

## Diarrhoea Episodes and Treatment-seeking Behaviour in a Slum Area of North Jakarta, Indonesia

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### ABSTRACT

Visits to household during a census in an impoverished area of north Jakarta were used for exploring the four-week prevalence of diarrhoea, factors associated with episodes of diarrhoea, and the patterns of healthcare use. For 160,261 urban slum-dwellers, information was collected on the socioeconomic status of the household and on diarrhoea episodes of individual household residents in the preceding four weeks. In households with a reported case of diarrhoea, the household head was asked which form of healthcare was used first. In total, 8,074 individuals (5%)—13% of children aged less than five years and 4% of adults—had a diarrhoea episode in the preceding four weeks. The two strongest factors associated with a history of diarrhoea were a diarrhoea episode in another household member in the four weeks preceding the interview (adjusted odds ratio [OR] 11.1; 95% confidence interval [CI] 10.4-11.8) and age less than five years (adjusted OR 3.4; 95% CI 3.2-3.5). Of the 8,074 diarrhoea cases, 1,969 (25%) treated themselves, 1,822 (23%) visited a public-health centre (PHC), 1,462 (18%) visited a private practitioner or a private clinic, 1,318 (16%) presented at a hospital, 753 (9%) bought drugs from a drug vendor, and 750 (9%) used other healthcare providers, such as *belian* (traditional healers). Children with diarrhoea were most often brought to a PHC, a private clinic, or a hospital for treatment. Compared to children, adults with diarrhoea were more likely to treat themselves. Individuals from households in the lowest-income group were significantly more likely to attend a PHC for treatment of diarrhoea compared to individuals from households in the middle- and higher-income groups.

**Key words:** Diarrhoea; Treatment-seeking behaviour; Epidemiology; Incidence; Prevalence; Slums; Indonesia

### INTRODUCTION

Diarrhoeal diseases remain a major cause of morbidity and mortality in all age groups in the impoverished areas of South-East Asia (1-4). In Indonesia, diarrhoea is the third leading cause of overall morbidity and the leading cause of infant mortality (2,5-7). Extensive studies have explored the causative organisms of diarrhoea

in the slums of Jakarta, the capital city of Indonesia (8-10). Environmental and behavioural risk factors for diarrhoea in Asian settings have been previously studied

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(11-13). Studies in Sumatra and Kalimantan have investigated the role of socioeconomic status, personal hygiene, and water supply as a risk factor for diarrhoea in Indonesia (14,15). Less is known about predisposing risk factors for diarrhoea in the slums of Jakarta (16,17).

There are no studies which explore where diarrhoea patients seek care in the slums of Jakarta; however, such studies have been conducted in other parts of Indonesia. To estimate the cost of diarrhoea in Indonesian children, Legman *et al.* estimated the use of several providers in rural and urban areas of Java (18). Grace investigated the choices between traditional healers and biomedicine in a rural community in Lombok (19).

As part of a large surveillance project to estimate the disease burden of typhoid fever, cholera, and shigellosis in an urban slum area of North Jakarta, we studied (a) reported diarrhoea rates and risk factors associated with diarrhoea episodes and (b) local healthcare use for these diarrhoea episodes and factors associated with the use of specific healthcare providers. An accurate understanding of disease incidence is needed to advise on appropriate policies. In the research setting, accurate rates of disease incidence are needed to calculate the sample size for trials of interventions, such as vaccines.

An understanding of healthcare-use patterns is important to minimize bias in cluster-randomized trials. In individually-randomized trials, the use of different types of healthcare providers can be expected to be balanced. This is not necessarily true in cluster-randomized trials, where the use of healthcare providers participating in case detection may vary between clusters. Community-based surveillance can overcome bias introduced in this fashion as case detection does not depend on treatment choices; however, community-based surveillance may not be desirable for studies on diarrhoea, because it may detect large numbers of trivial diarrhoea episodes, which would remain untreated outside the research setting.

## MATERIALS AND METHODS

### Study site

North Jakarta (Fig. 1) has an area of 154.1 sq km and, in 2000, a population of 1,435,207 (20). This congested urban area has an estimated population density of 9,314 individuals per sq km. The average annual income per person was US\$ 689 in 2000 (20). Water

supply and sanitation are inadequate. Many homes are temporary structures without any running water. More than one-third of households have no access to tap water. Water for cooking and drinking is purchased from local vendors who deliver city tap water collected from city pipe water and put in large containers.

Most sewage is collected in open drainage gutters, which tend to overflow during the rainy season or high tide, flooding adjacent homes. Some toilets, locally known as 'helicopters', are built on platforms above flooded areas or canals. Thus, direct defecation into the environment will lead to dispersion of fomites during a diarrhoea episode. The canal system slowly moves water towards the seaside in the North during low tide but pushes back the sewage-contaminated water during high tide. Besides being used as toilets and garbage dumps, in some places the canals are used for bathing, swimming, and washing of clothes (10).

Jakarta is divided into 43 districts (kecamatan), of which 7 are in North Jakarta. Two adjacent districts, Tanjung Priok and Koja (Fig. 1), were selected for the study, based on previous research experience in the area (21,22). These districts are representative of poor urban areas with a high incidence of diarrhoea, especially cholera, in Jakarta.

### The healthcare system in North Jakarta

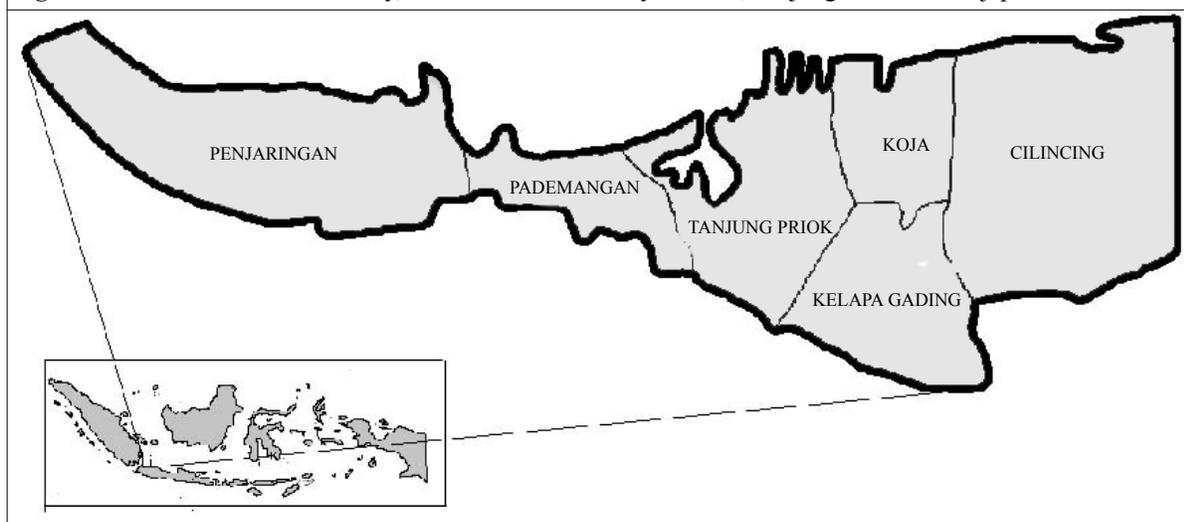
In the public health-service sector, the first-level healthcare facility is the public-health centre (PHC), locally known as the Puskesmas. Each PHC is generally staffed by 2 medical doctors, 1 dentist, several nurses, paramedics, laboratory technicians, and administrative staff. North Jakarta has, overall, 54 PHCs (1 PHC per 21,500 residents), 22 of which are in Tanjung Priok and Koja, primarily equipped to conduct preventive measures and treat mild illnesses. More severe conditions are referred to local (city) government hospitals. PHCs at kecamatan (district) level have inpatient facility for delivery and are bigger and better equipped than village-level PHCs. Each kecamatan has 1-3 ambulatory PHC(s) to serve remote areas in that kecamatan. The Infectious Disease Hospital and Koja Hospital, located in Tanjung Priok and Koja respectively, are the main local government hospitals in North Jakarta.

The public hospitals and PHCs charge a nominal fee (approximately US\$ 0.50 and 2.00 respectively for

consultation and medications for 3 days). In 2001, there were 314 private practitioners, 36 polyclinics, 32 maternal clinics, and 29 mostly very small private hospitals recorded in the study area (23). Medication, including antibiotics, can be purchased (with prescription) in 56 pharmacies and from other drug vendors, such as supermarkets and small stalls (without prescrip-

community health workers, employed by the Ministry of Health, conducted interviews in the local language. For each household member, the survey recorded sex, age, education background, and whether the individual reported any diarrhoea episode during the preceding four weeks. The study did not assess whether individuals had multiple episodes of diarrhoea.

**Fig. 1.** North Jakarta and Jakarta Bay, Indonesia and the study districts, Tanjung Priok and Kojap



tion). Private practitioners, clinics, and hospitals generally charge about US\$ 1-10 for a consultation alone.

An ongoing passive surveillance study has been set up to detect all patients in the two study districts presenting with diarrhoea and/or fever at PHCs, the Infectious Disease Hospital, or Kojap Hospital. Previous experience of the investigators in trying to include private hospitals in passive surveillance systems failed. These providers are reluctant to participate in surveillance studies due to conflicting interests, such as desire not to increase their workload with surveillance-reporting procedures and a wish not to expose business volume which could lead to increased taxes.

#### Data collection

This study was conducted from August to September 2001 during the peak of the diarrhoea season. A de jure census was undertaken: all members living in a household for more than six months and planning to stay 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 with a household member, preferably the household head. Trained

A diarrhoea episode was defined as three or more loose bowel movements within a 24-hour period. If any diarrhoea episode was reported for a household member, information was collected on where the individual was treated first. The choices included: (a) self-treatment, such as diet modifications or rehydration fluids, (b) PHC, (c) private practitioners, (d) public or private hospitals, (e) pharmacy, and (f) others, such as *belian* (traditional healer). In addition, the survey form recorded socioeconomic characteristics of each household.

#### Data analysis

Data were double-entered in a FoxPro database (Microsoft Visual FoxPro 7.0, 2001, USA) and cleaned. Characteristics were divided into categories as follows: individual, ecological factors of the household, income and expenditure, and health behaviour. To evaluate the statistical significance of correlation between episodes of diarrhoea and characteristics of the household, unadjusted crude odds ratios (ORs) were calculated for individuals residing in the study area reported to have any diarrhoea episode in the previous four weeks compared to those residing in the study area without diarrhoea. This approach does not take into account that

the risk of having a diarrhoea episode and healthcare-seeking behaviour are likely to correlate within a household. The odds ratios were, therefore, recalculated using generalized estimating equations (GEE). We used an exchangeable form for the within-household correlation. The exchangeable correlation option fits an equal-correlation population-averaged model that is equal to the random-effects model for linear regression. GEE of the binomial family was applied to the data to assess the relationship of the outcome (diarrhoea/non-diarrhoea) to the explanatory variables (household characteristics) (24). As education for children and adolescents was unlikely to be completed, the educational level was only included in the analysis of individuals aged 15 years or older. Stata 7 (Stata Corporation, USA) was used for the analysis.

#### Ethics

The study received approval from the Ethics Committee of the Ministry of Health, Indonesia, U.S. Naval Medical

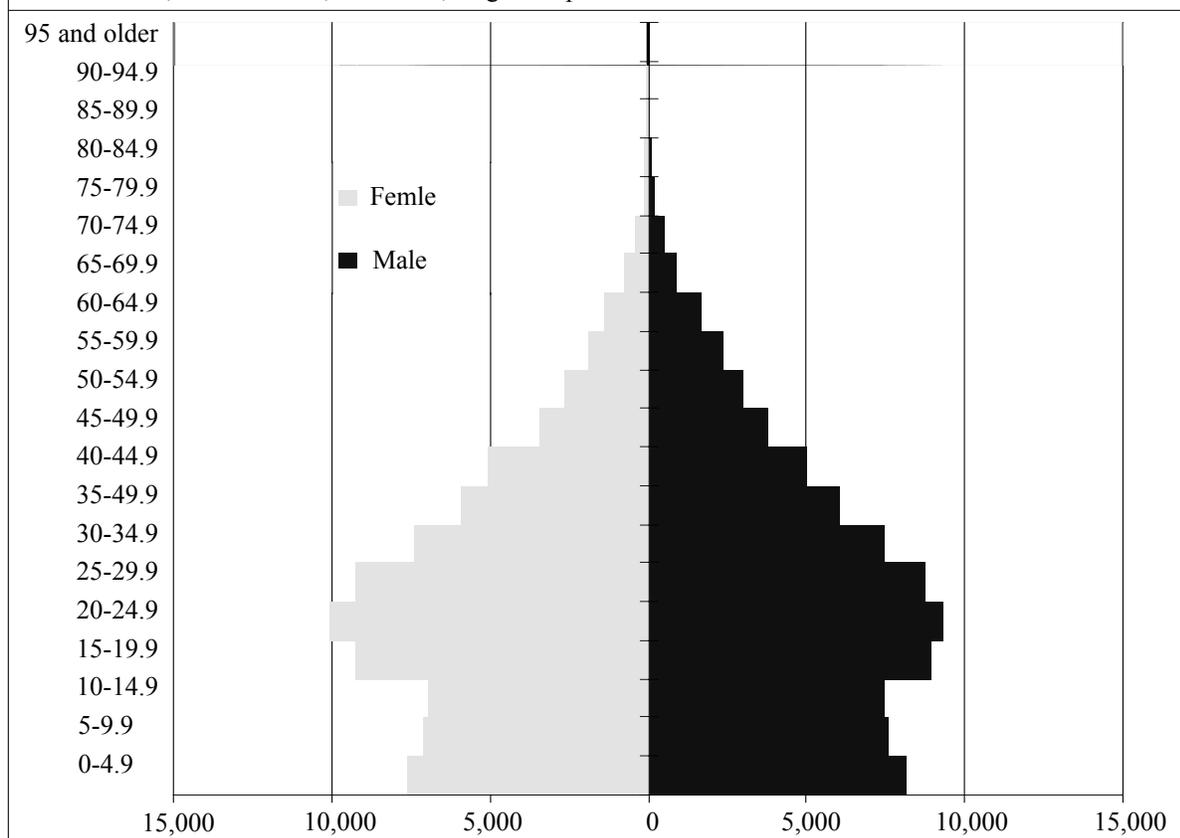
Research Unit No. 2, Institutional Review Board, Jakarta, Indonesia, and from the Secretariat Committee for Research Involving Human Subjects, World Health Organization, Geneva, Switzerland.

## RESULTS

### Four-week prevalence of diarrhoea

The total population enumerated by the study census was 160,261 individuals, living in 34,503 households (mean 4.6 individuals per household). Of these, 81,101 (50.6%) were male. The age distribution of the study population is shown in Figure 2. The median monthly income was Rp 600,000 or US\$ 67 per household (US\$ 1=Rp 9,000 in 2001). Of the 160,261 individuals included in the study, 8,074 (5%) reported a history of diarrhoea during the four weeks preceding the interview. There was no statistically significant difference in the frequency of diarrhoea episodes between the sexes; 4,054 (5%) males and 4,020 (5%)

**Fig. 2.** Age (years) distribution of study population based on household census, Koja district and Tanjung Priok district, North Jakarta, Indonesia, August-September 2001



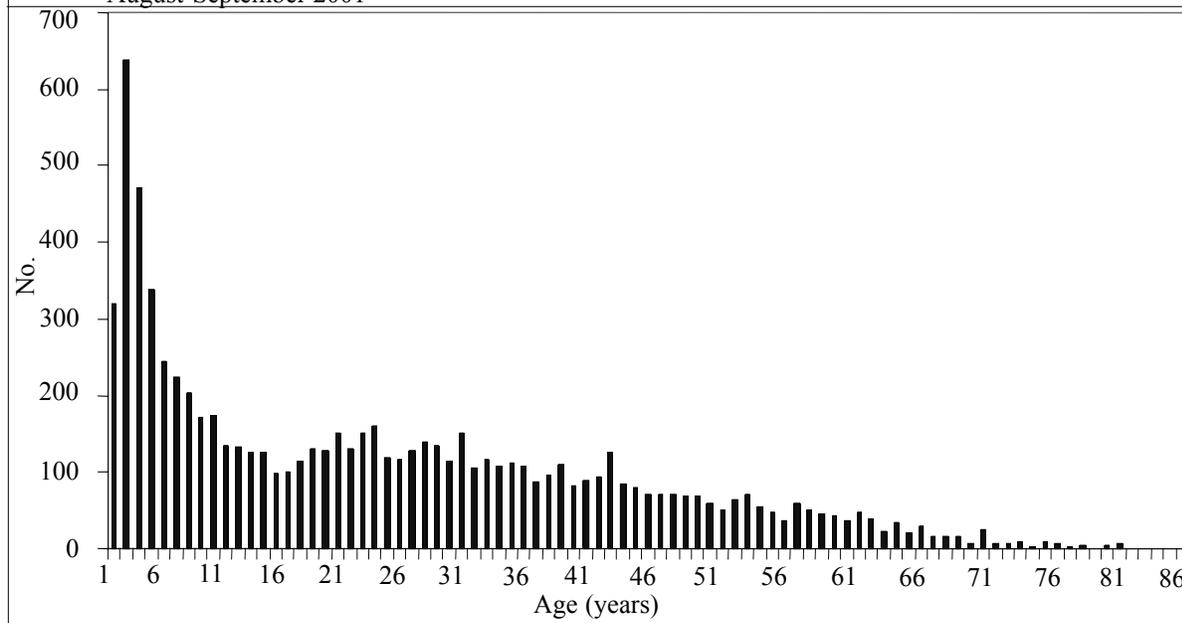
females reported a diarrhoea episode. The occurrence of a diarrhoea episode in the preceding four weeks was the highest among children aged less than five years (2,014/15,745, 12.8%), followed by children aged 5-14 years (1,491/29,092, 5.1%) and adults aged 15 years or older (4,569/115,424, 4%) ( $p < 0.001$ ) (Fig. 3).

### Factors associated with diarrhoea

The two strongest independent factors associated with a history of diarrhoea were a diarrhoea episode in another household member in the four weeks preceding the interview and age less than five years (Table). Other characteristics with a positive correlation for diarrhoea were: inadequate garbage disposal, daily consumption of food obtained from street vendors, low household income, use of water from a communal tap, illiteracy, living in a house flooded in the previous year, living in a wood structure, and sharing a toilet with other households.

providers, such as *belian* (traditional healers). Figure 4 shows that choice of treatment provider depended on the age of the individual with diarrhoea. Children were significantly more likely to receive treatment for diarrhoea at a PHC compared to adults. Compared to children, adults with diarrhoea were significantly more likely to treat themselves. One thousand four hundred thirty-nine (23%) of 6,252 diarrhoea patients, who did not use PHC, were aged less than 60 months compared to 575 (32%) of 1,822 patients who used PHC (adjusted OR 1.4; 95% CI 1.21-1.6). Individuals in the lowest income group were significantly more likely to visit a PHC for treatment of diarrhoea compared to individuals in middle and higher income groups. Two thousand two hundred thirty-five (36%) of 6,252 diarrhoea patients, who did not use PHC, were from a household with a monthly income below 500,000 rupiah compared to 876 (48%) of 1,822 patients who used PHC (adjusted OR

**Fig. 3.** Number of individuals with at least one episode of diarrhoea in previous four weeks, by age group, as reported in a household survey, Koja district and Tanjung Priok district, North Jakarta, Indonesia, August-September 2001



### Patterns of healthcare use

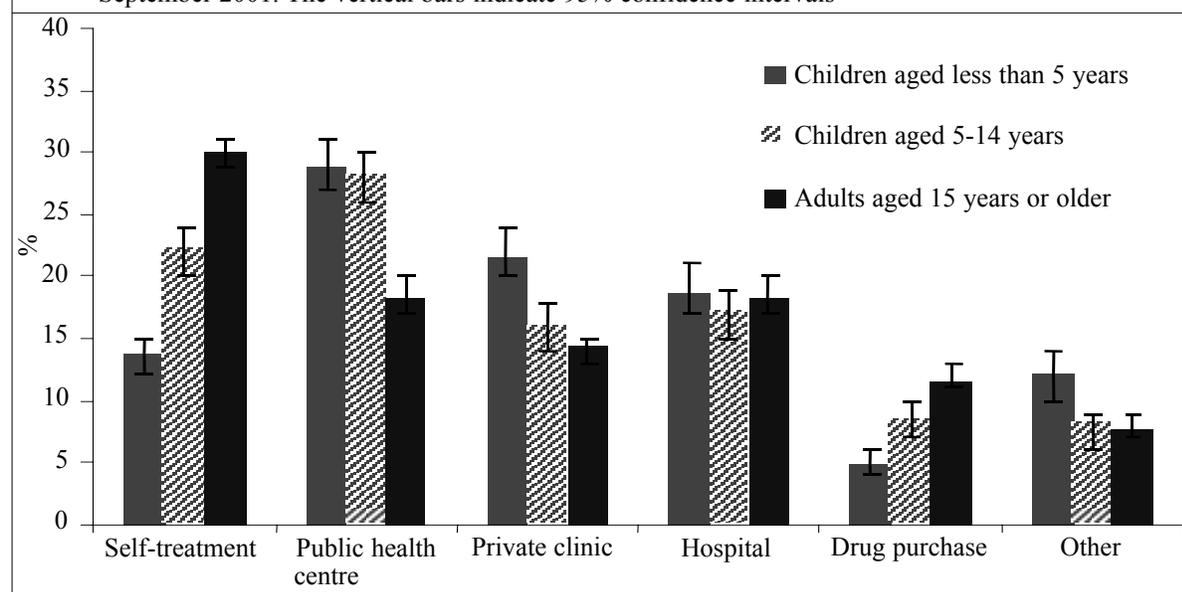
The 8,074 individuals who had a diarrhoea episode in the four weeks preceding the interview were asked where they first sought treatment: 1,969 (25%) treated themselves, 1,822 (23%) visited a PHC, 1,462 (18%) visited a private practitioner or a private clinic, 1,318 (16%) presented at a hospital, 753 (9%) bought drugs from a drug vendor, and 750 (9%) used other healthcare

1.6; 95% CI 1.5-1.9). Adults with college or university education were significantly less likely to visit a PHC for treatment of diarrhoea compared to adults with lower levels of education. One thousand four hundred forty-two (39%) of 3,737 adult diarrhoea patients, who did not use PHC, had completed high school compared to 280 (34%) of 832 adult patients who used PHC (adjusted OR 0.78; 95% CI 0.7-0.9).

**Table.** Characteristics of individuals and households

Characteristics	No diarrhoea		Diarrhoea		OR adjusted for age, number of household members, and education 95% CI		
	No.	%	No.	%			
Total population (n=160,261)	152,187	95	8,074	5			
<b>Individual</b>							
Age under 60 months	13,731	9	2,014	25	3.44	3.17	3.53
Completed high school (adults only)	46,735	42	1,722	38	0.89	0.85	0.96
Illiterate	2,741	1.8	171	2.1	1.31	1.13	1.53
<b>Household</b>							
Number of household members (mean)	4.6		4.9		0.95*	0.93	0.97
Household member with diarrhoea <sup>†</sup>	17,780	12	4,213	52	11.1	10.4	11.8
Individuals/room (mean)	1.7		1.8		0.96*	0.92	0.99
Live in a wood structure	19,490	13	1,327	16	1.20	1.06	1.35
Household was flooded last year	52,905	35	3,248	40	1.27	1.17	1.38
Family owns home	96,573	63	4,635	57	0.90	0.82	0.98
<b>Income/expenditure</b>							
Household income (mean; x1000 Rp)	821		750		0.99 <sup>‡</sup>	0.98	0.99
Household income <500,000 Rp/month	51,488	34	3,111	39	1.28	1.17	1.39
Healthcare expenditure (mean; x1000 Rp)	121		106		0.99 <sup>‡</sup>	0.99	1.01
<b>Health behaviour</b>							
Use water from communal tap	112,967	74	6,132	76	1.26	1.13	1.39
Buy water from water vendor	22,143	15	1,066	13	0.77	0.68	0.87
Eat streetfood every day	32,533	21	2,589	32	1.78	1.62	1.95
Garbage disposal outside home	108,698	71	6,504	81	1.75	1.58	1.95
Toilet shared between households	31,875	21	2,081	26	1.12	1.02	1.24

\* Odds of diarrhoea increase by the estimate shown for each additional individual  
<sup>†</sup> A household member with diarrhoea in the previous four weeks  
<sup>‡</sup> Odds of diarrhoea increase by the estimate shown for each additional 1,000 Rp  
CI=Confidence interval  
OR=Odds ratio

**Fig. 4.** Proportion of individuals with diarrhoea using various healthcare providers, by age group, as reported in a household survey, Koja district and Tanjung Priok district, North Jakarta, Indonesia, August-September 2001. The vertical bars indicate 95% confidence intervals

## DISCUSSION

We found that, in this impoverished area, 13% of children aged less than five years and 4% of adults reported at least one diarrhoea episode during the preceding four weeks. Since the survey was conducted during the peak of the diarrhoea season, it may not be appropriate to calculate annualized rates based on these data. Besides the major influence of epidemics, diarrhoeal incidence varies with region and age, ranging from 0.4 to 1.7 episodes per child per year among Indian children (25,26) to 3 to 7 episodes per child per year in Bangladesh (27,28). An active surveillance study based on clinical diagnosis conducted in North Jakarta between November 1980 and April 1981 detected 238 diarrhoea cases among 1,452 children aged less than five years and younger (16.3%; 95% CI 14.5-18.4) and 382 cases among 5,115 individuals of all ages (7.5%; 95% CI 6.7-8.2) (29). An active surveillance study based on clinical diagnosis conducted from February to March 1994 in Kapuk, an urban slum in West Jakarta, found that 148 of 408 children aged less than five years (36.3%; 95% CI 31.6-41.1) had one or more diarrhoea episode(s) (10). The four-week prevalence of diarrhoea found by this study is well within the range of published data. However, a direct comparison between findings of previously-published work and our findings may not be valid because of different observation periods (6 months or 4 months vs 1 month), with different seasonal characteristics (low season vs peak season), and the difference in study methodology (active vs passive surveillance).

The most important factor associated with a reported episode of diarrhoea was a history of diarrhoea in another household member; 52% of diarrhoea cases had another household member with diarrhoea. This extraordinarily high rate should not come as a surprise considering the crowded living conditions compounded by poor or absence of clean water supply and sanitation. The high risk of transmission of enteric infections among household members has been demonstrated in Asia (30-32) and USA (33). Enterotoxigenic *Escherichia coli* (ETEC) was found in 30 (14%) of 221 children with diarrhoea in Thailand and in 9% (8/88) of their household contacts, 8% (8/101) of their neighbours, and 2% (32/1,379) of inhabitants of 382 homes not associated with ETEC infections (31). The same serotype infecting the index child was isolated from 21 (4%) of 522 household contacts of 151 index children with infections

due to *Shigella* in Bangkok (30). Nineteen percent of persons in *Shigella* baris and 7% of persons in control baris were infected during the survey periods ( $p<0.001$ ) (32). The secondary attack rate of diarrhoea among household contacts exposed to children with diarrhoea in a study from the USA was 77 of 204 (38%) compared to 25 of 273 (9%) for household contacts of children without diarrhoea ( $p<0.001$ ) (33).

The household environment can predict the risk for diarrhoea. Households residing in wooden structures, such as shanties made mostly of plywood, had a significantly higher risk for diarrhoea. An association between the quality of housing and diarrhoea rates has previously been reported (34,35). Flooding, a seasonal hazard in Jakarta, was associated with a higher risk of having a household member with diarrhoea. In addition to flooding during the rainy season, some residents experience twice monthly flooding related to the phases of the moon. Flooding frequently includes overflowing sewers and widespread dispersion of faecal material which can lead to enteric infections. There may also be an indirect effect whereby disadvantaged, vulnerable households come to dwell in the flood-prone areas within a slum (36-38).

Reported monthly household income was used as an indicator in this study for the economic status of the household. Households with an income below Rp 500,000 per month (US\$ 56) had a significantly higher risk of having a member with a diarrhoea episode, independent of the number of household members, age, and education. A significantly increased risk of diarrhoea with decreasing income has previously been observed in Indonesia (39), and other countries, including Bangladesh (11,40), Peru (41), and Thailand (42). However, social pressure may interfere with accurate reporting of household income. Respondents may feel ashamed to report a low income or may fear recriminations if they report a high income. Furthermore, respondents may not be aware of the accurate household income if household members do not report their income to the household head. Respondents were, therefore, also asked to report household expenditures. The average household expenditure for food was significantly lower in households of diarrhoea cases compared to households without diarrhoea cases, but there were no significant differences in water and healthcare expenditures (data not shown).

In the study area, drinking-water is traditionally boiled: 99% of the respondents indicated that they always boil water prior to drinking. Nearly universal boiling of drinking-water has been reported previously in Indonesia (14,43). However, boiling water does not necessarily guarantee safe drinking-water. Prihartono *et al.* found that 37% of respondents mixed boiled water with un-boiled water to accelerate cooling or reintroduce 'life' to 'killed' water (43). The use of a communal tap was a predisposing factor for diarrhoea, while purchase of water from a water vendor reduced the risk of diarrhoea. Other behaviour, such as frequent consumption of food prepared and sold at the ubiquitous street stalls and disposal of garbage outside the house in contrast to a garbage bin inside the household also increased the risk for diarrhoea episodes.

Diarrhoea episodes can result in a range of behaviours and treatment choices. In North Jakarta, we found that, of 8,074 patients who reported one or more episode(s) of diarrhoea in the preceding four weeks, 1,969 (25%) treated themselves, 1,822 (23%) visited a PHC, 1,462 (18%) visited a private practitioner or a private clinic, 1,318 (16%) presented to a hospital, 753 (9%) bought drugs from a drug vendor, and 750 (9%) used other healthcare providers, such as *belian* (traditional healers). A passive diarrhoea-surveillance system based on identifying diarrhoea patients who present to PHCs and hospitals will, therefore, capture only 39% of all diarrhoea cases in the catchment area. This survey asked for the first choice of treatment. Since some patients visit multiple healthcare providers, the passive surveillance system may eventually capture a higher percentage of diarrhoea and dysentery patients, although a microbiological detection of causative organisms may no longer be possible due to pre-medication with antibiotics. This information has to be taken into account when results of passive surveillance studies are interpreted.

The study found that children with diarrhoea, compared to adult patients, were preferentially brought to the PHC for treatment. Compared to children aged less than five years, adults with diarrhoea were more likely to purchase treatment from drug vendors or treat themselves. One explanation for this behaviour is that, for adult patients, time needed for healthcare can result in a loss of income. In contrast, diarrhoea in children may be perceived as more severe and dangerous; therefore, time may be invested to consult a medical practitioner (44). Diarrhoea cases from households with a

low income were most likely to use PHCs, which is understandable considering that PHCs charge only a nominal fee for consultation and medication. Adults who had completed college or university were more likely to visit a hospital for treatment of diarrhoea than adults with lower levels of education. Our data are consistent with data collected in four subdistricts of Indonesia in 1984 considering the differences in study site and time. In 1984, 21% of children, aged less than five years, with diarrhoea were brought to a private doctor or nurse, and 10% were brought to a traditional healer (18). A recent qualitative study in a rural community in Lom-bok, Indonesia, found that young children with diarrhoea were brought to a clinic immediately or after treatment with a rehydration solution compared to children with fever who were first brought to a traditional healer (19).

The study has several limitations. The definition of a diarrhoea case is based on reported history, not on a clinical or microbiological diagnosis. Diarrhoea is an easily-recognizable symptom; however, there is a possibility that cases of diarrhoea in household members are overlooked or unknown to the respondent. There may be bias to under-report milder diarrhoea cases. The study depends also on the recall of cases and their treatment over the four preceding weeks and could, therefore, suffer from recall bias, although we did not collect sufficient data to examine this. An advantage of our retrospective study design is that it allows reporting of all treatment options, which would not be possible during prospective surveillance because investigators would be obliged to facilitate adequate treatment. The study did not collect data on the severity and duration of diarrhoea episodes. Previous experience has shown that diarrhoea episodes, perceived by patient or caregiver as more severe, bloody diarrhoea, acute watery diarrhoea, or persistent diarrhoea, change treatment-seeking behaviour (44). This study did not take the severity of the episode into account. Nor did our study examine the distance from the patient's residence to potential healthcare providers. Since detailed geographic data at the household level were not available, we could not analyze the influence of distance to providers on the ultimate treatment choice.

This study surveyed 160,261 individuals, detected more than 8,000 diarrhoea cases, and found that the poorest in North Jakarta are at a higher risk for diarrhoea than people even marginally better-off. It is important to note that all the respondents in this study live in a slum; therefore, the study did not measure differences

between a well-off and an impoverished population. The study shows that even relatively small differences in socioeconomic status make a difference in the vulnerability to diarrhoea.

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