of 611 children. Of the 569 caretakers, 490 (86.1%) were mothers, 38 (6.7%) grandmothers, eight

(1.4%) aunts, 27 (4.7%) fathers, and six (1.1%) others. In Tema, 24.0% of the caretakers had secondary school education or higher compared to 12.7% in Akwapim South. Both the study sites had a high proportion of caretakers without any formal education: 22.5% in Tema and 27.6% in Akwapim South. In Akwapim South, 29% of spouses of caretakers were farmers, while in Tema, 30.7% were construction workers, factory workers, or traders. Socioeconomic indicators suggest a somewhat better standard of living in the urban district. In Tema, 58% of households had refrigerators compared to 34.8% in Akwapim South. In Tema, 19.7% of households had either cars or access to cars compared to 5.1% in Akwapim South.

The age and sex distributions of the two samples of children were similar, with 24.2% and 24.5% being aged less than one year in Tema district and Akwapim South district respectively (Table 1). The female: male sex ratio was 1.08:1 in Tema and 1.09:1 in Akwapim South.

Table 1. Age and sex distribution of children of respondents, cluster surveys in Tema district and Akwapim South district, Ghana, October-November 2002

Age group (months)	Tema district (n=619)						Akwapim South district					
	Male (n=297)		Female (n=322)		Total (n=619)		Male (n=293)		Female (n=318)		Total (n=611)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-5	30	10.1	42	13.0	72	11.6	35	11.9	41	12.9	76	12.4
6-11	33	11.1	45	14.0	78	12.6	35	11.9	39	12.3	74	12.1
12-23	65	21.9	76	23.6	141	22.8	72	24.6	85	26.7	157	25.7
24-35	67	22.6	66	20.5	133	21.5	67	22.9	64	20.1	131	21.4
36-47	43	14.5	56	17.4	99	16.0	45	15.4	52	16.4	97	15.9
48-59	59	19.9	37	11.5	96	15.5	39	13.3	37	11.6	76	12.4

The overall prevalence of diarrhoea among children aged less than five years in the preceding month was not significantly different in the two surveys: 20.7% (95% CI 17.5-23.9) in Tema district compared to 18.0% (95% CI 15.0-21.1) in Akwapim South district. In Tema, the age-specific prevalence of diarrhoea was the highest among children aged 24-35 months (28.6%) and the lowest among children aged 48-59 months (7.3%). In Akwapim South, the age-specific prevalence of diarrhoea was the highest among children aged 6-11 months (34.1%) and the lowest among children aged 48-59 months (6.6%).

The mean duration of diarrhoea was 5.7 (range 1-24) days in Tema district and 6.0 (range 1-30) days in Akwapim South district; these means exclude five children in Tema and three children in Akwapim South whose diarrhoeal illness had just started at the time of the survey. The definition of protracted diarrhoea (at least 14 days)

was met by 7.8% of children with diarrhoea in Tema and 10.9% in Akwapim South. Of children with diarrhoea 18.0% had dysentery in Tema district compared to 5.5% in Akwapim South district.

The prevalence of severe diarrhoea among children aged less than five years was 13.6% (95% CI 10.9-16.3) in Tema district and 12.9% (95% CI 10.3-15.6) in Akwapim South district. The age-specific prevalence of severe diarrhoea was the highest among children aged 12-23 months in Tema district (19.1%) and among children aged 6-11 months in Akwapim South district (24.3%). The mean duration of severe diarrhoea was 4.7 (range 1-14) days in Tema district and 4.8 (range 1-14) days in Akwapim South district.

Table 2 summarizes care-seeking behaviour for children with diarrhoea, severe diarrhoea, and dysentery in the two districts. In Tema district, of 128 children with diarrhoea, care was sought outside the home for 71.1%

(95% CI 63.2-78.9). In Akwapim South district, of 110 children with diarrhoea, care was sought outside the home for 62.7% (95% CI 53.7-71.8). In Tema district, 45.3% (95% CI 36.7-53.9) of caretakers brought children with diarrhoea to the public or private clinics, while in Akwapim South district this was 20.0% (95% CI 12.5-27.5). In Tema district, 4.7% (95% CI 1.0-8.4) of children with diarrhoea received treatment at the district hospital compared to 13.6% (95% CI 7.2-20.1) in Akwapim South district.

In Tema district, 65.6% of cases of diarrhoea were classified as severe diarrhoea compared to 71.8% in Akwapim South district. Of cases of severe diarrhoea in Tema district, 69.0% received care outside the home, similar to 70.9% in Akwapim South district. In Tema district, a significantly higher proportion of children with severe diarrhoea (48.8%, 95% CI 38.1-59.5) were treated

at the public or private clinics compared to 22.8% (95% CI 13.5-32.0) in Akwapim South district. In Tema district, 3.6% (95% CI 0-7.5) of children with severe diarrhoea used the district hospital compared to 13.9% (95% CI 6.3-21.6) in Akwapim South district. For dysentery, 87.0% (95% CI 73.2-100) of caretakers sought care outside the home in Tema district, while 47.8% (95% CI 27.4-68.2) visited a public or private clinic.

received ORS at a hospital or clinic. In Akwapim South, of the 110 children with diarrhoea, only one received intravenous fluids and 49 (44.5%, 95% CI 35.3-53.8) received ORS; 30 (27.3%) received ORS at home and 19 (17.3%) received ORS at a hospital or clinic.

Of children with severe diarrhoea in Tema district, two received intravenous fluids and 41 (48.8%, 95% CI 38.1-59.5) received ORS, of which 21 (25.0%) were given the

Table 2. Care-seeking decisions of mothers for children, aged less than 5 years, with diarrhoea, severe diarrhoea, or dysentery, community-based surveys, Tema district and Akwapim South district, Ghana, September-October 2002

Type of disease and place of care	Tema district		Akwapim South district	
	No.	%	No.	%
Diarrhoea (n=238)	128		110	
Cared for at home	37	28.9	41	37.3
Sought medical care outside the home	91	71.1	69	62.7
Place where care was sought				
District hospital	6	4.7	15	13.6
Private hospital	2	1.6	3	2.7
Government clinic	31	24.2	7	6.4
Private clinic	27	21.1	15	13.6
Pharmacy	18	14.1	19	17.3
Other	7	5.5	10	9.1
Severe diarrhoea (n=163)	84		79	
Cared for at home	26	31.0	23	29.1
Sought medical care outside the home	58	69.9	56	69.6
Place where care was sought				
District hospital	3	3.6	11	13.9
Private hospital	2	2.4	6	7.6
Government clinic	22	26.2	6	7.6
Private clinic	19	22.6	12	15.2
Pharmacy	8	9.5	15	19.0
Other	4	4.8	6	7.6
Dysentery (n=29)	23		6	
Cared for at home	3	13.0	3	50.0
Sought medical care outside the home	20	87.0	3	50.0
Place where care was sought				
District hospital	3	13.0	1	16.7
Private hospital	2	8.7	1	16.7
Government clinic	7	30.4	-	-
Private clinic	4	17.3	-	-
Pharmacy	4	17.3	1	16.7

Table 3 provides information on treatment received for diarrhoea, severe diarrhoea, and dysentery, by district. In Tema district, seven children (6 with severe diarrhoea and 1 with dysentery) were admitted to hospital compared to three children (2 with severe diarrhoea) in Akwapim South district. In Tema, of 128 children with diarrhoea, 5.5% (95% CI 1.5-9.4) received intravenous fluids, while 49.2% (95% CI 40.6-57.9) received ORS. Forty (31.2%) received ORS at home, and 23 (18.0%)

solution in the home, while 20 (23.8%) first received ORS at a hospital/clinic. In Akwapim South district, one child with severe diarrhoea received intravenous fluids and 40 (50.6%, 95% CI 39.6-61.7) received ORS with 25 (31.6%) and 15 (19.0%) given ORS at home and at the hospital/clinic respectively. Of children with dysentery in Tema district, three received intravenous fluids and 16 (69.6%, 95% CI 50.8-88.3) received ORS; 47.8% first received ORS at home and 21.7% at a hospital or clinic.

In Tema district, caretakers of 13 children were advised to take the child to a hospital or a clinic but they failed to do so because six did not think that the child's illness was sufficiently serious, three indicated that the cost for treatment was too high, and four gave other reasons. In Akwapim South district, caretakers of 15 children were advised to take the child to a hospital or a clinic but they also failed to do so because 10 indicated that cost of treatment was too high, three provided medication at home, and two gave other reasons.

DISCUSSION

The surveys found that the prevalence of diarrhoea among children aged less than five years in the previous month was similar in the two study districts: 20.7% in urban Tema district and 18.0% in rural Akwapim South district ($p=0.64$). These prevalence rates are similar to those in other studies in Ghana. A recent study in the Accra Metropolitan area (Ablekuma South) found a diarrhoea-prevalence rate of 20% in children aged less than five

Table 3. Hospital admission and use of oral rehydration solution for children, aged less than 5 years with diarrhoea, severe diarrhoea, or dysentery, community-based surveys, Tema district and Akwapim South district, Ghana, September-October 2002

Type of disease and treatment received	Tema district		Akwapim South district	
	No.	%	No.	%
Diarrhoea (n=238)	128		110	
Child admitted to a hospital	7	5.5	3	2.7
Child received intravenous fluids	7	5.5	1	0.9
Child received ORS	63	49.2	49	44.5
Where ORS was first given				
Home	40	31.2	30	27.3
Hospital/clinic	23	18.0	19	17.3
Severe diarrhoea (n=163)	84		79	
Child admitted to a hospital	6	7.1	2	2.5
Child received intravenous fluids	2	2.4	1	1.3
Child received ORS	41	48.8	40	50.6
Where ORS was first given				
Home	21	25.0	25	31.6
Hospital/clinic	20	23.8	15	19.0
Dysentery (n=29)	23		6	
Child admitted to a hospital	1	4.3	-	-
Child received intravenous fluids	3	13.0	-	-
Child received ORS	16	69.6	1	16.7
Where ORS was first given				
Home	11	47.8	1	16.7
Hospital/clinic	5	21.7	-	-
ORS=Oral rehydration solution				

Mothers whose children did not have diarrhoea in the month prior to the survey were asked what they would do if their children had severe diarrhoea. In this hypothetical situation, more caretakers would use the district hospital as the clinical presentation of diarrhoea cases became more serious (Table 4). In Tema district, 28.4% of the 461 caretakers indicated that they would use the surveillance hospital if the child had diarrhoea; 49.5% if the child had diarrhoea with moderate dehydration; and 55.5% if the child experienced diarrhoea with loss of consciousness. In Akwapim South district, of the 431 mothers, the corresponding proportions were 44.1%, 89.3%, and 88.4% respectively.

years in the previous two weeks (18). The 1998 Ghana Demographic and Health Survey found that 26.3% of children aged less than five years had had diarrhoea during the previous two weeks (19).

The prevalence of severe diarrhoea among children aged less than five years during the previous month was 13.6% in Tema district and 12.9% in Akwapim South district, with the highest age-specific incidence in children aged 12-23 months in the urban district and in children aged 6-11 months in the rural district.

Although more caretakers took children with diarrhoea for care outside the home in the urban district

(71.1%) compared to the rural district (62.7%), the difference was not significant ($p=0.08$). For severe diarrhoea, the percentage that sought care outside the home was almost the same (69.0% vs 70.9%). Thus, health service-use rates for diarrhoea did not vary in the two districts. However, the types of facilities used by the caretakers and mothers in the two districts differed significantly. 48.8% of the urban mothers of children with severe diarrhoea visited public/private clinics, 9.5% pharmacies, and 3.6% the district hospital. 22.8% of the rural mothers visited public/private clinics, 19.0% pharmacies, and 13.9% the district hospital. It is likely that more mothers used the district hospital in the rural area because there were fewer healthcare treatment options compared to the urban district. It can be inferred from these surveys that passive surveillance of severe diarrhoea using only the district hospitals would miss about 86% of cases in the rural district and about 96% in the urban district.

ORS was used at a high rate for the treatment of cases of diarrhoea, with most of this occurring at home. This demonstrates a positive trend in the management of diarrhoeal case and indicates the existence of good preventive health programmes in the communities. It has been suggested that families should be encouraged to give any available fluid in adequate quantities to prevent dehydration (20).

Lack of money was the main reason for not taking children to the clinic/hospital upon advice. The low-use rate of the proposed surveillance hospitals could be a reflection of the healthcare financing system of 'cash and carry' where patients pay for all services and many caretakers find the cost of care to be beyond their reach. Cost of care is an important factor in using health services in Ghana (21).

In conclusion, the design of rotavirus surveillance studies must be guided by information on the healthcare-

Table 4. Choice of healthcare service for potential diarrhoea, by severity, among mothers whose children did not have diarrhoea at time of survey, community-based surveys, Tema district and Akwapim South district, Ghana, September-October 2002

Condition of treatment choice	Tema district (n=461)		Akwapim South district (n=431)	
	No.	%	No.	%
If child had diarrhoea (more than 3 watery stools without blood in a 24-hour period) and this lasted less than 14 days				
District hospital	131	28.4	190	44.1
Private hospital	9	2.0	1	0.2
Government clinic	205	44.4	39	9.0
Private clinic	74	16.0	38	8.8
Pharmacy	41	8.9	148	34.3
Traditional healer	-	-	13	3.0
Friend or relative	1	0.2	2	0.4
If, during this illness, child developed signs of dehydration (irritability, restlessness, decreased urine output, increased thirst, dry mouth, or sunken eyes)				
District hospital	228	49.5	385	89.3
Private hospital	33	7.2	20	4.6
Government clinic	134	29.1	26	6.0
Private clinic	60	13.0	-	-
Pharmacy	4	0.9	-	-
Traditional healer	2	0.4	-	-
If, during this illness, child also experienced loss of consciousness or lethargy, and inability to drink				
District hospital	256	55.5	381	88.4
Private hospital	37	8.0	15	3.5
Government clinic	112	24.3	23	5.3
Private clinic	52	11.3	5	1.2
Pharmacy	-	-	7	1.6
Traditional healer	1	0.2	-	-

use patterns of the community. The cluster survey, field-tested in two districts in Ghana, generated information on healthcare treatment-seeking behaviour relating to real illnesses among children in the community. In both the districts, the survey size was sufficiently large (sample size 600) to provide information on the prevalence of diarrhoea, severe diarrhoea, and dysentery in children aged less than five years. An important finding of the two surveys was that the hypothetical responses of mothers to questions about where they would seek treatment for their children with diarrhoea did not match the real treatment choices made by the mothers whose children had actually been ill. In the hypothetical situation, a large proportion of the mothers in both urban and rural districts indicated that they would visit the district hospital, whereas the mothers of children with actual diarrhoea were much less likely to do so.

Data from the cluster surveys in the two districts in Ghana indicate that conducting rotavirus surveillance only at the district hospital would miss the vast majority of children with severe diarrhoea. The study data further indicate that rotavirus surveillance could be much more robust if it were to be carried out at the public and private clinics and at the district hospital. Even if all the clinics and hospitals were recruited to participate in rotavirus surveillance, it is important that, in both the districts, some 30% of the mothers did not seek care outside the home for a child, aged less than five years, with severe diarrhoea. An additional benefit of the WHO protocol used in this study is that it has been possible to estimate the prevalence of diarrhoea in the areas studied.

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