ORIGINAL RESEARCH

Community Health Workers and Disasters: Lessons Learned from the 2015 Earthquake in Nepal

Karla Fredricks, MD, MPH;[1,2] Hao Dinh, BS;[1] Manita Kusi, BPH;[3] Chandra Yogal, MPH;[3] Biraj M. Karmacharya, MBBS, MSc, PhD;[3,4] Thomas F. Burke, MD;[1,2,5] Brett D. Nelson, MD, MPH, DTM&H[1,2,5]

1. Division of Global Health and Human Rights, Department of Emergency Medicine, Massachusetts General Hospital, Boston, Massachusetts USA
2. Harvard T.H. Chan School of Public Health, Boston, Massachusetts USA
3. Dhulikhel Hospital, Dhulikhel, Nepal
4. Kathmandu University School of Medical Sciences, Dhulikhel, Nepal
5. Harvard Medical School, Boston, Massachusetts USA

Correspondence:
Karla Fredricks, MD, MPH
Division of Global Health and Human Rights
Department of Emergency Medicine
Massachusetts General Hospital
E-mail: karla.fredricks@gmail.com

Conflicts of interest: none

Keywords: community health networks; disaster planning; earthquake; emergencies; Nepal

Abbreviations:
CHW: community health worker
FCHV: female community health volunteer
FGD: focus group discussion
MHG: mothers' health group
MUAC: mid-upper arm circumference
NGO: nongovernmental organization
WHO: World Health Organization

Received: October 25, 2016
Revised: January 27, 2017
Accepted: March 8, 2017

Online publication: August 8, 2017

doi:10.1017/S1049023X1700680X

Abstract

Introduction: The Nepal earthquake of 2015 was a major disaster that exacted an enormous toll on human lives and caused extensive damage to the infrastructure of the region. Similar to other developing countries, Nepal has a network of community health workers (CHWs; known as female community health volunteers [FCHVs]) that was in place prior to the earthquake and continues to function to improve maternal and child health. These FCHVs and other community members were responsible, by default, for providing the first wave of assistance after the earthquake.

Hypothesis/Problem: Community health workers such as FCHVs could be used to provide formal relief services in the event of an emergency, but there is a paucity of evidence-based literature on how to best utilize them in disaster risk reduction, preparedness, and response. Data are needed to further characterize the roles that this cadre has played in past disasters and what strategies can be implemented to better incorporate them into future emergency management.

Methods: In March 2016, key-informant interviews, FCHV interviews, and focus group discussions (FGDs) were conducted in Nepali health facilities using semi-structured guides. The audio-recorded data were obtained with the assistance of a translator (Nepali-English), transcribed verbatim in English, and coded by two independent researchers (manually and with NVivo 11 Pro software [QSR International; Melbourne, Australia]).

Results: Across seven different regions, 14 interviews with FCHVs, two FGDs with community women, and three key-informant interviews were conducted. Four major themes emerged around the topic of FCHVs and the 2015 earthquake: (1) community care and rapport between FCHVs and local residents; (2) emergency response of FCHVs in the immediate aftermath of the earthquake; (3) training requested to improve the FCHVs' ability to manage disasters; and (4) interaction with relief organizations and how to create collaborations that provide aid relief more effectively.

Conclusions: The FCHVs in Nepal provided multiple services to their communities in the aftermath of the earthquake, largely without any specific training or instruction. Proper preparation, in addition to improved collaboration with aid agencies, could increase the capacity of FCHVs to respond in the event of a future disaster. The information gained from this study of the FCHV experience in the Nepal earthquake could be used to inform risk reduction and emergency management policies for CHWs in various settings worldwide.

Fredricks K, Dinh H, Kusi M, Yogal C, Karmacharya BM, Burke TF, Nelson BD. Community health workers and disasters: lessons learned from the 2015 earthquake in Nepal. *Prehosp Disaster Med*. 2017;32(6):604-609.

Introduction

On April 25, 2015, Nepal experienced a major earthquake and ensuing aftershocks that killed nearly 9,000 people, injured greater than 22,000 others, and partially or fully destroyed more than one million homes.[1] In mountainous Nepal, the effect of this disaster was especially devastating in communities whose access to outside resources was difficult due to the terrain. While any earthquake can be expected to destroy roads, damage cell phone towers, disrupt electric and water supplies, render homes uninhabitable, decrease food availability, and create a myriad of medical needs, the impact is exponentially worsened when aid relief is delayed.[2] After the 2015 earthquake in Nepal, it was several

	Mean	Range
Age (years)	41.5	20-59
Length of Time as FCHV (years)	15.0	3-26
Walking Distance from Area to Health Facility (minutes)	41.3	3-180
Number of Households Covered per FCHV	125.3	15-350

Table 1. FCHV Demographic Data (n = 14)
Abbreviation: FCHV, female community health volunteer.

days before any outside supplies could reach many of the more isolated villages, and then only by helicopter. For countries with limited resources and populations living in areas that are difficult to access, the local community may be the only option available to assist in the critical time period immediately following a disaster.

With over 1.3 million community health workers (CHWs) globally,[3] this cadre is an untapped resource that may be able to contribute considerably to disaster risk reduction, preparedness, and response.[4] In Nepal, the CHW role is filled by approximately 50,0000 female community health volunteers (FCHVs) under the direction of the Ministry of Health and Population (Kathmandu, Nepal), supervised monthly by medical professionals at the local government level.[5,6] The FCHVs, like most CHWs worldwide, are trained to assist households with family planning services, track immunizations, and treat respiratory infections and diarrhea, in addition to providing education on newborn care, nutrition, proper hygiene, and safer motherhood.[5] By program design, they reside in the communities they serve, placing them in position to aid the households under their care in the event of an emergency. The challenge is that evidence is lacking on what type of training is most effective in preparing these CHWs for such an event, as well as on the best mechanism for incorporating them into the emergency response.

The primary objective of this study was to document – from the perspective of Nepalese FCHVs, community members, and key informants – the ways in which FCHVs contributed to the 2015 earthquake relief response, both independently and through collaboration with other organizations. A secondary goal was to elicit FCHVs' recommendations on trainings they felt would help improve their capabilities to prepare for and address the emergency conditions that arise as a result of a disaster. This information can be used to aid the international understanding of the community first-responder experience in emergencies and to guide future research and implementation of disaster risk management for CHWs around the world.

Methods

Key-informant interviews, FCHV interviews, and focus group discussions (FGDs) were conducted at local health facilities during a two-week period in March 2016. Prospective participants were included if they were: (1) established and in position prior to the earthquake; (2) still in the same position at the time of the study; (3) knowledgeable about the activities of FCHVs; and (4) able to communicate effectively in English or Nepali. Potential study candidates were excluded if they did not meet all four of the above criteria.

Key informants were chosen by reputational case selection to span different levels of FCHV supervision, while the FCHVs were purposively selected by maximum variation sampling to optimize the diversity of experiences included.[7,8] The FGD participants were recruited by phone and word-of-mouth invitation to all women in the community's "mothers' health group" (MHG), an association of women who gather regularly with their FCHV. The purpose of the FGDs was to provide a community perspective through which to triangulate the data gleaned from the FCHV and key-informant interviews.

All of the semi-structured interviews and FGDs were conducted with the assistance of a local Nepali-English translator, audio-recorded, and transcribed verbatim from the English translation. The transcripts were then coded by two independent researchers, using topics from the interview guide (Appendix; available online only), as well as themes that emerged during data analysis. Coding was performed both manually and with the assistance of NVivo 11 Pro software by QSR International (Melbourne, Australia).

The study was facilitated by the Dhulikhel Hospital Department of Community Programs (Dhulikhel, Nepal). The regions included were between 45 minutes and three hours driving distance from the hospital and were all sites that received outreach programming from the hospital. Ethical approval of this study was given by both Dhulikhel Hospital (Dhulikhel, Nepal) and the Harvard T.H. Chan School of Public Health (Boston, Massachusetts USA). Verbal consent was obtained prior to the initiation of each interview or FGD, and no financial incentive was provided for participation in the study.

Results

Fourteen FCHVs were interviewed, including two women from each of seven regions dispersed within Kavre, Sindhupalchowk, and Dhading Districts in central Nepal. They were all married mothers who had attended a standard 16-day or 18-day government training following their selection as FCHVs by the members of their respective MHGs. Five (35.7%) of them had never received any formal education and did not possess significant literacy skills. All FCHVs were uncompensated, except for the nominal financial assistance provided for attending trainings or special events such as vitamin distribution days or vaccination campaigns. The cohort of FCHVs interviewed represented different regions uniquely affected by the earthquake, a wide range of ages, varying amounts of experience as FCHVs, and considerable variability in distance of their community to the nearest health facility (Table 1).

The three key informants included the focal point person for FCHVs in Kavre District (who oversees 980 FCHVs), an FCHV supervisor and health center director, and an auxiliary nurse-midwife who worked alongside FCHVs in the community. The FGDs were conducted in two of the seven regions (one that

https://doi.org/10.1017/S1049023X1700680X Published online by Cambridge University Press

Improved:
• "They [community members] believe in us more than before the earthquake, as we have visited various places of the household and provided various suggestions to them."
• "As our responsibilities have increased, people have a lot of trust in us."
• "Nowadays, we are getting positive response from the community people after the earthquake… Maybe it's due to our active involvement during the earthquake activities, and after the earthquake we did provide much more information to the community."
• "After the earthquake, people have some more respect for us as we have served the people."
Worsened:
• "Nowadays, people don't have their shelter and living places, and FCHVs have not helped during the earthquake for rebuilding the houses. On other support [from FCHVs], like preparing the supplementary food for children, it is a very small matter [to the community], so they just ignore that."
• "Before the earthquake, people used to agree with what we said. But after the earthquake, they do not agree with what we say because at the time of the earthquake they felt that they didn't get any help. So, at the time of disaster, if you could not help, what should we expect from you now?"

Table 2. Post-Earthquake Relationship between FCHVs and the Community
Abbreviation: FCHV, female community health volunteer.

experienced severe destruction from the earthquake and one that suffered only minor damage) and involved nine participants in one group and 11 in the other.

During the interviews and FGDs, four major topics related to FCHVs and the 2015 earthquake emerged and reached thematic saturation: (1) community care and rapport; (2) emergency response; (3) training; and (4) interaction with relief organizations.

Community Care and Rapport

The FCHVs were committed to their communities and respected as providers of health information and services, especially for women and children. Prior to the earthquake, they were tasked with treating simple illnesses as well as providing health education and disease prevention. The FCHVs distributed medications such as zinc and oral rehydration solution to community members with diarrhea, acetaminophen for those with fever, iron tablets for pregnant women, and oral contraception pills and/or condoms for family planning. When illnesses required more advanced care, FCHVs referred patients to local health facilities. In terms of health education, each FHCV met monthly with her community's MHG to discuss topics pertaining to nutrition and sanitation. She also advised on birth spacing, neonatal care, and for pregnant women, the importance of antenatal visits and delivery in a health facility. To further prevent disease, she routinely gave vitamin A and polio immunizations to children under five years of age, checked that their other vaccines were up to date, and monitored their weights every month.

After the 2015 earthquake, FCHVs continued their regular duties and started assessing for malnourishment by measuring the mid-upper arm circumference (MUAC) of children ages six months to five years. In response to the increasing rates of pediatric malnutrition found by MUAC assessment, FCHVs were instructed to begin distributing a micronutrient powder supplement to all children in that age group.

Their commitment to help was summarized by one of the FCHVs, who stated, "I am ready to serve the people, as I have taken the step forward to help the community, so will not take that step backward." Another FCHV expressed why she felt so determined to assist in her community:

> By working as an FCHV, I have been involved in taking care of many children, and I am seen as one of the mothers. I feel I do have love and affection to each and every one of the children as if they are my own.

Due to the FCHVs' dedication and beneficial contributions, their communities held them in high regard. Some FCHVs stated, "They [community members] believe in me so much," and "People easily accept my suggestions and advice." The mothers in the FGDs concurred, saying, "They [FCHVs] have helped us in various aspects of care for our children. We think of them in a good way." In the aftermath of the earthquake, eight (57.1%) of the FCHVs reported that their communities continued to view them in the same positive manner. Four (28.6%) of them noted that they had gained additional respect after the disaster, while two (14.3%) found a less receptive audience in their communities (Table 2).

Emergency Response

After the earthquake, FCHVs were able to provide assistance for many of the new problems in the community, mostly without formal instruction from their supervisors. The major issues that arose pertained to shelter, water, food, latrines, and illness, including mental health and pediatric concerns. In terms of shelter, there was an immediate need for safe housing, as many homes were collapsed or damaged. The temporary shelters or tents that were erected were not able to withstand inclement weather, and people suffered further injuries from their destruction. Despite this, most people continued to reside in temporary housing nearly one year after the earthquake; their former homes were either completely collapsed or rendered unsafe, and they did not have the resources needed to rebuild. However, some community members returned to homes that had been damaged, despite the decreasing but persistent aftershocks that threatened to further weaken the foundations of their houses.

In addition to shelter, insufficient safe drinking water was a significant issue after the earthquake. Reservoirs that had been clean prior to the event became polluted or no longer accessible (eg, the pipes that brought water from the source became blocked). Due to the destruction of latrines, open defecation became routine practice in many communities, often on the banks of the same river used to obtain drinking water. Access to food was also a problem; people could not retrieve foodstuffs or cooking equipment from the piles of rubble that had once been their homes.

Physical and mental health were particularly large concerns, especially for children. Apart from injuries, common illnesses that presented after the earthquake were diarrhea, upper respiratory tract infections, fever, nausea, rashes, loss of appetite, and premature delivery. There were severe shortages of medical resources such as medication and transportation (eg, stretchers and vehicles to carry the

https://doi.org/10.1017/S1049023X1700680X Published online by Cambridge University Press

wounded/sick). Children were particularly at risk of negative effects from disease and lack of medications due to their increased susceptibility to cold and risk of exposure to snakes and insects. They also suffered from psychological trauma:

> The children who can understand, who are from the ages of 5-15, they still are afraid. If in case a little bit of shake comes, the children just want their parents to carry them so they can't fall.

In addition to the mental health effects on children, many adults – including FCHVs – struggled with anxiety and fear. According to one FCHV, she was afraid to resume her normal activities, even more than 10 months after the earthquake:

> I think that even now the aftershocks are coming. By working, by going to work, it might be bad for me. I have a decrease in my interest towards doing the work due to the aftershocks coming time and again.

Another FCHV noted:

> During the earthquake, other people, they have anxiety. And still I'm living in temporary shelter. If something comes and falls in my seat, it makes a loud noise and I am worried.

In spite of personal concerns, most FCHVs were able to contribute substantially to the disaster response prior to the arrival of external aid, since neither governmental nor international relief agencies reached the seven study regions for a mean of 18.9 days (range 1-60 days). Without instruction, FCHVs provided basic first aid, assisted with transport of the severely wounded, participated in search and rescue of people who were trapped, suggested proper management of human and animal corpses, helped distribute and ration available food, aided construction of temporary shelters, and salvaged useful materials from partially-collapsed houses. Perhaps most importantly, they took it upon themselves to share messages of psychological support, telling mothers and children to remain calm and reassuring them that they were safe. The FCHV supervisors were mainly concerned with preventing diarrheal illnesses and advised their FCHVs to have community members boil water or use purification units, wash their hands after using a latrine and before eating, and make temporary latrines by digging holes and then covering up deposited human waste with mud. It was generally at least two days before FCHVs heard these instructions and, since some FCHVs were never given relief-specific tasks from their supervisors, many of the interviewed FCHVs shared sanitation information on their own.

Training

Since FCHV training programs are largely focused on maternal and child health and do not include sessions on disaster management, the majority of FCHVs interviewed felt that they needed additional instruction in order to be better prepared for future emergencies. Firstly, they requested information on how to build safe housing, in terms of permanent structures that are less likely to collapse as well as temporary shelters that will resist the elements. Secondly, they wanted to understand how to keep pregnant women and children safe and healthy during a disaster (eg, how to meet their nutritional needs when limited food is available). Other desired trainings included more first aid courses, learning about common illnesses that could arise and how to prevent them, personal hygiene after a disaster, and further information on water purification techniques. The FCHVs were also interested in how to create resilience:

> Those kinds of training should be provided that can make the people psychologically strong so that they can be able to fight, be mentally strong before the earthquake.

Interaction with Relief Organizations

The FCHVs consistently stated that aid agencies, both governmental and nongovernmental, should partner with them when planning to bring disaster relief to their communities. In two of the areas, international nongovernmental organizations (NGOs) did collaborate with FCHVs to distribute aid such as medication, food, and water purification units. One region's FCHVs were requested to provide data to the NGOs on the number of households in their wards and the number of individuals within each household. This information was then used by organizations to apportion available relief funds to build shelters and latrines. While the majority of other FCHVs indicated that outside relief agencies were involved in their communities, they did not interact with them.

Interviewed FCHVs suggested that, subsequent to a disaster, governments and NGO emergency aid teams should closely collaborate with local FCHVs in the early stages of the response in order to help determine the exact needs of the community:

> Outside organizations, they should coordinate better with the FCHV so that they can get the knowledge from the FCHV about the whole community – what might be the needed things – so that they can find out or prioritize the needs and provide assistance to the community.

The FCHVs noted that acting as a liaison between their communities and relief agencies could help direct the distribution of aid to those who need it most. One FCHV stated, "FCHVs can be mediators because they know the community well and the community members trust them." According to the FCHVs, this method would bring about a more equitable allotment of services and "it would be easier for those organizations to work efficiently and effectively."

Discussion

This study highlights the vital roles of Nepalese FCHVs in the aftermath of the 2015 earthquake. Their entrenched, trusted relationships with the communities in which they live and serve uniquely positioned them to respond to the disaster. By helping build shelters, caring for the sick, and providing hope in the face of devastation, FCHVs brought support to those with whom they were intimately familiar. Although it is not possible to measure their effect, it is likely that the FCHVs' actions decreased mortality, improved the mental health of their communities, addressed simple illnesses and injuries, and helped prevent epidemic diseases. Where FCHVs were able to contribute beneficially to relief efforts, their communities' respect for them was maintained – and, in some cases, strengthened – after the event. However, in areas where the community felt that FCHVs were unable to assist with meeting their basic needs, the strong pre-earthquake rapport suffered.

The interviewed FCHVs suggested that dedicated training in disaster preparedness and emergency management for all FCHVs could help preserve the FCHV-community relationship. It could also improve the effectiveness of early relief efforts, since the majority of local leaders, health facilities, and humanitarian

https://doi.org/10.1017/S1049023X1700680X Published online by Cambridge University Press

aid agencies were not able to intervene immediately after the earthquake. The training topics requested by the FCHVs – including psychological first aid, wound care, water and sanitation, and construction of temporary shelters – are not methodologically difficult to teach or understand. These subjects could be incorporated into the standardized education that each new FCHV receives at the start of her career, as well as disseminated through separate information sessions for existing FCHVs. In turn, FCHVs could share the knowledge and skills with their communities at the monthly MHG meetings, thus increasing the entire community's capacity to take care of itself in the event of a future earthquake or other disaster.

In 2011, the Global Health Workforce Alliance, United Nations High Commissioner for Refugees (UNHCR; Geneva, Switzerland), United Nations International Children's Emergency Fund (UNICEF; New York, New York USA), World Health Organization (WHO; Geneva, Switzerland), and International Federation of Red Cross and Red Crescent Societies (IFRC; Geneva, Switzerland) published a joint statement that called upon governments and NGOs to recognize the key contributions of CHWs in emergency management and to invest in further training of CHWs in this arena.[9] This brought increased international attention to the importance of CHWs in fulfilling the community component of emergency management that has been endorsed by leading humanitarian agencies such as the United Nations International Strategy for Disaster Reduction (UNISDR; Geneva, Switzerland) – through the Hyogo Framework for Action 2005-2015 and Sendai Framework for Disaster Risk Reduction 2015-2030 – and the WHO, among many others.[10-12] In Nepal, however, the most recent iteration of its disaster policy was published in 2009 and does not include community-based participation in disaster preparedness, risk reduction, or emergency response.[13] Furthermore, a 2012 commitment from 47 African countries to implement a 10-year health disaster risk management strategy did not specifically mention the involvement of CHWs, despite the fact that a network of these individuals was already in place in many of the regions.[14,15] That same year, a systematic review of the international literature found that none of the published disaster management approaches described a holistic, health system strengthening plan.[16] Without the incorporation of all levels of the health system, including community-based resources such as CHWs, an emergency risk reduction and response strategy is unlikely to succeed.[10-12]

Although CHWs have not been formally incorporated into most emergency management plans, mounting evidence from disaster relief efforts (eg, 2008 Cyclone Nargis in Myanmar, 2010 flooding in Pakistan, and 2013 Typhoon Haiyan in the Philippines) indicates that CHWs can play a critical role in emergency response.[17-19] Future research is needed in order to better understand how to optimally utilize this often-overlooked cadre, including studies of best-practice training packages for CHWs on disaster management and further investigation into the most effective implementation strategies. While this research is ongoing, CHW programs should move forward with training and equipping CHWs in emergency response, based on the currently available evidence. The international humanitarian community does not have the ability to rapidly assist in all man-made and natural crises, and the inclusion of properly prepared CHWs in relief efforts may be the solution necessary to fill this void.

Limitations

This study was limited by the need to use a translator; while every attempt was made to do so, quotations may not represent verbatim Nepali responses from the participants. Nevertheless, clear themes consistently emerged from the data. The research was also restricted by geography, as only the outreach areas visited by Dhulikhel Hospital were included. Although these regions may have inherently had different occurrences after the earthquake than regions with no health access, the variability documented among the experiences of FCHVs, key informants, and community mothers in this study suggests the sample is representative of the broader effect of the earthquake in Nepal. Finally, although this type of study could be susceptible to social desirability bias, the effect was minimized by explaining to participants that their responses would remain anonymous and that the purpose of the questions was to capture their individual stories and thoughts.

Conclusion

In Nepal, community-based FCHVs were instrumental in mitigating the devastating effects from the 2015 earthquake, both in the immediate aftermath of the disaster and during the recovery period. Targeted training of FCHVs – and CHWs in general – on how to prepare for and respond effectively, coupled with formal collaborations with relief agencies, has the potential to significantly increase the capacity of CHWs to respond to future emergencies. The experiences and recommendations of the participants in this study could be used to help guide the design of disaster preparedness and emergency response policies for CHW programs in various contexts as well as inform humanitarian organizations and governments on how to best incorporate CHWs into coordinated disaster response plans.

Supplementary Material

To view supplementary material for this article, please visit https://doi.org/10.1017/S1049023X1700680X

References

1. Government of Nepal. Incident Report of Earthquake 2015. http://drrportal.gov.np. Accessed October 1, 2016.
2. Noji EK. Public health issues in disasters. *Crit Care Med*. 2005;33(1 Suppl):S29.
3. World Health Organization. Global Health Workforce Statistics database. Updated 2014. http://www.who.int/hrh/statistics/hwfstats/. Accessed October 1, 2016.
4. Nicholls K, Picou JS, Curtis J, Lowman JA. The utility of community health workers in disaster preparedness, recovery, and resiliency. *Journal of Applied Social Science*. 2015;9(2):191.
5. Miyaguchi M, Yasuoka J, Poudyal AK, Silwal RC, Jimba M. Female community health volunteers service utilization for childhood illness- improving quality of health services only is not enough: a cross-sectional study in mid-western region, Nepal. *BMC Health Serv Res*. 2014;14:383.
6. Schwarz D, Sharma R, Bashyal C, et al. Strengthening Nepal's female community health volunteer network: a qualitative study of experiences at two years. *BMC Health Serv Res*. 2014;14:473.
7. Schensul SL, Schensul JJ, LeCompte MD. *Essential Ethnographic Methods: Observations, Interviews, and Questionnaires (Ethnographer's Toolkit)*. Volume 2. Walnut Creek, California USA: AltaMira Press; 1999: 240.
8. Devers KJ, Frankel KM. Study design in qualitative research—2: sampling and data collection strategies. *Educ Health*. 2000;13(2):263.
9. Global Health Workforce Alliance, WHO, IFRC, UNICEF, UNHCR. Scaling-up the Community-Based Health Workforce for Emergencies: Joint Statement by the Global Health Workforce Alliance, WHO, IFRC, UNICEF, UNHCR. Published 2011. http://www.unicef.org/media/files/Scaling-up_community-based_health.pdf. Accessed October 1, 2016.
10. United Nations International Strategy for Disaster Reduction. Hyogo Framework for Action 2005–2015: Building the resilience of nations and communities to disasters. Published 2005. http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf. Accessed October 1, 2016.

11. United Nations International Strategy for Disaster Reduction. Sendai Framework for Disaster Risk Reduction 2015–2030. Published 2015. http://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf. Accessed October 1, 2016.
12. World Health Organization. World Health Assembly Resolution 64.10. Published 2011. http://apps.who.int/iris/bitstream/10665/3566/1/A64_R10-en.pdf. Accessed October 1, 2016.
13. Adhikari B, Mishra SR, Raut S. Rebuilding earthquake struck Nepal through community engagement. *Front Public Health*. 2016;4:121.
14. World Health Organization, Regional Committee for Africa. Disaster risk management: a strategy for the health sector in the African region. Report of the Secretariat. Published 2012. http://www.afro.who.int/en/downloads/cat_view/1501-english/2210-meetings-and-events/861-regional-committee/2065-sixty-second-session-of-the-who-regional-committee-for-africa/2066-english/2074-resolutions.html. Accessed October 1, 2016.
15. Olu O, Usman A, Manga L, et al. Strengthening health disaster risk management in Africa: multi-sectoral and people-centered approaches are required in the post-Hyogo Framework of Action era. *BMC Public Health*. 2016;16:691.
16. Bayntun C. A health system approach to all-hazards disaster management: a systematic review. *PLOS Curr*. 2012;1.
17. Campbell F, Shafique M, Sansom P. Responding to Cyclone Nargis: key lessons from Merlin's experience. Humanitarian Practice Network. Published 2008. http://odihpn.org/magazine/responding-to-cyclone-nargis-key-lessons-from-merlin%C2%92s-experience/. Accessed October 1, 2016.
18. United Nations Children's Fund. In Pakistan's flood-devastated Sindh province, female health workers play key role. Published 2010. http://www.unicef.org/infobycountry/pakistan_56039.html. Accessed October 1, 2016.
19. Hung KKC, Otsu S. Community Health Workers Prove the Key to Philippines Relief Efforts. *EPi Journal*. Published 2014. http://www.epijournal.com/articles/122/community-health-workers-prove-the-key-to-philippines-relief-efforts. Accessed October 1, 2016.

https://doi.org/10.1017/S1049023X1700680X Published online by Cambridge University Press