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	%	%	
Service quality							
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
Actions for malaria prevention and vector control							
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
Knowledge of malaria epidemiology and vector ecology (correct answers to all questions)							
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
Change in actions				
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^2 = 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.

Author details

[1]Department of Community and Global Health, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan. [2]National Centre for Parasitology, Entomology and Malaria Control, 372 Monivong Boulevard, Phnom Penh, Cambodia.

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.

Received: 26 July 2011 Accepted: 4 January 2012
Published: 4 January 2012

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.** *AmJTrop 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].
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.** *Am J Trop 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.

doi:10.1186/1475-2875-11-4
Cite this article as: Yasuoka *et al.*: Scale-up of community-based malaria control can be achieved without degrading community health workers' service quality: the Village Malaria Worker project in Cambodia. *Malaria Journal* 2012 **11**:4.

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[4] 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 derivate 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.[5]

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.

Alain Braillon
braillon.alain@gmail.com

Gres, 27 Rue Voiture, 80000 Amiens. France

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 Braillon A. Homoeopathic remedies and drug-regulatory authorities. *Lancet* 2010; **375:** 279–80.
4 Haute Autorité de Santé. Document preparatoire: 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 (accessed May 23, 2011).
5 Haute Autorité de Santé. Avis de la Commission de la Transparence: Médiator 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)[1] 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.[2,3] 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.[4]

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[5] 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.

Raoul Bermejo III
rbermejo@itg.be

Provincial Health Office, Capiz Provincial Government, Roxas City, Capiz 5800, Philippines

1 Dans A, Ng N, Varghese C, et al. The rise of chronic non-communicable diseases in southeast Asia: time for action. *Lancet* 2011; **377:** 680–89.
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,[1] 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.[2] 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,[2,3] 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,[2]

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.[2]

In Cambodia, the care for HIV, diabetes, and hypertension has been integrated in two public hospitals.[4] In Vietnam, cancer hospitals are adapting the HIV care systems, including home-based care for cancer patients.[5] 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.

Krishna C Poudel, Masami Fujita, Kimberly Green, Kalpana Poudel-Tandukar, Masamine Jimba
krishna@m.u-tokyo.ac.jp

Department of Community and Global Health, Graduate School of Medicine, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan (KCP, MJ); WHO, Phnom Penh, Cambodia (MF); Family Health International, Accra, Ghana (KG); and Waseda Institute for Advanced Study, Waseda University, Tokyo, Japan (KPT)

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 Srikantiah 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.[1] 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.[2] 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.

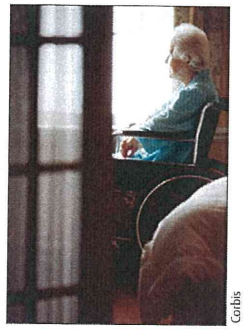
AD has received a research grant from AstraZeneca related to a study that involves a statin. He also received a research grant and honoraria for lectures from Boehringer Ingelheim related to a study on an angiotensin-converting-enzyme inhibitor. EST is a member of several advisory boards on dyslipidaemia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

Antonio Dans, Nawi Ng, Cherian Varghese, E Shyong Tai, Rebecca Firestone, Ruth Bonita
tdans@skybroadband.com.ph

University of the Philippines College of Medicine, Manila, Philippines (AD); Department of Public Health and Clinical Medicine, Epidemiology and Global Health, Umeå University, Umeå, Sweden (NN); Department of Public Health, Faculty of Medicine, Gadjah Mada University, Yogyakarta, Indonesia (NN); Western Pacific Regional Office, WHO, Manila, Philippines (CV); Division of Endocrinology, Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore, Singapore (EST); China Medical Board and Harvard Global Equity Initiative, Cambridge, MA, USA (RF); and School of Population Health, University of Auckland, Auckland, New Zealand (RB)

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


Corbis

Your Editorial on prevention of elder abuse is timely (March 12, p 876).[1] 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 tzar advocate at the federal level, increased resources, public awareness, better education of health