Sustainability of community-capacity to promote safer motherhood in northwestern Tanzania: what remains?

Indu B. Ahluwalia[1], Dorcas Robinson[2], Lisa Vallely[3], Karen E. Gieseker[4] and Alfreda Kabakama[5]

Abstract: *Objective*. To examine the remains of the Community-Based Reproductive Health Project (CBRHP) implemented by CARE-Tanzania to address high maternal mortality in two rural districts. *Methods*. In early 2007, data were collected from 29 villages and used to assess sustainability of emergency transport systems, retention of village health workers (VHWs), and their potential impact on maternal health. Surveillance data from the Ministry of Health were reviewed to assess changes in prenatal and service use indicators. *Results*. From 2001 through 2006, the CBRHP-trained VHWs have continued to provide education and referrals to women in their communities including prenatal and emergency obstetric care; six villages with emergency transport systems have continued for more than 5 years providing free or low-cost transport to health facilities. Selected maternal and infant health indicators, such as early prenatal care, identification of pregnancy-related danger signs, and data on maternal and infant outcomes, improved in the two targeted districts over time. *Conclusions*. The two components of CBRHP, work of VHWs and community-financing for emergency transport systems in six villages, have continued. Both of these promote maternal health and linkages with the health delivery systems. Surveillance data show changes in maternal health indicators that were targeted by the district-wide CBRHP interventions. Programs such as CBRHP, with focus on capacity-building and empowerment, can assist in mobilizing the formal and informal systems in communities, components of which may be sustained over time. (Global Health Promotion, 2010; 17(1): pp. 39–49)

Key words: community, emergency obstetric care, maternal health, sustainability, transport

Introduction

The World Health Organization (WHO) has estimated that annually more than half a million women worldwide die of pregnancy complications (1,2) and that the maternal mortality in sub-Saharan Africa is high (estimated at 900 per 100,000 live births) (2). Delays in recognizing danger signs during pregnancy, in deciding to seek care, in reaching a health facility, and in receiving appropriate care once at a health facility lead to increased maternal mortality (3–10). Although most obstetrical complications

1. Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA, USA. Correspondence to: Indu B. Ahluwalia, Centers for Disease Control and Prevention, Division of Adult and Community Health, 4770 Buford Hwy. NE, Mailstop K-66, Atlanta, GA 30341–3724, USA. Tel: (770) 488–5764; Fax: (770) 488–8150. (Iahluwalia@cdc.gov)
2. CARE-International in Tanzania, Dar es Salaam, Tanzania.
3. Ms. Vallely was with CARE-Tanzania at the time of the study and is now with the University of Queensland, Australia.
4. Georgia State University, Institute of Public Health, USA.
5. Ministry of Health and Social Welfare, The Lake Zone, Reproductive Health Coordinator, Tanzania.

(This manuscript was submitted on April 10, 2009. Following blind peer review, it was accepted for publication on June 5, 2009.)

Global Health Promotion 1757-9759; Vol 17(1): 39–49; 356627 DOI: 10.1177/1757975909356627 http://ghp.sagepub.com

cannot be predicted, timely response can reduce maternal mortality (5–7,11,12). Most pregnancy-related complications can be prevented or managed if danger signs are widely known and health services, including referral and transport, are available (1,2,8–12).

In response to high maternal mortality and high fertility rates in the two districts of Kwimba and Missungwi located in the Mwanza Region of northwestern Tanzania, CARE-Tanzania, in collaboration with the US Centers for Disease Control and the Ministry of Health and Social Welfare (MOHSW), implemented the Community-Based Reproductive Health Project (CBRHP). These two districts house a population of approximately 500,000 across 188 villages, with a crude birth rate of 39.5 per 1,000 populations with an estimated 20,000 births or more per year (Reproductive Health Coordinator, 2006). The Mwanza Region is composed of seven districts including the districts of Kwimba and Missungwi. The districts targeted by CBRHP are rural with one sitting adjacent to Lake Victoria where the nearest district hospital can be reached by travel on the lake. Three district-level hospitals, two private hospitals, four health centers, and 58 dispensaries serve the two districts. The CBRHP activities took place during 1998–2000, with a focus on increased demand for maternal health services and improving the supply of basic and emergency obstetric care (EMOC) in the two districts by working with the Ministry of Health.

Program interventions

The CBRHP was a multi-component project that focused on strengthening community-level prevention services and improving the quality of health services at the dispensary, health center, and district hospital levels in the districts of Kwimba and Missungwi. The maternal and newborn component of the project was designed (i) to increase demand for and access to prenatal care, (ii) to improve basic obstetric services through facility staff training and improvements in the quality of emergency obstetric care at all facilities in the districts, and (iii) to increase referrals of women experiencing pregnancy-related complications from the villages to the district hospitals for appropriate and timely management. The community mobilization component focused on community capacity building by training village health workers (VHWs) and mobilizing communities around maternal health. One component of this was to develop an affordable transport system to get women with EMOC to health facilities. This was a need identified by the villages themselves during the early phase of CBRHP (13,14).

The project trained 299 VHWs in the two districts and these workers implemented the community-level intervention and mobilization activities. These VHWs received six-week long training with periodic follow-up and supervision by the project field officers (13–15). Specifically, the VHWs were trained to educate pregnant women and their families on maternal and newborn health, birth planning, and recognition of danger signs during labor and delivery, referring pregnant women to health facilities for prenatal and emergency obstetrical services, providing postpartum follow-up, and keeping account of pregnancies in their villages. In addition, the VHWs worked closely with the MOHSW community development officers who were trained on mobilization and community capacity building by CBRHP (13,14). The work of the VHWs was supervised by village leaders and the Dispensary-in-Charge (person who provides treatment and is in charge of the facility affairs). The CBRHP and the village leadership developed a system of community-based supervision and mutual support for the VHWs (13,15).

In response to the increase in demand for prenatal care and obstetric services that CBRHP created, it became apparent that service delivery improvements (i.e. adequate supplies and trained staff to address obstetric emergencies) needed to be upgraded at the district-level health facilities to meet WHO standards (16). Therefore, a team composed of CARE-Tanzania and local health advocates, in partnership with Columbia University's Foundation to Enhance Management of Maternal Emergencies (FEMME), received funding in 2001 to upgrade the four hospitals in the two districts to meet the World Health Organization's comprehensive EMOC standards. The majority of the FEMME-initiated interventions and upgrades took place in late 2002 to 2003, about two years after the CBRHP (16). The FEMME project trained staff in comprehensive emergency obstetric care, supplied four MOHSW-affiliated hospitals in the two districts with equipment, and blood for transfusions (considered an essential service for addressing obstetrical emergencies), improved supply of water and electricity, implemented

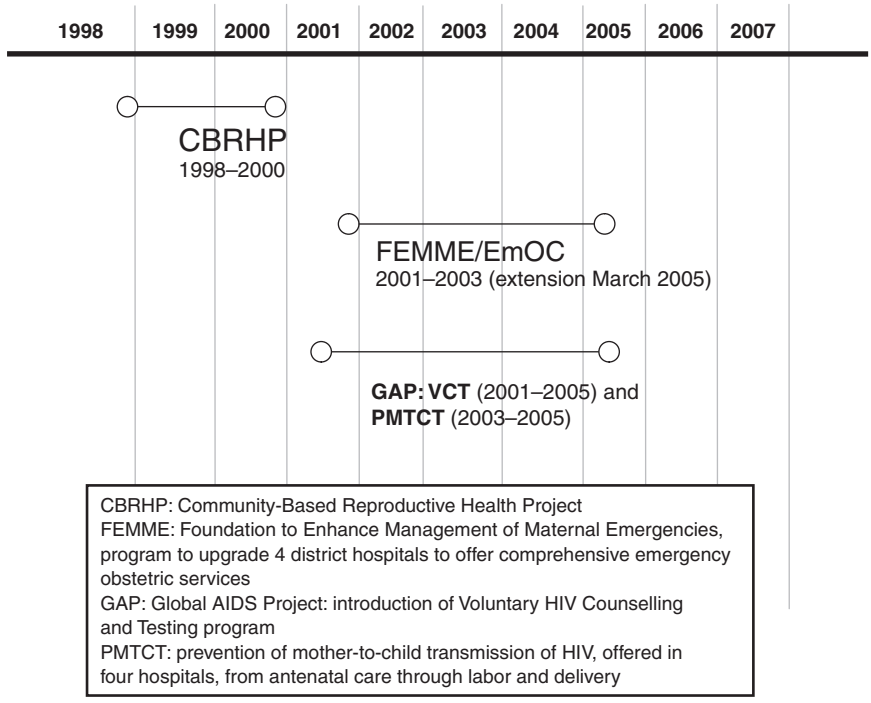

Figure 1. Timeline of important activities that took place in the two districts of Kwimba and Missungwi

protocols for addressing obstetric emergencies, and improved data collection (15). HIV counselling and testing services were implemented. The timeline of important activities that took place in the two districts of Kwimba and Missungwi are outlined in Figure 1. Since the completion of the CBRHP evaluation in 2001 (15), no follow-up has been performed to examine its status. In decentralized systems that state a commitment to bottom-up planning (as in many countries in Africa including Tanzania), government and non-government partners need to understand the long-term outcomes of community programs.

Assessing sustainability of CBRHP program components

Although assessing sustainability is a desired goal of many programs, there is seldom an opportunity to examine it. This is often due to limited project timeframes or lack of inclusion in the project planning phase or lack of funding. The existing literature has described dimensions of sustainability including an independent functioning of program or their components beyond the funding cycle, institutionalization of program or innovations that might be adopted during the implementation phase, continued relevance in terms of identification of program beneficiaries and advocates (17–20). Sustainability is typically viewed as a process or outcome of an activity or set of activities post-project implementation and evidence has shown the importance of community participation in the establishment and institutionalization of maternal and infant health programs (21–26). Programs that involve both formal and informal systems have been found to be sustainable (17–26). In late 2006, CDC and CARE conducted a post project assessment of the CBRHP components, including (i) community-supported transport systems; (ii) village health workers; and (iii) changes in selected maternal health service use indicators at the district level. The newborn components of CBRHP (i.e. staff training and quality improvements) and community mobilization

interventions were district-wide encompassing all 188 villages. These were designed to increase demand for services by pregnant women (e.g. prenatal care, clean facility delivery, emergency obstetric care). The CBRHP trained and implemented quality improvements at all levels of the service chain (i.e. dispensary staff, health center and hospital operations), while the FEMME project focused on upgrading the district-level hospitals to be able to provide appropriate and timely services to women with obstetric emergencies (16). We examined surveillance data on selected indicators to assess changes in service use patterns over time.

Methods

Village selection

In early 2007 we followed up with 29 out of 52 villages that were part of the 2001 evaluation (14). The selection was based on their end-project status on adoption of a community-supported emergency transport system (i.e. had a functioning transport system) (10 villages); viable plans to develop a system with resources allocated such as money or down payment (9 villages) and plans without specific action (33 villages). For the current assessment we selected all 19 villages with systems or viable plans and randomly selected 10 villages from the set without any specific action.

Data collection

We examined data from multiple sources: existing documents including surveillance data from the MOHSW, a community assessment survey, and a VHW survey. First, we examined existing documents to learn about types of programs or activities that had taken place in the two districts since the cessation of CBRHP activities. We worked with the district-level officials to document projects that had implications for conducting the assessment. Second, using a purposeful sampling strategy to maximize variation across the village, we selected 8–10 individuals representing different perspectives of the village. They were interviewed using a face-to-face community assessment survey. This group included male (n = 34) and female (n = 28) community leaders, sub-village leaders from different parts of the village (n = 30), women (n = 60) and men (n = 63) of target reproductive age groups living in outskirts of the village as well as near the center, and government extension workers (n = 34). No one refused participation in the community survey. All village health workers in the 29 villages were interviewed using the VHW survey.

Instruments

We developed tools (i.e. community assessment survey, village health worker survey) by working with the experts from CARE-Tanzania and reproductive health experts from the Ministry of Health. These tools were translated into the local language Kiswahili, reviewed by experts in translation, revised, pilot-tested, and re-revised to ensure both linguistic and conceptual consensus. The kinds of questions asked on the community survey included both closed and short open-ended questions (e.g. presence of VHW and the focus of their work; is there an emergency transport system in your village? If yes, describe the type of system [multiple choice options included: canoe, oxcart, tricycle, stretcher, community-funds, multiple systems, other]). Specific questions and items for the community survey were adopted from the survey instruments developed by CBRHP and qualitative work conducted by CARE-Tanzania with similar communities in different districts. Using this community assessment survey, each village was assessed on the status/existence of the emergency transport system, type of system, responsibility for maintaining the systems, and use. In addition, we inquired about the status of CBRHP-trained VHWs and their specific activities and place of activities (i.e. village, dispensary). Items from the survey were coded as dichotomous and categorical for those with multiple options, and open-ended questions were translated for analysis. Responses from the survey respondents were aggregated to represent the village. All village health workers (n = 124) were surveyed using the VHW survey, items on the VHW survey assessed their specific activities, nature of their work, schedules, and reasons for continuing to volunteer as VHW. The survey data were analyzed using EpiInfo.

Context

Once it was established that a number of villages had continued to maintain transport systems, we collected

contextual data to understand their reasons. Open-ended group interviews, two per village, were conducted with village leaders from the villages with community-supported transport systems to examine their reasons. The data were translated and summarized according to common themes that emerged. Three project staff experienced in qualitative methods and ministry of health staff reached consensus on these themes. Due to limited resources, it was not possible to do extensive follow-up with villages without transport systems.

Surveillance data

Examination of existing documents indicated that both CBRHP and a complementary project, FEMME focused on service delivery components of maternal health. Since project scope and resources did not allow us to collect data at each health facility, we opted to examine the existing surveillance data on maternal health indicators that were the targets of interventions in the two districts. Ecologic data on maternal and infant health indicators were obtained from the Regional Reproductive Health registers, which include data collected by local dispensaries, health centers, and district hospitals. Indicators such as recognition of danger signs during pregnancy, prenatal care initiation, facility deliveries and maternal mortality are routinely reported. The regional reproductive health coordinator (AK) maintains these records and she allowed the project staff to examine the surveillance data for the seven districts in the Mwanza region from 2000 to 2005, as data prior to that were not available. The rationale for doing this was that CBRHP efforts ended in early 2001 and a different project, FEMME, with direct impact on availability of EMOC at the district hospitals was funded in late 2001. The FEMME project began an initial needs assessment in 2002 with full implementation in 2003–2004 (Figure 1).

The surveillance data were used to assess the following indicators: percentage of pregnant women receiving prenatal care < 20 weeks gestation; the percentage of women presenting at healthcare facilities with one or more danger signs (e.g. anemia, malaria, syphilis – Rapid Plasma Reagin test positive, hypertension, a history of > 5 pregnancies, age < 18 years or >_35 years); a measure of community-identified danger signs not requiring clinical diagnosis (assessed by CBRHP-trained VHWs); the percentage of clean deliveries, defined as those assisted by a trained person and occurring at health facilities out of and the total deliveries expected in the district; and the number of maternal deaths per 100,000 live births, an important indicator of EMOC service availability and use. Data from each of the target districts of Kwimba and Missungwi and combined data for the other five districts in the Mwanza Region, including the city of Mwanza, are presented as Mwanza Region. Change over time was calculated using percentage change between two time periods, 2000 to 2002 and then between 2002 and 2005. The CBRHP effort focused on generating demand for maternal health services, and observed changes in these indicators prior to 2002 may have resulted from CBRHP district-wide activities implemented through VHWs in all the villages and quality improvements and trainings of facility staff. The trained personnel provide prenatal care and are able to assist in deliveries but those with obstetric complications are referred to district hospitals since they are equipped to address obstetric complications. The methods used to examine the ecologic data included percentages, percentage change, calculation of Z-scores to examine the significance of change in indicators over time and across districts compared with Mwanza Region (27).

Results

The review of existing documentation was useful in developing a timeline of activities in the two districts and to assess the extent of major external inputs that may have impacted maternal health (Figure 1). Furthermore, the review of existing documents allowed the project to establish that major community mobilization activities on maternal and child health had taken place under CBRHP and that district-level hospitals had been upgraded under the FEMME initiative. The follow-up activities assessed in 29 villages show that the work done by the VHWs in their communities has continued and that the CBRHP-trained VHWs have become an integral part of the services to pregnant women. They continue to link the women from the villages with service providers such as dispensaries and district hospitals. The community-financed transport systems have continued in six villages and in 2006 they transported pregnant women and others with medical emergencies to health facilities. A review of existing surveillance data showed improvements in prenatal care indicators

Table 1. Village health worker activities related to reproductive health issues in the 29 villages, in Tanzania

VHW[a] activities	*Number (n = 248)*	*Percent (%)*
Education about family planning	206	87.7
Education about sexually transmitted diseases	194	82.2
Education about pregnancy-related danger signs	188	80.3
Refer pregnant women for antenatal care	194	83.6
Give advice to pregnant women during labor and delivery	199	85.0
Following pregnancies	177	75.6
Keep records of pregnant women	167	70.8
Work at a health facility	208	91.6

[a]VHW participated in multiple activities

both over time within the target districts and in comparison to the five additional districts in the Mwanza Region. The changes appear to persist over the time periods examined. However, these increases were higher in the interval from 2000 to 2002, a period directly after CBRHP implementation.

Village health workers

All 29 villages assessed had multiple VHWs, and 41% (51/124) of the VHWs had been trained on maternal and infant health and community mobilization by the CBRHP. The community survey data showed that 56% of the VHWs worked on maternal and child health; 41% were working on HIV/AIDS; and the rest worked on other things. The VHWs with training from CBRHP have continued to provide an array of reproductive health education and services according to the community survey (Table 1). Each village assessed reported having 1–2 CBRHP-trained VHWs. No significant differences were observed on the number of VHWs or their activities among village with different end-of- project status. The majority of the CBRHP-VHWs spend time working at the local dispensaries assisting the Dispensary-in-Charge and that was the case throughout the 29 villages. The CBRHP-trained VHWs indicated that they assisted during the days when women and children attended clinic at the local dispensaries and that they maintained a regular schedule of work. Data from the VHWs survey showed that the reasons all the VHWs, including the CBRHP-trained, continue to volunteer included enjoyment (83%), becoming well known in the community (13%), praise (11%), and leadership opportunities (7%). Two villages paid their VHWs, one from a market-day tax levied on sales of goods, and the other from a community-fund. The CBRHP-trained VHWs have continued to work for more than five years and they report on their activities during village assembly meetings.

Transport

The community survey results showed that in 2006, 12 (41%) of the 29 villages reported having an emergency transport system (7 of the 10 villages with functioning systems in 2001, 4 of the 9 villages with plans for a system in 2001, and 1 of the 10 randomly selected villages without plans for a system in 2001). Six of the 12 emergency transport systems were community-financed, one had not functioned since 2005, and the other 5 were privately owned and people could pay for use. Therefore, six community-supported systems have continued to function since the CBRHP activities ended in 2000 (Table 2). The modes of transportation included tricycles with platforms, canoes, oxcarts, and stretchers. The transport to the local dispensary or health center is free or a nominal fee (1,500 Tanzania Shillings) may be charged for compensating the driver/tricycle operator. These costs may increase depending on mode (canoes require more people to operate) and distance to the district hospital. The community survey data showed that among the six villages with community-supported transport systems, village-level decisions were more likely to be made by discussion than among those without community-supported systems (94.6% versus 75.4%; Chi-square = 6.8; $p < 0.01$). There was a significant difference between the villages with community-supported systems and those without on the indicator of mutual assistance. Those with community-supported systems were more likely to report that people in the village gave each other assistance in times of need than among those without a

Table 2. Community financed emergency transport systems in use among villages in the Kwimba and Missungwi districts of Tanzania

Villages	*Number of pregnant women who used the system in 2006*	*Number of other villagers who used the system in 2006*[b]	*System type*	*Number of years system has been operational*
Gambajiga	7	8	Tricycle	≥5 years
Lutalutale	5	11	Canoes/oxcart/stretcher	≥5 years
Matale	1	5	Tricycle/oxcart/canoe	≥5 years
Mbarika	8	16	Canoes/oxcart/bicycle/ stretcher	≥5 years
Mwadubi	4	13	Tricycles/oxcart	≥5 years
Ngaya[a]	4	2	Tricycle/canoes	≥5 years
Total[b]	29	55		

[a]There was still free transport from the village to the health dispensary, but getting to a hospital required a canoe, which was broken but had been operational until January 2007. People now have to make there own arrangements to get to the hospital.
[b]May include people living outside the official boundary of the village.

system (64.9% versus 42.4%; Chi-square = 6.3; $p < 0.01$). The two sets of villages were similar on other indicators examined (e.g. presence of CBRHP-trained village health workers), and extent of female participation in village assembly meetings.

Qualitative data indicated that the VHWs in the villages with community-financed systems mobilize the transport system and arrange for a driver to pick up the person from their home and take them to the local dispensary or the district hospital. Contextual data on why the communities have continued to support transport systems in the six villages had several features in common (Table 3). Each village with a publicly financed transport system has institutionalized it by having a designated emergency transport committee to manage its use. Other characteristics that emerged

Table 3. Features common to villages with sustained emergency transport systems, Tanzania

Institutionalization/Capacity building – indicates the integration of transport in the village government
- Formal linkages between village government and Dispensary-in-Charge
- Emergency Transport Committee in each village
- Regular reporting about transport systems at village assembly meetings

Champions – people who advocate for emergency transport system
- Village leaders, including sub-village leaders
- Village health workers
- Dispensary-in-Charge
- Village residents

Characteristics defined by the village leaders to be important for continually investing in community systems
- Transparency in how the money generated for supporting transport system is handled by the village leadership
- Accountability from those in charge of maintaining the system to the village residents
- Open communication between village leaders and village members
- Regular communication between Dispensary-in-Charge and village
- Stable leadership
- Strong leadership
- Good governance

Program operations
- Establishment and maintenance of the Emergency Transport Committee
- Clear and well-communicated referral system
- Sub-village Canoe Maintenance Committee
- Installation of specific procedures/protocol for accessing transport services

Note: 12 open-ended group interviews were conducted with members of the village leadership and others who worked on maternal health issues.

from these interviews included: transparency, open communication with constituents, stable leadership and specific champions who advocated for maintaining these systems.

In 2006, the six villages with functioning transport systems reported having provided transport to 29 pregnant women with obstetrical difficulties and 55 other people needing emergency medical care. Using the 1998 census estimate of the six villages (16,20) and the World Health Organization surveillance guidelines (28), we estimated that of the 885 pregnant women about 133 (15%) may have needed assistance. Thus, 22% (29/133) of the pregnant women potentially in need of EMOC during pregnancy used the village transport systems to obtain that assistance.

Impact on maternal health

The existing MOHSW surveillance data were examined to assess changes in selected maternal health indicators that were the targets of CBRHP and FEMME interventions. There were significant improvements in women seeking prenatal care < 20 weeks gestation, identification of danger signs during pregnancy, both clinical and community identified, in the two districts from 2000 to 2002 and for most cases these improvements appear to have persisted, albeit at different levels between 2002 and 2005 (Table 4). Statistically significant increases were observed in the percentage of women identified with danger signs, especially community-identified danger signs; these were highest between 2000 and 2002 and then appear to drop between 2002 and 2005. Maternal mortality data show an increase between 2000 and 2002, but these were not statistically significant; however, a significant decrease, from 2002 to 2005, was observed in Kwimba (Table 4).

Discussion

Although, there is rarely an opportunity to go back and examine the legacy of projects, it is an important undertaking in contexts such as Tanzania. This assessment shows that some aspects of community-level programs may remain and continue to function after the project operations cease. The continued activities in turn may increase demand for maternal health services such as prenatal care and emergency obstetric services. The two components of CBRHP effort, the VHWs in 29 villages and the community-supported transport systems in 6 communities have been maintained for more than 5 years after the formal CBRHP program activities stopped, thereby demonstrating the independent continuation without external support.

Our assessment showed that the VHWs and the community-supported transport systems appear to have been integrated in the village political systems, where both VHW reports and transport committee reports are routinely discussed at village assembly meetings, adding evidence for institutionalization of some aspects of CBRHP (19–26). The CBRHP-trained VHW activities and reasons for working were similar across villages with different end-of-project status on transport system, indicating continued relevance. The maternal health indicators may represent the increase in demand for maternal health services generated by the CBRHP efforts and upgrading of district health facilities through FEMME within the two target districts. Existing research supports the integration of multiple approaches to safer motherhood (3–5,21–26).

The VHWs have continued with little compensation. Their roles appeared to have changed from solely village-based health workers to health-facility assistants and they may be expected to take on more responsibility (e.g. provide diagnoses). While this is an important contribution in a highly constrained human resource context, VHWs do need refresher training and proper supervision, concerns echoed by the VHWs and the village leadership during group interviews. In addition, CBRHP-trained VHWs continue to make contributions to maternal and newborn health in their villages by educating pregnant women and families and linking them with local and district health facilities. Getting women and their families to seek care for obstetrical difficulties and helping them access affordable transportation have been identified as significant steps in overcoming delays that can lead to maternal deaths (9–15,22,23). Maternal health indicators such as early entry into prenatal care, increased recognition of pregnancy-related danger signs observed in the surveillance data were likely to have been at least in part the result of community-level follow-up and education by VHWs. These indicators increased between 2000 and 2002 significantly, perhaps indicating increases in demand, and then dropped off between 2002 and 2005, perhaps indicating decrease in community-level effort.

Our finding that six villages had maintained their emergency medical transport systems for

Table 4. Selected service use indicators from the MOHSW surveillance data, 2000 to 2005

	2000		2002		*Percentage (%)change between 2000 and 2002*	*p-value for the percentage change 2000 to 2005*	2005		*% Change between 2002 and 2005*	*p-value for the percentage change 2002 to 2005*
Indicators	*N*	*Percent (SE)*	*N*	*Percent (SE)*			*N*	*Percent (SE)*		
Prenatal care < 20 weeks										
Kwimba	13370	37.7 (0.42)	13467	43.0 (0.43)	14.1⁺	<0.0001	14268	55.6 (0.42)	28.6⁺	<0.0001
Missungwi	11799	40.6 (0.45)	11530	59.0 (0.46)	45.3⁺	<0.0001	13740	49.0 (0.43)	16.9⁺	<0.0001
Mwanza Region‡	94012	32.8 (0.15)	114985	39.2 (0.14)	19.5	<0.0001	120133	46.9 (0.14)	19.6	<0.0001
Danger signs										
Kwimba	13370	22.7 (0.36)	13467	65.9 (0.41)	190.3⁺	<0.0001	14268	92.3 (0.22)	40.1⁺	<0.0001
Missungwi	11799	27.4 (0.41)	11530	38.7 (0.45)	41.2⁺	<0.0001	13740	40.9 (0.42)	5.7⁺	0.012
Mwanza Region‡	94012	32.6 (0.15)	114985	32.8 (0.14)	0.6	0.49	120133	38.4 (0.14)	17.1	<0.0001
Community identified Danger signs										
Kwimba	13370	15.7 (0.31)	13467	63 (0.42)	301.3⁺	<0.0001	14268	82.0 (0.32)	30.2⁺	<0.0001
Missungwi	11799	19.9 (0.37)	11530	34.0 (0.44)	73.8⁺	<0.001	13740	35.8 (0.41)	5.3⁺	0.036
Mwanza Region‡	94012	22.0 (0.14)	114985	28.8 (0.13)	30.6	<0.0001	120133	31.7 (0.13)	10.1	<0.0001
Access to service indicators		Expected deliveries						Expected deliveries		
Clean delivery# (%)										
Kwimba		No data	13765	51.0 (0.43)	—	—	13920	61.5 (0.41)	20.6	<0.001
Missungwi		No data	11396	54.0 (0.47)	—	—	11826	60.0 (0.45)	11.1⁺	<0.001
Mwanza Region‡		No data	96861	42.7 (0.16)	—	—	106518	52.4 (0.15)	22.7	<0.001
Maternal mortality per 100,000 live births (MMR)	Live births	MMR (SE)	Live births	MMR (SE)			Live births	MMR (SE)		
Kwimba	6501	261 (63.36)	8124	295 (60.26)	13.0	0.60	9538	115 (34.72)	61.0	0.028
Missungwi	5396	185 (58.55)**	6957	259 (61.01)	40.0	0.37	7764	116 (38.65)**	55.2	0.089
Mwanza Region‡	39582	285 (26.83)	62198	251 (20.09)	11.9	0.32	65620	210 (17.89)	16.3	0.13

‡Mwanza Region represents combined data from 5 districts and does not include data from the target districts of Kwimba and Missungwi.
#Clean delivery is defined by the MOHSW as those assisted by a trained person and occurring at a health facility. It is calculated as (health facility deliveries/total expected births)*100.
⁺Percentage change between the district (Kwimba or Missungwi) and the Mwanza Region is significant at p<0.05.
**Relative of Standard Error greater than 30; estimate may not be stable.

more than 5 years shows that communities are willing to invest in health initiatives that have broader appeal and fulfill an identified need (3,5,10–12). Such village-financed transport mechanisms have previously been shown to be effective in reducing delays in transporting patients to health facilities (3,5,17–20). The village representatives identified factors that have contributed to continuation of community support for emergency transport systems and these have been cited as important aspects of sustainability in the literature (17–20). Further work to fully assess patterns of transportation access by vulnerable populations in the village is needed as only one-fifth of projected EMOC need was addressed by the existing systems.

The results should be interpreted with caution because of several limitations. For one, the villages with community-supported transport systems may be different from villages without such systems in terms of their leadership priorities, changes in leadership, resources, experiences with maternal deaths, and distance to health facilities. The majority of the community-supported transport systems were from villages located in the Missungwi district, the more remote of the two districts and where lake travel is necessary to access the district hospital. It is possible that communities there were more organized around emergency transport due to the topographical challenges they experienced in accessing health facilities (14). There were no community-supported transport systems in these communities prior to CBRHP (13–15). Due to limited resources we were not able to follow up with villages that reported having privately owned transport systems. Development of private systems shows that there is still a recognized need for emergency transport and access in these communities may be determined by the economic means of individual families. Another limitation is that we examined data from a subset of villages that were part of the district-wide CBRHP efforts; therefore the findings are not generalizable to all the villages in the districts. However, the findings do provide insights about what remains of major components of CBRHP in 29 villages. Another limitation is that the district-wide impact of the CBRHP on maternal health may be influenced by factors that we did not assess. Although the surveillance data provide insights into the service use patterns, the findings should not be viewed as solely attributable to CBRHP efforts. The results may be due to the synergistic effects of community-level mobilization and interventions of quality improvements that were district-wide both by CBRHP and availability of EMOC services resulting from the FEMME initiative, both implemented by CARE-Tanzania (13–16). Finally, the surveillance data collected by MOHSW were derived from reports generated by the health facilities and these vary in both quality and completeness.

Despite these limitations, we found that CBRHP-trained VHWs were still providing an important link between village residents and the healthcare systems, and educating women and families about critical reproductive and pregnancy-related issues. Also encouraging was our finding that six villages have continued to maintain community support for emergency transport since the end of the CBRHP. District-level data on maternal health indicators suggested that district-wide CBRHP efforts coupled with improvements in access/quality of EMOC services may have contributed to observed changes within the districts of Kwimba and Missungwi (16). The patterns in the data reinforce the ideas that both community and service delivery systems working together may be necessary to effect change in maternal health (3–12,21–26). The community mobilization is important for educating families and women on birth planning, danger signs, and quick action should an obstetric emergency arise. The rise in demand for services has to be accompanied by functioning health facilities that are capable of providing EMOC services, an outcome that was accomplished by the FEMME initiative (16). Sustainability of this effort, however, will remain a subject of future research.

Conclusions

Using multiple sources of data, we were able to assess aspects of CBRHP that have remained and their potential impact on maternal health indicators. These findings provide insights about post-project follow-up and legacy of programs that require large investments from the target communities. Overcoming the three levels of delays that can occur during obstetrical emergencies is challenging and requires the mobilization of resources at both the community level and the health service delivery levels. Programs such as the CBRHP can increase community members' demand for EMOC services and continue to do so over time if the activities are sustained at the community level. However, such programs will impact maternal health

if well-staffed and adequately supplied healthcare facilities are available.

OMB Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

Acknowledgements

We express our gratitude to the field assistants and the communities who participated in the assessment. We also thank Dr. Thomas Schmid for his advice and support.

References

1. World Health Organization (WHO), UNICEF. Revised 1990 Estimates of Maternal Mortality. Geneva, Switzerland: WHO, UNICEF; 1996.
2. World Health Organization (WHO), UNICEF. Maternal Mortality in 2005: estimates developed by WHO, UNICEF, UNFPA and the World Bank. Geneva, Switzerland WHO; 2005.
3. Campbell O, Graham W, on behalf of the Lancet Maternal Survival Series steering group. Strategies for reducing maternal mortality: getting on with what works. Lancet 2006; 368: 1284–8.
4. Starrs A. Safe Motherhood Initiative: 20 years and counting. Lancet 2006;368:1130–2.
5. Goodburn E, Campbell O. Reducing maternal mortality in the developing world: sector-wide approaches may be the key. BMJ. 2001; 322: 917–20.
6. Maine D, Rosenfield A. The Safe Motherhood Initiative: why has it stalled? Am J Public Health. 1999; 89:480–2.
7. Tita AT. The role of emergency obstetric care in the Safe Motherhood Initiative. Am J Public Health. 2000; 90: 810.
8. Sundari TKO. The untold story: how the health care systems in developing countries contribute to maternal mortality. Int J Hlth Serv. 1992; 22: 513–28.
9. Thaddeus S, Maine D. Too far to walk: maternal mortality in context. Soc Sci Med. 1994; 38: 1091–110.
10. Fawacus S, Mbizvo M, Gunilla L, Nystrom L. A community-based investigation of avoidable factors for maternal mortality in Zimbabwe. Stud Fam Plann. 1996; 27(6): 319–27.
11. Urassa E, Massawe S, Linkmark G, Nystrom L. Operational factors affecting maternal mortality in Tanzania. Hlth Poli Plann. 1997; 12: 50–7.
12. Hofman JJ, Dzimazi C, Lungu K, Ratsma EY, Hussein J. Motorcycle ambulances for referral of obstetric emergencies in rural Malawi: do they reduce delay and what do they cost? Int J Gyn Obst. 2008; 102: 191–7.
13. Ahluwalia IB, Kouletio M, Curtis K, Schmid T. Community empowerment: CDC collaboration with the CARE Community Based Reproductive Health Project in two districts in Tanzania. J Womens Health Gend Based Med. 1999; 8(9): 1015–19.
14. Schmid T, Kanenda O, Ahluwalia IB, Kouletio M. Transportation for maternal emergencies in Tanzania: empowering communities through participatory problem solving. Am. J Pub Hlth. 2001; 91(10): 1589–90.
15. Ahluwalia IB, Schmid T, Kouletio M, Kanenda O. An evaluation of a community-based approach to safe motherhood in northwestern Tanzania. Int J Gynecol Obstet. 2003; 82: 231–40.
16. Kayongo M, Rubardt M, Butera J, Abdullah M, Mboninyibuka Madili M. Making EmOC a reality: CARE's exerience in areas of high maternal mortality in Africa. Int. J Gynecol Obstet. 2006; 92: 308–19.
17. Sarriot EG, Winch PJ, Ryan LJ, Bowie J, Kouletio M, Swedberg E, et al. A methodological approach and framework for sustainability assessment in NGO-implemented primary health care programs. Int J Health Plann Manage. 2004; 19: 23–41.
18. Swerissen H, Crisp BR. The sustainability of health promotion interventions for different levels of social organizations. Hlth Promot Int. 2004; 19: 123–30.
19. Shediac-Rizkallah MC, Bone LR. Planning for the sustainability of a community-based health program: conceptual frameworks and future directions for research, practice, and policy. Health Educ Res. 1988; 13(1): 87–108.
20. Johnson K, Hays C, Center H, Daley C. Building capacity and sustainable prevention innovations: a sustainability planning model. Eval and Program Plann. 2004: 27; 135–49.
21. Walraven GEL. Primary reproductive health care in Tanzania. Eur J Obstet Gynecol Reprod Biol. 1996; 69: 41–5.
22. Kwast BE. Building a community-based maternity program. Int J Gynecol Obstet. 1995; 48(Suppl): S67–S82.
23. Alisjahbana A, Dharmayanti R, Hermawan D, Kwast BE, Koblinsky M. An integrated village maternity service to improve referral patterns in a rural area in West-Java. Int J Gynecol Obstet. 1995; 48(Suppl): S83–S94.
24. Israel BA, Schultz AJ, Parker EA, Becker A. Review of community-based research: assessing partnership approaches to improve public health. Ann Rev Public Health. 1998; 19: 173–202.
25. Alexander JA et al. Sustainability of collaborative capacity in community health partnerships. Med Care Res Rev. 2003; 60(4 Suppl.): 130–60.
26. Koblinsky MA, Campbell O, Heichelheim J. Organizing delivery care: what works for safe motherhood? Bull World Health Org. 1999; 77(5): 399–406.
27. Keppel KG, Pearcy J, Klein R. Measuring Progress in Healthy People 2010. Statistical notes, No. 25. Hyattsville, Maryland: National Center for Health Statistics; September 2004.
28. World Health Organization. Reproductive Health in Refugee Situations-Interagency Manual. Chapter 9: Surveillance and Monitoring [Internet]. 1999. Available from: http:// www.who.int/reproductive-health/publiztions/interagency_manual_on_RH_in_refugee_situation.