

Beyond the crisis: did the Ebola epidemic improve resilience of Liberia's health system?

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Accepted on 15 August 2017

Abstract

Resilience was widely identified as a critical attribute for strong health systems following the 2014–15 West Africa Ebola epidemic. In Liberia, Sierra Leone and Guinea, struggles to control the disease and suspension of the operation of many health services demonstrated that health systems must plan for resilience long before a crisis. However, the operational elements of resilience and ways that a crisis experience can shape resilience are not well described in the literature. To understand how a health system adapts to crisis and how the priorities of different health system actors influence this response we conducted interviews with global, national, and local respondents in Liberia between July and September 2015 ($n = 108$), several months after the country was first declared Ebola-free. We found that health system resilience functions prioritized by global and national actors improved to a greater extent than those valued by community leaders and local health actors over the course of the epidemic. Although the Ebola epidemic stimulated some positive adaptations in Liberia's health system, building a truly resilient health system will require longer-term investments and sustained attention long beyond the crisis.

Keywords: Resilience, Liberia, health systems, responsiveness

Key Messages

- The 2014–2015 West Africa Ebola epidemic highlighted the importance of health system resilience, which must be built before a crisis.
- Health system functions prioritized by global actors improved over the course of the crisis; there was less progress on functions valued by local actors.
- Resilience priorities of local government and communities must be addressed for building and sustaining health system resilience.

Introduction

Since the 2014–15 West Africa Ebola epidemic, resilience has become increasingly recognized as an important attribute of strong health systems, emphasized by several international panels assembled to review lessons from the Ebola epidemic (Moon *et al.* 2015;

National Academy of Medicine 2016; United Nations High-level Panel on the Global Response to Health Crises 2016).

Health system resilience has been defined as the capacity to prepare for and effectively respond to crises while maintaining core health system functions pre-, during, and post-crisis (Kruk *et al.* 2015). It is conceptualized as a distinct but supportive concept to

health security and health system strengthening (Kutzin and Sparkes 2016). Resilience bridges preparedness priorities with national health system building by including both 'fast variables' (emergency workers, hazmat suits, vaccines) for immediate response to health shocks, and 'slow variables' (public health workers, functional facilities, sustained surveillance systems) to build a base for robust health system functions in crisis and non-crisis periods.

As observed in the introduction to the November 2016 Global Symposium on Health Systems Research, health systems today face a range of shocks, from armed conflict to economic instability and increasing zoonotic transmission due to urbanization (Health Systems Global 2016). However, there is little systematic understanding of how different health system actors conceive of resilience and what elements of resilience can be strengthened during crisis periods. As a result, health system resilience has been critiqued as a vague concept with limited application (van de Pas 2015; Topp et al. 2016). Greater specificity on how the concept can be applied to weak health systems—particularly in fragile states—is needed.

Barely ten years after the conclusion of two devastating civil wars, Liberia was severely affected by the 2014–15 Ebola epidemic. More than 10 500 cases of Ebola were reported in Liberia, causing nearly 5000 deaths (World Health Organization 2016a). In total, >28 500 cases and 11 300 Ebola deaths were reported in Liberia, Sierra Leone and Guinea (World Health Organization 2016b). In the early months of the epidemic communities' actively distrusted the health system and communities and health actors had divergent approaches to disease control that hindered efforts to control the epidemic (Dhillon and Kelly 2015; Fallah et al. 2016; Blair et al. 2017). Gradually, the Ministry of Health (MOH), along with local County Health Teams (CHTs), foreign donor implementing partners, and community leaders, employed new and old techniques to respond to the epidemic and subsequent incidents of Ebola reemergence. (Nyenswah et al. 2016) After the chaotic start, Liberia subdued the epidemic and was the first country to be declared Ebola free in May of 2015 (World Health Organization 2016c).

In this article, we review the evolution of Liberia's health system response to the 2014–15 Ebola epidemic from the perspective of global, national and local actors involved. Using a five-element resilience framework developed previously by members of our team (Kruk et al. 2015), we compare different actors' priorities for building a more resilient health system and assess how these priorities shaped the response of the health system to crisis.

Methods

Setting, participants and approach

This qualitative study assessed the operationalization of the concept of health system resilience in Liberia. We conducted semi-structured in-depth interviews (IDIs) and focus group discussions (FGDs) in seven counties in Liberia between July and September 2015. We conducted interviews in Montserrado, Bong, Bomi, Grand Cape Mount, Lofa and Margibi counties as these had the highest incidence of Ebola disease during the 2014–15 Ebola epidemic. We also interviewed respondents from Rivercess, a county with lower Ebola incidence, to include the perspective of a less affected county.

To capture a breadth of understanding of resilience, we identified global, national, and local-level actors from donor organizations, government, non-profit and non-government organizations (NGOs), and other groups involved in Liberia's Ebola response. All respondents were present in Liberia during the Ebola outbreak and typically held leadership positions within their respective

organizations. Given the MOH's integral role in the Ebola response, we included several perspectives from different units within the central-level MOH, including financing, planning, research and health service provision.

In addition to central MOH staff, we interviewed senior CHT administrators, county government figures, sub-county district leaders and community-level leaders to participate in our study. Local leaders included Town Chiefs, Clan Chiefs, and Paramount Chiefs. We also recruited two groups of community-level participants for focus groups: health care workers (HCWs) and community leaders. HCWs included nurses, pharmacists, and environmental health technicians. Community leaders included community elders, community chairpersons, youth leaders, and lead Ebola contact tracers. Focus groups included five to eight participants, and all efforts were made to ensure that each group included respondents from the same level of authority and from multiple geographic locations within each county. Participants were recruited in consultation with the Liberian MOH and John Snow, Incorporated (JSI), an international organization with a long and established in-country presence in Liberia. As implementing partner, JSI also contributed to the design and general management of the project.

On average, IDI and FGD sessions lasted 1.5 h. All interviews were conducted in English, with partial translation into local languages in two cases. Participants in rural counties were reimbursed transportation costs and offered refreshments. A team of two Liberian researchers and two North American researchers conducted all interviews. Interviews were digitally recorded and transcribed verbatim by the study team assisted by an independent professional transcription service.

Researchers discussed confidentiality and anonymity with all participants prior to recording interviews and all participants provided written, informed consent. All interviews were anonymized. The Liberian National Research Ethics Board and the Harvard T.H. Chan School of Public Health Institutional Review Board approved all research procedures.

Measures

To ensure comparability of answers across interviews and FGDs, we developed an open-ended interview guide that was edited and modified after consultation with Liberian national policy makers, community leaders, and HCWs. The guide included a graphic adapted from Kruk et al. (2015), which describes elements of resilience for health systems (Figure 1). Each interview began with a description of the framework followed by questions related to the framework and functioning of the Liberian health system. These included questions related to feedback on the most important resilience elements, observations on the health system functioning and the humanitarian response during the outbreak, health system decentralization and participant recommendations for improvements in the health system.

Data analysis

Both thematic analysis (Boyatzis 1998) and grounded theory approaches (Strauss 1998) were used for this analysis. We developed a set of codes representing core themes identified through reading and annotating the transcripts. We then compared these codes against a set of emic codes and built a preliminary coding manual with code titles, inclusion and exclusion criteria, as well as exemplar quotes from the subsample of transcripts.

Following the development of the initial codebook, we undertook a multi-step, inter-rater reliability (IRR) process to test the

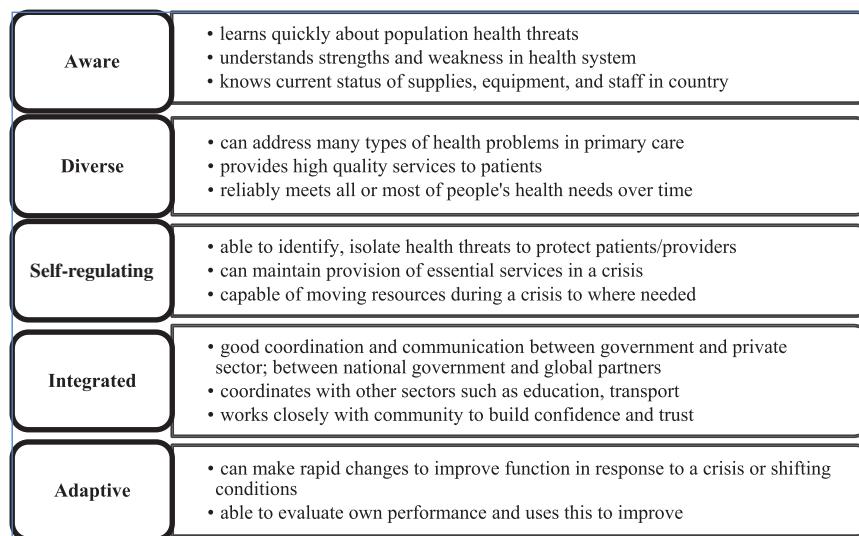


Figure 1. Resilience framework, adapted from Kruk *et al.* (2015)

codebook. Two coders independently coded two transcripts using NVivo 11 for Windows (QSR International 2015) and then subsequently reviewed codes with IRR κ values < 0.70 together, using this cutoff point as an indication of fair to good agreement (Cicchetti 1994). The research team then mapped emic coding onto etic codes taken directly from the resilience framework. In instances where the emic code mapped directly onto the etic code, the two were merged. Any unique codes were held separate.

We conducted a second coding-comparison query and IRR analysis, discussing nine remaining codes with κ values < 0.70 . Following this, we refined the codebook and completed a final round of coding using a new transcript, where coders achieved excellent agreement on all codes ($\kappa > 0.75$). The remaining 89 IDI and 16 FGD transcripts were coded using the final codebook.

Results

Between July and September 2015, we conducted 16 FGDs and 92 semi-structured IDIs, interviewing a total of 204 respondents. 50.8% of FGD respondents were female, while 25.0% of IDI participants were female. Of the 20 interviews we conducted with policymakers from the Liberian government, 60% were from senior management at the MOH. A summary of respondent characteristics is described in Table 1.

In the following Results section, we present our findings on resilience priorities, element progression during the Ebola response, and outline the connection between respondent priorities and resilience progression during the response.

Different actors, different priorities

After introducing and describing the resilience framework, we asked all respondents which elements they thought were most important. We found that global, national, and local respondents prioritized resilience elements differently (see summary in Table 2). Overall, 'aware' and 'integrated' were most frequently identified as a top priority, while no respondent category prioritized 'adaptive'.

County health actors and national actors prioritized 'aware', but focused on different aspects of the element. Local actors emphasized the importance of community awareness for protecting individual health and contributing to the health system's overall awareness of

Table 1. Respondent characteristics and sample size

	IDIs (FGDs)
Global actors	
Bilateral and multilateral organizations	6
International non-governmental organizations	9
Private sector	1
National actors	
MOH	12
Other national ministries	8
Religious and interest groups	3 (1)
Academia	2
Local government and community leaders	
County government	7
District, town, and community leaders	16 (8)
Local health system actors	
County health managers	28
HCWs	(7)
Total	92 (16)

emerging threats. In comparison, national actors focused on improving disease surveillance and the understanding of existing resources within the health system, such as the location, quantity, and availability of drugs, personal protective equipment and staff.

Global actors similarly emphasized understanding surveillance, however the majority of global actors prioritized 'integrated' first. We defined integration as the effective coordination, communication and collaboration between and within government, partners and communities at global, national, and local levels. Respondents focused on actor coordination, emphasizing a strong need for greater coordination between international NGOs, government ministries, and multilateral and bilateral actors. Global actors also emphasized the need to acknowledge the role of communities in health activities.

County-level respondents prioritized 'self-regulating' and 'diverse' more than national and global respondents. County government officials and community leaders prioritized broadening the provision of medicine and quality health services. CHTs emphasized the importance of 'self-regulation' to increase autonomy of decentralized health teams, pointing out that CHTs required greater control over county health budgets to improve autonomy. Although

Table 2. Actor resilience priorities

Actors	Elements of resilience prioritized by respondents
Global actors	Integrated: Increase coordination between actors, including communities
National actors	Aware: Improve disease surveillance and resource tracking
County health system actors	Self-regulating and aware: Allow CHTs greater autonomy and improve community awareness of health threats
County government and community leaders	Diverse: Broaden available health services to meet community needs

national-level MOH officials did not identify ‘self-regulating’ as a top resilience priority, when asked about decentralization, many mentioned that county-level teams required better management training to manage budgets and plans.

Which elements of resilience were strengthened during the Ebola epidemic?

We asked respondents to describe how the country’s Ebola response changed over the course of the epidemic. Differences in effectiveness of early vs late response efforts emerged as a common theme throughout interviews. Most respondents considered the early response as the period between September and October 2014, and the later response as the months following, including after the first Ebola-free declaration and the subsequent small resurgences. The first period coincides with the peak incidence rate in the country, where Liberia experienced the greatest rate of infection ([WHO Ebola Response Team 2016](#)). The second period coincides with the gradual epidemic decline ([CDC 2014](#)). Based on respondent sentiments about the effectiveness and timing of response, we categorized progress on resilience elements as ‘minor’, ‘moderate’ or ‘major’ ([Table 3](#)). The following section highlights main findings and representative comments on the performance of the health system along various dimensions of resilience during the early and late Ebola response.

Areas with more progress: awareness, integration, adaptiveness

Prior to the Ebola outbreak, respondents described poor system preparedness and awareness of the threat of infectious diseases, both in communities and in health facilities. County-level respondents commented that while structures for community input in county health systems existed (e.g. town hall meetings), they were frequently inactive. MOH officials and CHTs lacked the capacity and resources needed for effective disease surveillance. Health officers also pointed out that they did not have computers or printers prior to Ebola, which made tracking and documenting any illnesses difficult.

During the early response, respondents commented that the response was at first ‘chaotic’ and uncoordinated as many international actors entered the country. At first, communities were minimally engaged and poor coordination between NGO and government actors stifled response efforts at all levels. At the county level, community leaders observed overlapping humanitarian activities, and frequently described duplicative efforts distributing wash buckets, soap, and conducting Ebola case finding. Some community-level respondents noted that the extra buckets and supplies were not necessary, and expressed concern that sustained NGO initiatives past the epidemic were not evident. CHTs expressed a sense of helplessness, unable to exert control over duplicative NGO activities in their county. At the national level, multiple MOH respondents noted that NGOs were unwilling to disclose project budgets, although NGOs noted that this is standard practice. The lack of

transparency made it difficult to project available donor aid and affected community trust in response activities. An MOH official summarized,

[it] was on radio that there was ‘X’ amount of million dollars sent ... and that was sending a negative feedback to the community ... their reaction is that these people are sitting and they are eating our money, and we are working, struggling.

At the same time, during the early response actors focused on introducing public messaging and surveillance activities. Through multiple iterations, ‘Awareness’ activities gradually improved, highlighting the health system’s ‘Adaptive’ capacity. Public health messaging shifted from early fearful and decisive messages to consistently educational and hopeful messaging that promoted prevention and early detection of Ebola. Later response messages were communicated in multiple languages and disseminated through billboards, radio ads, posters and town criers—locals that shout news to communities. National surveillance progressed with the establishment of the Emergency Operations Centre (EOC) and the Incident Management System (IMS), system structures introduced by international actors but largely operated by the MOH. Rapid Isolation and Treatment of Ebola (RITE) teams and the ring surveillance approach were later adapted as response needs shifted towards rapid, targeted isolation of smaller resurgent outbreaks.

Gradually response efforts also grew more integrated. Commonly cited national events that changed the epidemic’s trajectory included President Ellen Johnson Sirleaf’s announcement that she would lead the epidemic response and the establishment of the national IMS, which led to similar county level structures. IMS meetings encouraged greater collaboration between partners at both national and subnational levels, improving integration. Most respondents noted that these county IMS meetings were effective because county government and county MOH health teams co-led IMS meetings. Community leaders and implementing partners (local and international NGOs, private organizations, and other government ministries) were invited to contribute and plan efforts at routine IMS meetings.

Notably, a few respondents described intensified coordination efforts as ineffective. One NGO respondent described the added coordination as

a paralysis in mapping and in coordination ... it's gone to an excessive point – of levels of coordination at every level, paralyzing actual progress and movement at times.

Areas with less progress: diverse services and self-regulating systems

Resilience elements ‘diverse’ and ‘self-regulating’ describe the availability of service provision during non-emergency and emergency periods, respectively. ‘Diverse’ also encompasses quality and variety of services, while ‘self-regulating’ includes health system capacity to isolate threats. We found that respondents described poor quality and little to no variety in health care services before and during the

Table 3. Assessment of progress in building health system resilience during the Ebola crisis

Element	Response Timeline	Change
Aware	Pre Ebola: MOH lacked resources and surveillance capacity; NGOs and CHTs monitored a few diseases inconsistently Early response: Actors lacked understanding of Ebola, few other diseases monitored. Conflicting government messages confused communities Late response: EOC and IMS improved surveillance and messaging; some communities resistant to change <i>[T]he problem is the rightful information, at the right time to the people ... the information came but we really never took view to the information...—HCW</i>	Major
Diverse	Pre Ebola: Malaria best managed; maternal health worst managed; care limited to siloes; medicine often unavailable in government facilities, patients resorted to private pharmacies Early response: No services available because most health facilities shut down Late response: Clinics slowly opened and offered limited health services, some facilities regained full service capacity <i>Everything was skeletal.—Ministry of Education</i> <i>The question would be that, do we, WE, we had any health system here?—HCW</i>	Minimal
Self-regulating	Early response: Health facilities were shut down, severely understaffed, or barely functioning; HCWs fled; International ETUs slowly built; limited CHT funds and capacity to respond Late response: Health facilities reopened; facilities used triage stations to screen for Ebola symptoms; National response teams (RITE) and ring surveillance developed for reemerging Ebola <i>If clinics are abandoned, medical area are abandoned how do you expect these people to live?—Community leader</i>	Minimal
Integrated	Pre-Ebola: Private and public health actors were unconnected; some collaboration between government ministries; communities mostly separate from health system Early response: NGOs and MOH hesitant to disclose funding and Ebola surveillance data, respectively; response slow to include Ministry of Internal Affairs; lack of transparency led to suspicion whether Ebola was real Late response: Health and non-health actors collaborated, though not all collaboration perceived as useful; government partnered with local and private actors; Central-level coordination forums established and used; traditional leaders engaged <i>[D]uring Ebola, we brought on board local authorities, from the Ministry of Internal Affairs, and the county health team and our partners. So everybody came on board during Ebola, because Ebola [w]as everybody's business.—CHT</i>	Moderate/Major
Adaptive	Early to late response: Introduction of IMS streamlined coordination; community care centers provided interim support for isolating suspect Ebola cases; most communities adapted safety precautions Late response: RITE teams and new surveillance efforts isolated Ebola outbreaks; health facilities improved IPC and community outreach <i>[F]irst was the recognition that even though we had made some gains there were still many lapses in the system. I think that the health system has identified many of those gaps and is now working on closing them.—Ministry of Education</i>	Moderate

Ebola outbreak. Respondents frequently commented that prior to the outbreak, health services were entirely segregated into diseases, based on available international funding. Interviewers recalled respondents laughing or being surprised by the question ‘Which health problems do you think the health system was best at dealing with, before the Ebola outbreak?’ As one MOH official replied:

[w]as best at dealing with? Hm...the health system was completely disease based!

Both the early and late Ebola response led to limited forward progress in sustaining existing health services or improving the quality of care provided. During the early response, respondents described a complete shutdown of all health services in eastern and central Liberia. Some Ebola Treatment Units (ETUs) opened during the early response, however most primary care facilities and hospitals shut down. This led to a void in health services for non-Ebola illnesses. Without being prompted, respondents frequently described family members, friends, or other acquaintances that died during the outbreak while searching for medical care.

Facilities reopened later in the response, though services remained limited in some areas and based on funding for diseases. By the summer of 2015, most facilities had opened and had prepared

makeshift triage stations that screened potential patients for fever symptoms.

Some facilities were able to continue functioning throughout the crisis, demonstrating capacity for self-regulation. Bong County respondents from local clinics and Phebe Hospital, a referral hospital, and Rivercess County respondents from local clinics and St Francis Hospital emphasized that their respective local facilities did not close. We were unable to concretely ascertain how or why these local facilities maintained functioning from our interviews; however, we found that respondents in both locations regarded their local clinics and hospitals more positively than respondents in other locations. Of note, the outbreak affected both locations differently, Bong was one of the hardest hit counties, while Rivercess experienced a brief surge of Ebola cases in remote areas but had substantially fewer cases overall.

How health system actors' priorities shaped Liberia's response

We assessed how resilience priorities were reflected in the response efforts during the Ebola outbreak. We observed that elements that

appeared to achieve the greatest progress reflected priorities of global and national actors.

Although the early response was markedly poor across all measures of resilience, ‘awareness’ and ‘integration’—the elements where the most improvement was seen, were priorities of global and national actors. Though ‘awareness’ was also a priority for county health actors, their focus was primarily on community awareness, in contrast to national actors that focused on surveillance and resource tracking. ‘Awareness’ priorities for county health actors were more similar to ‘integrated’ priorities of global actors. Global actors emphasized greater actor coordination, which included integrating communities in health activities.

‘Awareness’ strengthened with the provision of additional financial and human resource investments from global and national actors, which led to the adoption of initiatives such as the IMS, the EOC and the RITE approach. The introduction of screening and triage stations somewhat improved ‘self-regulation’ within at facility level, however respondents described little improvement in CHT autonomy—the main ‘self-regulation’ priority of county health actors. Aside from the gradual reopening of health services, all respondents described little to no improvement in the availability of a range of health services, the priority of county-level government and community leaders.

Discussion

Our study assessed the evolution of Liberia’s Ebola response and the degree to which this contributed to building a more resilient health system for the next crisis. We found that global, national, and local actors had different perspectives on the resilience elements and that the health system functions most prioritized by global and national actors improved most over the course of the epidemic. There was less progress for resilience elements that were highly valued by community leaders and local health actors.

Global and national actor priorities, ‘awareness’ and ‘integration’, improved meaningfully during the response, due to a large influx of resources from the international community for initiatives such as the IMS, the Emergency Operation Centre and the RITE approach (Nyenswah *et al.* 2016). These concepts parallel International Health Regulation (IHR) Core Capacities 2 to 6: coordination and communication; surveillance; response; preparedness; and risk communication (World Health Organization 2013). This is unsurprising as resilience is inclusive of the concept of security and protection from health shocks (Kruk *et al.* 2015). Since the Ebola epidemic, there has been a renewed global interest in strengthening national adherence to IHR standards, although this continues to be a challenge (World Health Organization 2014; Director-General 2016; Gostin *et al.* 2016; World Health Organization 2016d). Although most respondents in our study reflected positively on coordination improvement, comments on over-coordination leading to response ‘paralysis’ highlight continued coordination challenges that have pervaded most response efforts to natural disasters and crises (Altay and Labonte 2014; Tatham *et al.* 2017).

Our research consistently found minimal improvement in the so-called slow variables of resilience during the early and late response period. For example, strengthening the permanent health system infrastructure and development of human resources were not emphasized during the Ebola response and there was little effort made to connect the infusion of fast variables to lasting improvements in the health system. Donor restrictions limited most NGOs to focus on

building temporary infrastructure and introducing other fast variables such as surveillance teams, infection prevention supplies, and isolation units that reached Liberia within months (though even for these there were delays). (Siedner *et al.* 2015; Cancedda *et al.* 2016) The late arrival of ETUs was one example of a missed opportunity. By the time they were in place, most ETUs were sparsely used and the funds could have been redeployed to strengthen permanent infrastructure (Cooper 2014; Onishi 2015) Similarly, the huge investment in health worker training on infection prevention, while important in the short run, has been recognized to be no replacement for well-trained nurses (Government of Liberia 2015). Yet more sustainable approaches to changing health worker hygiene behaviors, such as reforms to nursing and medical education, were rarely mentioned.

Priorities of community respondents outside the health sector—county government officials and community leaders, differed the most from those of other respondents and improved the least during the response. Local leaders prioritized improving service delivery and emphasized the need for a breadth of health services, while most other actors focused on system-level efforts such as surveillance and coordination. These findings buttress conclusions from previous research from the Ebola epidemic that has emphasized the need to better understand and include community perspectives in health activities (Kutalek *et al.* 2015; Fallah *et al.* 2016; Martineau 2016). They also highlight that vertical interventions implemented in silos may not strengthen weak health systems, a challenge in Liberia prior to the Ebola epidemic (Kruk *et al.* 2010; Bermejo *et al.* 2011).

Since the completion of our fieldwork, Liberia has identified longer-term investments in the country’s post-Ebola strategic plan, including establishing a national public health institute, investing in health workers and upgrading health infrastructure (Government of Liberia 2015). Although intended to strengthen the health system’s resilience, a USD 700 million gap in requested vs committed donor aid hinders implementation of the strategic plan (Government of Liberia 2016). International investment and support in national plans will be necessary for any sustained resilience building in Liberia. In the meantime, Liberia continues to struggle with fundamental health system challenges that existed before the Ebola outbreak. In November 2016, Liberia’s 288 physicians threatened to strike, after not being paid for more than 2½ months (Sonpon 2016). This illustrates that system inputs (staff, clinics) alone will not generate resilience without attention to management and building social capital within the health system to promote a sense of community, commitment and professionalism.

Our findings have several limitations. Our data collection was limited primarily to health system actors and people involved or connected to health activities. Perceived strengths and weaknesses described by our respondents may not represent perceptions from the entire population of Liberia. Inference from this study should be augmented by analysis of health system and epidemiologic data. In future research, it would be valuable to gain insights from individuals entirely separate from health activities in other sectors and systematically assess why some facilities were able to maintain functioning during the epidemic. Our county respondents may have found resilience concepts such as ‘awareness’ (e.g. surveillance) less familiar and thus may have been more likely to de-emphasize these. However, interviewers were instructed to explain concepts using local terminology and probe for understanding. Due to the timing of our study, we cannot comment on recovery and investment efforts after September 2015 and the extent to which these might differ from earlier efforts. It is also possible that respondents in weak

health systems may not be fully aware of their systems' vulnerability thereby hindering their assessment of resilience. Finally, our findings are specific to the Ebola epidemic in Liberia and should not be extrapolated to dissimilar settings.

Liberia and its neighbours, Guinea and Sierra Leone, continue to recover from the horrific loss of life and social disruption wrought by the Ebola epidemic (Bogus *et al.* 2016; Shultz *et al.* 2015; World Health Organization 2016c). Our findings in Liberia add support to research findings from other countries affected by the Ebola epidemic (Denney *et al.* 2015). Our research shows that health system actors valued different elements of resilience and acted accordingly, often at odds with each other. We also noted that few of the emergency interventions were designed to promote resilience beyond the immediate crisis. Although a humanitarian response cannot by itself build health systems, by considering slow as well as fast variables and by investing more flexibly (e.g. re-routing funding for ETUs to health centres) it can do much more to build resilience (Philips and Markham 2014). Fundamentally, however, building resilience will require a deliberate effort far in advance of crisis, an effort that tackles the foundations of a health system as well as its emergency functions.

Funding

This work was supported by The Rockefeller Foundation.

Acknowledgements

We thank the Rockefeller Foundation for their support and all the individuals from the communities, health facilities, local and international organizations, and government who generously agreed to participate in this study. We wish to acknowledge the dedicated work of the data collection and transcription team, particularly Nenneh Kamara-Chieyoe and Colleen B.M.C. Parker.

Ethical Approval

The Liberian National Research Ethics Board and the Harvard T.H. Chan School of Public Health Institutional Review Board approved all research procedures.

Conflict of interest. None declared.

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