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KNOWLEDGE FOR
GLOBAL LIFESAVING SOLUTIONS

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EXECUTIVE SUMMARY

Volunteer community health workers (CHWs) are one approach to serving the poor community in developing countries. BRAC, a large NGO in Bangladesh, a pioneer in this area, uses female CHWs as core workers in its community based health programs. After 25 years of implementing the CHW model in rural areas, BRAC has begun using female CHWs in urban slums through a community-based maternal health intervention. However, high dropout rates among CHWs suggested a need to better understand the impact of their dropout which will help to reduce dropout and increase program sustainability.

Estimating impact of dropout of volunteer CHWs from both BRAC and community perspectives. Also, estimating cost of possible strategies to reduce dropout and compare whether they are more or less than the cost borne by BRAC and/or community.

We used 'ingredient approach' to estimate the cost of recruiting and training of CHWs and so-called 'friction cost approach' to estimate the cost of replacement of CHWs after adapting. Finally, forgone services in the community due to CHW dropout were estimated applying the concept of friction period.

In 2009, cost per regular CHW was US$ 59.28 which was US$ 60.04 for ad-hoc CHW if a CHW went through recruitment, a three-week basic training, a one-day refresher training, one incentive day and worked for a month in the community. One month absence of a CHW with standard average performance in the community means forgone health services like health education, antenatal visits, deliveries, a referral of complicated cases, and distribution of drugs and health commodities. However, cost of strategies reducing dropout recommended by CHWs was US$ 121.28 which was close to the sum of the cost of regular and ad-hoc CHW.

Although CHWs work as volunteers in Dhaka urban slums impact of their dropout was immense both in financial term and forgone services. High cost of dropout makes the program less sustainable. However, cost-effective strategies may improve the sustainability of the program.

INTRODUCTION

The emerging consensus is that one of the key ingredients to achieve improved health outcomes is stronger health systems, particularly an adequate health workforce (Travis et al., 2004). Estimates suggest a shortage of at least 4 million health workers worldwide (JLI, 2004). Without coordinated action to address the health human resources crisis, health systems will not deliver the care required to meet the Millennium Development Goals (MDGs) by 2015 (Dussault, 2005). In Bangladesh, as in many other developing countries, the scarcity of health human resources is a pressing issue. The provider-population ratio in Bangladesh is still very low, for example, the doctor-population ratio is 1:4645, Nurse-Population 1:7786 and the Family Welfare Assistant-population 1:5651 (Mabud, 2005). Such a scarcity of health human resources is likely contributing to a weaker health system and ultimately to poor health outcomes.

In response to this situation, BRAC has engaged large numbers of volunteer community health workers (CHWs) popularly known as *Shasthya Shebikas*. These CHWs are the core of BRAC's community-based health interventions, going from door-to-door and serving as the first point of contact between community members and BRAC health services. The CHWs are selected from their own communities and include both BRAC village organization (VO) members and community members. Currently, about 80,000 CHWs work throughout the country, in both rural and urban areas. Originally developed in rural communities, in urban areas CHWs participate in the tuberculosis (TB) program, and most recently, in the *Manoshi* project, which aims to provide mother, newborn and child health (MNCH) services in urban slums of Bangladesh where both government and other NGOs outreach is not enough. In addition, as a continuous commitment of investing in human capital development BRAC is training this CHW cadre to provide low-cost, immediate and effective health services. BRAC found that community members did not have access to affordable high quality medical services leaving them with little or no options for seeking health services (BRAC, 2005).

Since the inception of the CHW model, BRAC has struggled with high dropout rates of CHWs in both urban and rural areas. Estimates range from 20% to 32% depending on the location and the program (Khan et al., 1998, Personal Communication, 2008). The *Manoshi* program had been in operation for about four years in urban slums of Dhaka city where the median duration of employment for current CHWs was 13 months whereas it was six months for dropout CHWs. More

than one-fifth of the dropout CHWs dropped out in their first month of employment with *Manoshi*; 50% dropped out within six months; 76% within nine months; and more than 90% within the first year (Alam et al., 2009). High attrition rates, such as these, have been found to contribute to a decreased stability of programs and increased training costs because of the continuous need for replacement (Haines et al., 2007). They have also been shown to have important financial implications for programs. For example, in BRAC's Essential Health Care program it was estimated that the cost of a dropout CHW was US$ 24 if she had participated in a three-week basic training course, worked for a month, and attended one-day refresher training. If a CHW participated in a basic training course, worked for a month and then went to one refresher training her opportunity cost amounted to US$ 15. A CHW earned between US$ 2.30 and US$ 7.00 on average per month which made the economic cost at least twice more than the financial gain (Khan et al., 1998). We consider impact of dropout in two dimensions - 1) impact on BRAC from the supply side perspective and 2) impact on the community whom the CHWs serve from the demand side perspective. Dropout is a revealed preference for a CHW herself, so we will not examine this further in this study. We consider that CHWs drop out because they have better opportunity of earning or they value 'other' means of spending their time more, for example, rearing children, caring for older members of the family, household chores, etc.

A recent study on retention of volunteer CHWs identified some potential strategies to reduce their dropout (Alam et al., 2011). The most commonly discussed recommendation was to address CHW expectation of income by increasing the existing financial incentives e.g., an increased allowance for attending refresher training, an incentive package for pregnancy identification, and supply of drugs and commodities at lower cost. Moreover, alternatives like the supply of saris or shoes and free treatment for their family members when sick were also suggested. Still others suggested bonuses or tips before major festivals and an additional suggestion was the provision of ID card to make them more recognizable to the community. Expansion of the current range of incentives to better compensate CHWs and improvement of their current retention level must be considered. Secondly, in order to minimize the frustrations on the part of CHWs for missing incentives for delivery and to make their income stream less erratic, CHWs should be compensated for pregnancies rather than deliveries. Finally, the program should communicate clearly that the CHWs' role is voluntary and should develop guidelines in terms of the expected duration of participation for CHWs so that the program and the CHWs have similar expectations.

OBJECTIVE

The present study attempted to assess the impact of CHW dropout both on BRAC and the community served in terms of costs and health benefits foregone from the economic point of view. It also aimed to examine the cost of the above-mentioned possible strategies to reduce dropout, and compare whether they are more or less costly than the costs borne by BRAC and / or the community. In addition, this study intends to apply an important method of indirect cost estimation of disease – so-called 'friction cost approach' adapting in estimating the impact of dropout of CHWs. This will contribute to methodology development in the economic evaluation of health service delivery. This study will help *Manoshi* project to understand comprehensive costs involved with dropout of the CHWs and help to reduce dropout comparing the cost of strategies with the benefits of doing so. It will also develop a base for future cost-benefit analysis of the CHWs under *Manoshi*. Finally, this impact analysis will help BRAC to provide guidance for future planning, expansion and reform strategies related to CHWs in an efficient manner in the long run.

METHODS

This study includes the 'ingredient approach' of costing, and the 'friction cost approach' to measure the impact of dropout volunteer CHWs on BRAC and on community using a timeline duration of CHWs working in the community and the events of recruitment, basic training, refresher training, CHW operations in the community and then dropout in course of the timeline (Figure-1).

Figure1: Conceptual timeline of dropout for volunteer CHWs of BRAC

basic training	dropout					dropout CHW	Friction period	friction period	recruitment & basic training	dropout current CHW			
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Number of months CHWs work with BRAC													

At joining, each volunteer CHW receives a three-week basic training and attends a one-day refresher training each month. According to the average duration of employment for both current and dropout CHWs, the potential dropout occurs in the 7th month for dropout CHWs and in the 14th month for the current CHWs. So, 7th month and onward for dropout CHWs, and 14th month and onward for current CHWs are the potential friction periods until new recruitments take replace to fill the vacancies of dropout CHWs (Figure 1).

In order to aid in questionnaire development we conducted explorative field visits and informal interviews with the Senior Health Coordinator at BRAC Head Office, and two Managers at branch office level. These interviews identified the 'cost inventory' involved in CHW recruitment, basic training, refresher training, and CHW operations in the community.

Estimating the impact of volunteer CHW dropout on BRAC

We estimated costs for recruitment, basic training, refresher training and incentive day using the 'ingredient approach' (outlined below). We also estimated average duration of employment of CHWs in the community and average time after basic training when dropouts occur. Then we estimated the period of gap in services provided by a CHW in the community after dropout, i.e. how long before a new CHW is recruited and active in the community. Afterwards, we estimated the cost of recruitment and training of a new CHW adapting and applying the so-called 'friction cost approach' (outlined below). In addition, we estimated costs of BRAC to operationalize CHWs in the community apart from recruitment and training cost through reviewing financial documents and interviewing concerned staff members of BRAC.

Estimating the impact of volunteer CHW dropout on community

We estimated the average number of services i.e. household visits, pregnancy identification, bringing pregnant mothers to delivery centers, attending deliveries, selling drugs and health commodities and referrals for the complicated cases not provided by CHW during the 'friction period' recognizing that these services may be delivered by other providers of variable quality. We also looked at the categories of health services forgone in the community (for accumulated clients) in addition to its absolute number, as an impact of CHW dropout.

When dropout of CHWs occur ad-hoc CHWs are recruited without basic training. Due to dropout of CHWs, operations are understaffed and operating below the optimum level. When understaffed, existing CHWs might share the responsibilities of the missing CHWs. Taking into consideration the level of staffing and operations capacity, we estimated the above missing health services in the community during the friction period.

Estimating the cost of possible strategies to reduce dropout

We valued and examined the cost of the strategies identified in the earlier studies (Alam et al., 2011) to reduce dropout applying the combination of methods outlined in this study, and compared to whether they are more or less than the costs borne by BRAC and/ or the community. All the strategies mentioned are considered together since they are not mutually exclusive. The cost of these strategies was estimated using the same 'ingredient approach' as it was used in estimating the cost of training, recruitment and operation of CHWs. For example, we estimated the minimum cost of a sari, pair of shoes and an ID card using the current market price. In this way we estimated the minimum costs for every strategy and then provided a descriptive analysis comparing with the cost borne by BRAC and the community due to CHW dropouts. Here the basic assumption was the "minimum cost with maximum retention".

The overall strategy of costing followed three basic steps: identifying the cost inventories; measuring cost items; and valuing them.

Ingredient approach

All relevant resources used in the recruitment, basic training, refresher training and average month of work in the community of the CHWs were accounted for following the ingredients approach (Creese and Parker, 1988, Khan and Ahmed, 2007, Chankova et al., 2010). The ingredient approach is a standard costing methodology where the researcher examines the process of producing certain output and lists all the resources or inputs used in the process. The method quantifies all the inputs used in this process irrespective of who provided the input or how the inputs were paid. Here for the CHWs, all possible financial costs based on the cost inventory (salary of staff engaged in recruiting, training, supervision and monitoring of CHWs; rent of *Manoshi* offices used for CHWs, CHW recruitment venue, basic training and refresher training venue, transportation, training materials, training

and refresher allowance, supply and logistics used for CHWs) related to CHWs were considered. Then average cost for a CHW was estimated.

Friction cost approach

The so-called 'friction cost approach' (Koopmanschap et al., 1995) for measuring the indirect cost of disease (productivity losses) was adapted to measure cost of dropout. The friction cost method does not assume that work is left undone but attempts to calculate the costs of recruiting and training individuals to keep the work going. Its basic idea is that the amount of production lost due to 'disease' (in this study 'dropout') depends on the time-span organizations need in order to restore the initial production level. In this study, data were collected on when the friction period occurred; how long it lasted; and then the cost during the friction period was determined. The actual indirect costs of dropout consist of the value of production lost and/or the extra cost to maintain production and, if the CHWs are to be replaced, the cost of filling the vacancies and training new CHWs.

Collecting cost and service information on CHWs

Initial interviews were conducted with BRAC *Manoshi* Senior Health Coordinator, Regional Managers and Branch Managers who execute CHW selection, training, development and operations in order to identify the exact cost categories (cost inventory). Then, financial cost data were collected through interviews of *Manoshi* staff, extraction from facility records, and observation on the use of space, supplies and furnitures for CHW recruitment, training, development and operations in the community, using a structured costing questionnaire. The concerned staff of the branch, regional and head offices were interviewed to assess the percentage of total time of their involvement with CHWs, and types of activities performed for which there are not likely to be reliable records. Number of health services foregone in the community during the friction period was estimated from the BRAC MIS and monitoring records, and also from the interviews of the concerned BRAC *Manoshi* project staff.

The following are the potential cost categories:

Capital costs

Building
Information on the area of the branch offices used for the CHW activities was collected. A rough diagram of the office floors was drawn on the pages of the questionnaire. In the diagram for each of the rooms, the functions normally carried out for CHW related activities were recorded (recruitment venue, training venue, refresher training venue, supervisor's office and store rooms for training materials and health commodities).

Furniture
Different types of furniture being used for the CHW activities with their number, life expectancy and market price were collected.

Equipment
Different types of equipment and instruments being used for CHWs in aforementioned activities with their number, life expectancy and market price were collected.

Recurrent costs

Personnel
The questionnaire included all personnel who worked at the two *Manoshi* branch offices who were involved with CHW activities during the reference period. Personnel costs are mainly collected based on the information available from the salary register for the reference period, and both program and support staff were asked to find out the percentage of their time they spent during the reference period for those four categories of CHW related activities. Information on total amount of salary and benefits paid to the staff including staff working at regional and head offices for supervision and monitoring of CHWs during the reference period were collected.

Supplies
Information on all types of supplies including drugs, health commodities and training materials were collected. For items for which there was no record, the Branch Manager or concerned staff were interviewed to figure out the approximate cost.

Operations cost

Information on all operations costs including transportation, utilities and maintenance of the branch offices related to CHWs were collected.

Discounting and sensitivity analysis

Depreciation of capital assets was estimated in order to calculate annual capital costs. For this the market price in 2009 (replacement value) was calculated and the value was annualized. The rate of discount considered for as an opportunity cost of the capital inputs is 5% (Khan and Ahmed, 2007). The average life years for the capital items was considered for the calculations of annualized value. The average life years for each of the capital items were obtained from the branch office personnel. In this study furniture, machinery, equipment and vehicles were classified as capital items. The equipment, machinery and furniture having a life less than 1 year were not considered as capital item; rather it was included in recurrent cost as supplies. In addition, the recurrent costs including personnel costs (salaries and benefits), building rent, utilities and maintenance, and field operations cost for the duration of the reference period were considered. Sensitivity analysis of the estimates was also performed using the discount rate of 3% (Shepard et al., 2000) and rental rate of *Manoshi* office buildings to test the robustness of the cost estimates.

Allocation of shared costs

Table 1 details the allocation procedure and the allocation of costs for volunteer CHW related activities were rightly estimated. Personnel cost was allocated based on the percentage of time spent by the program and support staff related to CHWs. Personnel cost is the summation of share of individual's basic salary and benefits of the reference period. Cost for capital items (machineries, equipments, vehicles and furnitures) was allocated to CHW related services, according to their uses and location of services. Office space cost was apportioned in proportion to area used for CHW related activities. Operation costs including utilities and maintenance of *Manoshi* branch office were apportioned among CHW related activities. Kitchen training/meeting room and store room were also allocated to CHW related activities.

Table 1: Allocation of costs for volunteer CHW recruitment, training and work, Dhaka urban slums, 2009

Cost Category	Allocation Procedure
Personnel	Proportion of time spent for CHWs
Equipment	Proportion of use of equipment and machineries for CHW related activities
Furniture	According to use of furniture for CHW related activities
Space Rent	Proportion of floor space used for CHW related activities
Supplies	Proportion of supplies used for CHW related activities
Operation	Proportion of utilities & maintenance used for CHW related activities
Kitchen	Proportion of costs used for CHW related activities
Transport	Transport costs incurred for CHW related activities
Training/meeting room	Proportion of costs to CHW related activities
Store Room	Proportion of supplies, training materials and other CHW related activities

This information (Table 1) was also used for estimating the costs of recruitment and training of ad-hoc CHWs (substitutes of dropout CHWs).

Selection of study sites and respondents

The study was conducted in *Manoshi* field sites of Dhaka urban slums where the program started in January 2007. These are sites in which complete information are available since the length of time the program has been operating is long enough to allow adequate program experiences. The existing *Manoshi* sites under 12 branch offices were divided into two categories – high performing and low performing sites based on the program data. We selected a representative branch from each category. Expenditure documents of *Manoshi* offices related to CHW recruitment, basic training, and refresher training and operation costs for an average duration of employment of CHWs in the community were reviewed. MIS and monitoring

records were reviewed for estimating the missing health services in the community during the friction period. In addition, Program Organizers, Branch Managers, Accountants, Regional Managers, Health Coordinator and Program Manager who were directly involved in both financial and program matters regarding recruitment, training, monitoring and supervision of CHWs were interviewed for apportioning the shared costs. The reference period for the costing exercise was January 2009 to December 2009.

Data analysis

Data on all costs and services forgone were analyzed by the investigators using Microsoft Excel 2007. Impacts of CHW dropout were assessed in terms of effects of CHW dropout on BRAC and on the community. Average cost of BRAC due to CHW dropout was estimated to see the impacts of CHW dropout on BRAC. Similarly, average services forgone in the community due to CHW dropout were estimated to see the impacts of CHW dropout on the community. Costs of all strategies to reduce dropout were estimated. The strategies are involved with providing additional incentives to CHWs. The incentives are generally, ID card for recognition of CHWs, sari, shoes, treatment facility to the sick family members etc. The costs of such incentives (strategies) were estimated by market price of each incentive. For example, the cost for an ID card was estimated from the market price of buying an ID card. Finally, comparisons were made for the cost of all possible strategies to reduce dropout and whether they were more or less than the costs borne by BRAC and/ or the community.

RESULTS

Impact of dropout of a volunteer CHW from the BRAC perspective

Each Branch Office (BO) conducts a needs assessment survey in the respective catchment area before starting formal recruitment process of volunteer CHWs. The survey has two fold objectives – needs assessment of the intervention area and identification of prospective candidates from the community for the positions of volunteer CHWs. After identifying prospective candidates, final selection of CHWs is held at the BOs under the active guidance and supervision of Branch Manager

(BM). In the total recruitment process a significant amount of time of *Shasthaya Karmis* (SKs), Program Organizers (POs) and BM is involved. Secondly, office space for the interview, and the associated recurrent and capital items are involved to furnish the recruitment of CHWs. So the total cost for personnel, space rent, recurrent and capital items used for the recruitment of a single volunteer CHW in 2009 was estimated to be US$ 1.54 on an average. On the other hand, when a volunteer CHW drops out ad-hoc CHWs are recruited without any basic training to continue the daily health activities in the community. We found that on an average US$ 2.30 was spent to furnish the recruitment process of such an ad-hoc CHW.

Table 2: Cost of dropout of a volunteer CHW, Dhaka urban slums, 2009

Cost categories	Regular CHW		Ad-hoc CHW	
	BDT	US$	BDT	US$
Recruitment of volunteer CHWs	104.63	1.54	156.10	2.30
Three–week basic training	3,316.90	48.78	3,316.90	48.78
One month work in the community	212.98	3.13	212.98	3.13
One refresher training	283.13	4.16	283.13	4.16
One incentive day	113.63	1.67	113.63	1.67
Total	4,031.27	59.28	4,082.74	60.04

*US $1= 68 BDT

Each volunteer CHW must go through an intensive three-week basic training which is fundamental for becoming a CHW. CHWs are sent to the basic training in a batch of 20. An ad-hoc CHW also needs to participate in the basic training whenever a batch of 20 volunteer CHWs is formed. This basic training component involves significant investment on the part of BRAC to develop this cadre of community health workforce to serve the poor slum dwellers. The current study estimated the cost involved for the basic training of each volunteer CHW accumulating all the resources used from the supply side. Cost per volunteer CHW was US$ 48.78 after accumulating the cost of all human resources, supplies, training venue rent, communication and transportation, both recurrent and capital items involved in the three-week basic training.

While a volunteer CHW with the basic training works in the community she needs considerable amount of support and supervision from the BRAC staff. If a volunteer CHW works for one month in the community, support and supervision from SK,

PO, BM and Regional Manager (RM) is required at different degree and level. So the costs of these staff time, their transportation costs and allowances including the apportioned use of capital item like motor bike amounted to US$ 3.13.

At each month, every volunteer CHW needs to attend a refresher training course and an incentive day at the respective BO. In both cases, in addition to travel and daily allowances for each CHW, significant amount of staff time, venue rent, supplies and the use of capital and recurrent items occurred. Total cost of all tangible resources for conducting a one-day refresher training for a volunteer CHW was US$ 4.16. Similarly, for participating in an incentive day, total cost for a volunteer CHW was US$ 1.67.

So all together conducting recruitment, basic training, refresher training and an incentive day required an investment of US$ 59.28 per regular volunteer CHW and for an ad-hoc CHW, the total investment was US$ 60.04 (Table 2).

Impact of dropout of a volunteer CHW from the community perspective

Due to drop out of a volunteer CHW and subsequent ad-hoc replacement with a CHW without basic training there involved significant cost on part of the community, the demand side. Due to the absence of volunteer CHWs in the community for their dropout there causes a friction period when the community is deprived of all the community health services received usually from a CHW. During this friction period the program initiates replacement of a dropout CHW with an ad-hoc CHW. According to the program average time duration needed for such replacement is one month. The community is deprived of the services (Table 3) during this one month or, receives variable services from other sources with variable quality and price. After one month when the replacement happens with a volunteer CHW without basic training, the community is further deprived of the optimum services that the community usually receives from the trained regular volunteer CHWs. The ad-hoc CHW is able to perform equal to 50% of the regular trained CHW in terms of conducting health message session. In selling drugs and health commodities, an ad-hoc CHW is able to sell a little more than 50% level of a trained regular CHW. Similar suboptimal performance also happens in case of distributing iron and folic acid among the pregnant mother.

Table 3: Comparison between a regular and an ad-hoc CHW in providing health services per month, Dhaka urban slums, 2009

Health services	Regular CHW	Ad-hoc CHW
Household visit	200	200
Health message session	40	20
Selling drugs and health commodities (US$*)	7.35	4.41
Pregnancy identification	2	2
Bringing mother to EPI center for TT	2	2
Provide iron and folic acid to pregnant mothers	15	8
Bringing mother to delivery center	2	2
Attending mother and newborn after delivery	2	1
Referring complicated cases	1	1
Detect and treat neonatal sepsis and birth asphyxia and refer	<1	0
Bringing 0-1 baby to EPI center for immunization	2	2
Ensure vitamin A for undr-5 children in 6 months	11	11
Detect LBW and educate family members on kangaroo mother care and refer for complications	<1	0.25
Detect and treat ARI and diarrhea	2	2
Involvement in postnatal care of mothers	2	1

*US $1= 68 BDT

In case of attending mother and newborn after delivery, managing neonatal sepsis and birth asphyxia, detecting low birth weight (LBW) and postnatal care services, an ad-hoc CHW without basic training performs much lower than that of a trained regular CHW.

In addition, the community members are used to be served by regular volunteer CHWs, but their sudden dropout creates anxiety among the community members and it takes time for the community to get adjusted with the substitute ad-hoc CHWs. However, in this current study, anxiety of the community could not be captured.

Out of all possible strategies to reduce dropout, incentive packages from pregnancy identification to attending the delivery and newborn for a single year is US$ 81.18

assuming that a trained regular volunteer CHW with an average performance is able to serve 24 deliveries in a year. In current practice a CHW receives incentives separately for a) pregnancy identification; b) bringing pregnant mothers to birthing huts; and c) attending the delivery. But in the recommended strategy, they will receive the same money at a single time as a single package which will reduce their frustrations of missing incentives if the identified mother delivered in locations other than BRAC birthing huts.

Table 4: Cost of possible strategies to reduce volunteer CHW dropout, Dhaka urban slums, 2009

Strategies to reduce dropout	BDT (Yearly)	US$ (Yearly)
Incentive package from pregnancy identification to post-delivery care for 24 pregnancies @BDT 230	5520	81.18
Increased refresher training allowance @BDT 80/month	960	14.11
Health insurance for a 5-member VO family @ BDT 150	150	2.21
Bonus before major festivals twice a year @ BDT 300	600	8.82
Two uniform sari @ BDT 300	600	8.82
Two pair of shoes @ BDT 200	400	5.88
One Identity Card @BDT 18	18	0.26
Total	8,248	121.28

*US $1= 68 BDT

Increased refresher training allowance will cost US$ 1.18 each month which will be US$ 14.11 in a year. Health insurance can be the most convenient way for ensuring treatment for the family members of volunteer CHWs. Thus providing health insurance for a 5-member VO (village organization) family would cost US$ 2.21 according to the BRAC micro health insurance project. Cost of two bonuses for a year amounted US$ 8.82. Other strategies to reduce dropout of volunteer CHWs would be provide two saris and two pair of shoes for a year, and ID card. Clear guidelines for volunteer CHWs' role and communicating the guidelines clearly to them would help the volunteer CHWs to prevent from developing false expectation of being regular staff instead of volunteers.

DISCUSSION

Under the current purview of volunteer CHW operations in the community the total investment of BRAC for about 80,0000 volunteer CHWs is huge. In other way, total amount of services provided by BRAC in the under-served communities in Bangladesh over the years is also enormous in terms of overall health gain and particularly, preventing maternal and neonatal deaths in *Manoshi* project areas. With the current rate of dropout of volunteer CHWs the overall impact of such dropouts is really alarming in terms of absolute loss of financial resources on BRAC side and in terms of forgone health services from the community perspective. In low income settings, such as Bangladesh where services provided by formal health workers is always limited in addition to inefficient health service management issues. So, the optimum utilization of the invested resources for the informal health workers such as volunteer CHWs is critical to the improvements of the population health.

In case of dropout of volunteer CHWs, BRAC needs to replace with ad-hoc CHWs who needs to be developed through basic training and other subsequent arrangements for refresher trainings and field orientations. So, the investment of BRAC in true financial terms becomes altogether double because of dropout of regular CHWs and for keeping the community based health interventions functional through recruiting and training of ad-hoc CHWs. On the other hand, a set of possible strategies recommended by volunteer CHWs costs closely to the amount of financial loss due to dropout of regular CHWs and subsequent replacement with ad-hoc CHWs and their training. This implies high potentials to adopt the recommended strategies and thus reduce dropout of volunteer CHWs. This study explored the scopes of preventing wastage of financial resources with equal additional investment in materializing the recommended strategies of reducing dropout. So the findings of the current study has programmatic implications in making the community based health interventions less erratic but more functional by retaining trained volunteer CHWs. In case of forgone health services in the community due to dropout of volunteer CHWs implementation of possible strategies will prevent the loss of the health services. It would also be important to maintain the quality of services at standard level which would not be possible in absence of trained volunteer CHWs in the community.

Issues regarding certain behavioural variables like anxiety of the community members due to dropout of CHWs and getting adjusted with the substitute CHWs

were difficult to capture without new survey among clients. Mental agony and tension of the community members is important though it was not possible to cost these mental hazards in true financial terms. Such intangible costs arising from mental hazards are seldom reported in literature because of its difficulty to measure (Jacobson et al., 2000, Henriksson et al., 2001). Though the anxiety in the community or program is not quantified in this current study, retention of CHWs certainly puts additional benefit by reducing anxiety. The overall gain in preventing dropout of volunteer CHWs through adopting recommended strategies is absolutely higher than the loss due to dropout.

This study has important implications for making BRAC volunteer CHW model sustainable and cost-effective. Since BRAC is working in several parts of Asia and Africa in low income settings using the similar volunteer CHW approach, the findings of the current study has significant implications in ensuring the optimum utilization of invested resources in developing and training of such health cadres. Adopting the simple strategies of retention of such health workforce, which is often low, can be immensely improved. This improved retention of the grass root health care providers will certainly accelerate the positive health outcomes and contribute to reducing the disease burden at the population level. At the same time, similar positive health gain by preventing forgone health services in the communities is possible at the cost of these very simple strategies. Up-keeping trust of the community through such low cost health services, which is often in jeopardy due to frequent dropout of community health workforce, is also important for the success of community based interventions. Reducing tension of the community due to dropout of health workforce and maintaining the quality of services, which could be ensured through preventing dropouts of CHWs. So, significant reduction in dropout of CHWs and improvement in their retention are crucial to the success of the community based health interventions.

The other aspect of this current study is the important contribution to new knowledge through application of methodologies used in indirect cost estimation of diseases in health workforce research in a non-disease setting. The current piece of research is unique in terms of innovative methodological application. Exercises around the current study also demonstrate the feasibility of applying the so called 'friction cost approach' in measuring the impact of dropout of workforce in other non-health settings. So, the current study provides new insights in measuring the impact of dropout of workforce in both health and non-health sectors and it is an important step towards cost-effective and cost-benefit analyses for the interventions utilizing similar types of lay workforce.

CONCLUSION

Although CHWs work as volunteers in Dhaka urban slums impact of their dropout is truly high both in financial term and forgone services. Cost of dropout of female volunteer CHWs of BRAC was almost equal to the cost for retaining them following adaptation of the recommended strategies. Additionally, we can save the foregone services in the community at the cost of adapting the strategies of retention for these BRAC CHWs. High costs of dropout of CHWs without implementing strategies to reduce dropout made the program less sustainable. However, there are cost-effective ways which certainly can contribute to improving the sustainability of the program.

Retention of lay community health workforce is crucial to achieving the universal health coverage in low income settings like Bangladesh. In order to improve retention of the existing female volunteer CHWs of BRAC, it is an important step to learn the impact of their dropouts. Information and knowledge on impact of dropout of CHWs would guide the health sector program managers and policy makers increasing their awareness and sensitivity on this very issue of dropout of CHWs and thereby, instigating programmatic actions to reduce such dropouts and this would contribute to achieving improved health outcomes. Although the use of the above methodologies, particularly, so-called 'friction cost approach' on practical ground in a non-health setting was challenging. It demonstrated new ways and provided new insights in applying critical methodologies in health service research.

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