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Original article

Valuing the work of unpaid community health workers and exploring the incentives to volunteering in rural Africa

Frida Kasteng,[1,*] Stella Settumba,[2] Karin Källander,[3,4,5] Anna Vassall[6] and the inSCALE Study Group[†]

[1]Department of Global Health and Development, London School of Hygiene and Tropical Medicine, Health Economics and Systems Analysis Group, London, UK, [2]Malaria Consortium Uganda, Kampala, Uganda, [3]Malaria Consortium, London, UK, [4]Department of Public Health Sciences, Karolinska Institutet, Health Systems and Policy group, Stockholm, Sweden, [5]Department of Epidemiology and Biostatistics, Makerere University College of Health Sciences, Kampala, Uganda, [6]Department of Global Health and Development, London School of Hygiene and Tropical Medicine, Social and Mathematical Epidemiology Group, London, UK

*Corresponding author. London School of Hygiene and Tropical Medicine, Department of Global Health and Development, 15-17 Tavistock Place, London WC1H 9SH, UK. E-mail: frida.kasteng@lshtm.ac.uk
[†]The members of the inSCALE Study Group are listed in the Acknowledgements.

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Abstract

Community health worker (CHW) programmes are currently being scaled-up in sub-Saharan Africa to improve access to healthcare. CHWs are often volunteers; from an economic perspective, this raises considerations whether reliance on an unpaid workforce is sustainable and how to appropriately cost and value the work of CHWs. Both these questions can be informed by an understanding of CHWs' workload, their opportunity costs of time and the perceived benefits of being a CHW. However, to date few studies have fully explored the methodological challenges in valuing CHW time. We examined the costs and benefits of volunteering in a sample of 45 CHWs providing integrated community case management of common childhood illnesses in rural Uganda in February 2012 using different methods. We assessed the value of CHW time using the minimum public sector salary rate and a CHW-elicited replacement wage, as well as the opportunity cost of time based on CHW-estimated annual income and alternative work opportunities, respectively. Reported monthly CHW workload, a median of 19.3 h (range 2.5–57), was valued at USD 6.9 (range 0.9–20.4) per month from the perspective of the healthcare system (applicable replacement wage) and at a median of USD 4.1 (range 0.4–169) from the perspective of the CHWs (individual opportunity cost of time). In a discrete choice experiment on preferred work characteristics, remuneration and community appreciation dominated. We find that volunteering CHWs value the opportunity to make a social contribution, but the decision to volunteer is also influenced by anticipated future rewards. Care must be taken by those costing and designing CHW programmes to acknowledge the opportunity cost of CHWs at the margin and over the long term. Failure to properly consider these issues may lead to cost estimations below the amount necessary to scale up and sustain programmes.

Key words: Child health, community health workers, integrated community case management, opportunity costs, volunteers, Uganda

Key Messages

- It is sometimes assumed that the decision to volunteer in rural Africa reflects a negligible opportunity cost and can be largely sustained on intrinsic motivation. Altruism is often strong in health workers, so also in CHWs. However motivation is complex; opportunity costs, the utility derived from CHW work and the response to different incentives will differ across CHWs. Anticipated future benefits may weight heavy for some. Designing CHW programmes so that the net cost-benefit of being a CHW remains positive is critical to sustainability.
- The decision to provide volunteer time is sensitive to the total time spent volunteering. Adding new tasks to volunteering CHWs, including tasks that require a more proactive role of the CHWs, may alter the cost benefit trade-off of volunteering and should be combined with workload assessment and re-evaluation of support and funding.
- In settings with high levels of informal employment, as is often the case in communities in low-income countries served by CHWs, the opportunity cost of volunteering CHWs is not easily determined. The replacement cost method presents a more viable way to value CHW time and better represents the work time input in programme costing.

Introduction

Health workforce shortages are recognized as an important constraint to improving maternal and child health services in many low-income countries (WHO 2008). Community health worker (CHW) programmes are therefore being scaled up across sub-Saharan Africa (De Sousa *et al.* 2012). CHWs have the potential to provide a relatively quick solution to curbing human resource shortages in healthcare and may be a means to address the issue of insufficient numbers of health workers based in rural areas (WHO 2006). Moreover, as CHWs are resident in the communities where they work, they may be a vehicle for scaling up services to underserved populations, addressing geographical, cultural and financial constraints to healthcare seeking (Lehmann and Sanders 2007).

There is currently a wide diversity in the tasks and responsibilities of CHWs, ranging from health promotion, supporting HIV and tuberculosis patients and following-up pregnant women and newborns, to provision of basic curative services to children with malaria, pneumonia and diarrhoea—integrated community case management (iCCM) of common childhood illnesses (WHO/UNICEF 2012). The design of iCCM programmes vary substantially across countries, with training lengths ranging from 1 week to a year, CHW responsibility ranging from around 50 to over 500 households, and CHWs acting as volunteers or being considered a formal cadre of salaried health workers (George *et al.* 2012; Bosch-Capblanch and Marceau 2014).

The World Health Organization (WHO 2008) recommends that community-based care programmes are appropriately financed to ensure that services are sustainable, and that all trained health workers, including CHWs, should receive adequate wages and/or other appropriate incentives. Yet, policy makers may be concerned that paid CHWs are unaffordable and that the introduction of financial incentives perceived as too low, irregularly paid or discontinued due to lack of sustainable programme financing may result in more of a disincentive to CHWs than no payment at all (George *et al.* 2012; Strachan *et al.* 2012).

The interplay between work motivation and incentives is multifaceted. In some circumstances, the altruistic behaviour of volunteers may be crowded out by financial incentives (Bénabou and Tirole 2006; Frey and Jegen 2001). There may also be hidden costs of incentives in that they may orient activity towards quantifiable performance rather than long-term progress. Yet, the opposite may be the case if the incentive is considered as a sign of appreciation, most notably in the case of rewards not directly tied to performance (Bénabou and Tirole 2003). To inform the debate around how to best motivate and fund CHWs, this article presents a theoretical and empirical exploration of different economic approaches, rooted in utility theory, to measure and assign the economic costs of unpaid community health work, from the perspective of the CHWs. We argue that the cost of shifting healthcare provision from health facilities to the community may be underestimated if the value of the unpaid work provided in the community is not taken into account. This may result in programmes appearing more cost-effective from the healthcare provider perspective than they in fact are from a societal perspective. Furthermore, we explore the trade-off between perceived costs and benefits of volunteer work from the CHW perspective, with the aim of informing policy decisions on how to motivate and retain CHWs. Methods in these areas have been explored (El Ansari and Phillips 2004; Tranmer *et al.* 2005) but remain underdeveloped. This study adds to the evidence base on CHW programme design and incentive structures by being one of few studies to date that inquire CHWs on these matters (Gopalan *et al.* 2012; Maes 2012; Strachan *et al.* 2012).

Methods

Study setting

Since 2010, the Ministry of Health in Uganda has endorsed the implementation of iCCM for children <5 years through the village health team (VHT) programme (Uganda Ministry of Health 2010a). VHTs consist of up to five community members trained for 5 days in health education and promotion (Uganda Ministry of Health 2010b). Two members of each VHT, selected by their communities, are further trained for 6 days in iCCM. They are provided with diagnostic tools (malaria rapid diagnostic tests, respiratory timers); treatment guidelines for the diagnosis of malaria, pneumonia, diarrhoea; medicines to treat uncomplicated cases (artemether-lumefantrine, amoxicillin, oral rehydration solution and zinc) and instructions for how to identify danger signs in sick children and new-borns that require referral to a health facility. iCCM services and drugs are provided without charge to the community members. Evidence of the health impact of iCCM is yet inconclusive (Amouzou *et al.* 2014); however, studies from Uganda and beyond have shown that CHWs can correctly diagnose and treat children with the illnesses they have been trained to deal with at rates that equal those of health workers at facilities (Hamer *et al.* 2012; Gilroy *et al.* 2013; Kalyango *et al.* 2013). The iCCM implementation in Uganda has been funded primarily by international donors but governmental efforts are ongoing to integrate iCCM into national plans and budgets. Nearly 7300 CHWs were trained in iCCM between July 2010 and July 2012 in nine districts in mid-Western Uganda. The area has a total population of 1.8 million, of which 20% children <5 years old. Health facilities in the nine districts count to 276, whereof six hospitals.

Seventy percent of the facilities are government-run, 18% non-for profit and 12% private. Two-week prevalence of symptoms of fever, pneumonia and/or diarrhoea in children <5 years was estimated at 52% (47, 24 and 11%, respectively, as some children had multiple symptoms) in a household survey mid-2011 (Soremekun and Kasteng 2013). This study was carried out in Buliisa, Hoima and Kiboga. The three districts were selected using a purposive sampling process based on socioeconomic factors, rural/urban composition and ethnic groups.

Conceptual framework

Estimating the value of unpaid work

Because volunteer work is a non-market activity, its valuation cannot be determined by a market price and therefore involves some theoretical and practical considerations. Two principal approaches are used for measuring the value of unpaid work input: replacement costs and opportunity costs.

The replacement cost method uses a shadow wage under the assumption that this is the cost that would arise if the unpaid work was bought on the labour market and volunteers replaced with paid employees (UN Volunteers 2001; Salamon *et al.* 2011). This implicitly assumes that the output of voluntary work is the same as that of paid work and that increasing the number of wage earners would not impact on the equilibrium price of labour in that sector.

In the health economic literature, the opportunity cost method has often been applied to value time loss due to illness, healthcare seeking or informal care (Drummond *et al.* 2005). The opportunity cost method values the time spent at the individual's second best use of this time (Posnett and Jan 1996). In the case of volunteers, this may often be leisure time but not always as some volunteers may be willing to forgo paid work. In a scenario of a perfectly competitive labour market, an individual paid on an hourly basis will supply work up to the point where the wage rate equals the marginal value of leisure time forgone. Thus the opportunity cost of lost leisure time equals her/his market net wage rate. Yet, ideal market conditions rarely exist in practice. As many CHWs are not in formal employment, estimating their opportunity cost of time can be challenging (Posnett and Jan 1996; van den Berg *et al.* 2006; Sahlen *et al.* 2012). Particularly in the case of unemployment the marginal value of leisure cannot be determined, and a proxy—reservation wage—for the net market wage needs to be used. When the opportunity cost method is applied in the valuation of volunteer work, a wage rate assumed to be representative to the population of volunteers is often imputed as a shadow wage for the unpaid work (Salamon *et al.* 2011). Economic evaluations valuing unpaid CHW work with the opportunity cost method have used the local agricultural wage rate, the average reported income among respondents or the national minimum wage rate (Prado *et al.* 2011; Agyei-Baffour *et al.* 2012; Nonvignon *et al.* 2012).

A utilitarian perspective would argue that the decision to voluntarily engage in activities intended to serve broader societal means would only be pursued if perceived benefits exceed costs (Blau 1964; Becker 1965); utilitarianism is rooted in the principle that every decision that an individual makes can be viewed as a trade-off between the costs and benefits (utility) of alternative courses of action. Thus, volunteers may be willing to supply labour at below market rates, or for free, since they perceive benefits of volunteering that outweigh the opportunity costs associated with the activity.

The benefits of volunteering vary depending on the CHW's personal preferences. Microeconomic theories propose three utility models, which may all interact in an individual's decision to volunteer: in the public goods model, the volunteer values making an altruistic contribution to society where market failures restrict the supply of the volunteers' contributions otherwise; in the private consumption model the benefits are the positive emotions from being helpful and other personal stimuli from the volunteering tasks; and in the investment model, the volunteering allows for the development of skills, experience and contacts that may be useful for professional and personal development (Ziemek 2006). A utility model for prosocial behaviour developed by Bénabou and Tirole (2006) relates degrees of altruism and self-interest with self-respect and concern for social reputation, considering the relative impact of intrinsic, extrinsic and reputational incentives. Not only unpaid CHWs but also other health workers are often assumed to be predominantly altruistically motivated (Smith *et al.* 2013). Yet, it is often challenging to empirically weight selfish benefits vs concern for others. A study in Tanzania suggested that while non-financial factors are important, a commensurable salary is a first step towards increasing the motivation of health workers (Chandler *et al.* 2009). This resonates with work motivation theories, e.g. Herzberg (1987) does not consider money a true motivator: intrinsic motivators include achievement, recognition, the work itself, responsibility and growth; monetary rewards can serve as an instrument to work satisfaction from recognition, but its positive effects are often short term. Herzberg classifies reimbursement, together with for example interpersonal relationships, supervision, working conditions, status and security as 'dissatisfaction–avoidance' factors. These are not sufficient to sustain motivation *per se* but may undermine motivation if lacking, insufficient or perceived unfair. Work equity theory suggests that, with basis in the utility framework, individuals assess the tangible and intangible costs and benefits of their own work against those of others and if feeling unfairly treated may respond with low commitment and turnover (Adams 1965; Carrell and Dittrich 1978).

Empirical methods

Study methods encompassed four different approaches to CHW work time valuation, as well as open-ended questions and discrete choice methods to investigate and assess components involved in the trade-off between opportunity costs and perceived benefits that the CHWs face as community health volunteers.

The primary data were derived from semi-structured interviews conducted in February 2012 with 45 iCCM-trained CHWs. To keep the interviews to a reasonable length and avoid bias, our approach was pragmatic in balancing the complexity of methods with the aim to compare methods; acknowledging that for each method more rigorous and accurate approaches may be available. The sample size was determined within the conventions of what was deemed reasonable for our exploratory discrete choice experiment (DCE) (Rose and Bliemer 2005, 2013). CHWs were purposively selected based on maximum variation sampling to cover a spectrum of characteristics such as sex, age, occupation, income and previous work as CHWs in programmes run by non-governmental organizations (NGOs) prior to the creation of the national VHT programme. Six research assistants, having demonstrated their competence in previous household surveys in the study area, performed the interviews in one of three principal local language groups or in English. They were introduced to the questionnaire through a training session and pilot interviews. Interview arrangements with the CHWs were made over phone. The interviews lasted 2 h and 49 min on average. They took place in shaded areas outside the homes of the CHWs and included a break with refreshments provided. None of the CHWs approached declined to participate in the study. Informed consent was sought before each interview, and respondents were informed that they were free to withdraw at any time during the

interview, or decline to answer specific questions. At the end of the interview, the CHWs received a non-pre-adverted payment of USD 6.1 as time compensation.

Ethical approval

The study was covered by the ethical approval for the inSCALE study, registered as a randomized controlled trial with www.clinicaltrials.gov (identifier NCT01972321): Makerere University Institutional Review Board (ref. 100), the Uganda National Council of Science and Technology (ref. HS 958) and London School of Hygiene and Tropical Medicine Ethics Committee (ref. 5762).

Work time estimations

To estimate the total value of labour supplied by the CHWs, we first assessed the time spent volunteering. There are number of methods to measure labour time, including direct observations and asking the respondents to keep timesheets. However, for practical reasons, and as this study was primarily designed to explore valuation methods, we assessed workload by means of retrospective estimation. To mitigate recall bias, the period was limited to 2 weeks prior to the interview (Das *et al.* 2011). In addition to a detailed account of recent activities, the CHWs were asked how disease prevalence had changed over the last year to appreciate seasonal and other variations in workload over time. The interviews were conducted at the end of the dry season when malaria cases are less frequent—thus most CHWs reported they had fewer consultations than typical. Another reason for few consultations in the last 2 weeks given by some CHWs was that they had run out of stock of one or several of the drugs. Therefore, for comparison we also asked the CHWs what they estimated had been their average weekly workload over the last year. For further analyses of workload over time, service statistics based on CHW record books will be a more accurate source, although the most precise way may be to use observation or ask the CHWs to keep time records.

Valuing the replacement cost of time

The most appropriate replacement wage applied to the CHW work time was considered to be that of attendants at health facilities, who have the lowest salary level within the public sector in Uganda; USD 54 per month at the time of the interviews. Even though the iCCM-trained CHWs have responsibility for providing curative care, not all CHWs had completed secondary school, and they have received less healthcare training than the cadre at the next step on the salary scale—nurse assistants—with an entry level salary of USD 60 per month (Uganda Ministry of Public Service 2013). Nurse assistants have been trained for 3 months and, due to the lack of health workers in Uganda, may sometimes be responsible for running a rural health post.

A second approach involved asking the CHWs what they considered would be a reasonable remuneration for their CHW work (accentuating that salaried CHWs is not the iCCM policy in Uganda and this was only asked for the purpose of our research). This question was posed before other questions on income to avoid it might be influenced by those time-valuation exercises. We also asked the CHWs what they considered to be a reasonable number of hours of work per week.

Valuing the opportunity cost of time

The most straightforward—and generic—approach to estimating the opportunity cost of time for volunteers is to apply a wage rate that corresponds to the average potential earnings of the volunteering population. We asked the CHWs about the earnings of other members of their community with similar skills and competences as themselves. Proposed occupations included shop attendant, cattle keeper or waitress (USD 20–81 per month); or teacher, game ranger, cook or oil company worker (USD 109–154 per month). Casual work ranged from fetching water (USD 11–12 per month), farming (USD 28–121 per month), to house construction (USD 81–364 per month). Farming work was most commonly mentioned. Three CHWs did not propose any alternative income generating activities, saying there were none available. For comparative purposes, the pay estimates for casual work involved recalculation of weekly or daily rates assuming 20 working days a month. The median monthly earnings from proposed work opportunities, USD 60.7, were used as the opportunity cost wage value.

As a second approach to assessing the opportunity cost of time, the CHWs were asked to describe and estimate the value of annual household income; in cash as well as in kind—including the value of food produce that was consumed by the household. Where several household members contributed to self-subsistence food production, we asked for total household income and the work contribution per household member. This allowed estimation of an average monetary value per hour worked for the CHWs in our sample, regardless of whether they had a salaried job or were self-sufficient. The estimated mean monthly income of USD 173 (UGX 427;500) was in line with the mean household income documented in urban areas in western Uganda (Uganda Bureau of Statistics 2010); and in fact our wealth index suggested that the CHWs predominantly belong to the better off household in the rural communities (Table 1). We also looked at CHW-related income or expenses to understand to what extent this would compensate for dedicated time or add to the cost side.

Qualitatively assessing the benefits of volunteering

To better understand the perceived benefits of being a CHW, we used two methods. The first method consisted of a number of open-ended questions on the decision to become a CHW, and what was expected from, and valued with, the role. Thematic analysis allowed identification of factors that caused satisfaction or dissatisfaction in the present work situation. To further explore the relative importance of factors contributing to the net utility of being a CHW, we defined a number of characteristics of the CHW role that could be influenced by the programme organization. We then provided the CHWs with cards that described these different characteristics of the community health work and asked them to rank them in order of importance for work satisfaction. Thereafter, we asked them to indicate for each characteristic if it was satisfactory in their current work situation.

The second method consisted of an exploratory DCE to better understand the relative value to the CHWs of altering different characteristics of the CHW programme. DCE is a quantitative method used to derive preferences for selected attributes of a product, service or programme, by analysing the trade-off respondents make when choosing between sets of hypothetical alternatives. Although based on stated preferences its trade-off design resembles real life decision making better than ranking and rating techniques and can be useful for policy analysis and planning when choices cannot be observed from revealed preferences (Hensher *et al.* 2005; Train 2009). DCEs have previously been used in low- and middle-income countries to explore for example employment preferences for nurses in Malawi (Mangham and Hanson 2008), how to make rural jobs more attractive to clinical officers in Tanzania (Kolstad 2011) and to evaluate the relative effectiveness of different policies in attracting nurses

Table 1. CHW demographics

Indicator	Range	Study sample ($n = 45$, February 2012)		Data set including 97% of iCCM CHWs trained in the study area ($n = 6397$, July 2010–April 2011)	
		Female	Male	Female	Male
Gender		19(42%)	26(58%)	2895(45%)	3502(55%)
Age[a]	15–25	0	1(2%)	285(4%)	413(8%)
	26–35	8(18%)	12(27%)	910(14%)	1266(20%)
	36–45	7(16%)	7(16%)	963(15%)	1008(16%)
	46–65	4(9%)	6(13%)	720(11%)	774(12%)
	66–86	0	0	17(<0.5%)	45(1%)
Educational attainment	None	0	0	2(<0.5%)	3(<0.5%)
	Primary:			1195(19%)	1118(17%)
	Some	0	5(4%)		
	completed (7 years)	12(27%)	12(33%)		
	Secondary, ordinary level (11 years)	6(13%)	5(11%)	1544(24%)	2037(32%)
	Secondary, advanced level (13 years)	0	0	49(1%)	162(3%)
	Tertiary (13 + years)	0	3(7%)	96(2%)	171(3%)
	Unknown/missing	1(2%)	1(2%)	9(<0.5%)	11(<0.5%)
Principal occupation	Self-employed:			2463(39%)	3070(48%)
	farming/fishing/cattle/domestic	12(27%)	11(24%)		
	trade/business	4(9%)	6(13%)		
	Employed/casual worker:			103(2%)	155(2%)
	public sector	1(2%)	3(7%)		
	private sector	0	5(11%)		
	Unemployed	1(2%)	1(2%)	324(5%)	259(4%)
	Student	0	0	0	0
	Unknown/missing	1(2%)	0	5(<0.5%)	18(<0.5%)
Time as CHW[a]	1–2 years	7(16%)	13(29%)	731(11%)	1579(13%)
	3–5 years	3(7%)	1(2%)	578(9%)	735(11%)
	6–10 years	5(11%)	7(16%)	580(9%)	545(9%)
	11–20 years	2(4%)	4(9%)	175(3%)	282(4%)
	21–35 years	0	0	12(<1%)	30(<1%)
	Unknown/missing	2(4%)	1(2%)	819(13%)	1062(17%)
Household wealth quintile[b]	Lowest	0	2(4%)	N/A	N/A
	Second	1(2%)	2(4%)		
	Third	0	7(16%)		
	Fourth	3(7%)	7(16%)		
	Highest	13(29%)	8(18%)		
	Unknown/missing	0	2(4%)		
Household size	Total individuals, median (range)	7(3–19)	5(3–16)	N/A	N/A
	whereof working, median (range)	2(1–4)	2(1–5)		

[a] As of February 2012.

[b] Household wealth was estimated by means of an asset index, based on a number of questions on house construction, ownership of household items, land, animals and transport means and water and sanitation infrastructure. The wealth scores of the CHWs in this study were derived by merging the study data set with data from 360 VHT members and 4003 households with children < 5 years in the implementation districts from a randomized survey conducted in the summer of 2011. Overall a larger share of CHWs belongs to the higher wealth quintiles as compared with the household with children < 5 years that they serve, however the wealth index only encompasses household in rural populations and is not representative on the national level.

to rural areas in Kenya, South Africa and Thailand (Blaauw *et al.* 2010).

The purpose of the DCE was to assess what work characteristics with potential to be influenced by programme design were most highly valued by the CHWs. The design of our DCE was informed by previous qualitative work on CHW motivation in the study area (Strachan *et al.* 2012) and by the literature: insufficient earnings and time constraints have been indicated as reasons for CHW attrition elsewhere; while community recognition, supportive supervision and competence development can contribute to counter attrition (Rahman *et al.* 2010; Alam *et al.* 2012).

The more attributes used to describe the alternative goods or scenarios in a DCE, the greater the task complexity (Miller 1956). To keep the DCE reasonably simple, work scenarios presented were limited to five attributes; four with two levels and one with four levels (Table 5). This allowed a design restricted to 12 choice sets, all presented to each CHW in our sample. The DCE was analysed by means of a multinomial logit model and a mixed logit model.

Results

Table 1 outlines demographic indicators of the CHWs in our sample compared with the demographics of the CHWs who received iCCM training in the first programme round to illustrate the representativeness of our restricted sample. Seventy-three percent of CHWs in our sample (87% in the study area) were self-employed in

Table 2. CHW workload

Work activities	Median number in the last 2 weeks (range)	Median time per consultation/visit (range)	Place of consultation
Consultations, children < 5 years	4 (0–14)	30 min (5 min–1h 30 min)	Home of CHW: 91% Home of patient: 6% Other: 3%
Consultations, individuals > 5 years	3 (0–10)	30 min (2 min–1h)	Home of CHW: 78% Home of patient: 22% Other: 0%
Household visits, including travel time[a]	2 (0–21)	30 min (5 min–4h) (+35min (3 min–3h))	N/A
Other[b]		0(0–7 h)	N/A
	Median number in the last 3 months (range)		
Health facility visits, including travel time[c]	2 (0–12)	4 h(40 min–10h)	N/A
Median work time per month, calculated based on reported CHW activities in last 2 weeks		9 h 20 min (0–36 h 30 min)	
Median work time per month, based on CHW-estimated work time in last 2 weeks		17 h 20 min (0–208 h)	
Median work time per month, calculated based on CHW-estimated work load during last year[d]		19 h 20 min (2 h 30 min–57h 10 min)	

[a] To follow-up on children previously treated, to check on new-borns or to inform on preventive health practices.
[b] Record keeping/administration, community sensitization on health and sanitation issues, etc.
[c] To collect new drugs, deliver service statistics, meet with the supervisor.
[d] Estimated to a median of 15 children (range 5–100) and 6 household visits (range 0–24) per month. Average workload per month over the last year was explored to account for seasonal fluctuations in illness prevalence.

subsistence farming, fishing or trade. The female–male ratio was 42:58 in our sample (45:55 in the larger CHW population).

CHW workload

Table 2 gives an overview of CHW work activities and time per activity. The median CHW worked 9 h and 20 min (range 0–36 h and 30 min) per month based on reported work activities and time per activity in the 2 weeks preceding the interviews. The CHWs' own estimation of work time was a median of 17 h and 20 min (range 0–208 h) per month, thus slightly higher than calculations based on reported activities. To consider seasonal variations, the average time per work activity was also multiplied with reported workload over the last year, yielding a median workload per month of 19 h and 20 min (range 2 h and 30 min–57 h and 10 min).

Replacement cost—observed, public sector salary rate

The reported CHWs workload of a median of 19 h and 20 min a month on average over the year resulted in a replacement cost of USD 6.9 per month applying an hourly wage (USD 0.36) based on the minimum public sector salary (Table 3).

Replacement cost—declared, CHW sample

The median remuneration proposed by the CHWs if they were to be paid was USD 40.5 per month (range USD 2–101). Thus the CHWs considered appropriate a median monthly reimbursement at 75% of the lowest public servant salary rate. They were prepared to work considerably more than the currently reported workload. Combined with CHW-reported availability to carry out community health work—a median of 78 h (range 17–212 h) per month—the proposed pay gave an hourly median rate of USD 0.48 (Table 3). However, the majority of the CHWs commented that they had taken on the position as volunteers and knew that they could not expect to receive any payment for their work.

Opportunity cost—observed, alternative work opportunities

Valuing each hour volunteered at the median wage rate of alternative work opportunities in the communities resulted in a value of USD 60.7 (range USD 10–365) per month (USD 0.31 per h) (Table 3).

Opportunity cost—observed, estimated income CHW sample

The CHWs' assessment of total household income gave a median annual household income of USD 1330 (range USD 44–13 539); adjusting for the number of people working in the household, a median monthly income per working individual of USD 50.1 (range USD 2–1128). Dividing the income figure with CHW-reported workload before they became CHWs, a median of 45 h (range 12–74 h) per week gave a median hourly rate of USD 0.25 (Table 3).

Cost and benefits derived from the community health work

Fifty-eight percent of CHWs interviewed estimated that the time dedicated to other work had been reduced since they became CHWs, with a median time reduction per month of 26 h (range 9–134 h). Furthermore, being CHWs meant that they occasionally, or often, had to adjust their daily schedule due to CHWs duties. Sixty-seven percent of the CHWs did not report any financial income loss in the last year as a consequence of less time available for other work, however, 14 CHWs (33%) estimated that their annual income had been reduced with between USD 40 and USD 243, representing 1–42% of self-assessed household income.

Table 3. Valuation of CHW input

Valuation method	Monthly proxy salary rate	Hourly proxy salary rate	Monthly work value based on (a) CHW activities in last 2 weeks (b) CHW-estimated work time in last 2 weeks and (c) reported workload during last year, respectively
	USD[a]	USD	USD Median (range)
Replacement cost—observed proxy, public sector salary rate (2011/12)	53.8	0.36[b]	a: 3.4 (0–13.2) b: 6.2 (0–74.3) c: 6.9 (0.9–20.4)
	Median (range)	Median (range)	
Replacement cost—declared proxy, CHW sample ($n = 44$)	40.5 (2.0–101.2)	0.48[c] (0.04–2.3)	a: 2.8 (0–24.2) b: 5.8 (0–135.0) c: 12.2 (0.2–38.2)
Opportunity cost—observed proxy, wage rate of alternative work opportunities in the communities ($n = 36$)	60.7 (10.2–364.5)	0.31[d] (0.05–1.9)	a: 2.9 (0–11.5) b: 5.4 (0–64.8) c: 6.0 (0.8–17.8)
Opportunity cost—observed proxy, estimated income CHW sample ($n = 40$)	50.1 (1.8–1127.6)	0.25[e] (0.02–4.0)	a: 1.4 (0–34.3) b: 2.2 (0–416.3) c: 4.1 (0.4–168.8)

[a] 1 USD = 2470 UGX (average 2012 exchange rate)
[b] Official work hours in public service: 40 h/week*48 weeks/year
[c] CHW median estimate of reasonable weekly CHW workload: 18 h/week (range 4–49)*52 weeks/year
[d] 45 h/week*52 weeks/year
[e] CHW median estimate of working hours per week, non-CHW activities: 45 h/week (range 12–74)*52 weeks/year

All but two of the CHWs in our study had direct expenses as a consequence of the community health work; mainly transportation costs in relation to health facility visits, and to some extent costs of mobile phone use. CHW-related expenses exceeded CHW-related income for 84% of the CHWs. Reported median expenses were USD 1.5 (range USD 0–9.6) per month. Only 25% of the CHWs had received transport reimbursement during the last 3 month, a median of USD 2 a month. Three CHWs (7%) had received stipends for participation in community vaccination campaigns and an NGO-run health project (USD 12 on average per month).

Our open-ended questions indicated that being able to diagnose and treat sick children and see them regain health, the training and medical knowledge obtained, and the community appreciation and respect were the most highly valued benefits from being a CHW. While none of these questions mentioned payment, 70% of the CHWs mentioned they had expected to receive an allowance initially and 43% still hoped for this in the future (Table 4).

In the ranking of eight work attributes (respect and appreciation from the community, benefits, communication tools, reasonable workload, opportunities for career development, opportunities to receive further training, performance feedback, consistent supply of drugs) by how important they were for work satisfaction, 79% of the CHWs ranked 'consistent supply of drugs', 74% 'opportunities to receive further training' and 47% 'opportunities for career development' among the top three. Forty-nine percent ranked 'benefits (in kind or monetary contribution from the community and/or the health sector)' as least important. The common explanation for this was that they had agreed to volunteer thus this could not be an important attribute for them.

DCE, work characteristics

In the DCE, monthly remuneration and community appreciation were the preferred work characteristics (Table 5).

The majority of CHW said the DCE was easy to understand but that it was difficult to make choices between the different scenarios. One CHW explained it as 'It was difficult because I had to choose between the money which I need and what I value most, i.e. community appreciation'.

Discussion

In this study, we compared different methods of estimating the value of the unpaid work input provided by CHWs and explored the perceived benefits and cost of volunteering to the CHWs. First, when examining the input value of community health work using different techniques, we found that the replacement cost of volunteering CHWs, based on the lowest wage rage in the health system in Uganda, did not differ greatly from the opportunity cost of time calculated from the median reported wage rates in the local community (USD 0.36 and USD 0.31 per h, respectively). The estimated individual opportunity cost of time of the CHWs was slightly lower, at a median of USD 0.25 per h, yet subject to a greater range of uncertainty as it was measured by means of a rather complex calculation, involving assessing the value of annual household produce for self-sustaining farmers, workload over the year and work share between household members. In our efforts to estimate the monetary value of time to the volunteers themselves, we observed a large variation across the CHW sample, illustrating the income-span also in our small CHW population.

However, while the opportunity cost of time is conventionally calculated and presented as average rates, in practice, the marginal

Table 4. CHW views on the community health work

Open-ended questions	Principal response categories (% of CHWs in sample, more than one response per CHW possible)[a]
What reasons were most important for you in your decision to become a CHW?	Help to improve the health of the community (66%) Gain medical knowledge and skills (34%) Having been entrusted by the community (20%) Be able to treat own children (16%)
What expectations did you have about being a CHW before you started the work?	Receive an allowance (70%) Gain medical knowledge and skills (43%) Obtain further training and health sector career opportunities (23%) Receive a bicycle/means of transport (20%) Had no specific expectations (7%)
Have your expectations been fulfilled?/Have you expectations about your continuous work as a CHW changed in any way now that you have been a CHW for a while?[a]	Allowance: – Expectations have changed, learned it was a volunteer position (21%) – Expectations have not changed, still hope to might receive an allowance in the future (43%) Gain medical knowledge and skills/other career opportunities: – Expectations have been met (26%) – Had expected further training/opportunities than received (19%) Receive a bicycle/means of transport: – Expectation was met (5%)[b] – Expectation was not met (26%)
What changes, if any, would you like to see to the CHW programme?	Receiving an allowance (43%) Improved drug supply (32%) Receive a bicycle (27%) Being supplied with appropriate lighting to be able to attend to patient at night (a better torch than the one received, or a solar lamp) (16%) More training (18%) More supervision (11%) Being reimbursed for transportation expenses (11%) Expanded responsibilities to treat also children > 5 years (and adults) (9%)
Is there something that you do not like with being a CHW and/or the CHW work?	Do not dislike anything with being a CHW or the work (36%) When community members have too high expectations on CHWs, and misunderstand the CHW role and responsibilities (expecting CHWs to treat patients beyond their knowledge, or adults, or think CHWs are paid and thus should always put the community health work first) (25%) Drug stock-outs (20%) Being woken up at night or needing to interrupt other activities at times when it was convenient (18%) Spending money that is not reimbursed on CHW activities (14%)
What do you value most with being a CHW?/What do you enjoy most in your work as a CHW?	Be able to diagnose and treat sick children and see them regain health and thereby helping the community (73%) The training and the medical knowledge obtained (59%) The appreciation and respect from the community (48%) The opportunities the role gives in terms of social interaction (18%) Being able to treat own children (11%)

[a] Since the questions were open-ended the CHWs brought up different issues under each topic thus the percentages do not sum up perfectly.

[b] CHWs in the programme who were selected for peer supervision activities received a bicycle from the district governments using money from The Global Fund.

value of work decreases with the amount of work time; the first hour dedicated to income-bringing activities in the day is the most valuable, and may be necessary for survival, while the last hour of working is least valuable (Becker 1965; Hagberg and Lindholm 2010). There may be a low opportunity cost for low levels of volunteering, but as hours expands, the marginal cost per hour rise as volunteering impacts productive time. Thus workload is an important component in the trade-off between costs and benefits of volunteering that the CHWs face. Currently, most of the CHWs interviewed considered that their workload was manageable and did not experience direct opportunity costs in terms of financial losses. They had occupations that allowed some flexibility in terms of how they managed their time, which might have been a precondition for them being able to assume the position as CHWs. However, one third of the CHW sample reported that the community health work had affected (reduced) their overall income. CHW retention in the programme has been satisfactory to date, and was measured at 93% after 2 years of operation (Malaria Consortium 2013). CHW retention rates of 91% after 2 years and 86% after 5 year have been reported from another Ugandan programme (Ludwick *et al.* 2014). If additional tasks are added to the CHW role, an increasing opportunity cost of volunteering could shift the balance between cost and benefits. This may make volunteering more demanding to combine with income-bringing activities. All unpaid work needs to be supported economically through some means, e.g. through income-bringing activities from other members of the household. This is important to take into account when individuals from low-income communities are asked to contribute their time, knowledge and skills freely to help address health inequalities (South *et al.* 2014).

Examining the benefits to CHWs, our exploratory work is in line with findings from previous research on health worker benefits (Kironde and Bajunirwe 2002; Chandler *et al.* 2009; Maes and

Table 5. Discrete choice experiment, work characteristics

Job attribute alternatives in discrete choice experiment	Multinomial logit model:			Mixed logit model:		
	$n = 43$			$n = 43$		
	Co-efficient	$p > \|z\|$	SE	Co-efficient	$p > \|z\|$	SE
Monthly remuneration of USD 60.7 (as well as transport refunds) vs no remuneration (apart from transport refunds)	1.387	0.000	0.243	2.156	0.000	0.498
Monthly remuneration of USD 40.5 (as well as transport refunds) vs no remuneration (apart from transport refunds)	1.115	0.000	0.221	1.586	0.002	0.518
High appreciation and understanding from the community of my work vs limited appreciation and understanding from the community of my work	0.992	0.000	0.139	1.198	0.032	0.309
Monthly remuneration of USD 20.2 (as well as transport refunds) vs no remuneration (apart from transport refunds)	0.868	0.000	0.199	0.737	0.000	0.343
Half-time work on flexible hours vs full time work	0.484	0.002	0.160	0.534	0.089	0.314
Regular trainings that give opportunity to gain further competence in my VHT work: at least 1 week once a year vs occasional trainings: every second year or less often	0.379	0.014	0.155	0.514	0.072	0.286
Mobile phone provided to facilitate communication with supervisor and other VHTs vs no communication tools provided to facilitate communication with supervisor or other VHTs	0.247	0.104	0.152	0.359	0.183	0.270
Constant	−1.567	0.000	0.242	n/a	n/a	n/a

Kalofonos 2013), which indicate that while intrinsic factors, such as commitment, sense of achievement and altruism, are critical for the decision to become and remain a CHW, reputational and extrinsic incentives such as community appreciation and well-functioning support and recognition from the healthcare system should not be underestimated as requisites for CHW work satisfaction. The results from our DCE illustrate the interplay between reputational and extrinsic incentives. Remuneration levels at 75% of the minimum public salary or above were valued more highly than community appreciation while community appreciation dominated over a salary at 38% of the minimum wage. In a recent Cochrane review on lay health worker programmes for maternal and child health (Glenton *et al.* 2013), it was noted that the social recognition for volunteering was a more accentuated benefit in low-income than in high-income countries. The reputational value of pro-social contributions might diminish if one is paid (Bénabou and Tirole 2006). However, whether this applies to volunteering in settings where formal work opportunities are scarce may be queried (Maes 2012). For example, perceptions that 'being a volunteer when others are paid is foolish' and that community volunteers had learned that 'as villagers they were not worth being paid' were reported in a study from Malawi (Swidler and Watkins 2009). We asked the CHWs to trade between reimbursement and recognition, but these are not mutually exclusive; community recognition could remain unaffected, or increase also if CHWs were remunerated for their work, since a salaried position might further enhance community recognition.

Although the CHWs were overall satisfied with their role as volunteering CHWs, many nevertheless had expectations of additional incentives or paid work in the future. This illustrates how behaviour can be influenced by anticipated rather than immediate consequences; our study suggests that the CHWs to some extent trade-off the current opportunity costs of community health work against future aspired benefits. A continued lack or remuneration or other types of extrinsic incentives over time may become a source of dissatisfaction, undermining higher level intrinsic motivations. This may be the case even if CHW workload does not increase, since dissatisfaction could stem from a feeling that provision of long term support to the public healthcare sector ought to be rewarded out of fairness and equity reasons. However, crowding out of intrinsic motivation can occur at rewards perceived at inadequate (Bénabou and Tirole 2006). The average CHW in our sample wished for a stipend commensurable to 75% of the minimum public sector wage and an occupation closer to a full time job. Paying USD 7 a month, the time value of current reported workload, could potentially lead to feelings of being under-valued, once a value is placed on CHW contributions, as this is only 13% of the minimum public sector wage in Uganda (B-Lajoie *et al.* 2014, Bénabou and Tirole 2003). If the CHWs are to be paid, in the decision on an optimal level one should carefully take into account relative salary levels of other health workers in relation to workload and responsibilities. If CHW workload remains at a level that does not considerably interfere with other income-bringing activities, providing regular discretionary rewards such as bicycles and solar lamps that can also support the work might be a more valid option (Kimbugwe *et al.* 2014). Furthermore, the CHWs interviewed in this study had transport expenditures at a median of USD 1.5 per month and only 25% had received any transport reimbursement in the last 3 months. Dedicating USD 5–10 per CHW on a monthly basis to assure CHWs are properly reimbursed for travel and other expenditure, would allow CHWs more flexibility to use transport means and serve as a commensurable reward in relation to current workload even if not presented as a salary. Considering more formal employment for CHWs could be a subsequent step.

Limitations

The methods explored were applied in a relatively small sample; thus the results are not necessarily representative of the CHW

population in Uganda. Although the research assistants conducting the interviews presented the research as independent from the national iCCM programme, it is possible that some of the responses were influenced by what the CHWs deemed appropriate to answer. As noted in the theory, the opportunity cost of time is not easily determined in settings with high levels of informal employment. The CHWs overall provided readily estimations of the quantities and value of their produce from subsistence farming but in some cases the annual income and household workload calculations proved challenging in an interview setting which resulted in some missing data. Moreover, alternative work opportunities in the community could have been proposed by some respondents regardless of whether such work was actually available to the CHW or not—an issue in trying to estimate the opportunity cost of time in settings with limited formal employment opportunities. The DCE was an exploratory study; it should be interpreted taking this into account, but demonstrated the feasibility of DCEs in this context. Subgroup analyses in our sample indicated variations in work preferences by age and gender, something that could be of interest to explore in a larger sample.

Conclusion

We consider the replacement cost method more suitable than the opportunity cost method in the economic evaluation of volunteer CHW programmes. Because it values unpaid CHW work on basis of the type of work provided rather than from alternative work opportunities of the CHWs, it better represents the value of CHW work contribution from the programme perspective. Another issue with using the opportunity cost method for volunteer time valuation is that the opportunity cost is in fact off-set by the benefits seen with volunteering; otherwise the volunteer activity would not be pursued. Our study indicates that for volunteer workers in settings with limited formal work opportunities, a non-negligible part of the perceived benefits may often constitute the hope of future payment and employment. This brings in a time component in the equation which further complicates the assessment of a point-of-time opportunity cost. A volunteer CHW programme may help to select individuals with strong intrinsic motivation. However since the decision to become and remain a volunteering CHW can be influenced by anticipated future rewards, the management and provision of CHW incentives commensurate to CHW expectations is critical to assure long-term sustainability of programmes as reliance is placed on CHWs to deliver essential health services. In the continuous development of CHW programmes, incentive packages shall take into account the workload and opportunity cost for the CHWs, and the nature of the work itself to prevent suboptimal investments in CHW programmes due to low performance and/or high CHW attrition rates.

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