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Impact of Integrated Community Case Management on Health-Seeking Behavior in Rural Zambia

Philip D. Seidenberg, Davidson H. Hamer,* Hari Iyer, Portipher Pilingana, Kazungu Siazeele, Busiku Hamainza, William B. MacLeod, and Kojo Yeboah-Antwi

Zambia Centre for Applied Health Research and Development, Lusaka, Zambia; Center for Global Health and Development, Boston University, Boston, Massachusetts; Department of International Health, Boston University School of Public Health, Boston, Massachusetts; Section of Infectious Diseases, Department of Medicine, Boston University School of Medicine, Boston, Massachusetts; National Malaria Control Center, Ministry of Health, Lusaka, Zambia; Health Economics and Epidemiology Research Office, Department of Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Abstract. Provision of integrated community case management (iCCM) for common childhood illnesses by community health workers (CHWs) represents an increasingly common strategy for reducing childhood morbidity and mortality. We sought to assess how iCCM availability influenced care-seeking behavior. In areas where two different iCCM approaches were implemented, we conducted baseline and post-study household surveys on healthcare-seeking practices among women who were caring for children ≤ 5 years in their homes. For children presenting with fever, there was an increase in care sought from CHWs and a decrease in care sought at formal health centers between baseline and post-study periods. For children with fast/difficulty breathing, an increase in care sought from CHWs was only noted in areas where CHWs were trained and supplied with amoxicillin to treat non-severe pneumonia. These findings suggest that iCCM access influences local care-seeking practices and reduces workload at primary health centers.

INTRODUCTION

Pneumonia, malaria, and diarrhea are three of the leading causes of mortality in children under 5 years old worldwide, accounting for approximately 3.6 million deaths annually.[1] Integrated community case management (iCCM) of these common childhood illnesses is a strategy that is increasingly being adopted to help reduce the burden of deaths of children under 5 years old in resource-poor countries in Asia and sub-Saharan Africa. This approach allows the provision of care closer to home and thus obviates the need for transportation or a long walk to a health center and the associated loss of productive time for the child's care provider. It may possibly halt progression to more severe disease. In addition, it has potential to reduce the volume of patients seen at primary health facilities. Given the human resource constraints in many countries,[2,3] there is a need for task shifting from primary healthcare centers to the community.

There are a number of factors that influence care-seeking behavior, including perceptions of cause of illness, distance, cost, and quality of available care.[4–6] Several studies have evaluated the impact of community-based management of malaria with artemisinin-based combination therapy (ACT) on care-seeking behaviors. A before and after survey of communities where volunteer Malaria Control Assistants in Sudan provided treatment of malaria for children guided by rapid diagnostic tests (RDTs) found a significant increase in treatment-seeking for fever at the community level after introduction of this program.[7] Similarly, a study that evaluated the home management of malaria in Burkina Faso found that this approach resulted in significant reductions in health center attendance.[8] A cross-sectional survey in Malawi found that consulting a community health worker for evaluation of febrile illness might decrease health center attendance.[5] The delivery of ACT by community medicine distributors was well-accepted by community members in five urban sites in sub-Saharan Africa, and the community-based agents were often the first point of care when a child was ill with fever.[9] Although all of these studies suggest that the availability of malaria diagnostics and quality treatments at the community level are well-accepted and likely to reduce the workload of health workers at primary health centers, none have evaluated the impact of iCCM on care-seeking behaviors or healthcare center attendance.

The Zambia Integrated Management of Malaria and Pneumonia Study (ZIMMAPS) was a cluster randomized controlled trial that compared two approaches to iCCM of malaria and/or non-severe pneumonia in children provided by trained community health workers (CHWs) in two rural districts of Southern Province, Zambia.[10] This study provided a context to evaluate the impact of the availability of iCCM services in the community on healthcare-seeking behaviors and the use of CHWs relative to rural health centers as a first point of care for young children with possible malaria and/or pneumonia. Our primary objective was to determine the impact of two different models of iCCM on health-seeking behaviors, and we also sought to determine whether there were differences in health-seeking practices as a function of the types of services offered by CHWs.

METHODS

Study population and design. Cross-sectional household surveys on healthcare-seeking practices were performed before and immediately after ZIMMAPS. The study was conducted within the catchment area of Chikankata Mission Hospital (CMH), which has a population of about 70,000 covering parts of Mazabuka and Siavonga Districts in Southern Province, Zambia between December of 2007 and November of 2008. Healthcare in the study area is provided by the mission hospital, five rural health centers (RHCs), of which only one has a full complement of staff (clinical officer, environmental health technician, and midwife), and CHWs who work in a fixed location called the community health post (CHP), which serves several villages. There are no private clinics or drug shops in the study area.

*Address correspondence to Davidson H. Hamer, Center for Global Health and Development, Crosstown 3rd Floor, 801 Massachusetts Avenue, Boston, MA 02118. E-mail: dhamer@bu.edu

Before the study, CHWs treated children suspected to have malaria with sulfadoxine-pyrimethamine and referred those children with suspected pneumonia cases to the nearest health facility. They were also responsible for managing other minor illnesses, including diarrhea, with oral rehydration therapy. All children with signs of severe disease were referred to the RHC for management. The CHWs were supposed to receive kits (containing essential drugs and supplies) from CMS or the RHCs every one month, but the supply of the kits was very irregular. The CHWs were also supposed to engage in community mobilization and sensitization for outreach services and health education, but these activities were rarely performed. The study team did not perform community sensitization to raise awareness of the new iCCM models that were being evaluated in the CMS catchment area before study initiation.

ZIMMAPS was a cluster randomized controlled trial that compared two approaches to the iCCM of malaria and/or non-severe pneumonia in children by trained CHWs in the two rural districts. CHWs in iCCM model A clusters were taught to perform and interpret RDTs for malaria, administer artemether-lumefantrine (AL) to children who tested positive for malaria, and administer amoxicillin for treatment of children diagnosed with non-severe pneumonia. CHWs in iCCM model B clusters were supplied with AL for treatment of suspected malaria cases and were taught to refer all non-severe pneumonia cases to the nearest rural health center for treatment as per the standard of care. Both groups of CHWs were given antipyretics for treatment of children with fever (including RDT-negative fever) and were taught to immediately refer all children with signs and symptoms of severe illness to the nearest RHCs. The detailed study design and results have been described elsewhere.[10]

Household surveys and data collection. Household surveys were designed to measure baseline and post-study healthcare-seeking behavior among the targeted population of households with children under 5 years. The surveys collected information on demographics, care-seeking behaviors, childhood morbidity and mortality, preventive health measures, and knowledge of danger signs for childhood illnesses plus acceptability and use of CHWs, RHCs, and other informal healthcare sector services. Women were also asked specific questions surrounding the most recent illnesses of their under 5 years of age children, including disease-specific signs and symptoms, where they sought care, what kind of care they sought, what kind of care they received, and adherence to the treatment regimens provided. They were also queried about their knowledge of signs of severe illness.

We recruited women aged 15–45 years old who had at least one child under the age of 5 years and resided within the study area. Two villages per CHP cluster were randomly selected for recruiting women, and the same villages were used for selecting women for both the baseline and post-study data surveys. However, we did not make any conscious effort to recruit the same women for both the baseline and post-study surveys, and therefore, it is most likely that different women were interviewed in the surveys. In each village, 14 households with mothers with young children were selected systematically. The center of the village was identified with the help of the village headman, and the first house with the door nearest to the center was selected. The next house selected was the one with the door nearest to the previous one, and this process continued until the number of survey participants for the village was attained. Only one woman per household was allowed to participate, and if more than one woman resided in a household, the oldest woman was selected. If the woman had more than one child under 5 years, the child with the most recent illness was selected. For these surveys, women were not required to have had their children enrolled in the randomized trial to participate.

For both baseline and post-study surveys, trained data collectors administered the questionnaires. Data collectors underwent training in study procedures, use of study instruments, research ethics, and informed consent protocols.

Informed consent and ethical clearance. Written informed consent was obtained from all women participating in the household surveys before surveys were conducted. Ethical approval for the study was obtained from the University of Zambia Research Ethics Committee and the Boston University Institutional Review Board. We also received approval from the Zambian Ministry of Health, the two District Health Management Teams (Mazabuka and Siavonga) where the studies were conducted in Southern Province, and local community leaders.

Statistical analysis. Data were double entered into CS Pro 3.3 (US Census Bureau, Washington, DC); consistency and validation checks were conducted. Analyses were performed with SAS v 9.1.3 (SAS Institute, Cary, NC). With respect to questions on first action taken by mothers when the child was sick, those women who reported visiting a RHC and those women who visited a hospital were classified as having sought care at a health facility. We also combined mothers who reported visiting a traditional healer with those mothers who visited spiritual leaders. Regarding signs of infection, we combined mothers who reported seeking care if their child had either fast or difficult breathing. With respect to medications, we combined mothers who reported using amoxicillin with those mothers who used other antibiotics. We compared crude proportions of source of first care in response to different illnesses in the iCCM model A and B groups at baseline and post-study using the Mantel–Haenszel χ^2 or Fisher exact test as appropriate. Data for changes in health-seeking behavior are presented as relative risks (RRs) adjusted for sampling cluster effect (adjusted RR [aRR]). We included both groups in the model and included a group $\times$ time interaction to determine whether there were significant differences in healthcare-seeking behaviors between the two iCCM models. We used a significance level of 0.05 to report *P* values.

RESULTS

A total of 440 women (210 from iCCM model A and 230 from iCCM model B communities) was interviewed during the baseline survey conducted in August of 2007, and 441 women (213 from model A and 228 from model B communities) were interviewed during the post-study household surveys conducted in December of 2008. In both surveys, the women were recruited from 62 villages (2 villages per each of the 31 study clusters).

Study population characteristics. There were no major differences in demographic characteristics (age, household size, marital status, and education) in the model A and B communities at both the baseline and post-study periods (Table 1). Most women reported being married, having obtained a primary school level of education, and working as farmers or housewives within the study area, although there were more

TABLE 1
Demographic and household characteristics of survey respondents

Characteristic	iCCM model A*		iCCM model B**	
	Baseline ($N = 210$)	Post ($N = 213$)	Baseline ($N = 230$)	Post ($N = 228$)
Mean age in years (range)	27.5 (16–46)	28.7 (15–48)	27.5 (15–68)	29 (16–66)
Mean household size (range)	5.8 (1–14)	5.7 (3–15)	5.8 (2–14)	5.9 (2–12)
Mean number of children under 5 years old in the household (range)	1.5 (0–4)	1.5 (1–3)	1.5 (1–5)	1.5 (1–3)
Education (highest level attained)				
No formal education	28.7%	32.2%	36.7%	34.2%
Primary	65.1%	59.1%	57.7%	59.9%
Marital status				
Married	88.0%	86.2%	90.9%	86.6%
Single/divorced	11.5%	12.8%	9.1%	13.4%
Occupation				
Housewife	33.0%	36.2%	51.3%	45.5%
Farmer	61.2%	61.4%	43.5%	51.1%
Reported household cell phone ownership	8.6%	19.3%	11.3%	20.6%
Reported use of ITN for malaria prevention	68.4%	94.4%	60.4%	92.5%
Reported that a < 5-year-old child slept under ITN last night	57.9%	85.0%	53.5%	83.3%

*Model A CHWs performed and interpreted malaria RDTs, administered AL to children who tested positive for malaria, and administered amoxicillin for treatment of children diagnosed with non-severe pneumonia.
**CHWs in iCCM model B communities treated suspected malaria cases with AL and referred all non-severe pneumonia cases to the nearest rural health center.

farmers and fewer housewives in the model A communities than the model B communities. During the course of the study, household ownership of cell phones and the use of insecticide-treated bednets (ITNs) increased in both model A and B groups. In addition, more households in both the models A and B communities reported that a child under 5 years had slept under an ITN the previous night during the post-study period.

Maternal knowledge of serious illness. When mothers were asked to tell the interviewer (without prompting) the signs of illness that would indicate that their child was very sick and in need of urgent attention or treatment, most mentioned high fever and not playing (Table 2). Other common signs that were mentioned included vomiting, not eating or drinking, difficulty in waking, difficult breathing, and having convulsions. At baseline, mothers in the model B communities described several potential danger signs less frequently than mothers in model A communities. Notably, the survey that was done after study completion revealed significant decreases in maternal knowledge of danger signs of illness for several specific signs in model A and to a lesser extent, model B.

Care-seeking behaviors. In both the model A and model B groups, more than 80% of mothers reportedly sought care on the day that their child first showed signs of illness or the next day, and there was no significant difference between baseline and pre-and post-study in both groups. In the pre-study baseline period, the mothers of children in both iCCM models A and B communities used CHWs about one-half the time and health facilities a little over 40% of the time as the first source of care for any reported illness (fever, cough, fast/difficult breathing, or diarrhea), whereas a small proportion managed their child at home or sought assistance from traditional healers (Table 3). There were no differences in treatment-seeking behaviors at baseline between the model A and B communities. There was a significant increase in the proportion of mothers who sought care from CHWs between baseline and post-study in both groups for all types of illness, whereas there was a decrease in use of health facilities and traditional healers (Table 3).

First health-seeking action for children with fever. At baseline, about one-half of mothers in both communities used CHWs as their first source of care if their child was febrile, with health facilities serving as the next most common source of care (Table 3). Comparing care-seeking for fever between groups (iCCM models A and B) as well as changes over time (baseline and post-study surveys), similar patterns to the patterns of all illnesses were observed. There was a significant increase in the proportion of mothers who sought care from a CHW between the baseline and post-study surveys in both

TABLE 2
Maternal knowledge of signs of severe childhood illness

Signs of illness*	iCCM model A communities		iCCM model B communities	
	Baseline ($N = 209$)	Post ($N = 212$)	Baseline ($N = 230$)	Post ($N = 228$)
Not playing	167 (79.9)	168 (79.2)	196 (85.2)	179 (78.5)**
Not eating or drinking	133 (63.6)	102 (48.1)†	113 (49.1)	103 (45.2)
Difficult to wake	104 (49.8)	76 (35.8)‡	66 (28.7)	84 (36.8)**
High fever	193 (92.3)	187 (88.2)	205 (89.1)	195 (85.5)
Vomits everything	140 (67.0)	84 (39.6)†	133 (57.8)	86 (37.7)†
Difficult breathing	97 (46.4)	53 (25.0)†	51 (22.2)	50 (21.9)
Convulsions	82 (39.2)	49 (23.1)‡	40 (17.4)	42 (18.4)

*More than one response possible.
**Comparison of baseline and post-study survey results ($P = 0.06$).
†Comparison of baseline and post-study survey results ($P < 0.001$).
‡Comparison of baseline and post-study survey results ($P < 0.01$).

TABLE 3
First source of care for illness stratified by iCCM model

	iCCM model A communities				iCCM model B communities			
	Baseline	Post-study	RR (95% CI)	Adjusted RR (95% CI)	Baseline	Post-study	RR (95% CI)	Adjusted RR (95% CI)
Any illness	*N* = 174	*N* = 191			*N* = 163	*N* = 203		
Managed at home	9.2%	2.6%	0.47 (0.16–1.39)	0.55 (0.18–1.64)	5.5%	4.0%	0.43 (0.19–0.98)	0.41 (0.12–1.38)
CHW	47.1%	79.1%	1.55 (1.31–1.84)	1.39 (1.11–1.74)	50.9%	77.3%	1.64 (1.38–1.95)	1.55 (1.20–2.01)
Health facility	40.2%	18.3%	0.44 (0.31–0.62)	0.49 (0.28–0.86)	41.7%	17.7%	0.44 (0.31–0.62)	0.49 (0.29–0.82)
Traditional/spiritual healer	3.4%	0			1.9%	1.0%	0.29 (0.06–1.40)	
Fever	*N* = 149	*N* = 179			*N* = 154	*N* = 190		
Managed at home	10.1%	2.2%	0.43 (0.13–1.40)	0.48 (0.14–1.60)	5.2%	3.7%	0.37 (0.15–0.88)	0.37 (0.10–1.30)
CHW	48.3%	81.0%	1.58 (1.33–1.87)	1.42 (1.14–1.78)	51.3%	77.9%	1.61 (1.34–1.94)	1.55 (1.18–2.02)
Health facility	39.6%	16.8%	0.40 (0.28–0.59)	0.45 (0.25–0.81)	41.6%	17.4%	0.44 (0.31–0.63)	0.48 (0.28–0.81)
Traditional/spiritual healer	2.0%	0			5.9%	1.1%	0.52 (0.09–3.09)	
Cough	*N* = 140	*N* = 142			*N* = 133	*N* = 156		
Managed at home	7.9%	2.1%	0.40 (0.11–1.5)	0.42 (0.11–1.63)	5.3%	3.8%	0.48 (0.19–1.29)	0.52 (0.15–1.83)
CHW	52.9%	79.6%	1.51 (1.26–1.81)	1.45 (1.15–1.81)	52.6%	78.8%	1.49 (1.25–1.78)	1.39 (1.07–1.79)
Health facility	37.9%	18.3%	0.45 (0.30–0.68)	0.42 (0.23–0.79)	40.6%	16.7%	0.44 (0.29–0.66)	0.54 (0.31–0.94)
Traditional/spiritual leader	1.4%	0%			1.5%	0.6%	0.45 (0.04–4.90)	
Difficult or fast breathing	*N* = 61	*N* = 35			*N* = 59	*N* = 25		
Managed at home	6.6%	2.9%	0.56 (0.06–5.20)	0.49 (0.05–4.82)	5.1%	12.0%	1.83 (0.44–7.59)	1.79 (0.31–10.18)
CHW	50.8%	74.3%	1.37 (1.01–1.86)	1.39 (0.98–1.98)	54.2%	52.0%	1.02 (0.65–1.61)	1.10 (0.68–1.77)
Health facility	42.6%	22.9%	0.59 (0.30–1.17)	0.56 (0.23–1.32)	39.0%	36.0%	0.85 (0.46–1.54)	0.78 (0.42–1.47)
Traditional/spiritual healer	0	0			1.7%	0		
Diarrhea	*N* = 105	*N* = 52			*N* = 103	*N* = 59		
Managed at home	7.6%	1.9%	0.33 (0.04–2.67)	0.33 (0.04–1.10)	5.8%	5.1%	0.67 (0.18–2.42)	0.65 (0.14–3.01)
CHW	54.3%	78.9%	1.62 (1.27–2.07)	1.48 (1.10–1.99)	48.6%	76.3%	1.41 (1.12–1.76)	1.39 (1.02–1.89)
Health facility	34.3%	19.2%	0.44 (0.24–0.80)	0.49 (0.23–1.01)	43.7%	16.9%	0.49 (0.27–0.92)	0.55 (0.27–1.24)
Traditional/spiritual healer	3.8%	0			1.9%	1.7%	0.44 (0.05–3.89)	

model A (48.3% versus 81.0%, aRR = 1.42, confidence interval [CI] = 1.14–1.78) and model B (51.3% versus 77.9%, aRR = 1.55, CI = 1.10–2.02) groups. There was a corresponding decrease in the proportion of mothers who sought care from health facilities between baseline and post-study in both model A (39.6% versus 16.8%, aRR = 0.45, CI = 0.25–0.81) and model B (41.6% versus 17.4%, aRR = 0.48, CI = 0.28–0.81) groups. Mothers in both groups used traditional healers less after the study period, but this difference was not significant. There were no significant between-group differences in the use of CHWs or health facilities over time.

First health-seeking action for cough. In the pre-study period, mothers in both groups used CHWs as the first source of care for cough about one-half the time, with the health facility serving as the next most common source of care (Table 3). Mothers in the post-study survey used the CHWs significantly more than at baseline in both groups (model A: 52.9% versus 79.6%, aRR = 1.51, CI = 1.26–1.81; model B: 52.6% versus 78.8%, aRR = 1.49, CI = 1.25–1.78). There was a concurrent significant decrease in the use of health facilities in both groups. There were no significant between-group differences in the use of CHWs or health facilities over time.

First health-seeking action for children with fast or difficulty breathing. For children with difficulty or fast breathing, there was an increase of 23.5% in the proportion of women who sought care from CHWs between the baseline and post-study in the model A communities that was significant on unadjusted analysis but became non-significant after adjustment for clustering (Table 3). There was also a decrease in the proportion of women who sought care from health facilities between baseline and post-study surveys in the model A group; this finding was significant when unadjusted but then became non-significant after adjustment for clustering. In contrast, there were no differences in care-seeking in the model B communities. Despite an increase in the use of CHWs as the first source of care for fast/difficult breathing in model A relative to model B communities, the between-group difference was not significant.

First health-seeking action for diarrhea. In the pre-study period, mothers in both groups used CHWs as the first source of care for diarrhea about one-half of the time, with the health facility serving as the next most common source of care (Table 3). Mothers in the post-study survey used the CHWs significantly more than at baseline in both groups (model A: 54.3% versus 78.9%, aRR = 1.48, CI = 1.10–1.99; model B: 48.6% versus 76.3%, aRR = 1.39, CI = 1.02–1.89). There was a concurrent significant decrease in the use of health facilities in both groups, especially in the model B communities.

Medication use. For the most recent illness in children under 5 years, mothers reported significant increases in the proportion of febrile children receiving antipyretics (paracetamol) between time periods in the model A communities (84.1% versus 96.7%, $P < 0.001$) and a trend to an increase in the model B areas (90.3% versus 95.7%, $P = 0.06$).

Mothers in both groups reported increases in the use of AL for their children's most recent illnesses between pre- and post-study periods, although there was a larger increase in the proportion receiving AL in the model B communities (14.0–72.2%, $P < 0.001$) where CHWs had been taught to treat all children presenting with fever with AL without confirmatory testing with RDTs. The proportion of mothers who reported receiving antibiotics for their child's most recent illness increased between pre- and post-study time periods in model A areas, where the CHWs were able to treat non-severe pneumonia with amoxicillin (16.0% versus 25.0%, $P = 0.04$) but decreased in model B areas, where the CHWs referred children with pneumonia to the health facility for evaluation (21.1% versus 10.7%, $P = 0.01$).

Maternal satisfaction with CHWs. Maternal satisfaction with the care provided by CHWs was high at both baseline (312/327, 95.4%) and post-study surveys (415/417, 99.5%) in

both model A and B communities. When asked in the pre-study period whether they would go to a CHW the next time that their child was sick, the vast majority of mothers in both communities would see a CHW again (96.1%, 199/207; 97.8%, 224/229, respectively). During the post-study survey, all (100%, 213/213, $P = 0.003$ compared with baseline survey) of the mothers in the model A group would see a CHW again, and nearly all model B mothers would see a CHW again (223/228, 97.8%).

DISCUSSION

Two approaches for iCCM of malaria and non-severe pneumonia in children under 5 years old in rural Zambia led to significant changes in health-seeking behavior by mothers living in these areas with access to these programs. More mothers in both areas (models A and B communities) reported visiting CHWs as their first source of care for any illness after the introduction of iCCM in their villages, and both groups of mothers reported similar increases in the use of CHWs for febrile illnesses. At the same time, mothers reported decreases in care sought for all illnesses and fever from formal health facilities as well as care provided at home or from traditional healers after the introduction of enhanced care delivery by CHWs through the ZIMMAPS iCCM programs. The increase in the use of the services of the CHWs was most likely because of the confidence that the community had in the improved CHW services as a result of the availability of drugs, supplies, and up-to-date skills and knowledge. Before ZIMMAPS, the CHWs did not have drugs and had not received any refresher training for years. Mothers reported increased use of AL for management of malaria and antibiotics for pneumonia (the latter in the model A clusters only). These findings corroborate the findings of the main study, which showed significant increases in the prescription of AL for malaria and amoxicillin for pneumonia by CHWs based on review of their logbooks.[10]

In model A areas, where the CHWs were trained to provide amoxicillin to children presenting with signs/symptoms of non-severe pneumonia and perform RDTs to diagnose malaria, mothers of children with difficult or fast breathing reported increases in first care sought by CHWs with concomitant decreases in care sought at health facilities and home management. The same changes were not recorded in model B communities, where CHWs were trained to provide AL to all children with fever and refer children with signs/symptoms of non-severe pneumonia to the nearest formal health facility. Because the two surveys were carried out during different seasons (baseline in August, which is the cold, dry season; post-study in December, which is early rainy season), there were fewer children with recent episodes of fast/difficulty breathing (suggestive of pneumonia) in the post-study survey period. Although there was a more than 20% increase in visits to CHWs in model A and no change in model B, the lack of significance might be because of the small numbers reporting fast/difficulty breathing during the post-study period. It is encouraging to note that the inclusion of skills, training, supplies, and an additional clinical algorithm for CHWs to evaluate and treat non-severe pneumonia in the community led to shifts in health-seeking behaviors by mothers in communities with these services and a greater percentage of children having recently been treated with antibiotics. As more iCCM programs are being designed and implemented, these findings suggest that there is potential for successful uptake of iCCM in settings similar to rural Zambia.

Interestingly, we found that mothers' first care-seeking behavior for children with diarrhea was also significantly affected by the introduction of the iCCM approaches in both models A and B communities. Larger proportions of mothers in both communities reported seeking care for children with diarrhea from CHWs after introduction of two iCCM models and a concomitant decrease in care sought from health facilities. Although ZIMMAPS did not train CHWs to manage and treat diarrheal diseases in children and it did not assure increased availability of oral rehydration solutions through its enhanced CHP supply chain system, the surrounding communities might have developed more confidence in the care provided for all illnesses by CHWs after the introduction of iCCM and witnessing enhanced services for malaria and non-severe pneumonia. The CHWs also may have helped to educate community members about the risk of complications of diarrhea and the need for early oral rehydration therapy. The implementation of a routine referral system (CHP to RHC or mission hospital) by ZIMMAPS-trained CHWs may have also led to more children with diarrheal disease being evaluated and managed at the first point of care by CHWs at CHPs. Regardless of possible causes, if implementation of iCCM for specific illnesses (like malaria and non-severe pneumonia in ZIMMAPS) leads to increased community demand for the care of other illnesses by the same cadre of healthcare providers, this change has public health implications for the scope of iCCM programs. This finding may be an argument in favor of designing iCCM programs that integrate commonly presenting diseases and illnesses, like diarrhea, malaria, pneumonia, and potentially, identification of malnutrition, to account for these care-seeking behavior changes and avoid vertical disease programs. At the same time, caution must be entertained that community-based health workers are not being asked to provide care for which they are neither trained nor equipped to manage or to perform too many duties, which may limit their ability to provide quality care.

Overall satisfaction with CHWs both pre- and post-iCCM implementation was extremely high in both iCCM model areas, with most mothers reporting that they would continue to use CHWs for future care. Although the survey did not probe deeper for reasons for such high satisfaction, this finding may partly be a reflection on the austere setting in rural Zambia where ZIMMAPS was conducted and both the limited access and great distances that people need to travel for more formal healthcare delivery through Zambia clinics and hospitals. In any case, such high community acceptance for programs like ZIMMAPS portends well for the design, implementation, and overall scale-up of future iCCM programs in similar settings with limited access to healthcare.

Although ZIMMAPS focused on sensitizing communities to the iCCM programs before their introduction, we did not provide any ongoing health education for the mothers and caregivers of under 5 years children. This lack of education might explain why maternal knowledge of signs of severe childhood illnesses (Table 2) did not improve over time and in fact, seemed to have worsened during the post-study survey. In addition, mothers may have changed their perceptions of disease severity in their children knowing that convenient, immediate care was available.

Although several past studies have shown that the capacity of CHWs to treat malaria was associated with increased use of community-based providers for initial care and reduced visits to primary health centers,[5,7–9] our study is one of the first to show changes in health-seeking behavior for multiple diseases based on the local availability of iCCM. Two recent qualitative studies in Malawi and Uganda found that local health workers noted reductions in patients presenting to their health facilities after the introduction of iCCM in their communities.[11,12] In contrast to our findings, another study in Uganda that evaluated the impact of community medicine distributors trained to treat febrile children with AL and children with non-severe pneumonia with amoxicillin found only marginally increased use of this cadre of health worker by mothers in the community.[13] The context in this rural area of Uganda was substantially different from our study site in rural Zambia, because in Uganda, there were many other options available for local treatment, including private clinics, drugs shops, and government health centers.

There are several limitations to this study, including the use of different survey participants at baseline and post-study, potential recall bias for mothers completing the survey, absence of data from RHCs on the volume of sick children seen during the pre-/post-study periods, and lack of survey questions investigating why mothers changed their health-seeking behaviors over time.

The recently released WHO and UNICEF Inter-Agency joint statement advocates for the more widespread use of iCCM of common childhood illnesses by trained community-based healthcare providers in resource-limited environments as a strategy to address the burden of morbidity and mortality in children less than 5 years old.[14] Although many factors influence successful introduction and scale-up of iCCM programs, such as stakeholder perceptions, community-based reporting systems, government policy, training, supervision, and supply chain management, their effectiveness as child survival interventions is dependent on changes in care-seeking behavior and practices in the communities where iCCM programs are being introduced.

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Authors' addresses: Philip P. Seidenberg, Davidson H. Hamer, and Kazungu Siazeele, Zambia Centre for Applied Health Research and Development (ZCAHRD), Lusaka, Zambia, E-mails: pseidenberg@gmail.com, dhamer@bu.edu, and nzunga.siazeele@gmail.com. Hari Iyer, William B. MacLeod, and Kojo Yeboah-Antwi, Center for Global Health and Development (CGHD), Boston University, Boston, MA, E-mails: hiyer@bu.edu, wmacleod@bu.edu, and kyantwi@bu.edu. Portipher Pilingana, Zambia Chlorhexidine Application Project, ZCAHRD, Choma, Zambia, E-mail: ppilingana@yahoo.co.uk. Busiku Hamainza, National Malaria Control Centre, Ministry of Health, Lusaka, Zambia, E-mail: bossbusk@gmail.com.

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