

Use of Community Health Workers for Management of Malaria and Pneumonia in Urban and Rural Areas in Eastern Uganda

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Abstract. Use of community health workers (CHWs) has been implemented the same way in urban and rural areas despite differences in availability of health providers and sociodemographic characteristics. A household survey was conducted in rural and urban areas in eastern Uganda, and all children who were febrile in the previous two weeks were assessed for their symptoms, treatment received at home, and when and where they first went for treatment. Rural children were more likely to use CHWs than urban children. Urban children received outside treatment more promptly, and used herbs at home less. Symptoms and proportion of children being taken out for treatment were similar. Children from the poorest households used CHWs less and private providers more than the middle quintiles. Drug shops and private clinics should be included in the community case management to cater for the poorest in rural areas and persons in urban areas.

INTRODUCTION

Malaria and pneumonia are among the main killers of children less than five years of age in low-income countries.^{1,2} One of the interventions to reduce child mortality that has been effective is the community management of malaria and pneumonia by using community health workers (CHWs).^{3,4} The World Health Organization recommended use CHWs at the community level for the management of malaria and pneumonia through community case management.⁵ The availability of alternative sources of quality care and medicines in nearby health facilities contribute to the care-seeking patterns of mothers of febrile children,^{6,7} and these are different between urban and rural areas. There are also underlying socioeconomic differences between rural and urban areas that make urban mothers behave differently towards febrile illnesses in children than rural mothers.^{8,9}

Few studies have evaluated differences in use of CHWs between urban and rural areas. It is important that as community case management is implemented, an assessment is conducted on who is actually benefiting from the program in rural or urban areas and how CHWs are being used alongside other partners in health care provision. Therefore, we conducted a study that assessed these potential differences.

MATERIALS AND METHODS

Study area. A survey was conducted in the Iganga-Mayuge Demographic Surveillance Site (DSS) in eastern Uganda located approximately 115 km east of the capital Kampala. The DSS covered approximately 70,000 persons in 65 villages by the end of 2009. There were approximately 11,000 children less than five years of age. Within the geographic boundaries of the DSS is Iganga Hospital, a 100-bed general hospital located in the town of Iganga; six lower level government facilities, one of which is in Iganga; four non-governmental

organization lower level health facilities, one of which is in Iganga; approximately 120 drug shops and private clinics mostly in the trading centers and Iganga; traditional healers; and 132 CHWs with at least two CHWs per village. Two large villages were allocated three CHWs. Twenty eight CHWs were in the urban area and 104 were in the rural area. The CHWs had been involved in community-based distribution of antimalarial drugs (artemether–lumefantrine) and antibiotics (amoxicillin) in the DSS since December 2009. All CHWs were involved in distribution of antimalarial drugs but 58 of them also distributed amoxicillin. The health facilities, drug shops, and clinics in the DSS are shown in Figure 1.

Data collection. Data were collected during the DSS round during February–June 2010. This was conducted by field assistants who work in the DSS during the regular update round. The field assistants collect the routine demographic data and data for studies that need information from all the households in the DSS. Field assistants had a minimum of secondary school education and were trained in data collection techniques and confidentiality. For the purpose of this study, they were trained on the purpose of the study and the research tool. The tool was translated into Lusoga, the local language, and pretested in the neighboring area just outside the DSS.

All children in the DSS who had become ill with a fever in the previous two weeks were asked about their symptoms, the treatment they received at home, whether they went out for treatment, whether they went out the same day they noticed the symptoms or later, and where they sought treatment first. Those who went out on the same day were considered to have gone for treatment within 24 hours, and those who went out later were considered to have gone out later than 24 hours. This assumption was made because the general population does not use watches, and this was an attempt to estimate those children who received treatment within 24 hours, which is the recommended time for early treatment of acute illness.

The options they went out for treatment first were CHW, health facility, drug shop, or private clinic. A drug shop was defined as a place where they went to purchase drugs such as tablets or syrup but the attendant did not examine the child. A private clinic was defined as a place where they went for

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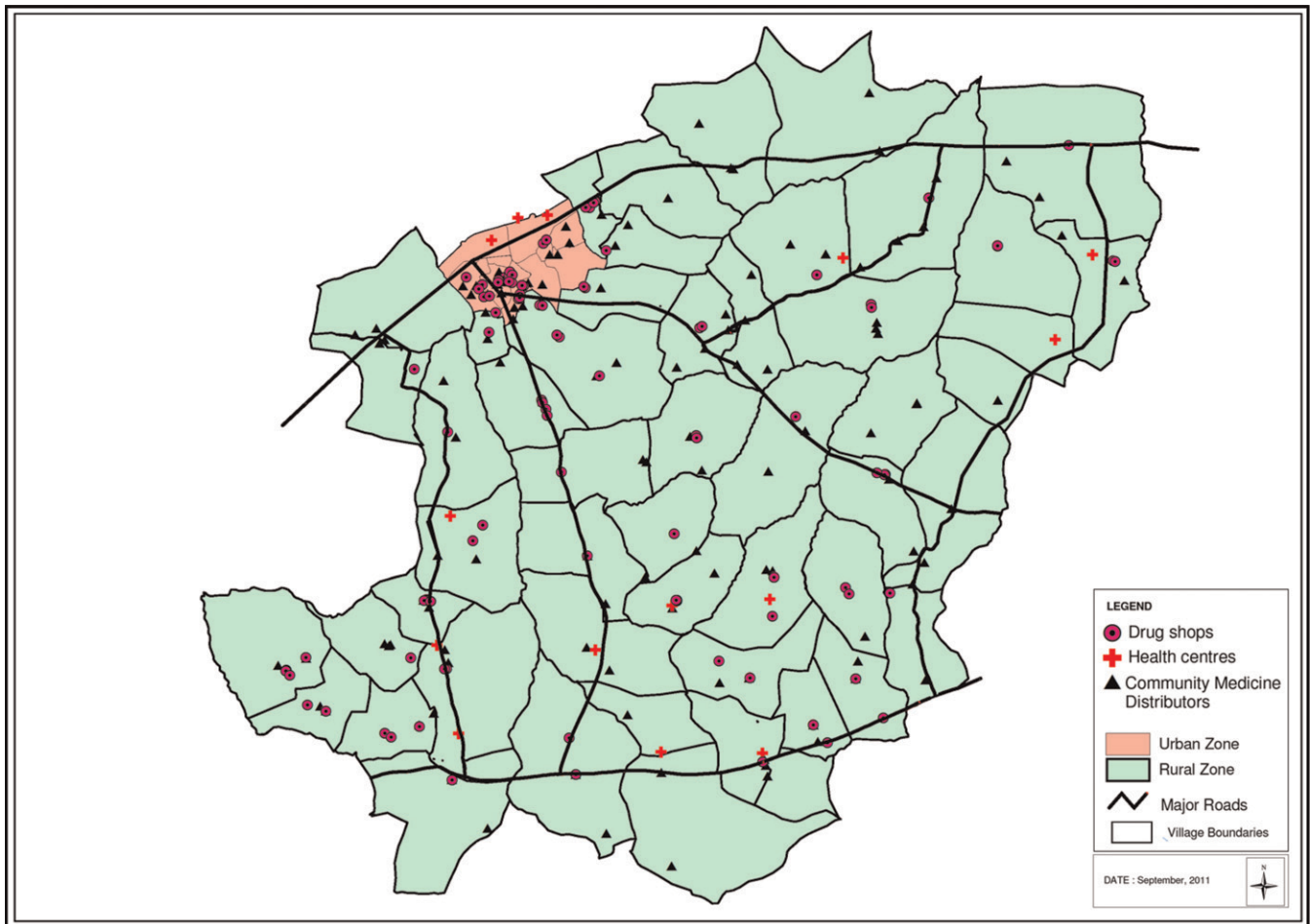


FIGURE 1. Iganga-Mayuge demographic surveillance site in Uganda, showing health centers, drug shops and clinics, and community health workers in rural and urban areas.

treatment and the child was examined. Data were collected by using paper questionnaires.

Data management and analysis. Data was transferred to the DSS headquarters on a daily basis and checked for consistency and completeness. Data was then entered using FoxPro software (Custom Computer Services, Danbury, CT) and cleaned. To obtain sociodemographic variables such as mother's age, mother's education level, and household socioeconomic status, data were linked with the DSS database. Data were then exported into STATA version 10 (StataCorp LP, College Station, TX) for bivariate and multinomial analysis. Calculation of socioeconomic status has been described by Rutebemberwa and others.¹⁰

To establish whether there were differences between the urban and rural sick children, the two groups were compared with respect to age, sex, presenting symptoms, socioeconomic status of their households, and mothers' age and education. The two groups were also assessed on what treatment care-takers gave the child immediately they noticed the child was sick, whether they went to seek treatment outside the home, whether they did it on the same day or after one or two days, and which provider they visited: CHW, health facility, drug shop, or private clinic. The association between the household socioeconomic status and age and education of the mother with the choice of provider was assessed by using multinomial regression for choice of provider, using those who went to

CHWs as the referent group. Because some households had more than one child less than five years of age who had been sick and care-seeking habits are associated with household socioeconomic status, adjustment for clustering was performed by using the svy feature in STATA. The unit of analysis was the sick child episode.

Ethical clearance. The study was approved by the Makerere University School of Public Health Higher Degrees Research and Ethics Committee and the Uganda National Council for Science and Technology. Permission to conduct the study was granted by the DSS Management, the District Health Office, and the village local council leaders. In addition to the consent that respondents gave in the routine data collection of the DSS rounds, verbal consent was sought and received specifically for this tool, which was assessing care-seeking practices for febrile illness within urban and rural areas.

RESULTS

Of 10,181 children less than five years of age visited during the survey, 3,234 (30.8%) reported having fever in the previous two weeks. Of those who had fever, 254 (7.9%) lived in urban areas and 2,980 (92.1%) lived in rural areas. The children's age, sex, and presenting symptoms are shown in Table 1. There were no significant differences between febrile

TABLE 1
Characteristics of children and their symptoms, Uganda*

Characteristic	Urban, n = 254, no. (%)	Rural, n = 2,980, no. (%)	OR	P	95% CI
Age, months					
0–12	61 (24.0)	657 (22.1)	1		
13–24	52 (20.5)	695 (23.3)	1.24	0.3	0.84–1.82
25–36	70 (27.6)	681 (22.8)	0.90	0.6	0.63–1.29
37–48	42 (16.5)	587 (19.7)	1.30	0.2	0.86–1.95
49–60	29 (11.4)	360 (12.1)	1.15	0.5	0.72–1.82
Sex					
F	119 (46.9)	1,520 (51.0)	1		
M	135 (53.1)	1,460 (49.0)	0.85	0.2	0.66–1.10
Symptoms					
Fever					
Yes	249 (98.0)	2,875 (96.5)	1		
No	5 (2.0)	105 (3.5)	1.82	0.189	0.73–4.50
Vomiting					
Yes	86 (33.9)	796 (26.6)	1		
No	168 (66.1)	2,184 (73.4)	1.41	0.01	1.07–1.85
Fast breathing					
Yes	58 (22.8)	667 (22.4)	1		
No	196 (77.2)	2,313 (77.6)	1.02	0.87	0.75–1.39
Runny nose					
Yes	220 (86.6)	2,580 (86.5)	1		
No	34 (13.4)	400 (13.5)	1	0.1	0.70–1.47
Cough					
Yes	189 (74.4)	2,334 (78.4)	1		
No	65 (25.6)	646 (21.6)	0.80	0.14	0.60–1.08
Difficulty in breathing					
Yes	63 (24.8)	860 (28.8)	1		
No	191 (71.2)	2,120 (71.2)	0.81	0.17	0.61–1.10
Diarrhea					
Yes	89 (35.0)	1,041 (35.9)	1		
No	165 (65.0)	1,939 (65.1)	1	0.98	0.77–1.31
Convulsions					
Yes	17 (6.7)	151 (5.1)	1		
No	237 (93.3)	2,828 (94.9)	1.34	0.26	0.80–2.26

*OR = odds ratio; CI = confidence interval.

children from urban and rural areas with respect to sex, age, and presenting symptoms, except for vomiting, which was more frequent in urban areas than in rural areas.

Comparison of urban and rural febrile children. Results of comparison of urban and rural febrile children is shown in Table 2. Compared with urban areas, households with febrile children in rural areas were poorer, more likely to have mothers who were older, and more likely to have fewer mothers who had finished a post-primary level of education. For example, in urban areas, 32.8% (83 of 254) of the households of febrile children were classified as being least poor compared with 9.5% (248 of 2,980) of those in rural areas. In urban areas, 28.9% (62 of 254) of the mothers were less than 25 years of age compared with 19.8% (510 of 2,980) in rural areas. In urban areas, 54.4% (136 of 254) of children had mothers who had finished a post-primary level of education compared with 17.8% (511 of 2,980) in rural areas.

There was no significant difference between urban and rural areas with respect to the proportion of febrile children who sought treatment outside the home (odds ratio [OR] = 1.27, 95% confidence interval [CI] = 0.89–1.80). When providers where children went to first were assessed, children from urban areas more likely went to health facilities than those from the rural areas. Febrile children in rural areas used more CHWs (OR = 1.74, 95% CI = 1.07–2.83), drug shops (OR = 1.48, 95% CI = 1.04–2.12), and private clinics (OR = 66, 95% CI = 1.13–2.46) than those in urban areas. However, children in urban areas were more likely to be taken outside

for treatment within 24 hours than children from rural areas (OR = 1.93, 95% CI = 1.44–2.58). A total of 11.4% (29 of 254) of caregivers from urban areas and 19.6% (585 of 2,980) of caregivers from rural areas used herbs as first treatment of febrile illness before they sought care from outside the home. Caregivers who treated their children with herbs were less likely to be in urban areas than in rural areas (OR = 0.53, 95% CI = 0.35–0.79). Other treatments offered at home were tepid sponging, chloroquine, pain killers, arthemether–lumefantrine, and cotrimoxazole. There was no significant difference in the use of other treatments at home between urban and rural areas.

Choice of provider for febrile children according to sociodemographic characteristics. The association between the household wealth quintiles of febrile children, the mother's age and education, treatment received at home, promptness of seeking outside treatment, and eventual choice of provider were assessed. It was not possible to separate the urban from rural areas because of the small numbers in the urban areas. Pooled results are shown in Table 3. Household socioeconomic status was not associated with any choice of provider except for the less poor, who were less likely to choose private clinics than CHWs (adjusted OR [aOR] = 0.52, 95% CI = 0.31–0.86) and the least poor, who were more likely to choose health facilities than CHWs (aOR = 2.03, 95% CI = 1.02–4.04). Care givers whose education level was post-primary were more likely to choose a health facility than CHWs (aOR = 1.86, 95% CI = 1.01–3.44), and those who had finished primary school chose drug shops more often than CHWs (aOR = 1.77, 95% CI = 1.16–2.88). The mother's age did not affect the choice of provider. Those who went to CHWs were more likely to go there within 24 hours than those who went to health facilities (aOR = 2.28, 95% CI = 1.62–3.19) drug shops (aOR = 1.66, 95% CI = 1.23–2.22), and clinics (aOR = 2.40, 95% CI = 1.74–3.30). Those who had given herbs at home were less likely to go to CHWs than to private clinics (aOR = 0.35, 95% CI = 0.20–0.61) and drug shops (aOR = 0.38, 95% CI = 0.22–0.61).

DISCUSSION

The CHWs were more likely to be used by rural children than urban children. Urban febrile children came from less poor households, had younger and more educated mothers, and were taken outside for treatment more promptly than their rural counterparts. They were less likely to be given herbs for treatment at home. The more educated and least poor were less likely to use CHWs than health facilities and drug shops. Children who went to CHWs were more likely to have been taken within 24 hours than those who went to other health providers.

Findings from the study indicate that CHWs were used more by children in rural areas than those in urban areas. Other studies have also demonstrated less use of CHWs in urban areas than that reported in rural areas.¹¹ The CHWs provide free treatment to all children less than five years of age who have a febrile illness. To caretakers in rural areas, introduction of community case management for malaria and pneumonia through CHWs was a relief. Previously, the major providers in rural areas in the absence of government health facilities were the drug shops and clinics.^{12,13} Before implementation of community case management through CHWs in

TABLE 2
Socioeconomic status, mother's characteristics, and care seeking for urban and rural febrile children, Uganda*

Characteristic	Urban, n = 254, no. (%)	Rural n = 2,980, no. (%)	OR	P	95% CI
HH wealth quintiles					
Poorest	3 (1.8)	439 (16.8)	1		
Poorer	15 (9.1)	653 (25.1)	0.30	0.04	0.09–1.04
Poor	16 (9.8)	722 (27.8)	0.31	0.04	0.10–1.07
Less poor	47 (28.7)	538 (20.7)	0.09	< 0.001	0.012–0.26
Least poor	83 (50.6)	248 (9.5)	0.02	< 0.001	0.00–0.07
Mother's age, years					
< 25	62 (28.9)	510 (19.8)	1		
25–35	113 (52.8)	1,486 (57.7)	1.6	< 0.001	1.15–2.22
≥ 36	39 (18.2)	580 (22.5)	1.81	< 0.001	1.19–2.75
Mother's education					
None	13 (5.2)	298 (10.3)	1		
Primary	101 (40.4)	2,062 (71.9)	0.89	0.71	0.50–1.61
Post-primary	136 (54.4)	511 (17.8)	0.16	< 0.001	0.09–0.30
Treatment outside home					
Yes	213 (83.9)	2,389 (80.3)	1		
No	41 (16.1)	587 (19.7)	1.27	0.17	0.89–1.80
Promptness in getting treatment outside					
≤ 24 hours	96 (47.8)	748 (32.1)	1		
> 24 hours	105 (52.2)	1,580 (67.9)	1.93	< 0.001	1.44–2.58
Facility					
Health facility	61 (28.8)	481 (20.3)	1		
CHW	25 (11.8)	343 (14.5)	1.74	0.02	1.07–2.83
Drug shop	75 (35.4)	876 (36.9)	1.48	0.03	1.04–2.12
Clinic	51 (24.1)	670 (28.3)	1.66	0.01	1.13–2.46
Treatment given at home					
Tepid sponging					
Yes	27 (10.6)	297 (10.0)	1		
No	227 (89.4)	2,682 (90.0)	1.07	0.11	0.71–1.63
Herbs					
Yes	29 (11.4)	585 (19.6)	1		
No	225 (88.6)	2,394 (80.4)	0.53	< 0.001	0.35–0.79
Pain relief					
Yes	90 (35.4)	918 (30.8)	1		
No	164 (64.6)	2,060 (69.2)	1.23	0.13	0.94–1.61
Arthemether–lumefantrine					
Yes	10 (3.9)	90 (3.0)	1		
No	244 (96.1)	2,890 (97.0)	1.32	0.42	0.68–2.56

*OR = odds ratio; CI = confidence interval; HH = household; CHW = health care worker.

the Iganga-Mayuge DSS, studies highlighted more use of drug shops and private clinics in the rural areas compared with health facilities.⁷ The health facilities are not easily accessed geographically in rural areas and in most cases the poor people in the villages are left with drug shops and clinics where they have to pay for treatment.¹⁴ Therefore, introduction of CHWs provided a safety net for caretakers in rural areas to receive free treatment that they would not have previously received. In rural areas, caretakers are also poorer and lack money and transportation to take sick children to fairly distant health facilities, most of which are in urban areas. Therefore, it is important to recognize that CHWs address a need, especially in rural areas, where there are higher proportions of poor, elderly, and less educated persons.

Herbs were more likely to be used for treating rural children before seeking treatment outside the home than for urban children. Those who used herbs were less likely to visit CHWs than the drug shops and private clinics. This finding is a challenge because children who are given herbs, which might or might not be curative, might eventually not be taken to CHWs, to whom the government was providing efficacious drugs. Giving herbs also delayed sick children being taken to CHWs or health facilities. Studies have highlighted the likelihood of using herbs for the treatment of fever, especially

among the elderly.^{15,16} Although studies have indicated that communities had started shifting from giving traditional medicine as a first-line treatment for fever to offering modern medicines,^{8,17} giving traditional medicines could still be a delaying factor when one considers rural areas. A possibility of including other health providers such as using registered drug shops and private clinics in community case management could be considered because they are more likely to take care of a category of children that would have been given herbs. This activity further delays access of children to adequate and appropriate treatment.

Findings from this study indicated that febrile children in rural areas came from poorer households than those from urban areas. However, use of CHWs was not significantly associated with the poorest quintile, even when the rural sick children were considered alone. Community case management of fever was intended to address the challenges the poorest people experience in accessing care. In this case, middle quintiles were accessing CHWs more than the poorest quintile. Previous studies have demonstrated that the poor have less access to health care than the rich.¹⁸ Households that had a higher economic status have been associated with completing treatment of fever compared with poorer households.¹⁹ In this case, middle quintiles accessed

TABLE 3
Use of health providers in relation to CHWs, Uganda*

Characteristic	CHW (referent), no. (%)	Health facility			Drug shop			Clinic		
		No. (%)	AOR	95% CI	No. (%)	AOR	95% CI	No. (%)	AOR	95% CI
Wealth quintiles										
Poorest	46 (14.4)	62 (13.5)	1		135 (16.5)	1		115 (18.9)	1	
Poorer	77 (24.1)	97 (21.2)	1.08	0.62–1.89	207 (25.4)	0.96	0.60–1.54	154 (25.3)	0.91	0.56–1.49
Poor	89 (27.8)	132 (28.8)	1.25	0.74–2.11	195 (23.9)	0.76	0.45–1.20	165 (27.1)	0.82	0.51–1.32
Less poor	83 (25.9)	112 (24.5)	1.19	0.69–2.05	182 (22.3)	0.82	0.51–1.33	93 (15.3)	0.52	0.31–0.86
Least poor	25 (7.8)	55 (12.0)	2.03	1.02–4.04	97 (11.9)	1.41	0.75–2.63	83 (13.6)	1.75	0.93–2.81
Mother's age, years										
< 25	66 (20.8)	92 (19.7)	1		116 (20.5)	1		154 (24.7)	1	
25–35	176 (55.4)	259 (55.6)	1.24	0.81–1.90	468 (57.8)	1.17	0.80–1.72	358 (57.5)	0.86	0.61–1.27
≥ 36	76 (23.9)	115 (24.7)	1.41	0.85–2.34	176 (21.7)	1.14	0.72–1.81	111 (17.8)	0.70	0.44–1.14
Mother's education										
None	45 (12.7)	40 (7.6)	1		81 (8.9)	1		82 (11.7)	1	
Primary	246 (69.5)	353 (67.0)	1.42	0.85–2.37	642 (70.8)	1.77	1.16–2.88	472 (67.1)	1.18	0.58–1.87
Post-primary	63 (17.8)	134 (25.4)	1.86	1.01–3.44	184 (20.3)	1.60	0.91–2.81	149 (21.2)	1.06	0.60–1.89
Prompt care seeking										
≤ 24 hours	166 (46.8)	144 (27.5)	1		319 (34.4)	1		208 (29.7)	1	
> 24 hours	189 (53.2)	379 (72.5)	2.28	1.62–3.19	608 (65.6)	1.66	1.23–2.22	492 (70.3)	2.40	1.74–3.30
Tepid sponging										
Yes	35 (9.5)	59 (10.9)	1		116 (12.2)	1		50 (6.9)	1	
No	333 (90.5)	483 (89.1)	1.15	0.69–1.95	834 (87.8)	1.05	0.65–1.71	671 (93.1)	1.685	0.98–2.85
Herbs										
Yes	33 (9.0)	79 (15.5)	1		231 (24.3)	1		146 (20.3)	1	
No	335 (91.0)	463 (85.5)	0.73	0.41–1.27	719 (75.7)	0.38	0.22–0.61	575 (79.7)	0.35	0.20–0.61
Pain killer										
Yes	84 (22.8)	137 (25.3)	1		185 (19.5)	1		144 (20.0)	1	
No	284 (77.2)	404 (74.7)	1.10	0.65–1.86	765 (80.5)	1.38	0.85–2.24	577 (80.0)	1.03	0.60–1.78
Arthemether–lumefantrine										
Yes	5 (1.4)	12 (2.2)	1		14 (1.5)	1		11 (1.5)	1	
No	530 (97.8)	363 (98.6)	0.73	0.24–2.22	937 (98.5)	0.90	0.30–2.66	710 (98.5)	0.76	0.25–2.36

*CHWs = health care workers; AOR = adjusted odds ratio; CI = confidence interval.

CHWs more than poorest quintiles. This finding agrees with the inverse equity hypothesis, which Victora and others highlighted in public health programs to improve child health in Brazil, where the poor benefit from programs much later in the intervention.²⁰ This finding calls for two actions: first, that interventions need to be sustained for a longer time so that the poorest persons can also benefit from them; and second, to have more focused interventions targeting where the poorest go for treatment (in this case drug shops and private clinics).

Children in urban areas were more likely to seek care within 24 hours than the children from rural areas. One of the aims of integrated community case management is to provide timely care to sick children.²¹ Previous studies have indicated that children who went to CHWs were more likely to have got treatment within 24 hours.¹⁰ The presence of CHWs could have contributed to more prompt treatment of febrile children especially in rural areas. Caretakers might be delaying to get treatment from the drug shops and clinics because they have to get funds first to pay for the drugs they receive but with subsidized treatment, the promptness may increase. It is important to note that drug shops and private clinics still take care of a considerable number of children. Studies that have been conducted to assess use of private and public providers have highlighted that some children derive their care solely from private providers²² or when they need ambulatory care.²³ Inclusion of private providers in community case management of malaria and pneumonia may provide another avenue to reach the febrile children promptly. Using drug shops has been shown to improve prompt treatment of febrile children in Kenya.²⁴

The socioeconomic status that was used for households in this study was the one calculated from the data collected in the DSS during January–June 2008 and was in effect for two years. Thus, new households that were included in the DSS within the previous two years did not have a socioeconomic status ascribed to them. This finding could have affected estimates for use according to socioeconomic status because of missing values. However, for those that were available, values were two years old. Because the wealth quintiles estimate wealth that is long term,²⁵ it is possible that there would not have been significant changes within household socioeconomic status in the two years and if they took place, they were minimal. The strength of the study was that it was a census of all children who became sick in the previous two weeks. Therefore, results represent closely use of CHWs by care takers of children less than five years of age at that time.

The CHWs are used proportionately more in rural areas than in urban areas. Rural areas have more of elderly mothers and less educated mothers. The CHWs are therefore supporting a specific category of the poor (less educated and elderly mothers). The use of herbs for the treatment of fever in children was more likely to be used in rural areas than in urban areas. Because those who use herbs are more likely to see other providers rather than CHWs, a possibility of incorporating other providers in the community case management could be explored. The poorest households use the CHWs less than the middle quintiles. It is critical that CHWs should focus in rural areas, where most of the poorest persons live, and include drug shops and private clinics, where most of the poorest persons seek care. In addition, drug shops and private

clinics should be used in community case management in towns because these facilities are highly used by urban dwellers.

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