

Evaluating implementation of the Ebola response in Margibi County, Liberia

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Summary

Implementation of the Ebola response was credited with reducing incidence of Ebola virus disease (EVD) in West Africa; however little is known about the amount and kind of Ebola response activities that were ultimately successful in addressing the 2014 outbreak. We collaboratively monitored Ebola response activities and associated effects in Margibi County, Liberia, a rural county in Liberia deeply affected by the outbreak. We used a participatory monitoring and evaluation system, including key informant interviews and document review, to systematically document activities, code them, characterize their contextual features, and discover and communicate patterns in Ebola response activities to essential stakeholders. We also measured incidence of EVD over time. Results showed a distinct pattern in Ebola response activities and key events, which corresponded with subsequent decreased EVD incidence. These data are suggestive of the role of Ebola response activities played in reducing the incidence of EVD within Margibi County, which included implementing safe burials, social mobilization and community engagement and case management. Systematic monitoring and evaluation of response activities to control disease outbreaks holds lessons for implementing and evaluating similar comprehensive and multi-sectoral community health efforts.

Key words: community implementation, Ebola response effort, monitoring and evaluation, community engagement

INTRODUCTION

The Ebola virus disease (EVD) outbreak of 2014 in West Africa was the most severe and devastating among all of the Ebola epidemics to date (Feldmann and Geisbert, 2011). Among those countries primarily affected—Liberia, Sierra Leone and Guinea—residents of Liberia experienced the greatest number case-fatalities related to the disease (World Health Organization, 2016). Several factors were particularly important in this public health and humanitarian crisis: insufficient capacity, misinformed

communities, false rumors and a low-resourced and inadequate health system infrastructure (Weldon, 2001; Ratzan and Moritsugu, 2014). By mid-summer, the EVD outbreak reached epidemic proportions in West Africa, highlighting the need for a full-scale response led by the World Health Organization (WHO).

WHO's Ebola Response Roadmap provided guidance to local government officials to adjust county-specific operations plans, coordinate international action and crisis management and complement a UN-led effort for addressing basic needs among affected residents (e.g. food

security, physical protection, education). The plan's objectives were to: (i) achieve full geographic coverage with complementary Ebola response activities within the most affected countries/areas, especially those activities that promoted social mobilization through community engagement; (ii) ensure application of comprehensive Ebola response interventions in countries that contained initial cases or with localized transmission; and (iii) strengthen preparedness of all countries to rapidly detect and respond to Ebola exposures, especially among those sharing land borders with affected countries and hubs for international travel. To achieve them, the Roadmap identified priority activities for each objective that included the implementation of a comprehensive intervention package (e.g. creation of treatment centers, supervised burials), policies that limited national and international spread (e.g. limiting travel, exit screenings at airports) and ensuring essential services (e.g. increase capacity to address critical gaps in essential services, fast-track training programs for health workers), to name a few (World Health Organization, 2014). The policy implementation component of the Ebola response effort was a key priority activity of the strategic plan as these policies had the potential to affect a greater number of persons than targeted programs. For example, limiting the movement of people in areas with reported Ebola cases through quarantine has the potential to affect a much larger number of people than the amount that could participate in a program; and is potentially more impactful.

By early 2015, much of the outbreak had been contained in Liberia, one of the countries most affected by the EVD outbreak. Understanding the functional features of the Ebola Response Roadmap's implementation and its subsequent effect on EVD incidence is necessary and important for assuring a comprehensive public health infrastructure. This study sought to identify the amount and kind of activities implemented in the Ebola Response Roadmap in one affected county (Margibi County, Liberia) and to describe factors that corresponded with increases in activity and an associated marked reduction of EVD incidence in that area.

METHODS

Context and community description

Margibi County, home to more than 200 000 people, is the second-most densely populated county in Liberia. Located in the South-Central region of Liberia, it borders Montserrado County, the site of the nation's capital of Monrovia. Residents experience extreme rates of poverty—most without access to electricity, running water

or flushable toilets (Liberia Institute of Statistics and Geo-Information Services, 2011). Margibi County residents also have limited access to health care. The Liberia Institute of Statistics and Geo-Information Services report that between 56 and 69% of Margibi residents live more than 40 min from the nearest health facility (Liberia Institute of Statistics and Geo-Information Services, 2011), a fact that had exacerbated the challenges associated with treating those infected with EVD during the outbreak.

Multi-sectoral engagement

The Ebola response effort required engagement of community members and other actors across multiple sectors. This multi-sectoral engagement involved government agencies, non-profit humanitarian organizations, religious and community leaders, volunteers, survivors and the international community. Coordinated by the WHO and other country and international partners, it was vital for implementation of the Ebola Response Roadmap that ultimately succeeded in eliminating the EVD outbreak in not only Margibi County, but in other counties in Liberia as well.

Case study collaborating partners

This study was conducted as a collaboration between two organizations. The World Health Organization Regional Office for Africa (WHO AFRO) was the lead partner in the current study. This organization coordinated the implementation of social mobilization and community engagement activities related to the Ebola response. The WHO AFRO office also oversaw the deployment of a monitoring and evaluation (M&E) specialist to the WHO Country Office in Monrovia, Liberia.

The second partner in this study was the Work Group for Community Health and Development, a World Health Organization Collaborating Center, at the University of Kansas (KUCC). This partner developed the online M&E approach used in this study (Fawcett and Schultz, in press; Fawcett *et al.*, 2015). At the request of WHO AFRO, the KUCC adapted this M&E system for this project, using the Ebola Response Roadmap (World Health Organization, 2014) as a guiding framework. Additionally, the KUCC provided ongoing quality assurance and technical support for data collection and data analysis.

M&E approach

An M&E system was developed by staff from the KUCC, and adapted with WHO AFRO partners, to record the amount and kind of activities related to implementation of the WHO-led Ebola response effort in Liberia. A WHO M&E specialist and WHO AFRO

health promotion staff were trained to capture, code and characterize implementation activities using the online system. A codebook was developed and applied to incoming streams of evidence that included prospective data collection through key-informant interviews, and retrospectively through document review and abstraction. To facilitate use of the M&E system in the field where internet access was difficult or improbable, the online data collection tool was adapted in paper form for this purpose. The training, which included both didactic instruction and an interactive workshop was conducted via an internet-based video conferencing session. Additionally, participatory sensemaking set the occasion for systematic reflection of the data and communication to stakeholders, which included WHO staff, administrators, country partners and community constituents.

Table 1 describes the conceptual framework of the M&E system, including what activities were measured, evidence source and outputs that were produced. Informed by the Ebola Response Roadmap and evaluation questions of interest, activities and indicators (e.g. the number and type of activities related to safe burials) and their sources are shown. Table 1 also identifies the specific outputs yielded and captured within the M&E platform; including the amount and kind of specific activities (e.g. the number of sensitization trainings conducted with community members and with traditional and religious leaders), epidemiological data and identified contextual factors related to implementation identified through systematic reflection on the data.

Implementing the Ebola response effort

Ebola response activities consisted of five key components that were consistent with the specific objectives outlined within Ebola Response Roadmap (World Health Organization, 2014). These activities were: (i) Surveillance, contact tracing and case investigation; (ii) Case management; (iii) Safe burials; (iv) Social mobilization and community engagement; and (v) Delivery of basic services (see Table 1). Table 1 describes the core intervention components (e.g. social mobilization and community engagement), elements (e.g. conducted an engagement program with community leaders to mobilize them for addressing the EVD outbreak) and partners (e.g. The Council of Chiefs and Elders) engaged in the implementation of the Ebola response effort.

Data collection and measurement

Ebola response activities

Data on Ebola response activities were collected in two ways. First, the last two authors conducted interviews of

key informants at the county and country levels using a semi-structured interview protocol. Key informants identified all Ebola response activities that had occurred; both locally within Margibi (i.e. contact tracing, disinfecting the home) and at broader levels (e.g. at WHO Headquarters which had coordinated the Ebola response). Key informants were identified and interviewed during the time period of December 2014 to May 2015. A total of 10 key informants were interviewed. These interviews were distributed across key informants from five of the Ebola response thematic areas: (i) Case Management (Ministry of Health and Médecins Sans Frontières); (ii) Surveillance (Ministry of Health and the World Health Organization); (iii) Social Mobilization (Ministry of Health, UNICEF, Carter Center and a local NGO); (iv) Dead Body Management (Ministry of Health); and Counseling (Ministry of Health).

Additionally, the last author conducted a systematic document review and abstraction to identify and record activities related to the comprehensive intervention. Documents of this type included country and county-level WHO reports, reports supplied by the Liberian Ministry of Health and Social Welfare, and documents from WHO humanitarian non-profit organization partners (e.g. UNICEF, Médecins Sans Frontières).

Using protocols developed by the KUCC (Fawcett and Schultz, 2008), the M&E system captured a narrative description of each documented activity (e.g. who did what, when, where and toward what goal). Next, these qualitative data were coded for distinct types of activity. The four coded types of activity were: (i) Community or systems changes, defined as new or modified programs, policies and practices (e.g., 'The Ministry of Health and Social Welfare established hotlines for the public to call and get information about Ebola on 27 March 2014, in Monrovia.');

(ii) Development activities, defined as activity taken to enable the implementation of the initiative (e.g. 'UNICEF held a meeting with Inter-Religious Council of Liberia heads to discuss strengthening collaboration in reaching Christian and Muslim communities as part of Ebola virus response on 15 July 2014 in Monrovia.');

(iii) Services provided, defined as the delivery of valued goods or services to members of the community (e.g. 'Margibi County Health Team conducted Ebola awareness activities in seven schools and six health facilities in the county to educate teachers, students and health workers on Ebola in Margibi county on 31 March 2014.');

and (iv) Resources generated; defined as the acquisition of funding or in-kind support (e.g. 'UNICEF donated an additional 90 kg of chlorine

Table 1: Implementation components, elements and engaged partners in implementation of the Ebola response effort in Margibi, Liberia

Intervention component	Specific intervention elements implemented	Engaged partners
Surveillance, contact tracing and case investigation	Conducted contact tracing training with team supervisors and contact tracers	The Country Health Team, MoHSW, WHO, World Bank
Case management	Implemented policies limiting contact with those suspected of infection (e.g. market moratoriums, denying service to those with symptoms) Implemented quarantines of individual communities to limit the contact between infected and non-infected residents	The Government of Liberia, MoHSW Firestone, The Government of Liberia
Safe burials	Coordinating Ebola response activities across multiple sectors Disinfected homes of the deceased to control disease transmission to loved ones Developed and administered an Ebola treatment checklist to assure adequate care Delivered psychosocial outreach and counseling services to community residents Conducted safe and culturally respectful burials for those deceased persons suspected of EVD infection Implemented an Ebola burial form to assure safety to members of the burial teams and loved ones	WHO AFRO Disease Prevention and Control Cluster The Country Health Epidemiology Team MoHSW The Country Health Epidemiology Team Global Communities, MoHSW Global Communities, MoHSW
Social mobilization and community engagement	Conducted sensitization training to local authorities and Community Health Volunteers to convey the importance and severity of EVD Convened a national consultative meeting with traditional community leaders Launched a revised National Ebola Action Plan Conducted community advocacy meetings with local and religious leaders Implemented a coordination system for social mobilization activity partners Conducted a capacity assessment of the social mobilization effort Developed a facilitator's guide for the Community Health Volunteer training curriculum Conducted an engagement program with community leaders to mobilize them for addressing the EVD outbreak Supplied partner organizations with information, education and communication materials for the EVD response effort Distributed a Key Message Guidance package to all social mobilization stakeholders with accurate and consistent information about EVD Provided training to Community Health Volunteers for conducting behavior change programming at the individual and community levels Conducted a radio campaign to draw attention to the EVD response effort Established an Ebola hotline for residents to receive EVD information and report suspected cases of those with EVD Enacted an ordinance that prevented public gathering during the height of the EVD outbreak	The Carter Center The Carter Center, MoHSW, WHO, The Government of Liberia The Country Health Promotion Team, United Nations Mission in Liberia, Save the Children, Red Cross, MoHSW WHO WHO MoHSW The Carter Center, MoHSW, The Council of Chiefs and Elders UNICEF MoHSW WHO The Carter Center, The Country Health Promotion Team MoHSW MoHSW

(continued)

Table 1: Continued

Intervention component	Specific intervention elements implemented	Engaged partners
Delivery of basic services	Conducted a door-to-door campaign to raise public awareness for the importance and	National Health Promoters Association of Liberian NGOs, MoHSW, United Nations Mission, Liberian National Police, UNPOL
	Implemented a survivor reintegration program to prepare communities for the return of community residents that had recovered from EVD infection Implemented an anti-discrimination campaign against EVD survivors Provided psychosocial outreach and counseling services	Firestone Psychosocial Team MoHSW, Save the Children, UNICEF, WHO, The Carter Center, Médecins Sans Frontières MoHSW
	Conducted orphan profiling training to Community Health Volunteers Implemented Operation WASH Ebola Away and associated distribution of essential sanitary and hygiene supplies	National Health Promoters of Liberian NGOs, Ministry of Public Works, National WASH Promotion Committee
	Implemented a policy freezing the price on the sale of essential sanitary and hygiene supplies	The Government of Liberia
	Implemented a new policy required improved sanitation facilities at retail centers	The Government of Liberia

to the Ministry of Health and Social Welfare to support the Ebola response.’).

Coded entries of activities were then characterized by their specific attributes; for instance, objectives addressed, sectors involved and number of those affected. Last, these data were displayed as graphs (e.g. of the number of activities over time) to examine patterns in implementation. Participatory sensemaking, dialogs with WHO AFRO staff and other stakeholders, were used to identify and communicate lessons learned. Staff from WHO AFRO and the KUCC used a process of systematic reflection to carefully consider the data in answering the questions, ‘What are we seeing?’ and ‘What does it mean?’ Using the graphs of the data (similar to Figure 1), WHO AFRO staff identified key events that corresponded with accelerations and decelerations in the implementation of Ebola response activities over time (e.g. WHO completing the EVD operational plan for Liberia).

Staff from WHO AFRO and KUCC served as the primary and secondary documenters, respectively. The first documenter captured and coded a total of 95 entries of activities. The second documenter independently and blindly coded a sample of 31 (32.6%) of the entries. The authors calculated interobserver agreement between primary and secondary observers by dividing the number of concordant entries (29) by the total number of observations in the sample (31). The resulting interobserver agreement was 93.5%.

Incidence of EVD

Data on incidence (new cases) of EVD were obtained from two data sources: the Epi Info Viral Hemorrhagic Fever database (Epi Info VHF, 2014) and the District Health Information Software 2 (DHIS 2, 2015) databases. Both the Epi-Info-VHF and DHIS 2 databases were cleaned and prepared by epidemiology department staff at the WHO Country Office, Liberia to produce a historical dataset of unduplicated cases. Consistent with the WHO’s Ebola Situation Reports, three categories of EVD incidence were included in this study—suspected, probable and confirmed cases. Suspected cases included any person that had experienced symptoms consistent with EVD (e.g. high fever and vomiting), or had come in contact with persons that had suffered symptoms of EVD or with a dead or sick animal. Probable cases are defined as those suspected cases evaluated by a physician. Confirmed cases are those suspected cases that were confirmed positive for EVD antigen through laboratory testing. By including suspected cases, rather than only those persons examined by a physician or

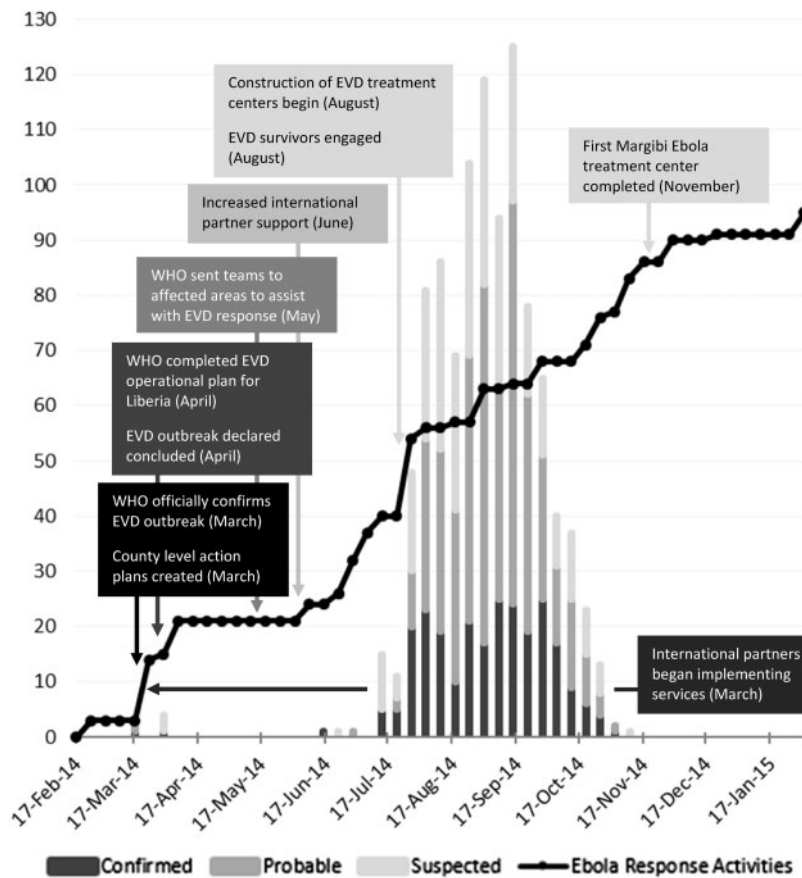


Fig. 1: Cumulative number of Ebola response activities implemented and new cases of EVD (confirmed, probable and suspected) by week; in Margibi County, Liberia; from 17 February 2014 through 2 February 2015.

experienced laboratory confirmation for EVD diagnosis, we can better capture cases among those without access to healthcare, an important segment among those affected by the outbreak.

Evaluating outcomes and data analysis

This research used an empirical case study design (Yin, 2009) to examine the following evaluation questions:

- What amount and kind of Ebola response activities were implemented in Margibi County, Liberia?
- What factors corresponded with increased levels of implementation and reduction of EVD incidence in Margibi County, Liberia?

Data for both the implementation of Ebola response and the incidence of EVD were reported descriptively and visually using graphic displays.

RESULTS

Evaluation question 1: what amount and kind of Ebola response activities were implemented in Margibi County, Liberia?

The WHO and its partners implemented a total of 95 EVD response activities at local and broader levels (see Figure 1). A majority of these activities (46) were changes to the community or system in the form of new or modified programs, policies and practices. Example community/system changes included: (i) implementing a policy that limited the exposure of residents to persons infected with EVD in public spaces (e.g. ‘On 30 July 2014, the Government of Liberia order the closure of all markets in border areas until further notice to stop the spreading of Ebola Virus to and from neighboring countries.’); (ii) delivering sanitation initiatives that assured disinfection in the homes of infected persons

(‘The Carter Center distributed mega phones, posters, buckets, Clorox and Chlorine to assist traditional leaders in carrying out hygiene promotion activities as part of Ebola prevention in August 2014 in Lofa and Margibi.’ [The Carter Center is an International nongovernmental organization which promotes policy dialog, community empowerment and leadership by engaging government, civil society groups, development partners and community-based organizations. During the Ebola outbreak, the Carter Center facilitated consultative meetings that brought together traditional and religious leaders [chiefs, Moslems and Christians], development partners including UN agencies, civil society groups and Government to find best approaches for halting the spread of Ebola. The Center facilitated dialog on sensitive issues such safe burials and the role of traditional and religious leaders during Ebola outbreak.]); and c) providing counseling for residents that refused treatment for EVD in an effort to promote emergency care (‘The County Epidemiology Team Conducted counseling for the people who refuse to go to the Ebola Treatment Units in order to encourage them to go to the Ebola Treatment Unit for treatment.’).

Development activities comprised the second-most recorded activity (33). Illustrative development activities included: (i) Conducting health promotion advocacy meetings with religious and traditional leaders (e.g. ‘From March 2014 the County Health Promotion Team in collaboration with United Nations Mission in Liberia, Save the Children and Red Cross conducted advocacy meetings with Chiefs, traditional leaders and influential people in the County 4 districts to get their support in the Ebola response; a total of 80 leaders were reached across the County.’); (ii) Collaboration and information sharing among partner organizations (e.g. ‘UNICEF supplied Information, Education and Communication materials to partner organization to ensure that social mobilization messages is reinforced through these Education and Implementation Committee materials throughout the country starting end of March 2014.’); and (iii) Assessment and planning for the coordinated response (e.g. ‘From March 2014 the County Health Promotion Team in collaboration with United Nations Mission in Liberia, Save the Children and Red Cross conducted advocacy meetings, with Chiefs, traditional leaders and influential people in the County 4 districts to get their support in the Ebola response; a total of 80 leaders were reached across the County.’).

Services provided and resources generated, the two other types of activities documented, totaled 16 entries. Commonly occurring services provided included the distribution of hygiene supplies, disinfection agents and

activities related to safe and respectful burials (e.g. ‘Global Communities in collaboration with the Ministry of Health and Social Welfare conducted health talks with the bereaved members to ensure that they are able to cope with the loss of their loved ones to Ebola and ensure that they fully cooperated in the process of burying their loved ones from August 2014, in Margibi county.’). Resources generated, which included funding and gifts-in-kind resources, included five entries (e.g. ‘The Centers for Disease Control donated specimen collection materials and PPEs to ensure the collection of specimens from Ebola patients safely on 12 April 2014 to Margibi Response Team’).

Documented Ebola response activities ($n = 95$) were each characterized by the specific objectives addressed; including basic services, case management, contact tracing and surveillance, safe burials and social mobilization. Basic service activities ($n = 12$) included those events that assured sanitation, psychological support and other essential services (e.g. ‘Ministry of Health and Social Welfare deployed 17 Social Workers to the four health districts in Margibi county to reach out to every district with psycho-social support especially to the Ebola survivors.’). Activities related to case management ($n = 8$) were those activities that provided direct support to the treatment of persons infected with EVD (e.g. ‘On 8 July 2014 the Ministry of Health and Social Welfare, World Health Organization and partners developed a checklist to ensure that every case of Ebola is treated comprehensively.’). Contact tracing and surveillance activities ($n = 15$) focused primarily on the implementation of new programs, policies and practices, but also included efforts to increase the capacity of WHO and its partners (e.g. ‘World Health Organization and Ministry of Health and Social Welfare conducted training of contact tracers to enable them to do contact tracing and line listing and case investigation in August 2014 in Kakata district, Margibi County. 30 contact tracers were trained.’). Activities aimed at promoting safe and respectful burials ($n = 6$) included burials themselves and the development of new programs, policies and practices that supported them (e.g. ‘Global Communities in collaboration with the Ministry of health and Social Welfare developed and implemented for the first time an Ebola Burial form to enable correct classification of sick people as either probable or suspected Ebola deaths, beginning of September 2014, in Margibi county.’). The majority of activities were aimed at social mobilization. Social mobilization activities ($n = 40$) included the development and implementation of enhanced supports for community residents (e.g. ‘The Carter Center conducted a district level sensitization meeting for

traditional leaders to introduce them to Ebola home kits in September 2014 in Bong, Lofa and Margibi. The sensitization was conducted in collaboration with Center for Disease Control, Ministry of Health and social Welfare and 50 traditional leaders were engaged.’). The remaining 14 documented activities were not characterized or characterized as ‘other’. These activities supported the five identified objectives indirectly through the donation of essential supplies and other donations of resources (e.g. ‘On 10 July 2014 UNICEF donated to the MoHSW an additional 5000 surgical face masks, 10 tarpaulins and 337 buckets to support Ebola case management and treatment centers.’).

Evaluation question 2: What factors corresponded with increased levels of implementation and reduction of EVD incidence in Margibi County, Liberia?

Figure 1 displays the cumulative number of all EVD response activities key events from February 2014 to February 2015. The data show an initial acceleration of activities (steeper slope) in late March 2014, following the confirmation of reported EVD cases by the WHO epidemiology team. Contextual factors identified included the creation of County-level action plans and WHO’s involvement in developing Liberia’s operational plan. When the Ebola outbreak was declared as concluded by government officials, Ebola response activities ceased from the first week of April 2014 until June 2014. Data show that increased implementation occurred in concordance with a reduction in EVD incidence. A marked acceleration of activities began in June 2014 coinciding with reemergence of confirmed, probable and suspected cases of EVD incidence. After 3 months of accelerated activity (mid-July to mid-September), there was a marked reduction in EVD. The marked acceleration of Ebola response activities implemented was associated with several factors including WHO teams sent to support Ebola response, increased donations and other support from international partners, construction of EVD treatment centers and enhanced engagement of EVD survivors in health promotion. The rate of implementation activities decelerated in December 2014, a point at which resources were allocated elsewhere since no new cases of EVD had been reported in Margibi.

DISCUSSION

This study systematically examined implementation of Ebola response activities in an affected county in Liberia, and the factors that were associated with fuller

implementation. By coding and characterizing the amount and kind of Ebola response activities implemented, we were able to see the pattern and dose of Ebola Response associated with reduced incidence of EVD. Community/system changes—the most prevalent type of activity documented—included programs, policies and environmental changes consistent with the Roadmap. These changes—including survivor reintegration programs, city ordinances, developing and implementing treatment checklists—may have had a durable and lasting effect in the community or system by making behavior change easier and more likely to occur. Adopted policies may have had a broader reach than service programs. For example, a community ordinance that freezes prices on sanitary and hygiene supplies has the potential to affect everyone in a particular community. In contrast, providing the service of offering community advocacy meetings is limited to only those community residents that attend. The fact that the majority of activities were community or system changes is consistent with the theory of change suggested by the Ebola Response Roadmap.

This study also identified key events or factors that corresponded with higher rates of Ebola response activities. The WHO officially confirmed the EVD outbreak in March 2014. After, a sharp increase in EVD response occurs, including action planning at the county level. International Non-Governmental Organizations also begin implementing humanitarian services at this time. By April 2014, the outbreak is declared contained and response activities cease by the end of April and through May. Activities resume in June after several EVD cases are reported. The next largest increase in the rate of EVD response activities occurs in August 2014 as the construction of EVD treatment centers begin (see Figure 1).

Engagement of community-led initiatives brought about the reduction in incidence of EVD in Liberia as was the case in Sierra Leone and Guinea. In the case of Liberia, there was less reliance on community isolation (quarantine) but rather there was an emphasis on community self-policing or monitoring, whereby each traditional leader (chief or religious leader) took it upon themselves to enforce policies on visitors, strangers and reporting of sick or deceased. The media, specifically community radio, was instrumental in dissemination of information including dispelling of rumors. Liberia did not use law enforcement officers (police or army) to obtain adherence from the communities following one bad experience at the beginning of the outbreak. Instead, the Government relied on the various community leaders, NGOs and development partners and United Nations agencies led by the WHO.

Safe and respectful burials conducted by the International Federation of the Red Cross (IFRC) and the WHO, the two United Nations agencies mandated with supervising all burials, were an important component to the Ebola response. To obtain community entry, the IFRC and WHO worked with community religious and traditional leaders and local NGOs as well as government agencies. Individuals were locally recruited and trained in the handling of the deceased, notably the putting on and disposing of the special protective clothing. These individuals also interacted with local traditional and religious leaders on burial rites observed within the community, including dressing and language that was culturally sensitive. Those practices deemed harmful were explained and advised against while other practices where modified (e.g. washing of dead bodies as per Moslem practice could only be done by someone in protective clothing). Touching of the deceased by relatives was not allowed, however, eulogies were not forbidden. Only those with specific training performed the final burial. Keeping with tradition, older people were recruited to carry out the burials.

This study has a number of limitations. It was necessary to complete most of the documentation of Ebola response activities retrospectively. This presented challenges in getting complete and accurate documentation of all activities. We attempted to control for this by careful document review and abstraction. Using a snowball-sampling methodology, the team interviewed key informants across multiple sectors involved in the Ebola response effort. Authors documented activities until the point of saturation—the point at which no new activities were identified by key informants and document review. Although the list of implemented activities is likely incomplete, it offers the fullest characterization yet of Ebola response activities in this area.

Despite these limitations, a strength of this study is that it is one of the few studies to comprehensively examine implementation of Ebola Response activities and factors associated with fuller implementation and corresponding reduction in incidence of EVD. This study describes combinations of activities—in multiple sectors, at multiple levels—that constituted the Ebola response in an area (Margibi County) in which the once high incidence of EVD was brought under control. Also, the M&E system used helped to structure a dialog that identified factors and lessons learned about implementation.

This and other participatory research can enhance our understanding of what it takes to bend the curve in communicable disease outbreaks that afflict such costs upon affected people and communities.

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