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# Scale-up of community-based malaria control can be achieved without degrading community health workers' service quality: the Village Malaria Worker project in Cambodia

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## Abstract

**Background:** Malaria control has been scaled up in many developing countries in their efforts to achieve the Millennium Development Goals. Cambodia recently scaled up their Village Malaria Worker (VMW) project by substantially increasing the number of VMWs and expanding the project's health services to include treatment of fever, diarrhoea, and Acute Respiratory Infections (ARI) in children under five. This study examined if the scale-up interfered with VMWs' service quality, actions, and knowledge of malaria control, and analysed VMWs' overall achievements and perceptions of the newly added health services.

**Methods:** Structured interviews were conducted pre scale-up in February-March 2008 with 251 VMWs and post scale-up in July-August 2010 with 252 VMWs. Comparing the pre and post scale-up survey results ( $n = 195$ ), changes were examined in terms of VMWs' 1) service quality, 2) malaria prevention and vector control actions, and 3) knowledge of malaria epidemiology and vector ecology. In addition, VMWs' newly added health services were descriptively analysed based on the post scale-up survey ( $n = 252$ ).

**Results:** VMWs' service quality and actions significantly improved overall during the scale-up of the VMW project (mean index score:  $+0.805$ ,  $p < 0.001$ ;  $+2.923$ ,  $p < 0.001$ ; respectively). Although most of knowledge areas also showed significant improvement (between  $+0.256$  and  $+0.499$ ,  $p < 0.001$ ), less than half (10.3%-47.7%) of the VMWs correctly answered a set of questions on malaria epidemiology and vector ecology, even in the post scale-up survey. About 70% of the respondents reported that their health services to control malaria remained the same or that they were more active after the scale-up. Two-thirds (66.3%) had become more enthusiastic about serving as a VMW since the scale-up, and all but one respondent reported being willing to continue the new services.

**Conclusions:** The Cambodian experience clearly demonstrated that a nationwide scale-up of community-based malaria control can be achieved without degrading community health workers' service quality. The government's strategy to expand VMWs' health services, while providing sufficient training to maintain the quality of their original malaria control services, could have contributed to the improvement of VMWs' service quality, actions, and knowledge in spite of the rapid scale-up of the project.

**Keywords:** Scale-up, Malaria control, Community health workers, Service quality, Cambodia

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## Background

There is a growing consensus that it is critical to scale-up national malaria control programmes in affected countries to meet the Millennium Development Goal (MDG) target for reducing malaria [1]. Since 2005, the concept of Scale-Up for Impact (SUFi) has also been endorsed by the Roll Back Malaria Partnership. It aims at achieving widespread coverage of a set of preventive and treatment interventions that will lead to a dramatic reduction in the global disease burden that malaria poses [2,3]. Rapid and accelerated coverage increase is considered to achieve a substantial burden reduction and added benefit from accelerated scale-up, compared to gradual incremental coverage increase [1].

Malaria control has been scaled up in a number of low- and middle-income countries during the last several years [4-8], and its effectiveness of reducing malaria mortality and morbidity has been demonstrated in several studies [3,5]. In Ethiopia and Rwanda, long-lasting insecticidal nets and artemisinin-based combination therapy that had been distributed nationwide by 2007 reduced in-patient malaria cases and deaths in children under five by > 50% [8]. Zambia has reduced child parasitaemia and severe malaria by > 50% and child mortality by > 30% through scaling up a package of malaria interventions [9]. According to a study that explored the relationship between all-cause child mortality and malaria mortality in sub-Saharan Africa, if malaria control interventions were scaled up to achieve 70% coverage, malaria mortality could be reduced by 50% [2].

Scale-up can only be achieved by substantially increasing the delivery of malaria interventions and requires an adequate number of well-trained human resources [1]. Therefore, community health workers have come to receive much attention in promoting scale-up of disease control and achieving MDGs [10-12]. However, there is a massive global shortage and mal-distribution of health workers [13-15] and hence an urgent need of task shifting by making more efficient use of the existing cadres and to train new cadres to expand the health workforce [11,16,17]. In order to approach the MDGs, sub-Saharan African countries need to triple their health workers by adding one million workers through retention, recruitment, and training [14]. All Southeast Asian countries also struggle with the mal-distribution of health workers, especially in rural areas [15].

To strengthen the national malaria control programme through training more community health workers, Cambodia's National Centre for Parasitology, Entomology and Malaria Control (CNM) recently scaled up their Village Malaria Worker (VMW) project. This project was initiated in a remote province in 2001 and gradually expanded until 2008, identifying malaria-prone villages, where two VMWs were selected through community consensus in

each village. Trained VMWs are supposed to perform rapid diagnostic tests (RDTs) on any villager suspected of having malaria, to provide anti-malarials for test-positive cases, according to the national guidelines, and to refer severe cases to hospitals. They are also encouraged to conduct active case detection, record fever cases and positive RDT results, follow up patients, and provide information on malaria preventive measures to their villagers. Their services are directly supervised by the CNM staff in two ways: 1) check VMWs' records and resupply RDT kits and medications at monthly meetings held at health centers in each region, and 2) visit each VMW village twice a year to monitor VMW activities and observe their relationship and communication with villagers [18].

The scale-up took place in 2009 with technical support from the World Health Organization (WHO) and financial support from three international donors. The VMW project was scaled up in three dimensions: the number of VMWs was increased, the number of villages with VMWs was increased, and the range of the project's health services was expanded. Approximately 2,000 new VMWs were trained in malaria prevention, diagnosis, and treatment. At the same time, the number of villages with VMWs more than quadrupled from 315 in seven provinces to 1394 in 17 provinces.

Furthermore, the health services provided by all the VMWs in original 315 villages, who had already been trained and started malaria control services by 2008, were expanded. These VMWs participated in a newly developed three-day training programme, which covered fever, diarrhoea, and ARI case management and prevention for children under five (Figure 1), in addition to a two-day refreshers' training programme on malaria control. Most of the VMWs initiated their new health services within a month or two, utilizing the training material and medicine supplied by the CNM.

Expanding the VMWs' health services was an attempt to merge the VMW scheme with the country's Integrated Management of Childhood Illnesses (IMCI) [19]. Integration of the fever, diarrhea, and ARI interventions became possible in collaboration with the IMCI programme and the National Programme for ARI, Diarrhoea and Cholera under the Ministry of Health (MoH). The necessary medications (paracetamol, oral rehydration salts (ORS), zinc, and cotrimoxazol) were procured and supplied through the MoH, utilizing funding from the WHO. This attempt reflects a recent recommendation made by several researchers to link a vertical approach that promotes disease-specific control programmes with a horizontal approach that focuses on strengthening the overall structure and functions of a health system in order to make a "diagonal approach" that could impact health systems and improve overall health status [20-23].



**Figure 1** Sample artwork from VMW training material for diarrhoea treatment of children under five.

This study examined whether the scale-up of the VMW project with the additional health services interfered with the VMWs' original services to control malaria. By comparing VMWs' service quality, actions, and knowledge of malaria control before and after the scale-up, changes in their performance were detected, and determinants of these changes were identified. This study also descriptively analysed VMWs' overall achievements, perceptions, and knowledge regarding the additional health services they performed.

## Methods

### Data collection

This study was conducted in 7 remote provinces of Cambodia where 315 VMW villages had been established prior to 2008: Rattanakiri, Kratie, Mondulkiri, Stung Treng, Kampong Thom, Kampot, and Preah Vehear. Pre scale-up survey was conducted from February-March, 2008, as described in a previous paper [18]. Post scale-up data was conducted from July-August, 2010. In both surveys, face-to-face interviews were conducted by trained surveyors, targeting the head VMW who leads the malaria control activities in each of the 315 VMW villages.

In the pre scale-up survey, a structured questionnaire with 46 questions addressed the VMWs' 1) socio-demographic characteristics, 2) service quality, 3) actions to prevent malaria and control vectors, and 4) knowledge of malaria epidemiology and vector ecology [18]. The post scale-up survey questionnaire had 16 additional questions to examine VMWs' new health services to treat fever, diarrhoea, and ARI in children under five in terms of 1) the VMWs' overall achievements and perceptions of the new services, 2) changes in VMWs' workload for malaria control since service expansion, and 3) accuracy of VMWs' knowledge of treatment. Both questionnaires were developed in English, translated into Khmer by local malaria experts, back-translated to English by another expert, and piloted on VMWs in Kampot province.

### Measures: quality, action, and knowledge indices

As described in detail in our previous paper, a "Quality index", an "Action index", and "Knowledge index" were developed, based on respondents' answers to the survey questions [18]. Briefly, the Quality index measured the quality of VMWs' services for malaria control, focusing on five items: active detection, diagnosis and treatment, prescription of anti-malarials, follow-up of patients, and dissemination of preventive measures. The score for each item was calculated as [total points divided by maximum points], so that each item was given a maximum of 1 point, and was added up to create the index. The Action index was developed to quantify the different malaria preventive and vector control measures the VMWs took. Each measure was given either 1 or 2 points, depending on its effectiveness and frequency. The Knowledge index measured quantified VMWs' understanding of malaria epidemiology and vector ecology: malaria symptoms, malaria transmission, vector species, vector active time, vector development time, breeding places, and natural enemies.

### Newly added services for fever, diarrhoea, and ARI treatment

VMWs were asked about how long they had been offering the new services and the number of diarrhoeal and ARI patients they treated per month. Three questions assessed changes in their workload since the service expansion, especially on the perceived change in the activeness for malaria control and in their enthusiasm about serving as a VMW. Two questions addressed their willingness to continue the new services and support needed, and six questions examined whether knowledge of fever, diarrhoea, and ARI treatment was accurate, focusing on the prescription of medicine (correct dosage of paracetamol, ORS, and cotrimoxazole, and how to prescribe them) and the need of referring patients to a hospital, depending on patients' age and severity.

### Data management, statistical analyses, and ethical considerations

Data from the 195 VMWs who participated in both the pre and post scale-up surveys were used to detect any changes in their malaria control services before and after the scale-up of the VMW project. Paired t-tests were conducted for each index to examine the changes in VMWs' service quality, actions, and knowledge. McNemar's test was conducted for each item that created the indices, to test if there were any significant differences between pre and post scale-up survey results. To identify determinants of the changes in VMWs' service quality and actions, multiple linear regression analyses were run with 15 independent variables: eight socio-demographic factors and seven variables regarding the change in each knowledge area described above. Using the post scale-up data from VMWs, descriptive analyses were conducted regarding the new health services. All data analyses were done using STATA/SE version 11.

Informed consent was obtained from all participants for the interviews in both surveys. Participation was voluntary, and confidentiality was secured. The study protocol, consent forms, and survey questionnaires were approved by the Ethical Committee of the University of Tokyo. They were also reviewed by the CNM Institutional Review Board, National Ethics Committee for Health Research, Cambodia, and were exempted from the ethical procedure.

## Results

### Socio-demographic characteristics

Out of 315 VMWs, 195 (62%) took part in both the pre and post scale-up surveys, and 252 (80%, including the 195) participated in the post scale-up survey (Table 1). At pre scale-up, respondents had served as VMWs for about 3 years, and most of them attended the VMW training or refresher training on malaria control between 1 and 1.5 years ago. At post scale-up, respondents had served as VMWs for about 6 years, and all of them had attended trainings for malaria control as well as fever, diarrhoea, and ARI treatment 7 or 8 months ago.

### Changes in quality, action, and knowledge indices

Both VMWs' service quality and actions for malaria prevention and vector control significantly improved during the scale-up of the VMW project (mean index score: +0.805,  $p < 0.001$ ; +2.923,  $p < 0.001$ ; respectively) (Table 2). Most knowledge areas of malaria epidemiology and vector ecology also significantly improved (between +0.256 and +0.499,  $p < 0.001$ ). Knowledge of vector active time did not improve significantly (+0.015,  $p = 0.090$ ), but the mean knowledge score on the topic (0.979 out of 1) was already high in the pre scale-up survey.

### Changes in service quality

Widespread significant improvement was observed in most items related to service quality (Table 3). To diagnose malaria, more measures were taken, in addition to using RDTs, at the time of the post scale-up survey. In the post scale-up survey, all VMWs responded that they always prescribed artesunate and mefloquine (A+M) to treat those with positive RDT results (+2.1%,  $p = 0.046$ ). When prescribing anti-malarials, more VMWs explained about the importance of compliance, in addition to the appropriate dosage after the scale-up (+25.6%,  $p < 0.001$ ). VMWs' understanding of the possibility of compliance failure causing or spreading drug resistance significantly improved (+85.6%,  $p < 0.001$ ), as did their understanding of other issues regarding the prescription of anti-malarials (between +17.9% and +28.2%,  $p < 0.001$ ). The percentage of VMWs who followed up patients to make sure that they recovered from malaria significantly increased (+34.4%,  $p < 0.001$ ). Dissemination of a variety of vector control measures improved, especially about covering water jars/tanks (+39.5%,  $p < 0.001$ ) and filling in water pools (+25.6%,  $p < 0.001$ ). Active detection of malaria patients was the only item that declined (-18.5%,  $p < 0.001$ ).

### Changes in actions

VMWs reported taking more actions to prevent malaria and control vectors in the post scale-up survey than in the pre scale-up survey. Percentage of VMWs who took each malaria preventive measure slightly increased (between +4.1 and +10.8%,  $p < 0.005$ ), except for refraining from going to the forest (-49.7%,  $p < 0.001$ ). VMWs who took vector control measures such as sealing holes/cracks on the walls/ceilings, covering water jars/tanks, and spraying houses improved significantly (between +21.0% and +37.9%,  $p < 0.001$ ), as did other measures such as using mosquito coils, filling in water pools, and burning trash and clearing bush around houses (between +9.7% and +17.4%,  $p < 0.001$ ).

### Changes in knowledge

Percentage of VMWs who gave correct answers to all questions regarding malaria symptoms, transmission route, vector breeding places, development time, and natural enemies significantly increased (between +18.5% and +32.8%,  $p < 0.001$ ). Nevertheless, only less than half (10.3%-47.7%) of the VMWs were able to correctly answer all questions regarding these topics even in the post scale-up survey, with the exception of one on vector active time, which could be known from experience.

### Determinants of the changes in service quality and actions

The important determinants for the improvement in both VMWs' service quality and actions for malaria

**Table 1 Selected socio-demographic characteristics of the study population**

Characteristics	Pre and post scale-up survey participants (n = 195)				Post scale-up survey participants (n = 252)			
	Mean	SD	Number	%Total	Mean	SD	Number	%Total
Age	38.0	12.4			37.2	12.2		
Education (final grade)	3.7	2.7			3.6	2.7		
Gender*								
Male			160	82.1			203	80.6
Female			35	17.9			47	18.7
Occupation								
Farmer			187	95.9			242	96.0
Other			8	4.1			10	4.0
Region								
Mountainous			118	60.5			157	62.3
Other			77	39.5			95	37.7
Ethnicity*								
Khmer			64	32.8			75	29.8
Other			131	67.2			161	63.9
VMW career (months): pre scale-up	40.2	15.2			N/A	N/A		
VMW career (months): post scale-up	71.0	8.3			69.1	12.3		
Reason for becoming VMW								
Recommended by villagers			100	51.3			102	40.5
Interested in malaria treatment/prevention			95	48.7			150	59.5
Most recent VMW training attended (months ago): pre scale-up	15.6	5.0			N/A	N/A		
Most recent VMW training attended (months ago): post scale-up	7.5	0.5			7.5	0.6		
Most recent training for fever, diarrhoea, ARI treatment attended (months ago)	7.5	0.5			7.5	0.6		

\*2 missing data on gender and 16 missing data on ethnicity in post scale-up survey

prevention and vector control were having a personal interest in malaria control as the reason for becoming a VMW (Beta = 0.739 and 2.490,  $p < 0.001$ , respectively), having improved knowledge about malaria transmission (Beta = 0.620,  $p < 0.007$ ; Beta = 2.439,  $p < 0.002$ , respectively), and attending the refresher training earlier (Beta = 0.700,  $p < 0.001$ ; Beta = 1.629,  $p = 0.007$ , respectively) (Table 4).

#### VMWs' newly added health services for fever, diarrhoea, and ARI treatment

The post scale-up survey results revealed VMWs' overall achievements in the newly added health services to treat fever, diarrhoea, and ARI cases of children under five (Table 5). Nearly all of the respondents (96.9%) began providing the new services shortly after they attended the training during the scale-up. About half (54%) of them treated 1-3 patients with diarrhoea per month, and 30.6% treated 4-6 patients. In general, VMWs treated fewer ARI patients than diarrhoeal patients: about 60% treated 1-3 ARI patients per month, and 19.4% treated 4-6 patients.

In terms of changes in their workload for malaria control since the scale-up, about 70% of the respondents reported that their services for malaria control remained the same or became more active. Two-thirds (66.3%)

were more enthusiastic about serving as a VMW since the scale-up. All but one respondent (99.6%) showed willingness to continue the new services.

Accuracy in VMWs' knowledge of fever, diarrhoea, and ARI treatment were examined by a set of questions that considered patients' age and the severity of their symptoms. In general, VMWs correctly answered questions regarding extreme cases, such as a one-month old fever case (96.8%) and a child with bloody diarrhoea (94.8%). However, when it came to details about prescriptions, for example the number of paracetamol or cotrimoxazole tablets to prescribe and how to prescribe them, the answers were often inaccurate (21.0% and 64.3%, respectively).

#### Discussion

This study found that community-based malaria control can be scaled up without degrading the quality of the health services that community health workers provide. Cambodian VMWs' service quality and actions for malaria prevention and vector control significantly improved during the scale-up of the VMW project. Most areas of knowledge on malaria epidemiology and vector ecology also showed significant improvement in the post scale-up survey.

**Table 2 Changes in indices to measure VMWs' service quality, actions, and knowledge (n = 195)**

Indices and their items	Number of items in index	Maximum possible score	Reliability (Chronbach's alpha)	Pre scale-up		Post scale-up		Change in mean	Paired t-test p-value*
				Mean	SD	Mean	SD		
Service quality	5	5	0.822	3.258	0.900	4.063	0.440	0.805	< 0.001
Active detection									
Diagnosis and treatment									
Prescription of anti-malarials									
Follow-up									
Dissemination of preventive measures									
Actions	2	23	0.813	13.159	4.217	16.082	2.140	2.923	< 0.001
Malaria preventive measures									
Vector control measures									
Knowledge									
Malaria symptom	5	1	0.591	0.568	0.223	0.838	0.183	0.270	< 0.001
Malaria transmission	6	1	0.797	0.585	0.317	0.841	0.199	0.256	< 0.001
Vector natural enemies	4	1	0.783	0.114	0.244	0.613	0.344	0.499	< 0.001
Vector breeding places	4	1	0.744	0.347	0.321	0.751	0.281	0.404	< 0.001
Vector development time	1	1	N/A	0.072	0.259	0.354	0.479	0.282	< 0.001
Vector species	6	1	0.856	0.329	0.294	0.604	0.197	0.275	< 0.001
Vector active time	1	1	N/A	0.979	0.142	0.995	0.072	0.015	0.090

\*One-tailed t-test p-value

**Table 3 Changes in VMWs' service quality, actions, and knowledge (n = 195)**

		Pre scale-up		Post scale-up		Absolute change	p-value
		n	%	n	%	%	
<b>Service quality</b>							
Active detection	Visit villagers to find malaria patients (Regularly)	58	29.7	22	11.3	-18.5	<0.001
Diagnosis and treatment	Take body temperature (Always)	53	27.2	141	72.3	45.1	<0.001
	Observe symptoms (Always)	101	51.8	142	72.8	21.0	<0.001
	Ask symptoms from family (Always)	56	28.7	89	45.6	16.9	<0.001
	Prescribe A+M to those who had positive RDT results (Always)	191	97.9	195	100.0	2.1	0.046
	Use RDTs (Always)	194	99.5	194	99.5	0.0	1.000
Prescription of anti-malarials	Explain about the importance of compliance (Always)	116	59.5	166	85.1	25.6	<0.001
	Explain about dosage (Always)	193	99.0	195	100.0	1.0	0.157
	Compliance failure can cause/spread drug resistance	13	6.7	180	92.3	85.6	<0.001
	Inappropriate to save tablets for next infection	137	70.3	192	98.5	28.2	<0.001
	Inappropriate to save tablets to treat other people's malaria	144	73.8	192	98.5	24.6	<0.001
	Compliance failure can result in incomplete treatment	146	74.9	181	92.8	17.9	<0.001
Follow-up	Make home visits or ask patients' family to check if patients recovered (Always)	40	20.5	107	54.9	34.4	<0.001
Dissemination of preventive measures	Cover water jars/tanks	113	57.9	190	97.4	39.5	<0.001
	Fill in water pools	141	72.3	191	97.9	25.6	<0.001
	Spray house	21	10.8	66	33.8	23.1	<0.001
	Wear long-sleeve shirts/pants	154	79.0	194	99.5	20.5	<0.001
	Bring hammock nets to forest	163	83.6	194	99.5	15.9	<0.001
	Use mosquito coils	24	12.3	52	26.7	14.4	<0.001
	Clear bush around house	169	86.7	195	100.0	13.3	<0.001
	Never told not to come close to malaria patients	156	80.0	182	93.3	13.3	<0.001
	Sleep under bednets	183	93.8	195	100.0	6.2	0.001
	Never told not to share utensils with malaria patients	166	85.1	178	91.3	6.2	0.070
<b>Actions for malaria prevention and vector control</b>							
Malaria preventive measures	Come back home before dawn	173	88.7	194	99.5	10.8	<0.001
	Bring hammock nets to the forest	170	87.2	190	97.4	10.3	<0.001
	Sleep under bednets at home	187	95.9	195	100.0	4.1	0.005
	Wear long-sleeved shirts/pants	187	95.9	195	100.0	4.1	0.005
	Refrain from going to the forest	169	86.7	72	36.9	-49.7	<0.001
Vector control measures	Seal holes/cracks on walls/ceilings	16	8.2	90	46.2	37.9	<0.001
	Kill mosquitoes by hands	118	60.5	179	91.8	31.3	<0.001
	Cover water jars/tanks	138	70.8	192	98.5	27.7	<0.001
	Spray house	7	3.6	48	24.6	21.0	<0.001
	Use mosquito coils	8	4.1	42	21.5	17.4	<0.001
	Fill in water pools	162	83.1	193	99.0	15.9	<0.001
	Burn trash around house	171	87.7	194	99.5	11.8	<0.001
	Clear bush around house	171	87.7	190	97.4	9.7	<0.001
	Don't plant flowers/grasses around house	101	51.8	95	48.7	-3.1	0.527
<b>Knowledge of malaria epidemiology and vector ecology (correct answers to all questions)</b>							
Malaria symptoms		23	11.8	87	44.6	32.8	<0.001
Malaria transmission		40	20.5	93	47.7	27.2	<0.001
Vector breeding places		12	6.2	75	38.5	32.3	<0.001
Vector development time		14	7.2	69	35.4	28.2	<0.001
Vector natural enemies		4	2.1	40	20.5	18.5	<0.001
Vector species		21	10.8	20	10.3	-0.5	0.862
Vector active time		191	97.9	190	97.4	-0.5	0.180

**Table 4 Determinants of the change in VMWs' malaria service quality and in VMWs' actions for malaria prevention and vector control**

Change in service quality	Beta coefficient	SE	t	p-value
Ethnicity	-0.415	0.141	-2.94	0.004
Reason for becoming VMW	0.739	0.109	6.79	< 0.001
The most recent malaria training	0.700	0.150	4.67	< 0.001
Change in knowledge of malaria transmission	0.620	0.157	3.95	< 0.001
Change in knowledge of vector breeding places	0.458	0.138	3.33	0.001
<b>Change in actions</b>				
Occupation	-4.441	1.386	-3.20	0.002
Reason for becoming VMW	2.490	0.553	4.51	< 0.001
The most recent malaria training	1.629	0.602	2.71	0.007
Change in knowledge of malaria transmission	2.439	0.772	3.16	0.002

(Adjusted R<sup>2</sup> = 0.404 and 0.278, respectively, for the best model by backward elimination)

Note: Multiple linear regression analyses were run with 15 independent variables: 8 socio-demographic factors (age, education, gender, occupation, ethnicity, length of VMW career, reasons for becoming VMWs, and the most recent VMW training on malaria control attended; "region" was excluded due to its multicollinearity with ethnicity), and 7 variables regarding the change in each knowledge area

This substantial improvement observed could be attributed to both VMWs accumulated experiences and gaining more knowledge through every day practices, as well as the training programmes carried out with the scale-up, which not only covered newly added health services, but also reviewed their original health services to control malaria. VMWs had at least 30 more months of experience between the pre and post scale-up surveys. It is clear from monthly reports they submitted to the CNM that they diagnosed and treated malaria cases throughout the year. There is little doubt that their accumulated experiences contributed to the improvement in service quality, actions, and knowledge. This is supported by our previous study, in which a longer VMW career was associated with better service quality [18].

Another factor that could have been effective in improving their original health services is the training programmes organized by the CNM during the scale-up, which covered both new and original health services. Several previous studies have stressed the importance of leadership from national governments and thorough training of community health workers for successful task shifting. To make the task shifting successful in the long run, governments should make serious political and financial commitments to implement the process, ensure adequate resources, and support training activities [17,24]. It is likely that negative unintended consequences of the scale-up have been prevented by the CNM's direct supervision of the VMWs, which has been continued since the beginning of the VMW project [18], as well as their strategy to give VMWs new tasks, while making sure the quality of the VMWs' malaria control services are maintained.

Despite the overall improvement in VMWs' service quality, actions, and knowledge, some items needed

additional attention. The most important among these is VMWs' knowledge of malaria epidemiology and vector ecology. Even in the post scale-up survey, less than half of the VMWs correctly answered a set of questions on most knowledge areas. Since the improvement in knowledge was found to be an important determinant for improvements in service quality and actions, it is recommended that more efforts would be made to improve VMWs' knowledge on these areas either in the training programme or through supervision.

Another important finding of this study was that about 70% of VMWs responded they were just as active in controlling malaria, or even more so, after they began providing additional health services for under-five children. Moreover, all except one indicated that the service expansion was worthwhile by reporting their willingness to continue the new health services. As demonstrated by a previous study describing a successful intervention delivered by community health volunteers in Nepal, it may be possible to reduce the burden of diarrhoea and ARI by training and engaging VMWs to implement community-based case management and prevention [25].

However, VMWs' knowledge about fever, diarrhoea, and ARI treatment has plenty of room for improvement, depending on the topic. Although VMWs were able to correctly answer questions regarding extreme cases, their answers for questions about the details of prescriptions were often inaccurate. VMW training programmes could better be organized in this regard, using more simple terms or messages that can be more easily remembered by VMWs who have limited formal education. Some previous studies have demonstrated the effectiveness of using simplified messages delivered directly to community health workers in achieving better health service coverage [24].



**Table 5 Responses from the post scale-up survey participants (n = 252) about the treatment of fever, diarrhoea, and ARI in children under five**

		n	%
Have been offering fever, diarrhoea and ARI treatment services (months)	0-3	2	0.8
	4-5	6	5.2
	6-7	237	94.1
	8	7	2.8
Number of diarrhoeal patients treated/month	0	15	6.0
	1-3	136	54.0
	4-6	77	30.6
	6-9	15	6.0
	10 or more	9	3.6
Number of ARI patients treated/month	0	46	18.3
	1-3	151	59.9
	4-6	49	19.4
	6-9	3	1.2
	10 or more	3	1.2
Change in malaria service since service expansion	More active	2	0.8
	Same	173	68.6
	Less active	77	30.6
Enthusiasm about serving as VMW since service expansion	More enthusiastic	167	66.3
	Same	59	23.4
	Less enthusiastic	26	10.3
Willingness to continue fever, diarrhoea, and ARI treatment services	Yes	251	99.6
	Other	1	0.4
Support needed to improve services for malaria, fever, diarrhoea, and ARI treatment services*	Honorarium/salary	251	99.6
	More advice/supervision from health center	243	96.4
	More advice/supervision from CNM	226	89.7
	More VMWs in the village	80	31.8
Knowledge(correct answer)	Treatment for 4-year-olds with 39.3C	53	21.0
	Referral: one-month-olds with 38.2C	244	96.8
	Treatment for 3-year-olds with diarrhoea > 2 weeks	233	92.5
	Referral: 4-year-olds with bloody diarrhoea	239	94.8
	Treatment for 2-year-olds with ARI symptom	162	64.3
	Referral: 3-month-olds with ARI symptom	58	23.0

\*multiple choices ok

One limitation of the study was that only self-reported data were used to evaluate VMWs' service quality, actions, and knowledge. However, these data were double-checked with VMWs' records in their monthly reports, and information about VMWs' service quality from local health centre staff in the region were also obtained. At the same time, the absence of a comparison group prevents us from being able to draw definitive conclusions about the actual impact of the scale-up on VMWs' service quality, actions, and knowledge. It has yet to be demonstrated, based on the pre and post scale-up comparison, that the scale-up was achieved without affecting the VMWs' health services that had been provided by the VMWs.

Despite the reported effectiveness of malaria control scale-up in reducing malaria mortality and morbidity, many countries have been struggling with scale-up barriers [23]. One economic and epidemiological assessment estimated that the cost for comprehensive malaria control to reduce malaria burden in Africa by 75% by 2015 would average up to US\$3.0 billion per year [26]. Another study regarding 27 sub-Saharan African countries demonstrated that recent scale-up of malaria intervention coverage has achieved equal access to health services in some countries (especially with ITNs), but delivery systems in other countries have not reached the most-at-risk poor and rural populations [27]. In order to make sure that malaria control scale-up will reach at-risk

populations with limited access to quality health care, countries need strong leadership and governance, timely access to resources, and coordinated efforts from well-trained health workforce who work at the national, district and local levels [1]. Maintaining and improving the quality of health services provided by community health workers could be key to successfully scale-up national malaria control interventions to achieve MDGs.

## Conclusions

The experience in Cambodia has demonstrated that a nationwide scale-up of community-based malaria control can be achieved without degrading the quality of the health services originally provided by community health workers. The CNM's strategy to expand VMWs' health services, while providing sufficient training to maintain the quality of their original malaria control services, could have prevented possible negative impacts of the scale-up on the quality of VMWs' original services. The lessons learnt from this study can be useful for other countries to successfully scale-up their community-based malaria control interventions in their efforts to achieve MDGs.

## Acknowledgements

We heartily thank all the VMWs who participated in the surveys. We would like to acknowledge the contribution of the field work team: Dr. Sok Vanne, Dr. Srey Socheat, Ms. Kim Marath, Mr. Yoeuk Sok Lim, and Dr. Neang Vannrith. We are grateful to Ms. Akiko Kobayashi for her assistance in data collection, and Dr. Kalpana Poudel-Tandukar, Ms. Khin Zayar Myint, and Ms. Miwa Murata for their efforts in data entry and management. We wish to acknowledge helpful advice to improve the manuscript received from Mr. Donald Halstead and Prof. Richard Levins. This study was supported by the Grant for International Health Cooperation Research (19 C-1) and the Health and Labour Sciences Research Grants (Research on global health issues, 2009) from the Ministry of Health, Labour and Welfare, Japan.

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## Authors' contributions

JY conceived the study, developed questionnaires, conducted fieldwork, analysed data, and wrote the manuscript. KCP contributed to the study design, conducted fieldwork, and improved the manuscript. PL, CN, and DS supervised fieldwork. MJ monitored the study progress and provided guidance to improve the manuscript. All authors read and approved the final draft.

## Competing interests

The authors declare that they have no competing interests.

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## References

1. Roll Back Malaria: Global Malaria Action Plan: The Global Strategy. 2008 [<http://www.rollbackmalaria.org/gmap/part2.pdf>].
2. Rowe AK, Steketee RW: Predictions of the impact of malaria control efforts on all-cause child mortality in sub-Saharan Africa. *Am J Trop Med Hyg* 2007, **77**(Suppl 6):48-55.
3. Steketee RW, Campbell CC: Impact of national malaria control scale-up programmes in Africa: magnitude and attribution of effects. *Malar J* 2010, **9**:299.
4. Yamey G: Scaling up global health interventions: a proposed framework for success. *PLoS Med* 2011, **8**:e1001049.
5. O'Meara WP, Mangeni JN, Steketee R, Greenwood B: Changes in the burden of malaria in sub-Saharan Africa. *Lancet Infect Dis* 2010, **10**:545-555.
6. Noor AM, Mutheu JJ, Tatem AJ, Hay SI, Snow RW: Insecticide-treated net coverage in Africa: mapping progress in 2000-07. *Lancet* 2009, **373**:58-67.
7. Slutsker L, Newman RD: Malaria scale-up progress: is the glass half-empty or half-full? *Lancet* 2009, **373**:11-13.
8. Otten M, Aregawi M, Were W, Karema C, Medin A, Bekele W, Jima D, Gausi K, Komatsu R, Korenromp E, Low-Beer D, Grabowsky M: Initial evidence of reduction of malaria cases and deaths in Rwanda and Ethiopia due to rapid scale-up of malaria prevention and treatment. *Malar J* 2009, **8**:14.
9. Chizema-Kawesha E, Miller JM, Steketee RW, Mukonka VM, Mukuka C, Mohamed AD, Miti SK, Campbell CC: Scaling up malaria control in Zambia: progress and impact 2005-2008. *Am J Trop Med Hyg* 2010, **83**:480-488.
10. Haines A, Sanders D, Lehmann U, Rowe AK, Lawn JE, Jan S, Walker DG, Bhutta Z: Achieving child survival goals: potential contribution of community health workers. *Lancet* 2007, **369**:2121-2131.
11. Samb B, Celletti F, Holloway J, Van Damme W, De Cock KM, Dybul M: Rapid expansion of the health workforce in response to the HIV epidemic. *N Engl J Med* 2007, **357**:2510-2514.
12. Lee CI, Smith LS, Shwe Oo EK, Scharschmidt BC, Whichard E, Kler T, Lee TJ, Richards AK: Internally displaced human resources for health: villager health worker partnerships to scale up a malaria control programme in active conflict areas of eastern Burma. *Glob Public Health* 2009, **4**:229-241.
13. World Health Organization: *The World Health Report 2006: Working Together for Health* Geneva; 2006.
14. Chen L, Evans T, Anand S, Boufford JI, Brown H, Chowdhury M, Cueto M, Dare L, Dussault G, Elzinga G, Fee E, Habte D, Hanvoravongchai P, Jacobs M, Kurowski C, Michael S, Pablos-Mendez A, Sewankambo N, Solimano G, Stilwell B, de Waal A, Wibulpolprasert S: Human resources for health: overcoming the crisis. *Lancet* 2004, **364**:1984-1990.
15. Kanchanachitra C, Lindelow M, Johnston T, Hanvoravongchai P, Lorenzo FM, Huong NL, Wilopo SA, dela Rosa JF: Human resources for health in Southeast Asia: shortages, distributional challenges, and international trade in health services. *Lancet* 2011, **377**:769-781.
16. Walsh A, Ndubani P, Simbaya J, Dicker P, Brugha R: Task sharing in Zambia: HIV service scale-up compounds the human resource crisis. *BMC Health Serv Res* 2010, **10**:272.
17. Lehmann U, Van Damme W, Barten F, Sanders D: Task shifting: the answer to the human resources crisis in Africa? *Hum Resour Health* 2009, **7**:49.
18. Yasuoka J, Poudel KC, Poudel-Tandukar K, Nguon C, Ly P, Socheat D, Jimba M: Assessing the quality of service of village malaria workers to strengthen community-based malaria control in Cambodia. *Malar J* 2010, **9**:109.
19. World Health Organization: Scaling up child survival interventions in Cambodia. 2007 [[http://www.who.int/child\\_adolescent\\_health/documents/a91058/en/index.html](http://www.who.int/child_adolescent_health/documents/a91058/en/index.html)].
20. Ooms G, Van Damme W, Baker BK, Zeitz P, Schrecker T: The 'diagonal' approach to Global Fund financing: a cure for the broader malaise of health systems? *Global Health* 2008, **4**:6.
21. Balabanova D, McKee M, Mills A, Walt G, Haines A: What can global health institutions do to help strengthen health systems in low income countries? *Health Res Policy Syst* 2010, **8**:22.
22. Bhattacharya S: The local bases of global public health: complexities and opportunities. *Bull World Health Organ* 2008, **86**:163.
23. Dye Tde V, Apondi R, Lugada E: A qualitative assessment of participation in a rapid scale-up, diagonally-integrated MDG-related disease prevention campaign in Rural Kenya. *PLoS One* 2011, **6**:e14551.
24. Ouma PO, Van Eijk AM, Hamel MJ, Sikuku E, Odhiambo F, Munguti K, Ayisi JG, Kager PA, Slutsker L: The effect of health care worker training on

- the use of intermittent preventive treatment for malaria in pregnancy in rural western Kenya. *Trop Med Int Health* 2007, **12**:953-961.
25. Ghimire M, Pradhan YV, Maskey MK: Community-based interventions for diarrhoeal diseases and acute respiratory infections in Nepal. *Bull World Health Organ* 2010, **88**:216-221.
  26. Teklehaimanot A, McCord GC, Sachs JD: Scaling up malaria control in Africa: an economic and epidemiological assessment. *AmJTrop Med Hyg* 2007, **77**(6):138-144, Review.
  27. Steketee RW, Eisele TP: Is the scale up of malaria intervention coverage also achieving equity? *PLoS One* 2009, **4**:e8409.

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Among the regulators, Mullard does not mention the Haute Autorité de Santé (the French health-care watchdog) and its “transparency” committee. This committee assesses drugs for reimbursement and pricing. A draft report<sup>4</sup> it produced in 2006 on the reassessment of benfluorex included a prominent note that benfluorex was (a) a hidden anorexigen misused for slimming; (b) a derivative of the fenfluramine family, withdrawn for pulmonary hypertension and valvular disease; and (c) withdrawn in Spain for these same adverse effects. The final version of the report contained no such note.<sup>5</sup>

Lastly the role of the experts and of many medical colleges was not mentioned by Mullard. This might need a separate piece.

I was sacked by the Department of Health from my position as a senior tenured consultant in public health at Amiens University Hospital.

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- 1 Mullard A. Mediator scandal rocks French medical community. *Lancet* 2011; **377**: 890–89.
- 2 La Revue Prescrire. Benfluorex interdit en Espagne. *Rev Prescrire* 2005; **25**: 589.
- 3 Brailion A. Homoeopathic remedies and drug-regulatory authorities. *Lancet* 2010; **375**: 279–80.
- 4 Haute Autorité de Santé. Document préparatoire: 12 Avril 2006. [http://www.has-sante.fr/portail/upload/docs/application/pdf/2010-12/mediator\\_document\\_preparatoire\\_avisct\\_2006\\_2010-12-01\\_15-24-30\\_947.pdf](http://www.has-sante.fr/portail/upload/docs/application/pdf/2010-12/mediator_document_preparatoire_avisct_2006_2010-12-01_15-24-30_947.pdf) (accessed May 23, 2011).
- 5 Haute Autorité de Santé. Avis de la Commission de la Transparence: Médiateur 150 mg, comprimé enrobé. 12 Avril 2006. <http://www.has-sante.fr/portail/upload/docs/application/pdf/ct032758.pdf> (accessed May 23, 2011).

## Non-communicable diseases in southeast Asia

In describing features of a comprehensive response to the rise of chronic non-communicable diseases (NCDs) in southeast Asia, Antonio Dans and colleagues (Feb 19, p 680)<sup>1</sup> highlight the need to strengthen

primary health care as the way to ensure care for millions affected with chronic conditions. This point echoes that of recent reviews on NCDs.<sup>2,3</sup> But beyond establishment of a comprehensive service at primary level, putting people living with chronic conditions at the centre of managing themselves must be considered.

Traditional service delivery platforms that put health teams at the heart of disease management might not be feasible given the nature of chronic conditions and current resources. Even with stronger prevention programmes, we can expect an ever-growing number of people to be affected with chronic disease in the next decades. Just between Indonesia and the Philippines, the most populous countries in the region, there will already be an estimated 29.2 million people with diabetes by 2030.<sup>4</sup>

Organisation of lifelong care for chronic conditions must move towards greater self-management, whereby patients gain a mastery of their disease. The role of expert patients, and peer and community support groups, must be harnessed further. In Cambodia, a community-based diabetes support group<sup>5</sup> provides not only information but also facilitates greater access to laboratory tests and essential medicines among its members. We must also seize the opportunities provided by the spread of mobile phones and smart devices to support patients in managing their own conditions and to reshape how they interact with health-care providers.

We need to radically rethink our concept of health care to address the rise of non-communicable disease. This shift implies very simple diagnostic and treatment protocols, fewer barriers to essential medicines, greater access to simple monitoring devices, and a move towards true empowerment of patients.

I declare that I have no conflicts of interest.

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- 2 Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low-income and middle-income countries. *Lancet* 2010; **376**: 1785–97.
- 3 Miranda JJ, Kinra S, Casas JP, Davey Smith G, Ebrahim S. Non-communicable diseases in low- and middle-income countries: context, determinants and health policy. *Trop Med Int Health* 2008; **13**: 1225–34.
- 4 Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004; **27**: 1047–53.
- 5 MoPoTsyo. Patient information center. <http://www.mopotsyo.org/> (accessed March 1, 2011).

According to Antonio Dans,<sup>1</sup> lack of workforce and infrastructure is one of the limitations to management of non-communicable diseases (NCDs) in southeast Asia. We agree that the health-care delivery system was designed mainly to manage acute infectious diseases in resource-limited southeast Asian countries. However, many of these countries have also established a system to manage HIV as a chronic disease, and such systems can be applied for the management of NCDs too.

In Burma, Cambodia, Thailand, and Vietnam, 312 566 HIV patients were on antiretroviral therapy (ART) in 2009: 68% of those in need.<sup>2</sup> To promote a long-term continuum of care, these countries established pioneer chronic disease management systems. Services were integrated within public health-care facilities and linked to the communities. A key feature was the involvement of affected communities as co-service providers,<sup>2,3</sup> whereby patients had a central role in promoting self-care, treatment adherence, and peer support. Further, a longitudinal patient follow-up system has been developed with registers and individual patients' cards and files,<sup>2</sup>

which is used to monitor and assess service performance and quality. For example, 84–88% of patients who started ART in 2008 remain in the 12-month follow-up in all four countries.<sup>2</sup>

In Cambodia, the care for HIV, diabetes, and hypertension has been integrated in two public hospitals.<sup>4</sup> In Vietnam, cancer hospitals are adapting the HIV care systems, including home-based care for cancer patients.<sup>5</sup> Rather than reinventing the wheel to manage NCDs, southeast Asian countries can adapt and apply learning from chronic care HIV systems.

The views expressed in this letter are those of the authors and do not necessarily represent the official views of their organisations. KCP has received remuneration from WHO and Family Health International to review the paper, "HIV service delivery in six Asia and the Pacific countries"; however, this correspondence is independent of the above-mentioned work. The other authors declare that they have no conflicts of interest.

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- 1 Dans A, Ng N, Varghese C, Tai ES, Firestone R, Bonita R. The rise of chronic non-communicable diseases in southeast Asia: time for action. *Lancet* 2011; **377**: 680–89.
- 2 Srikanthiah P, Ghidinelli M, Bachani D, et al. Scale-up of national antiretroviral therapy programs: progress and challenges in the Asia Pacific region. *AIDS* 2010; **24** (suppl 3): S62–71.
- 3 Green K, McPherson R, Fujita M, et al. Scaling up the continuum of care for people living with HIV in Asia and the Pacific: a toolkit for Implementers. Bangkok: Family Health International, Asia Pacific Regional Office, 2007.
- 4 Janssens B, Van Damme W, Raleigh B, et al. Offering integrated care for HIV/AIDS, diabetes and hypertension within chronic disease clinics in Cambodia. *Bull World Health Organ* 2007; **85**: 880–85.
- 5 Krakauer EL, Ngoc NT, Green K, Van Kham L, Khue LN. Vietnam: integrating palliative care into HIV/AIDS and cancer care. *J Pain Symptom Manage* 2007; **33**: 578–83.

### Authors' reply

We support the adoption and expansion of strategies for self-management, including expert patients and peer and community support groups. Self-care, in fact, is part and parcel of a "whole of society" approach that we have advocated. Many models of self-management for chronic disease are likely to be present in southeast Asia, often well adapted to indigenous concepts of disease; however, these models are insufficiently documented and tested for their effectiveness in ensuring good patient outcomes in the long term and in other populations. Whatever the approach, self-care can be made effective with support from a strengthened primary care system.

We also agree that many lessons can be learned from HIV and tuberculosis management, which are increasingly being conceived of as chronic diseases.<sup>1</sup> However, non-communicable disease (NCDs) are a mixed bag of conditions, so the care required can vary substantially. Furthermore, HIV and tuberculosis programmes have benefited from substantial investments in financial, technical, and political resources. This has not yet been the case for NCDs.<sup>2</sup> We are hopeful that the upcoming high-level meeting on NCDs at the UN will lead to greater international commitment to address the challenge of NCDs.

We look forward to long-term outcomes of these important programmes that have been mentioned. We also keenly await results of attempts to scale up their implementation. For sure, there will be no magic bullets to solving NCDs, and each southeast Asian government must lead the way in shaping their own responses to the challenge.

AD has received a research grant from AstraZeneca related to a study that involves a statin. He also received a research grant and honoraria for lectures from Boehringer Ingelheim related to a study on an angiotensin-converting-enzyme inhibitor. EST is a member of several advisory boards on dyslipidaemia for Merck Sharpe and Dohme, on liraglutide for

Novo Nordisk Pharma, and on diabetes for AstraZeneca and Bristol-Myers Squibb. He is the recipient of a research grant from Pfizer, and has received honoraria for lectures from Merck Schering-Plough, GlaxoSmithKline, and Abbott Manufacturing. RF receives honoraria for her work with the China Medical Board. NN, CV, and RB declare that they have no conflicts of interest.

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- 1 Atun RA, Gurol-Urganci I, McKee M. Health systems and increased longevity in people with HIV and AIDS. *BMJ* 2009; **338**: b2165.
- 2 Nugent RA, Feigl AB. Where have all the donors gone? Scarce donor funding for non-communicable diseases. CGD Working Paper 228. Washington, DC: Center for Global Development, 2010.

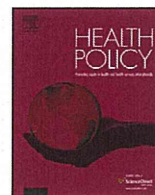
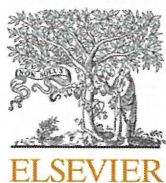
### Prevention of elder abuse

Your Editorial on prevention of elder abuse is timely (March 12, p 876).<sup>1</sup> However, any parallel with child abuse programmes should be approached with caution.

On the positive side, advocates for older people could learn much by studying the factors whereby child protection benefits from greater public awareness, superior funding, better education of health-care providers, a more organised response team and legal system, and a more robust research base. Some, but not all, of this represents a longer history in the health and social care arena. Older people would certainly benefit from the adoption of many of these features including the creation of a czar advocate at the federal level, increased resources, public awareness, better education of health



Corbis



## Sibling caregiving among children orphaned by AIDS: Synthesis of recent studies for policy implications<sup>☆</sup>

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### ABSTRACT

**Objective:** The HIV/AIDS epidemic has increased the number of orphans who have to care for their younger siblings. However, their caregiving practices are poorly reported. This review aimed to explore and accumulate available evidences on sibling caregiving among children orphaned by AIDS.

**Methods:** We conducted a systematic review of sibling caregiving among AIDS orphans in developing countries and identified 25 relevant articles. We analysed the compiled literature and extracted information on the prevalence of sibling caregiving, the framework of sibling caregiving, factors influencing caregiving, and the impact of sibling caregiving on caregivers and those cared for.

**Results:** Sibling caregiving, which includes economic, physical, psychological, and educational care, was influenced by children's, familial, community, and policy factors. Unlike sibling caregiving that occurs under adequate adult supervision, sibling caregiving among AIDS orphans negatively impacts both the sibling caregivers and the cared for. However, the lack of studies about such sibling caregiving had prevented measurement of the level of burden and impact of sibling caregiving on orphans.

**Conclusions:** Policy makers need to be aware that older children caring for younger siblings risk physical and psychological ill health and information must be collected so that measures can be developed to mitigate this burden on orphans.

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### 1. Introduction

The HIV/AIDS epidemic has caused a considerable increase in mortality among people of reproductive age [1]. As a consequence, more than 15 million children are estimated to have lost one or both parents because of AIDS [2,3].

National-level data on the prevalence of orphans affected by AIDS are available from Demographic and Health Surveys (DHS) and AIDS Indicator Surveys (AIS)

(available at Measure DHS <http://www.measuredhs.com/start.cfm>). According to these data, the prevalence of paternal, maternal, and double orphans ranges from 2.1% to 17.7%, 0.5% to 3.8%, and <0.1% to 6.3%, respectively. Thus, in some countries, 1 in 5 children is orphaned by AIDS.

Traditionally, children orphaned by AIDS are placed with relatives, usually grandparents or aunts and uncles [1,4,5]. However, the rapid increase in orphans has overburdened the extended family network, leading to the emergence of child-headed households [6,7]. Child-headed households are more likely to have economic constraints [8,9]; have poor accommodation [10]; be disadvantaged in education [11,12]; and have physical [13], nutritional [14], and psychological [15,16] problems.

However, these disadvantages may not be equally distributed among orphaned children. The emergence of

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child-headed households suggests that the burden of caring for brothers and sisters falls on older siblings. In developing countries, sibling care is a common practice not limited to orphans [17]. However, in the case of AIDS orphans, older siblings care for younger siblings without supervision or support from adults.

Older siblings with HIV-affected parents assume the caregiver's role much before parental demise. As the parents develop AIDS symptoms and become too weak to work or care for their children, older siblings usually assume the parental role [18]. Older siblings often take on household chores, farming, caring for younger children, and nursing ill adults despite being in school themselves and in need of care. Baggaley and Needham [19] reported a case in which a child as young as 6-year old became the principal caregiver for a sick parent and younger siblings.

These caregiving children, who are often teenagers, need specific attention. They have burdensome responsibilities and stresses as compared to the children they care for despite being adolescents themselves. However, studies on the caregiving load of HIV/AIDS-affected families have focused on adult females and grandparents who adopt orphans, while the effects of sibling caregiving have not been well-documented.

This review aimed to explore and accumulate available evidence on sibling caregiving among children orphaned by AIDS and identify further research needs. The focus of this review was 4 questions:

1. To what extent is sibling caregiving prevalent among children orphaned by AIDS?
2. What kinds of care comprise sibling caregiving?
3. What factors affect the quality and quantity of sibling caregiving?
4. What are the impacts of sibling caregiving on caregivers and the cared for?

Guided by these review questions, we conducted a thematic synthesis of both qualitative and quantitative articles.

## 2. Materials and methods

### 2.1. Operational definition of orphans, sibling caregiving, and sibling caregivers

UNAIDS and UNICEF define an orphan as a child under 18 years of age whose mother (maternal orphan), father (paternal orphan), or both parents (double orphan) have died from any cause [3,20]. In our review, we followed this definition in principle. However, articles describing sibling caregiving were limited, and eventually, we included articles whose subjects included orphans up to 19-year old.

We defined 'sibling caregiving' as the act of siblings caring for their younger siblings. Sibling caregiving occurs not only among orphans but also among children living with both parents. It can be a culturally appropriate practice when it occurs under adult supervision. However, in the case of orphans who do not have adults supervising and advising them, the nature of the care, burden on the caregivers, and impact on their health differ from those under

the normal practice of sibling caregiving. In our study, we limited our subjects to children orphaned by AIDS, and therefore, sibling caregiving was limited to caregiving that occurred under insufficient adult supervision.

The children being cared for were, in many cases, not defined but simply referred to as 'younger siblings'. We also defined the cared for as all children younger than the caregivers.

### 2.2. Search strategy

We followed the search strategy described by Petticrew and Roberts [21]. We conducted an electronic search of the literature from 2000 to date, using PubMed, MEDLINE, CINAHL PsycINFO and Academic Search Elite databases. Our search was completed on 25 September 2009. Search terms included 'AIDS' or 'HIV' and 'orphan', 'orphans', or 'orphaned' combined with 'siblings', 'younger' (for such phrases as 'younger sibling', 'younger children', and 'younger brothers and sisters'), 'child-headed household', and 'parentally bereaved'. To take into account the rapid changes in HIV/AIDS policies and treatment, we limited our search to articles published from 2000 to 2009.

The types of studies included in our review were original articles and reports from international agencies and NGOs that contain original qualitative or quantitative data on sibling caregiving by orphans. Case reports are also included because of the richness of the descriptions related to sibling caregiving. Exclusion criteria were reviews, commentaries, essays, opinions, letters, project reports, and physiological and psychological experiments. Articles that stated that children cared for their younger siblings but did not include concrete data or detailed descriptions were excluded. Studies conducted in developed countries were excluded because welfare systems are usually well-developed in these countries, and hence, the nature of sibling caregiving would differ between developing and developed countries.

We conducted an additional search 'by hand' by reviewing bibliographies of articles obtained through the electronic search. We also tried to locate 'gray' literatures such as conference proceedings, dissertations and theses by searching the following sources: COPAC, Dissertation Abstracts, and OpenSIGLE. Web pages of the United Nations and international NGOs were also searched in order to locate their reports. Thus, 250 potential studies were initially found.

Although there were many articles on children orphaned by AIDS, many did not include concrete data on sibling caregiving. The majority – 211 – described difficulties faced by and negative consequences for orphans of AIDS but did not relate these descriptions to sibling caregiving. Thirty-nine articles were eventually selected as articles containing information on sibling caregiving. We examined the content and quality of each study included in the synthesis, using the framework of Petticrew and Roberts [21] for surveys and an appraisal tool developed by Critical Appraisal Skills Programme (CASP) [22] for qualitative studies.

Sixteen articles were excluded: 6 articles did not have original data on sibling caregiving (e.g. narratives of

orphans), the sampling or recruiting methods of 3 articles were poorly described, and 3 articles duplicated results. In the case of qualitative studies, rigor of analysis was not found to be adequate for 2 articles and another 2 articles were published after 2000 but used data from early 1990.

Thus, 22 articles met our sampling criteria and were of adequate quality. Of the 22 articles, 4 were used to estimate sibling care rate; 15, to examine factors and impacts of sibling caregiving; and 3 for both. Of the 18 articles used to examine factors and impact of sibling caregiving, 13 employed qualitative methods or a mixture of qualitative and quantitative methods. Twenty-one studies were conducted in Africa and one study was from Asia. Because articles that estimated sibling care rate were limited in terms of study areas, we selected an additional 3 articles that used national- and provincial-level data even though their subjects were all types of orphans and were not limited to AIDS orphans. Thus, a total of 25 articles were included in the analysis.

### 2.3. Data analysis

Because no direct indicator for estimating the prevalence of sibling caregiving was available, we used sibling guardian rate. It counts households of orphans whose primary caregiver is a sibling and may include siblings older than 18 years. Child-headed household rate was excluded because sibling caregiving is not limited to 'children only households' but can also occur in households where children live with ill parents or dependent adults.

To explore factors and impacts related to sibling caregiving, a thematic synthesis was undertaken. There was no article whose primary focus was sibling caregiving. Therefore, we extracted descriptions regarding sibling caregiving from the articles selected for this review. Some articles were extremely descriptive, while others had just 1 descriptive paragraph. Each description was coded and then categorized into factors affecting the quality and quantity of sibling caregiving and its impact on caregivers and the cared for.

## 3. Results

### 3.1. Sibling care rate

Table 1 shows sibling guardian rates [5,9,23–30], which were used to estimate the prevalence of sibling caregiving. Sibling guardian rate ranged from <1% to 17% among sampled orphans or to <1% of surveyed households. However, the subjects differed among articles. Some included all types of orphans and others included only double orphans. The sibling guardian rates were 2–5 times higher for double orphans than single orphans.

### 3.2. Framework of sibling caregiving

Articles used for qualitative analysis of constructs, factors, and impacts of sibling caregiving are shown in Table 2 [5,9–13,31–41]. To answer the second question, 'what kinds of care comprise sibling caregiving', we tabulated the sibling caregiving described in the articles and developed a

framework (Table 3). Sibling caregiving comprises 4 types of care: economic care, physical care, psychological care, and educational care.

Economic care included earning money for food, managing the household income and expenditure, and paying school fees for younger siblings. Physical care included daily activities such as doing household chores and caring for young siblings as well as emergency care of ill siblings. Psychological care was based on expressing love and care in the role of a sibling and probably in the role of a 'parent' responsible for the cared for. Educational care included training the cared for to assist in the daily care burden as well as preparing cared for siblings to be independent in the future.

A specific feature of sibling caregiving was its reciprocal nature. Although older siblings were the chief caregivers, younger siblings also shared responsibilities and occasionally played the role of caregiver towards older siblings, especially in the area of psychological care. The younger siblings would also 'earn and contribute to the household income' and 'talk about household issues, plan what to do and how to manage their household, and how to raise funds for schooling' along with the older sibling. The level of reciprocity depended on the relationship among siblings. Broken reciprocity was described as a sibling who 'was not interested in helping [older siblings]' or 'not cooperative'.

### 3.3. Factors related to sibling caregiving

Table 4 shows factors related to the quality and quantity of sibling caregiving. We found 12 related factors and categorized them areas as follows: children's factors, familial factors, community factors, and policy factors.

#### 3.3.1. Children's factors

Children's factors included 'children's preference', 'caring ability of older siblings', and 'good sibling relationship'. Children chose to stay by themselves after their parents' deaths because they did not want to be separated, were afraid of maltreatment at a foster family, or were concerned about losing their inheritance rights to property and land. Advantages related to schooling, for example, geographic accessibility, were also factors that caused children to choose to take care of younger siblings despite the burden of caregiving [35]. Older siblings who acquired considerable experience in caring for their younger siblings before the death of their parents were better prepared to cope with the caregiving burden [39]. Siblings' good relationship was also a factor determining the quality and quantity of sibling caregiving; sibling caregiving increases resilience and coping capacity of orphans [11].

#### 3.3.2. Familial factors

This category comprised 7 factors: 'parent's wish', 'parental training', 'relationship of family members', 'function of extended family network', 'incapacity or death of guardians', 'mistreatment at foster household', and 'isolation from relatives'

Mothers had an expectation to older siblings to help with caring for younger children when they got sick or foresaw their demise. Some parents wanted the children to stay



**Table 1**  
Descriptive table of studies on sibling care rate.

No.	Author	Year	Country	Methods	Study area	Subjects	Sibling caregiver
1	Gilborn et al.	2001	Uganda	Quasi-experimental study (2 intervention 1 control)	Two districts, population not described	277 current guardians of orphans Age 5–17	5.3% (of sample orphans)
2	Nyambedha et al.	2003	Kenya	Cross-sectional	Sub-location of a district Population 79 833	243 orphans including 75 double orphans Age <18	All orphans 6.6% Double orphans 18.7% (of sample orphans) All aged 18 years and over
3	Masmas et al.	2004	Guinea-Bissau	Cross-sectional	The capital city and five most populous regions, total population not described, sampling using cohort population	Cluster sampling of women (100) Urban: 185 orphans, control 293 (2:1) Rural: 129 orphans, control 506 (4:1) Matched age, sex, area of residence Relatives of the sample interviewed	Before and after maternal death Urban: orphans 1.1 → 4.7% control 0.3 → 2.3% Rural: orphans 0.9 → 3.7% control 0.0 → 0.7% (of sample orphans)
4	Atwine et al.	2005	Uganda	Cross-sectional	A sub-county in a district, population 738,355	123 orphans due to AIDS 110 neighbor children with same age and gender Sampling method was not described Age 11–15	Sibling only household: Orphans 12.2% Non-orphans 0% (of sample orphans)
5	Sarker et al.	2005	Uganda	Cross-sectional	A parish, population not described, estimated orphans 4000	241 orphans and 278 non-orphans Age 12–59 months Cluster sampling	Non-orphans 0.3% Non-AIDS orphans 0.7% AIDS orphans 5% (of sample orphans)
6	Floyd et al.	2007	Malawi	Retrospective cohort	A district, population not described	134 orphans cared by HIV(+) index individuals and 662 orphans cared by HIV(-) matched index individuals Age <18	HIV(+) 8% HIV(-) 13% (of sample children living apart from both parents, not CHH)
7	Kumakech et al.	2009	Uganda	Cluster RCT	A municipality, population 1,089,051	Orphans due to AIDS aged 10–15: 298 Intervention 157, control 141	6.4–7.6% (of sample children)
8	Arnab et al. <sup>a</sup>	2006	Botswana	Cross-sectional	Nationwide	8380 households selected by stratified two-stage sampling Age <18	Total 8.6% Male 10.7% Female 7.6% (of sample orphans)
9	Saito et al. <sup>a</sup>	2007	Zimbabwe	Cross-sectional	21 districts, population not described	In selected districts: Children aged 5–17 years: 23,203 Orphans 8566 Non-orphans 14637 Children aged 6–59 months: 6925 Orphans 961 Non-orphans 5964	0.4% (of households)
10	Hill et al. <sup>a</sup>	2008	South Africa	Second data analysis	A province 11,000 households	28837 children aged <18	Household head <sup>b</sup> Non-orphan 0.4% Paternal orphan 3.3% Maternal orphan 2.8% Double orphan 15.7% School fees responsibility Non-orphan 0.7% Paternal orphan 2.2% Maternal orphan 3.3% Double orphan 14.5% Children's day-to-day care Non-orphan 1.6% Paternal orphan 2.6% Maternal orphan 4.6% Double orphan 8.6% (of sample children)

<sup>a</sup> These articles are showing national-level data of orphans, not limited to orphans due to AIDS.

<sup>b</sup> This sell indicates household head is a sibling of the cared child, school fees responsibility is on a sibling, and primary children's day-to-day caregiver is a sibling.

**Table 2**  
Descriptive table of studies on factors and impacts of sibling caregiving.

No.	Author	Year	Country	Subjects	Methods
1	Social Impact Assessment and Policy Analysis Corporation	2000	Namibia	Interviews: 10 National-level key informants, 29 local key informants FGD: 36 caregivers FGDs, 31 orphans FGDs (107 orphans) Large group discussion: 13 meetings with Regional AIDS committee members Case study: 26	Qualitative and quantitative (key informant interviews, FGDs, large group discussions, case studies, statistical modeling using existing data)
2	Nyambedha et al.	2003	Kenya	243 orphans including 75 double orphans Age <18	Cross-sectional
3	Germann	2005	Zimbabwe	Questionnaire: 105 child-headed household head FGD: 83 CHHs, 34 volunteers and staff of OVC programs, 61 neighbors, friends and extended families, 21 childcare professionals and policy makers	Interview, FGD, bi-daily journal data collection, questionnaire
4	Hartell et al.	2005	South Africa	4 adolescents aged 15–18	Case study
5	Sarker et al.	2005	Uganda	241 orphans and 278 non-orphans Age 12–59 months Cluster sampling	Cross-sectional
6	Roalkvam	2005	Zimbabwe	A girl 9-year old	Case study
7	Yamba	2005	Zambia	A girl followed up from 9- to 21-year old	Anthropological case study
8	Arnab et al.	2006	Botswana	8380 households selected by stratified two-stage sampling Children aged <18: 737,241 Orphans 111,828 (15.2%)	Second data analysis
9	India HIV/AIDS alliance	2006	India	In-depth interview: CHHs Questionnaire: NGO directors) Interviewed: 29 CHHs (of 275), fostered children 6 (of 28), elders in CHHs 2, foster mothers 6 FGD: NGO staff 3, self-help group 3 Purposive sampling	Qualitative and quantitative (FGD: field staff of NGOs, CHHs, children under foster care, foster mothers, self-help groups)
10	Ruiz-Casares	2006	Namibia	Interview: 33 children in 30 child-headed households Survey: 33 children in child-headed households 163 non-orphans	Interview, group interview, observation, network mapping, survey
11	Wood et al.	2006	Zimbabwe	18 households (households in which breadwinner was chronically ill; a child–young person-headed household; an orphan has been fostered)	Qualitative (case study, semi-structured interview)
12	Abebe et al.	2007	Ethiopia	Field work: rural and urban orphans and families Interview: 42 orphans aged 8–17 y 18 household heads of orphans 12 social workers FGD: 8 orphans, 6 community leaders	Qualitative (observation, In-depth interview, FGD)
13	Cluver et al.	2007	South Africa	Children orphaned aged 8–19 by HIV/AIDS: 60 Caregivers of orphaned children: 42 Care professionals: 20	Children: Interview (answering in writing, drawing or verbally) Caregivers: FGD individual interview: care professional FGD
14	Landry et al.	2007	Kenya	Orphans aged 11–14 who had lost both parents within the previous 2 years: 31 Males 15, females 16 Their caregivers	
15	Birdthistle et al.	2008	Zimbabwe	Girls aged 15–19: 863 Blood samples of the girls: 839	Survey, HIV test
16	Kürzinger et al.	2008	Tanzania Burkina Faso	Orphans and non-orphans aged 6–18 y Tanzania 4931 (no. of orphans is not provided) Burkina-Faso 4835 (orphans 777)	Survey
17	Schenk et al.	2008	Zambia	Wives of household heads: 1503 Children aged <18: 5009 FGD: male and female adult (>18 y) and youth (15–24 y)	Survey, in-depth interview, FGD
18	Withell B	2009	Uganda	Adolescents: 10	Interview

**Table 3**  
Framework of sibling caregiving by older siblings.

<Economic care>
Earn a living
Manage the household
Pay school fees
<Physical care>
Do household chores (cooking, sweeping, washing, fetching water)
Look after young siblings (feeding, bathing, getting ready for school)
Care for ill siblings/Seek treatment
<Psychological care>
Provide general emotional support
Help siblings cope with parental death
Show love/concern
<Educational care>
Train younger siblings in daily chores
Train younger siblings to help with farming/business

Note: Sibling caregiving can be reciprocated by younger siblings.

together by themselves and that the children, not relatives, inherit all properties. This determined the amount of help orphans could receive from relatives [11]. Some parents prepared children for future challenges [39]. Familial bond or conflict before parental decease affected the quality of sibling caregiving [11].

The function of the extended family network was a key factor in determining the quality and quantity of sibling caregiving. In rural areas, the extended family network functioned well and absorbed orphans into the network. However, even in societies with functioning extended family networks, sibling caregiving burden increased when HIV prevalence became high and the caregiving burden of orphans exceeded the capacity of the network. Extended family members might be reluctant to take in orphans if they already had their own children and foster children [34,35]. Or they might foster orphans but treat them harshly, resulting in older siblings deciding to care for younger siblings themselves [11].

**Table 4**  
Factors related to sibling caregiving.

Factors	Examples
<Children's factors>	
Children's preferences	Wanting to stay together Sense of responsibility Unwilling to be placed with relatives Wanting to continue living at their own residence in familiar surroundings Not wanting to be separated from siblings; siblings could be separated if siblings were fostered by different relatives Unwilling to relocate Wanting to secure inheritance rights to property and land Advantage for schooling
Caregiving ability of older siblings	Age of caregivers Skills developed and responsibilities managed before parents became terminally ill Learning child-care during caregiver's illness
Good sibling relationship	Children help and care for each other
<Familial factors>	
Parents' wish	Parents wanted siblings to stay together
Parental training	Parents prepared children for challenges
Relationship among family members	Pre-parental death and family conflict Some older siblings refused to care for younger siblings
Function of extended family network	Relatives' decision Relatives provide food and goods needed for daily use Extended families are reluctant to foster orphans Relatives respect children's decision to stay together Illness or death of a fostering relative
In capacity of guardians	Relatives treat children badly
Mistreatment at fostered household	Discriminatory treatment of children in the foster family
Isolation from relatives	Lack of support from relatives Familial problems before the death of parents Distance and lack of communication with relatives Separation from a surviving parent Migration
<Community factors>	
Child-care capacities of communities	Local initiatives providing support for food, schooling, and shelter Insufficient community support Need for support from churches Community's view about orphans
Services of health sector and NGOs	NGOs' operation of orphan support programs A clinic provided orphans with milk Community program works as a safety net
<Policy factors>	
Government policy and commitment	Government policy on orphans should be developed Policies must be implemented Rights should be protected

**Table 5**  
Impact of sibling caregiving.

Impact	Examples
Care burden	Over work Responsible for household chores Multiple roles played by older sibling take (caregiver, bread earner, student) Responsibilities include caring for the sick and dependent adults
Economic responsibility	Struggling with poverty and hunger Playing the role of primary bread-winner Managing the household Coping with job disadvantage Having poor accommodation
Educational disadvantage	Dropout of school Late arrival to school Delay in school Sleepy/unable to concentrate Low school performance Resignation of future career
Psychological impact	Developing a sense of responsibility/achievement Strengthening of the relationship among siblings Feeling burdened and stressed Pitying oneself Having no time for fun/relaxation Dealing with younger siblings' grief in the midst of own sense of loss Dealing with challenge to identity caused by having to play parental role Feeling resentment at not receiving sufficient support from relatives and community
Social isolation	Losing school friends Restricted peer friendship
Compromised health and nutrition	Physical exhaustion and aches Malnutrition Inappropriate care of infants and ill siblings

Relatives were, of course, not always harsh. Relatives living near orphans might support them in their daily life [10,13]. Therefore, families that had migrated from rural areas to urban or mining or farming areas were especially vulnerable [30] because of isolation from relatives. Some relatives whom orphans were placed with treated the orphans with affection, caring and love. However, the foster parents, often grandparents, might become too weak or die. Yamba [33] reported the case of a girl orphan with 2 younger brothers, who experienced 3 consecutive bereavements: her mother, her grandparents who cared for them after the maternal demise, and her uncle and aunt who accepted the girl and her brothers after the grandparents' death.

### 3.3.3. Community factors

Two factors were related with communities. They were 'child care capacities of communities' and 'services of health sector and NGOs'. How much a community supports orphans varied with the community's economic conditions and culture. Some communities had local initiatives for supporting orphans with food, schooling and shelters, although these services could be insufficient and sporadic [10]. In some communities, orphans performed various services in exchange for support from community members [35].

Teachers were a source of support, providing tangible aid (food, blankets, school fees, and uniforms). However, the authority structure interfered with the provision of

support, and orphans did not always recognize teachers as resources [35].

Existing services of the health sector and NGOs were also an important factor. Health visitors or NGO staff could alleviate the caregiving burden of older siblings by providing material as well as psychological support. A study found that orphans' educational status was relatively equivalent to that of non-orphans. The authors attributed this observation to family-based or community-based programs that worked as safety nets [12]. However, often the services were not sufficient and represented a small fraction of the children's support network [35].

### 3.3.4. Policy factors

Government policy had a crucial effect on sibling caregiving. However, in many developing countries, statutory support for orphans is not well-established or not well-functioning. Communities recognized that their support was not sufficient and that government commitment is necessary [10].

## 3.4. Impact of sibling caregiving

Six areas of impact were identified in relation to sibling caregiving: 'care burden', 'economic responsibility', 'educational disadvantage', 'psychological impact', 'social isolation', and 'compromised health and nutrition' (Table 5).