



Human preparedness: Relational infrastructures and medical countermeasures in Sierra Leone

Shona J. Lee, Eva Vernooij, Luisa Enria, Ann H. Kelly, James Rogers, Rashid Ansumana, Mahmood H. Bangura, Shelley Lees & Alice Street

To cite this article: Shona J. Lee, Eva Vernooij, Luisa Enria, Ann H. Kelly, James Rogers, Rashid Ansumana, Mahmood H. Bangura, Shelley Lees & Alice Street (2022) Human preparedness: Relational infrastructures and medical countermeasures in Sierra Leone, *Global Public Health*, 17:12, 4129-4145, DOI: [10.1080/17441692.2022.2110917](https://doi.org/10.1080/17441692.2022.2110917)

To link to this article: <https://doi.org/10.1080/17441692.2022.2110917>



© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 27 Sep 2022.



[Submit your article to this journal](#)



Article views: 591



[View related articles](#)






[View Crossmark data](#)



Citing articles: 1 [View citing articles](#)

Human preparedness: Relational infrastructures and medical countermeasures in Sierra Leone¹

Shona J. Lee ^a, Eva Vernooij^{a,b}, Luisa Enria^c, Ann H. Kelly ^d, James Rogers^e, Rashid Ansumana^f, Mahmood H. Bangura^g, Shelley Lees ^c and Alice Street^a

^aSchool of Social and Political Science, University of Edinburgh, Edinburgh, UK; ^bDepartment of Interdisciplinary Social Science, Utrecht University, Utrecht, Netherlands; ^cLondon School of Hygiene and Tropical Medicine, London, UK; ^dDepartment of Global Health and Social Medicine, Kings College London, London, UK; ^eLaboratory Technical Working Group, Sierra Leone Ministry of Health and Sanitation, Freetown, Sierra Leone; ^fSchool of Community Health Sciences, Njala University, Bo, Sierra Leone; ^gCollege of Medicine and Allied Health Sciences, University of Sierra Leone, Freetown, Sierra Leone

ABSTRACT

This paper examines health worker experiences in two areas of post-epidemic preparedness in Sierra Leone – vaccine trials and laboratory strengthening – to reflect on the place of people in current models of epidemic response. Drawing on ethnographic research and interviews with health workers in the aftermath of Ebola, it explores the hopes and expectations that interventions foster for frontline workers in under-resourced health systems, and describes the unseen work involved in sustaining robust response infrastructures. Our analysis focuses on what it means for the people who sustain health systems in an emergency to be ‘prepared’ for an epidemic. Human preparedness entails more than the presence of a labour force; it involves building and maintaining ‘relational infrastructures’, often fragile social and moral relationships between health workers, publics, governments, and international organisations. The COVID-19 pandemic has underscored the value of rethinking human resources from an anthropological perspective, and investing in the safety and support of people at the forefront of response. In describing the labour, personal losses, and social risks undertaken by frontline workers for protocols and practicality to meet in an emergency context, we describe the social process of preparedness; that is, the contextual engineering and investment that make response systems work.

ARTICLE HISTORY



Received 10 October 2021
Accepted 2 August 2022

KEYWORDS


Preparedness; epidemic response; Ebola; Sierra Leone; health worker

Background

The 2014–2016 West African Ebola outbreak dramatically revealed both the under-preparedness of Sierra Leone’s health system to respond to a large-scale epidemic of a new disease and the stark absence of a global stockpile of medical countermeasures – vaccines, drugs, diagnostics – to tackle it. Nowhere was the lack of regional preparedness more evident than in the region’s clinical and surveillance laboratories, which rapidly became the frontline of epidemic response and yet lacked the equipment and personnel necessary to diagnose Ebola, and whose operation was severely

CONTACT Shona J. Lee  shonajlee@rcsi.ie  School of Social and Political Science, University of Edinburgh, Edinburgh EH8 9LD, UK

Present address: Shona Lee is now based in the Department of Public Health and Epidemiology at the Royal College of Surgeons in Ireland, Dublin, Ireland.

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/17441692.2022.2110917>.

© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

hampered by under-resourced and broken medical supply systems. The lack of diagnostic capacity on the ground exposed the chronic and arguably racialised neglect of the regions' health infrastructure (Beisel, 2014; Benton & Dionne, 2015; Hirsch, 2021). At the same time, the lack of any available medical countermeasures to Ebola at the beginning of the outbreak revealed its status as a 'neglected' disease, long disregarded by the global pharmaceutical and biotechnology industries, considered an inviable target for profitable investment (Kelly, 2018). Several candidate vaccines and diagnostics for Ebola existed in 2014, many of which were developed through close collaborations between West African and international researchers (Bevan et al., 2018). However, prior to 2014, the unpredictability of outbreak-based markets meant there was little appetite among large-scale manufacturers for progressing these products along the regulatory and commercial pipeline (WHO, 2016).

The UN Security Council's announcement of Ebola as a threat to international peace and security in its Resolution 2177 (U.N.S.C., 2014) provided one frame for emergency intervention, initiating a highly militarised public health response on the ground involving national and international armed forces (Burci, 2014; de Waal, 2014; Parker et al., 2019; U.N.S.C., 2014). A second thread to the emergency response can be traced through the efforts made by international agencies to accelerate the development of highly targeted biomedical technologies and their deployment to the region. This included the rapid mobilisation of internationally supported treatment centres and temporary laboratories on the ground (Kelly et al., 2022; Vernooij, 2021); the establishment of accelerated regulatory pathways for drugs, diagnostics, and vaccines for Ebola by the WHO and FDA (Kelly et al., 2022); the injection of vast sums of public and philanthropic funding into vaccine research in the region (Graham, 2019); and the establishment of commercial incentives for the development and manufacture of Ebola countermeasures, such as advance market commitments. This emphasis on 'emergency R&D' has been replicated more recently in the global response to the COVID-19 pandemic with the accelerated development of new tests and a multitude of vaccine trials, demonstrating the high expectations and promise imbued in global health commodities (Paun, 2020).

In the West Africa Ebola outbreak these various technology-driven operational and research-based initiatives initially operated under the legal and symbolic umbrella of emergency response that was created by the WHO's announcement of a Public Health Emergency of International Concern in August 2014 (Kelly, 2018). Towards the end of the outbreak, however, as case numbers dropped the rationale for investment in testing equipment, scientific evaluations of novel diagnostic products, and vaccine trials increasingly shifted from a temporal logic of emergency response to that of future preparedness (Kelly et al., 2022). The **DiaDev** (University of Edinburgh) and **EBOVAC 3** (London School of Hygiene and Tropical Medicine, Inserm, University of Antwerp, College of Medicine and Health Sciences, University of Sierra Leone) projects on which this paper is based each examined frontline workers' experiences of epidemic work toward the end of the Ebola outbreak and in its immediate aftermath – that is, in the midst of this temporal blurring of emergency response and preparedness. The EBOVAC 3 project, amongst other studies involved social science research within the EBOVAC-Salome Ebola vaccine trial. One focus of the social science research was on trial staffs' experience of clinical research as an infrastructure building programme in Kambia district. DiaDev was a multi-sited study of health workers' experiences of laboratory strengthening initiatives during and after the outbreak. Our analysis draws on and repurposes the two qualitative datasets to explore the everyday labour involved in technology-driven responses to epidemics.

Diagnostics and vaccines are valuable tools for preventing and controlling epidemics, and can be 'game changers' in these efforts (Gupta & Gupta, 2021; McCarthy, 2021), but they are not the full story of a response. Public health measures such as case surveillance, contact-tracing, and isolation are necessary parts of epidemic response in addition to biomedical countermeasures. Recent anthropological studies have shown that even ostensibly simple, mobile, stand-alone technologies require substantial work and effort in order to be integrated, modified, and adapted to health

systems and labour relations on the ground (Beisel et al., 2016). Building on this insight, we examine the ‘relational infrastructures’ that congregate around technology-driven modes of emergency response and preparedness. Specifically, we focus on the physical and emotional labour of frontline workers who implement research and intervention programmes, and how ‘bodies remember’ these experiences (Benton, 2021, p. 170).

Contributing to literature that describes the daily life and practices of responding to Ebola (Boltan & Shepler, 2017; Desclaux & Anoko, 2017; Hoffman, 2016; Lipton, 2017), we explore how workers responding to public health emergencies perform a multitude of hidden tasks through the assessment, management, and leveraging of personal and professional relationships and risks in order to negotiate and advocate for patients, colleagues, communities, and organisations to access care and capacity building opportunities. While the highly specialised knowledge and skills required for this relational work is often naturalised and devalued through the framings and rhetoric of heroism, duty, and selfless sacrifice, this work is both publicly celebrated yet relegated to the background, and thus falls outside financial and professional systems of recognition and reward. Such narratives obscure ‘the political economies, racial and gendered structures, and geographical processes that usher people into different kinds and unevenly regarded forms of essential work’ while masking material inequalities among these ‘heroes’ in the process (Cantungal, 2021, p. 407).

The physical and emotional labour of emergency response and preparedness is thus often socially invisible and economically undervalued. Anthropological research on health systems has also shown that such hidden labour is as important in times of ‘routine’ as it is in times of crisis. Indeed, in chronically under-resourced health systems, the distinction between these different temporal frames can make little sense, with an epidemic emergency only compounding existing conditions of everyday crisis. Examining the everyday hidden labour involved in health work, anthropologists have, for example, described the often unacknowledged ‘organising work’ that nurses conduct in managing their patients’ care (Allen, 2014); the labour undertaken by patients in managing their own healthcare (Unruh & Pratt, 2008); the work of medical ‘improvisation’ (Livingston, 2013) and ‘resourcing’ (Wendland, 2010) necessary to uphold basic standards of care in under-resourced hospitals; and the ‘repair work’ that health workers, patients, and relatives are forced to undertake when systems for coordinating care within and between health institutions break down due to a lack of resources (Vernooij et al., 2021). This work on the creative and improvisational aspects of health work builds on a much larger body of scholarship in anthropology and political science around the role of frontline public sector workers in keeping critical public services going in the face of resource shortages and system failures by way of local innovation and ingenuity (Abram & Silvast, 2021; Roe & Schulman, 2012).

Running through these different studies is a shared focus on invisibility and the social and economic undervaluing of the expertise, skill, and effort involved in keeping public services working. Labour becomes economically devalued through intersecting cultural, legal, and spatial mechanisms of invisibility; invisible work may take place in private households, ‘in the field’ or ‘in the community’, as well as in formal workplaces (Hatton, 2017). These tasks often fall within existing gendered dimensions, for example during outbreaks, where gendered norms leave women more exposed to infection due to their principal roles as caregivers within families and as frontline health care workers (Korkoyah & Wreh, 2015; Nations, 2020; Parry & Gordon, 2021; Wenham et al., 2020).

Our analysis extends this literature on the invisible labour of public sector service provision through a focus on the additional pressures and challenges that technology-driven projects of ‘emergency response’ and ‘preparedness’ impose on frontline health workers. A focus on ‘relational work’ emphasises the emotional and social work involved in building relationships with others, and provides a person-centred perspective on concepts of preparedness. This focus prompts the question: ‘who is being prepared for what, by whom and how?’ (Leach et al., 2021, p. 2). Our findings thus expand technology-centred concepts of preparedness, exploring the knowledge and unacknowledged labour systems produced during and after epidemics, and reiterate the importance

of anthropological approaches in epidemic response research (Abramowitz, 2017; Abramowitz et al., 2015; Abramowitz et al., 2018; Ripoll et al., 2019; Stellmach et al., 2018). We centre the hopes and expectations that research projects and recovery programmes foster for frontline workers in under-resourced health systems; the unseen work of building robust response infrastructures (including the ethical issues raised by this); and the contribution of anthropological approaches to understanding preparedness as a social process. In doing so we contribute to a growing body of ethnographic research on ‘preparedness’, exploring how such efforts actually unfold outside the linear assumptions and predictions of epidemiological models (Leach et al., 2021) and temporal logics of preparedness and emergency response.

Recording these experiences, this paper contributes to a reconceptualisation of what preparedness means as a human endeavour, and reiterates the importance of supporting and protecting the people responding during and recovering after health emergencies. In our findings, we examine the value of people and social relationships to epidemic response and preparedness processes, and how these systems value people in return. We argue that the invisible contributions to this work by local staff responding to outbreaks should be incorporated into the ledger of lessons learned, and recognised as critical infrastructures of preparedness.

Materials and methods

This paper is based on the analysis of qualitative research data generated by the DiaDev and EBOVAC 3 research projects, over 2018 and 2019. For DiaDev, qualitative data collection on experiences of laboratory strengthening in Sierra Leone was conducted over a period of 15 months (September 2018–December 2019) and consisted of 41 interviews with laboratory staff (15); health workers (12); and key informants (14), who included (inter)national-level policymakers, local administrators, and international laboratory scientists involved in supporting the response to Ebola in Sierra Leone and in post-outbreak laboratory strengthening.

Data collection for the DiaDev project was undertaken at multiple levels of the health system (community, primary health clinic, district hospital, and referral hospitals) across Sierra Leone (Bah et al., 2021; Vernooij et al., 2021). Laboratory staff and health workers were purposively selected from government hospitals and laboratories where Ebola diagnostic testing had been carried out. This was in key locations in Western Area District (Connaught Hospital, Princess Christian Maternity Hospital, Lakka TB Hospital, Newtown, Hastings), within the cities of Bo and Kenema, and in Kono district.

Data collected under the EBOVAC 3 phase of the ‘EBOVAC-Salone’ Ebola vaccine trials formed part of a programme of social science research that explored the impacts and legacy of the trial on participants, staff, and the local community in Kambia. Key informant interviews were conducted with key stakeholders who were outside the trial project, but were otherwise involved in the Ebola response and/or subsequent ‘community-led’ preparedness efforts in Kambia. These included area chiefs and other community leaders, local NGO staff, district administrators, and local outbreak response system staff (13). In-depth interviews (18) and focus group discussions (3) were also conducted with members of staff who worked in different sectors of the EBOVAC-Salone trial, including trial managers (representing the three clinic sites). The staff interviewed worked in the laboratory, clinic, quality assurance, data management, pharmacy, depot, and logistics. Focus groups were conducted with departments comprising large teams, namely local Kambian field-based staff. This included: field staff, who were responsible for contacting participants and facilitating their travel to trial appointments, and conducting follow-up visits at home; the community liaison team who were responsible for sensitising the local population to the activities of the trial; and the social science team who conducted ethnographic, qualitative research and gathered feedback and concerns from members of the public and trial participants. Interviewees were a mixture of international (5) and Sierra Leonean staff (13), including a number who were local to Kambia

district, all of whom were working on the EBOVAC 3 trial study at the time of interview. Interviews and focus groups were organised and conducted by EBOVAC 3's lead social scientist who is a medical anthropologist (Shona Lee), and the social science research team at the informant's place of work, whether Kambia or London.

Responses from EBOVAC group discussions are identified as 'field staff focus group number X' to preserve anonymity. Management staff and 'sector leaders', were also interviewed to gain perspectives of the organisational and inter-institutional aspects of project and team management. To preserve anonymity quotes are not attributed to informants' sectors and are instead identified only as 'team manager number X'. Responses from DiaDev interviews are identified either by the specific role held by informants at the time of interview, or (where present in Sierra Leone as part of an international response), by 'international Ebola response'.

In accordance with the principles of data-sharing, collaboration, and rapid publication promoted by the WHO's COVID-19 Global Research Roadmap (WHO, 2020), we have pooled data from the two projects for a rapid-response social science collaboration that brings a relational, social infrastructures framework to bear on epidemic preparedness in Sierra Leone.

Ethical approval

Ethics approval was obtained for the DiaDev project from the Sierra Leone Ethics and Scientific Review Committee (SLESRC) on 27 September 2019 and from the University of Edinburgh Ethics Committee on 14 September 2019 (ref: 715450). Ethical approval for the material collected by EBOVAC 3 was obtained from SLESRC on 26 July 2019, and from the London School of Hygiene and Tropical Medicine Ethics Review Committee on 18 May 2019 (ref: 16241-1). Approval letters are attached in Appendix A. All participants in both DiaDev and EBOVAC-Salone studies provided written or verbal consent, in compliance with professional guidelines for best practice.

Analysis

A thematic analysis was conducted by the lead author (SL) with input from AS and EV on search terms and themes arising from coding. The first draft of preliminary analysis was shared with all co-authors who provided feedback and developed the manuscript's conceptual framework and contribution. Bringing these two large qualitative datasets together allowed us to revisit data collected for different purposes and to reinterrogate our findings, although this came with challenges. Both studies were designed and conducted independently, therefore the research objectives, participant profiles, and data collection tools differed in a number of ways. It is also important to reiterate that while data were collected within the same timeframe, data collection for the DiaDev project took place across multiple sites in Sierra Leone; EBOVAC 3 data were collected amid an internationally funded, purpose-built trial site in Kambia. The diversity of 'complex, historically-embedded, social and political realities' in Sierra Leone meant that response efforts 'encountered diverse local meanings embedded in experiential knowledges and socio-cultural logics' (Leach, 2020). Similarly, the social and political histories and contexts of the different sites included in the DiaDev and EBOVAC 3 studies will have shaped the specific experiences of those interviewed. The experiences of responders working across these field sites would have differed owing to regionally specific encounters of the Ebola epidemic. For example Kenema Hospital, being 'uniquely prepared' as the site of the country's Lassa fever ward and laboratory, received samples and large numbers of patients who were brought from all over the country at the beginning of the epidemic (Wilkinson, 2017). Elsewhere, Kambia would become one of the last remaining Ebola hotspots, making it a unique site of dual operations with conflicting interests; Operation Northern Push (to intensify efforts to contain and eradicate Ebola), and the EBOVAC-Salone vaccine trial (for which efficacy data required ongoing transmission), producing a 'striking clash of temporalities, between the urgency of the

emergency and the slower process of setting up clinical re-search' (Enria, 2019). Furthermore, involvement in different projects led to different kinds of experiences of the epidemic for frontline workers, as working in a well resourced vaccine trial at the tailend of an epidemic was markedly different to collecting samples at its height to support the emergency response. These highly localised social political histories have been explored in detail in several publications arising from each project (Enria, 2019; Enria et al., 2016; Enria & Lees, 2018; Enria & Lees, 2019; Lees & Enria, 2020; Mooney et al., 2018; Tengbeh et al., 2018; Vernooij et al., 2020; Vernooij et al., 2021). In this paper, our thematic analysis across the two datasets necessarily focused less on these local specificities in favour of drawing out common themes and concepts which, we argue in this article, provide important insight into some of the shared experiences of epidemic response and preparedness, regardless of location. The two primary crosscutting thematic areas we identified were:

- 1) How frontline workers implementing epidemic response and recovery programmes uphold preparedness structures through daily practice.
- 2) How experiences of Ebola and post-epidemic preparedness efforts shape expectations of how Sierra Leone might respond to future outbreaks.

Our findings have significant relevance for international institutions bringing high-profile capacity building and system strengthening projects to Sierra Leone in three key areas: the different kinds of relational work involved in delivering services; the social and physical risks involved in this work; and the importance of supporting, compensating, and valuing the staff who undertake this relational work.

Results

Valuing the work of improvising infrastructures

One of the principal themes to emerge across the two datasets was that of improvisation; that is, the additional and resourceful – yet often uncompensated – work undertaken by staff working to keep a laboratory or project functioning on a day-to-day basis. Such challenges were amplified in the context of the Ebola epidemic, when informants described the chaotic atmosphere and stresses of working in high-pressured and time-sensitive situations. Describing some of the ways they mobilised resources and undertook additional roles, many talked of working round the clock and of firefighting multiple challenges:

If we had a shipment, things that had a deadline, things that we were behind on, they'll just tell you, '[colleague X] came to work by 8 and then he didn't leave here until 2 in the morning'. Yes, there were times when he used to come here in the middle of the night to work. (Lab staff 3, EBOVAC 3)

In the absence of official guidance or resources to deal with the unfolding crisis, local responders resorted to mobilising their own resources and improvised approaches that were locally specific, acceptable, and supported:

We were overwhelmed at that time; we didn't have support, we didn't have resources. WHO was not prepared, the government was not prepared, nobody was prepared. So we had to galvanise local support. Nobody was given an incentive, nobody was given a top-up to communicate, nobody was given fuel for their cars to attend meetings, they were doing it on their own, voluntarily. If we don't take it up by ourselves, the government will not come [...] We didn't have SOPs [standard operating procedures], we didn't have protocols, so it was like on our own initiative we were able to do it. (Local administrator, DiaDev)

Some of these pressures increased towards the end of and after the epidemic, when international response teams withdrew, taking key structures and support with them and leaving local staff to shore up the financial support to maintain basic material components of response systems, such

as internet connectivity, printer cartridges and paper, fuel for generators and transportation to collect blood samples, or phone top ups to report test results.

It's true that there was a lot of money with the Ebola response, but the moment the Ebola response finished all the structures disappeared. (Health worker, international Ebola response, DiaDev)

I had to go scouting, meeting people, talking in some of the meetings just to gain support so that we'd get the fuel we need. Especially after the South African team had left it was a whole problem [...] I'd take the jerry cans in my car and then we'd take like 500–600 litres and then we'd come and put it in all the machines. (Lab manager, DiaDev)

Challenges were not always related to a lack of resources or infrastructural paucity. While these were often encountered by DiaDev informants, EBOVAC staff tended to refer more to the emotional/relational work involved in their roles, as well as working overtime and under difficult circumstances. EBOVAC informants gave multiple examples of additional work they undertook outside their formal roles in order to hold systems together and keep projects running from one day to the next. Motivations for taking on these additional responsibilities and tasks varied from receiving a good salary, having a 'determination to make sure things work', to taking pride in being able to see the immediate improvements that their efforts were making. However, some of this work involved trade-offs and 'compromises' which left staff in precarious positions, exposed to professional risk and reprimand. Some staff described difficulties in adhering to professional and ethical standards while navigating pressures to meet targets:

I had to sneak just to make sure that things were done. It was a conflicting moment at the time because these are my job descriptions to which I was strictly allowed to do, but this is also a situation that was needing my intervention. To actually hav[e] the determination to make sure that things work, I had to kind of compromise with my job description just to make sure that the system works. (Field staff Focus Group 1, EBOVAC 3)

Informants recounted episodes of having to work outside their job description such as advocating for patients or trial participants' and mediating conflict with relatives or hospital/trial staff, as they felt necessary in order to improve patient outcomes and ensure the safety of themselves and colleagues. A common strategy to close gaps in healthcare delivery is developing and leveraging personal relationships as tools of advocacy for patients, making bridges across private and public health sectors or levels of management to negotiate affordable access to testing, transport, or treatment. One laboratory worker described one such example of calling upon a personal relationship in order to manage challenging situations and meet the needs of a patient:

They brought [a patient], they put him in the isolation room. They collected the first sample, they took it to Kenema, after three days the results were missing. [...] the man became very, very furious [so] that anybody entering in that place now he would fight him. So I talked to him, I said, 'tomorrow you will be out', and thank God, the guy in Kenema who was doing the Ebola tests was a schoolmate. So I had to personally call [him] on the phone. I explained the whole situation to him and said, 'Please give this guy's result a priority'. It was out of the regulation, but because of personal [relations it was resolved]. (Lab staff 39, DiaDev)

Many informants from both research projects emphasised the importance of acknowledging these difficult negotiations, and valuing the first-hand experiences of staff who are familiar with local clinical realities. One informant compared it to the relationship between an architect and an engineer to illustrate the expectations that projects and colleagues place on individuals to produce desired outcomes, where the details and time required to achieve these are not always fully appreciated:

An architect will have this very nice idea on how they want this house to look, and they will put a shape, sometimes it's just a straight line on the drawing, but for the engineer, that single line might involve lots of calculations, how to make it a reality. And the architect says, 'Okay, this is what I want, it's very beautiful', but then the engineer has to decide, 'How do I make this a reality? How do I make sure that all this he's put in actually comes out?' (Team manager, EBOVAC-Salone)

Describing the frustration of monitoring conducted by external organisations with little contact with or practical experience of realities on the ground, staff involved in the EBOVAC-Salone vaccine trial spoke of the personal sacrifices and suffering endured in their work, and the emotional effects of feeling ‘put upon’ and reprimanded while trying to manage things beyond their control:

Dealing with or talking to people who maybe have come in who have not been here since the start, one thing that I always find is that is really not being appreciated. People do not really understand the level of suffering that went into it. The sacrifice was what we offered to the trial, that this is what we put in. But attached to that came a certain level of suffering [...] in the beginning it was like they came here for a week and then they had some complaints and then they would go, but then forgetting that we’re here all the time, this is nothing. (Laboratory scientist, EBOVAC-Salone)

Many Sierra Leonean staff who predominantly shouldered the burden of pressure and risks of delivering trial objectives spoke of feeling undervalued. Some described their attempts to have their efforts recognised and compensated, while others in senior management positions recounted varied approaches to addressing staff morale and concerns. The following examples illustrate some of the ways high-level pressure filtered down to frontline staff implementing programmes:

There is no electricity, there is no running water; those were challenging [...] and being at the clinic until late. We had one time I can remember, we were told that we had not met our targets and they were going to take the trial somewhere else, so everybody was consenting [trial participants] and we had to use all the spaces in Kambia to do enrolment. (Clinical staff, EBOVAC-Salone)

[The sponsor] put us in a very tight corner. They wanted us to finish the recruitment by the set date, so we had to work on weekends and the local staff resisted because they said that if they were going to work on the weekend, they needed to be compensated for that, they needed to be paid. We tried to talk to them to appreciate the importance of the trial [...] I also told them that if they were not going to work on the weekend, they’re not going to work in a trial. It will be taken to Liberia, that kind of thing, that they would lose their jobs. (Team manager 1, EBOVAC-Salone)

More positive approaches to motivating staff were praised by informants as simple but important gestures toward acknowledging and attending to the wellbeing of staff who worked long hours in difficult conditions. For example, one team manager lobbied the project management to construct a small outdoor seating area where staff could take breaks and eat together.

These people here, they are used to problems. They are used to challenges. They can take what you give them, but if you can revolutionise their life with just a simple structure like this, you see them being motivated. Actually, it’s just making them feel they’re important [...] You find that we are here, so the risks that we face, the challenges that we face, if only the employer can shoulder them, then that would be really be good to us. (Lab staff 2, EBOVAC-Salone)

Managing physical and social risk

Another strong theme expressed by informants was the exposure to risk that their work posed, and the potential impacts of those risks on their health and wellbeing. Many of the health workers and laboratory staff interviewed who had worked in the Ebola response described feeling exposed to risk of infection through lack of personal protective equipment (PPE) and training, and poor infection prevention and control (IPC) measures. For example, a nursing student who volunteered to work in an Ebola isolation unit, also known as a holding centre, in a hospital in Freetown stated;

Sometimes at night I would be the doctor or I would be the nurse, I would be the cleaner also, because most of the cleaners are so afraid to clean the mucus that has come out of the patients because they are afraid that they might be affected by the virus. (Healthcare worker 30, DiaDev)

There was no PPE; no scrub[s], only gloves and apron with my home clothing on. The holding centre was not even protected. Then I have to go in, myself and [my supervisor]. I wanted to come out but just as I was about to come out, the ambulance brought in another ten [patients] and [supervisor] asked me, ‘You are exhausted, but do you have to leave these patients without their samples being collected?’ I looked at her and I cried, and said ‘let’s go in’. We went in and collected another ten. Just about to come out again and four [new patients]

came in. I was so exhausted. [My supervisor] said, 'You should not collect this one now, go'. I said 'no, because by then it takes a week or so before the result will come out from Kenema', because the lab was overworked. (Lab staff 39, DiaDev)

Participating in the response and protecting oneself from infection required the negotiation of numerous relationships. Informants shared harrowing experiences of epidemic trauma and stigmatisation. Many spoke of their fear working in frontline roles, for example involving direct contact with patient samples, and the isolation from family and society due to their work. These relational negotiations are important parts of the response and what enable health systems to work, particularly where they are struggling:

Before I went to the Ebola Treatment Centre, coming from university, I told my parents 'as a healthcare worker this is our fight and I have to go'. My dad just said, 'young man, if you are going for that fight then please stay until the end of Ebola'. I was thinking 'Eh! Is my father disowning me now?' The first Ebola patient I treated, they had all the classic signs; fever, bleeding, passing stool. I was in PPE and I recalled back to that conversation and I thought, if I contract this disease and I die, my father will never forgive me. It was very stressful. (Clinician, EBOVAC-Salone)

When I started working [in the Ebola Isolation Unit] my aunt said that if I don't stop working in there I must leave. By then I'd started working and I decided to continue the work, so I have no option, I leave and I transfer here. (Health worker 49, DiaDev)

Staff often found themselves isolated from family at a time where social support was most needed, living separately and alone. One informant's wife suffered a miscarriage during the outbreak, making self-isolation even more challenging.

In Kambia, where the EBOVAC-Salone trial was established toward the end of the Ebola epidemic, local staff – particularly field-based staff such as community liaison and social science teams – responded to and navigated multiple dangerous and risky situations where they had fears over their own safety. Some went on to describe strategies of utilising trust and rapport built with their own community members, developing plans to manage potential risks, and the traumatic psychological effects such encounters had on them:

Before going there, I told my husband. I said, 'I'm going to a red zone'. He said, 'What do you mean?' I said, 'Because of the job I am going. But please, where I am going, follow me. In case you do not hear anything take your bike and follow me, because where I'm going I think is very dangerous'. So, I have to make some strategies. So that's been a problem especially for me, a woman, to take that challenge to go there more than 15 miles. It's really very difficult for me. (Field Staff Focus Group 1, EBOVAC-Salone)

If there was a kind of issue of staff being attacked etc., I have always been the person who staff colleagues have been calling upon to rescue them, to come to their aid [...] facing some serious threats, angry youths going there at night, pelting stones, banging on the gates etc. Each time they had a threat you understand they always called on me [...] So each time I was actually like to an extent even putting my own life at risk. Because I was in a very difficult situation wherein even indigenes would see me as a collaborator [...] I found that I owed to my colleagues the moral responsibility as an indigene to come to their aid, because of course what are friends for? What are colleagues for? (Field Staff Focus Group 1, EBOVAC-Salone)

Kambian staff found themselves under particular pressure to take up roles of mediation, as concerns about the ethno-religious background of staff – many of whom were recruited from the South of the country and unable to speak the local Themne language – fed into complex notions of 'belonging', and concerns among the community that local 'sons of the soil' were overlooked for employment opportunities with the project (Enria & Lees, 2018). While their proximity to local customs and language made local staff instrumental to the trial's success in their capacity as conduits to communities, being an active community member while working for the project also exposed staff to significant social as well as physical risks. Some described how dividing these loyalties placed strain on personal relationships and friendships:

It kind of created a strained relationship even among closest friends. Even trying to sit with them the way we used to come to be a problem. (Field staff Focus Group 1, EBOVAC)

One member of management staff acknowledged the overlapping layers of risk of physical, social, and emotional harm that local field staff faced at individual, family, and community levels when high-level decisions were made or changed:

The fact is our frontline staff, they live in that community and they are friends and neighbours and everybody else [...] You could well end up in a riot situation, and the first people that are going to get hurt are going to be our staff in the community. It occurred to me a lot during the election, staff were getting attacked during the election for being Mende¹, and we asked our community liaison and social science staff to help mediate. But actually, that's a massive risk to them, isn't it? And they were going and doing it. But actually, this massive personal risk, not just reputational, but actual physical risk to staff from fronting this stuff. (Team manager 3, EBOVAC-Salone)

Few reported these occurrences to trial management, having accepted these risks as 'part of the job'. In a setting where job opportunities are limited and the salary was high for the region, distinctions between job commitment and compulsion were obscured by precarious employment, particularly in high-pressure and time-sensitive periods of participant recruitment.

Hope and hesitation: anticipating epidemic futures after Ebola

Out of the tragedy and upheaval of the epidemic, opportunities for change arose from the experience of responding to Ebola. Interviewees mostly discussed improvements in terms of increased infrastructural capacity such as strengthened laboratories, more automated testing platforms and materials, greater training opportunities, and more clinical research:

I have no doubt Ebola made it all happen. It wasn't a good experience, it was really bad. But I just believe from every bad thing something good comes out of it. Nobody is hoping it comes again, but it's how prepared you are. So yes, I believe it's because we had an Ebola outbreak that made EBOVAC possible in Kambia. (Lab technician, EBOVAC-Salone)

Although Ebola was bad, but it was actually good because immediately after Ebola a lot of things come in the country. The government was capacitated financially. Even though we don't even know how much, but I think a lot of money came in the country for different infrastructural development especially the medical institutions [...] A lot of training has taken place within the medical sector [...] We can say post-Ebola [there has been] benefit [to] the country because now we have a lot of PCR establishment centres in the country. Post-Ebola I think is better. (Lab staff 13, DiaDev)

Not everyone shared this level of optimism, however, and the disappointment of unfulfilled promises of improvements and training left some of those who 'fought during the war' against Ebola dejected and sceptical. Even with the acknowledgment of progress, discussion around Sierra Leone's preparedness to respond to future outbreaks was tempered with hesitance:

To be very honest with you, when Ebola ended of course, there were a lot of promises that a lot of facilities are going to come. A lot of improvement is going to come, and we who actually fought during the war, according to some promises we heard that things are going to be better for us. They are going to make certain facilities for us in terms of further training, in terms of other facilities. But we are yet to see those promises happen. That's the reality. (Lab staff 40, DiaDev)

If we can sustain and improve on this it does not necessarily have to be Ebola, but I feel Sierra Leone as a whole still has a lot of potential for clinical trials [...] Realistically, I'm talking like a Sierra Leonean. If the current administration lasts for quite a while I think – it might not be today, but this site might be developed, But if there is a change in the politics of the country, that might be far-fetched because we know how things go. (Support staff, EBOVAC-Salone)

Discussion

The question of whether and in what ways emergency response can provide a foundation for future preparedness was brought to the fore in Sierra Leone with the arrival of the COVID-19 global pandemic. Across parts of West Africa affected by the 2014–2016 Ebola epidemic, public health

infrastructures, protocols, and personnel that were mobilised during the response have been adapted to respond to COVID-19 (Husaini, 2020).

In Sierra Leone, public health agencies and civil society have repurposed their knowledge and networks of response (Enria et al., 2020). The ‘muscle memory’ for public health response has played out through the reactivations of structures and mechanisms gained from the previous outbreak of Ebola (Weyer, 2021), with the establishment of testing laboratories, and equipping of isolation centres suggesting that first-hand knowledge of Ebola had indeed ‘prepared the country for the rainy days’ like these (Bayoh et al., 2021; Enria et al., 2020).

However, publications of frontline experiences of responding to the COVID-19 pandemic across the African continent have also illuminated challenges facing healthcare workers (Dione & Inveen, 2021; Maxmen, 2020; Sow & Criel, 2020; Wanduru et al., 2020). In Sierra Leone, as during Ebola, some districts have borne the impacts of the epidemic more heavily than others, seeing some hospitals running out of beds, basic medicines, disinfectants, and fuel for vehicles to carry people to hospitals. Healthcare workers surveyed across the country have reported feeling unsafe and exposed due to lack of PPE, and that their facilities are poorly equipped to respond adequately to the COVID-19 pandemic (Kanu et al., 2021), with substantial gaps in basic pillars of public health response such as diagnosis, isolation, and IPC measures (Parmley et al., 2021).

In Kambia district, where the EBOVAC 3 project took place, long-standing concerns about the powerful profiteering from the 2014–2016 outbreak have resurfaced in the light of the COVID-19 pandemic, gesturing toward a ‘historic lack of confidence in the health system and leaders’ (Kamara & Enria, 2021). These cumulative experiences in badly affected areas reproduce difficult dilemmas for frontline workers, who undertake significant risks, as one ambulance driver in Kenema explained: ‘since they never paid us what they owed us during Ebola, I’ve decided not to risk my life again for COVID’ (Maxmen, 2020).

Such ‘echoes of Ebola’ (Leach, 2020) prompt us to think carefully about how responses are regenerated, and who is (and who is not) involved in shaping these legacies. Qualitative evidence on frontline health workers’ coping mechanisms and support needs during and after public health crises indicate the importance of training and development, provision of supplies, supervision, workload, remuneration, and personal relationships between family, community, and other healthcare staff (Raven, Baral, et al., 2018; Raven, Wurie, et al., 2018; Raven et al., 2020). Frontline workers and volunteers responding to Ebola continue to experience the social, economic, and psychological impacts of the outbreak, struggling long after ‘the end’ of Ebola to receive promised payments or compensation for their traumatising and often stigmatising work (Kingori & Gerrets, 2016).

Understanding the human labour of epidemic preparedness and response, we argue, involves paying attention to the relational work involved in ‘making the system work’ under emergency conditions. Such interventions depend on the individualisation of responsibility, and at times can be best conceptualised as ‘acts of temporary repair and care for the health system itself’ (Vernooij et al., 2021). Relational work includes the work of emotional investment in people, bodily care work, and improvisatory problem solving under significant political, societal, and institutional pressure, all of which takes place within the context of unevenly balanced relationships of power. The outcome of this relational work, we argue, is relational infrastructures of preparedness.

EBOVAC-Salone’s recruitment of local field staff from Kambia as ‘community-embedded data-collectors’ (Kingori & Gerrets, 2019) built bridges into communities and trust among key stakeholders through reciprocity, relatability, relationships, and respect (Dada et al., 2019). Building these critical relational infrastructures was invaluable to the success of this large-scale, international project, but came at significant social cost to staff. In the process of building bridges through leveraging their social proximities to the local population, liaison and social science teams found themselves in fact building walls that isolated and distanced them from their own communities and relationships. The interfacing role played by community staff between communities and the health

system is critical because of their ‘embedded positionality and the trust they (often) have’ (Raven et al., 2020, p. 12). This is particularly important in contexts where staff and communities have faced ‘epidemic trauma’, and echoes the recent Ebola outbreak in the Democratic Republic of Congo, where community health workers played an important role in allaying fears about the disease, and supporting Ebola vaccination campaigns (Nguyen, 2019; Raven et al., 2020).

In light of the epidemic trauma experienced by many during Ebola (Raven, Wurie, et al., 2020), complicated dynamics of fear and hope play an important part in how frontline workers envisage Sierra Leone’s preparedness to respond to future epidemics. Respondents in both our projects described the ways in which preparedness becomes interweaved with individual biographies, as positive experiences of gaining skills and knowledge from the Ebola response led to aspirations for further training and career development. Laboratory strengthening and clinical research projects like EBOVAC have steered people’s professional pathways through capacity building and exposure to international organisational cultures. Informants discussed their experiences of responding to Ebola and expressed a mixture of hopes, expectations, and concerns about Sierra Leone’s ability to respond to future outbreaks that spoke to logistical, organisational, and political factors that are relevant to the COVID-19 response today. Given the critical health infrastructure that is the human workforce, protecting and supporting frontline workers to realise these expectations should be key feature of a human-centred reconceptualisation of preparedness.

This paper joins others concerned with establishing equitable research partnerships by ‘highlighting less visible equity concerns’ in global health (Grieve & Mitchell, 2020) calling for health authorities and policymakers to provide the necessary resources to allow staff to work in a safe environment (Kanu et al., 2021) and be given adequate resources and psychological support for what is often traumatic and stigmatising work (Raven, Wurie, et al., 2018). Institutions must be conscious of how hiring practices delegate reputational and physical risk to local staff working among their own communities, and the long-term disruption to personal relationships this can cause. These accounts challenge the idiom of heroism regularly deployed to describe the work of staff in emergencies. When individuals have to resort to plugging infrastructural gaps with their own resources, external expectations of courage and sacrifice risk translating into burnout and loss of dignity.

Conclusion

What does it mean to incorporate health workers into preparedness frameworks? Stories such as those we have collected bring to the surface a dual reading of preparedness as both a question of ‘preparation’ in terms of planning and resources, and a question of individual will or motivation. The question of whether Sierra Leone is prepared to respond to COVID-19 is one that also asks: do Sierra Leone’s frontline workers have the energy and capacity to respond to another epidemic? And, relatedly, given the lack of political recognition and financial compensation they received during the Ebola outbreak: are they willing to take the risks involved again?

In bringing these two distinct projects together we have sought to illuminate the daily work and challenges faced by government laboratory and healthcare workers as well as programme trial staff. While acknowledging that indeed many lessons have been learned from previous outbreaks, we reveal the critical yet often unacknowledged relational work involved in epidemic response, and consider the implications of how failure to acknowledge this labour leaves frontline responders feeling devalued in heavily technology-centred models of preparedness. As this paper has shown, not only do ‘institutions remember’ (Enria et al., 2020) – so too do the people whose ‘traumatic experiences surely shape how health workers have prepared for and responded to the current coronavirus epidemic’ (Benton, 2021, p. 170).

Epidemic experiences become embedded in preparedness through protocols, exercises, and publications such as simulations and ‘lessons learned’ publications (Dada et al., 2019; Graham et al.,

2018; Green, 2018; Mooney et al., 2018; O’Callaghan, 2020; Shrivastava et al., 2015; WHO, 2020). These often refer to the importance of community engagement and ‘human resources’, but overlook the human experience of implementing response structures. The relational practices that hold this work together, including the formal and informal ‘networks of solidarity and support’, which are critical to ensuring the distribution of goods, services, and information during outbreak response, continue to go largely unrecognised (Benton, 2021, p. 171).

The erasure of these experiences not only diminishes and devalues labour (Hatton, 2017) but means important knowledge is lost, and leaves the same people over-exposed and unsupported to manage risks and improvise strategies to deliver programmes and care. Our findings demonstrate the need to address the prevailing institutional cultures and narratives that benefit from framing indignity and sacrifice as heroism (Street, 2019). This is not to diminish the recognition that ‘Ebola champions’ and ‘health worker heroes’ deserve, but to draw attention to the ways such framings leave responders and researchers exposed, demoralised, and devalued by systems that rely on them to perform beyond their mandate.

Definitions of preparedness that focus on the ‘race’ to develop vaccines and diagnostics fail to recognise the role of people, their relationships, memories and hopes in building and maintaining infrastructures capable of responding to and containing an infectious disease outbreak. They also forget that preparedness is not merely a state of technological capacity, but a social process that takes place in the context of broader health systems, and relies on the experiential knowledge, intuition, and inter-personal skills of individuals to effectively and sensitively maintain the critical pillars of public health, including vigilant diagnostic surveillance, education, contact-tracing, and isolation, all in the context of delivering routine healthcare services.

Our findings outline the hidden costs, labour, and delegation of risk placed on frontline laboratory and health workers responding to and preparing for epidemics. These testimonies outline an alternative narrative to the tropes of resilience, innovation, and heroism that are often employed to characterise African healthcare workers and systems (Babe, 2016; Campbell, 2019; Husaini, 2020; Murphy, 2016; Ojomo, 2019;). This alternative narrative highlights the exposure to trauma and violence that staff experience by plugging infrastructural gaps and absorbing health system shocks with their own bodies, time, and finances (Vernooij et al., 2021). When preparedness is discussed in terms of ‘slack in the system’ (Bryce et al., 2020) the question of *who* is expected to absorb this tension – and whether they are willing and able to do so again in response to successive epidemics – deserves critical attention.

Note

1. Elections held in 2018 re-surfaced long-standing tensions, as community members complained about only seeing ‘Mende’ faces from the southeast employed by the EBOVAC project, highlighting some of the ethno-regional and political dimensions of ‘belonging’ that placed some workers in difficult positions socially (Enria & Lees, 2018).

Acknowledgements

The authors wish to thank all of the laboratory and project staff in Sierra Leone interviewed by DiaDev and EBOVAC for their willingness to share their experiences and invaluable insights. We extend our deepest gratitude to our colleagues and research team with EBOVAC for facilitating this research, particularly Dr David Ishola, Abdul Deen, Kadiatu Bangura, Rosetta Kabia, and Alhaji Nyakoi. We are thankful for the support of the Sierra Leone Ministry of Health and Sanitation and King’s Sierra Leone Partnership of the DiaDev project, and thank Momoh Gbetuwa, Mambu Momoh, Dr Isatta Wurie and Dr Fenella Beynon for facilitating introductions to lab staff and health workers involved in the Ebola response. Conceptualisation, S. J. L., A. S.; methodology, S. J. L., E. V., L. E., S. L., A. S.; formal analysis, S. J. L., E. V., A. S.; investigation, S. J. L., E. V.; writing—original draft preparation, S. J. L., E. V., A. S.; writing—review and editing, all authors; funding acquisition, S. L., A. S. All authors have read and agreed to the published version of the manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

Research for this paper was supported by the Scottish Funding Council SFC-GCRF Covid-19 Urgency Fund. DiaDev was supported by the European Research Council under the Horizon 2020 European Union research and innovation programme (grant agreement No 715450). EBOVAC has received funding from the Innovative Medicines Initiative under grant agreement No 800176. This Joint Undertaking receives support from the Horizon 2020 research and innovation programme and the European Federation of Pharmaceutical Industries and Association.

ORCID

Shona J. Lee  <http://orcid.org/0000-0002-8584-9729>

Ann H. Kelly  <http://orcid.org/0000-0003-4658-2133>

Shelley Lees  <http://orcid.org/0000-0003-0062-7930>

References

- Abram, S., & Silvast, A. (2021). Flexibility of real-time energy distribution: The changing practices of energy control rooms. *Journal of Energy History/Revue d'Histoire de l'Énergie*, 5. <http://energyhistory.eu/node/254>
- Abramowitz, S. (2017). Epidemics (especially Ebola). *Annual Review of Anthropology*, 46(1), 421–445.
- Abramowitz, Sharon, Epidemics (Especially Ebola) (October 2017). Annual Review of Anthropology, Vol. 46, pp. 421-445, 2017, Available at SSRN: <https://ssrn.com/abstract=3058756>. <https://doi.org/10.1146/annurev-anthro-102116-041616>.
- Abramowitz, S. A., Bardosh, K. L., Leach, M., Hewlett, B., Nichter, M., & Nguyen, V.-K. (2015). Social science intelligence in the global ebola response. *The Lancet*, 385(9965), 330. [https://doi.org/10.1016/S0140-6736\(15\)60119-2](https://doi.org/10.1016/S0140-6736(15)60119-2)
- Abramowitz, S. A., Hipgrave, D. B., Witchard, A., & Heymann, D. L. (2018). Lessons from the West Africa Ebola epidemic: A systematic review of epidemiological and social and behavioral science research priorities. *The Journal of Infectious Diseases*, 218(11), 1730–1738. <https://doi.org/10.1093/infdis/jiy387>
- Allen, D. (2014). *The invisible work of Nurses: Hospitals, organisation and healthcare*. Routledge.
- Babe, A. (2016). Can Developing Countries Innovate Themselves Out of Poverty? *Innovations: Technology, Governance, and Globalization*. <https://innovationsjournal.net/can-developing-countries-innovate-themselves-out-of-poverty-412f27b1c01a>.
- Bah, F., Vernooij, E., & Street, A. (2021). Patient pathways and diagnostic value in Sierra Leone. *Medicine Anthropology Theory*, 8(2), 1–11. <https://doi.org/10.17157/mat.8.2.5212>
- Bayoh, A. V. S., Carew-Bayoh, E. O., Turay, F. U., Ivan, I., Munu, F. U., Koroma, J. M., Bangura, A. O., Gyeltshen, D., Tejam, Y. S., Talib, H. H., Okereke, M., Lin, X., Ogbodum, M. U., Ogunkola, I. O., & Lucero-Priso, D. E. (2021). COVID-19 in Sierra Leone: A situation of once bitten, twice shy. *Journal of Global Health Science*, 3(1), 1–4. <https://doi.org/10.35500/jghs.2021.3.e7>
- Beisel, U. (2014). On gloves, rubber and the spatio-temporal logics of global health. *Somatosphere*. <http://somatosphere.net/2014/rubber-gloves-global-health.html/>.
- Beisel, U., Umlauf, R., Hutchinson, E., & Chandler, C. I. R. (2016). The complexities of simple technologies: Re-imagining the role of rapid diagnostic tests in malaria control efforts. *Malaria Journal*, 15(64), 1–9. <https://doi.org/10.1186/s12936-016-1083-2>
- Benton, A. (2021). COVID-19 in Ebola's wake. *Current History*, 120(826), 167–171. <https://doi.org/10.1525/curh.2021.120.826.167>
- Benton, A., & Dionne, K. (2015). International political economy and the 2014 West african ebola outbreak. *African Studies Review*, 58(1), 223–236. <https://doi.org/10.1017/asr.2015.11>
- Bevan, I., Street, A., & Kelly, A. H. (2018). ReEBOV: Developing an Ebola rapid diagnostic test at research zero. *Somatosphere*. <http://somatosphere.net/2018/reebov.html/>.
- Bolten, C., & Shepler, S. (2017). Introduction: Producing Ebola: Creating knowledge in and about an epidemic. *Anthropological Quarterly*, 90(2), 349–368. <https://www.jstor.org/stable/26645881>. <https://doi.org/10.1353/anq.2017.0022>
- Bryce, C., Ring, P., Ashby, S., & Wardman, J. K. (2020). Resilience in the face of uncertainty: Early lessons from the COVID-19 pandemic. *Journal of Risk Research*, 23(7-8), 880–887. <https://doi.org/10.1080/13669877.2020.1756379>
- Burci, G. L. (2014). Ebola, the Security Council and the securitization of public health. Questions of International Law (The Security Council as a Global 'Health-keeper'? Resoluituion 2177 (2014) and Ebola as a Threat to the Peace).

- Vol. 1 (2014). <http://www.qil-qdi.org/security-council-global-health-keeper-resolution-2177-2014-ebola-threat-peace/>.
- Campbell, J. (2019). Innovating Africa Out of Poverty. *Council on Foreign Relations*. <https://www.cfr.org/blog/innovating-africa-out-poverty>.
- Catungal, J. P. (2021). Essential workers and the cultural politics of appreciation: sonic, visual and mediated geographies of public gratitude in the time of COVID-19. *Cultural Geographies*, 28(2), 403–408.
- Dada, S., McKay, G., Mateus, A., & Lees, S. (2019). Lessons learned from engaging communities for Ebola vaccine trials in Sierra Leone: Reciprocity, relatability, relationships and respect (the four R's). *BMC Public Health*, 19(1), 1–13. <https://doi.org/10.1186/s12889-019-7978-4>
- Desclaux, A., & Anoko, J. (2017). L'anthropologie engagée dans la lutte contre Ebola (2014-2016): approches, contributions et nouvelles questions. *Santé Publique*, 29(4), 477–485. <https://doi.org/10.3917/spub.174.0477ff.fird-03123490f>
- de Waal, A. (2014). Militarizing Global Health. *Boston Review*. Retrieved 11 November, 2014, from <https://bostonreview.net/articles/alex-de-waal-militarizing-global-health-ebola/>.
- Dione, N., & Inveen, C. (2021). Senegalese doctors, cemetery workers battle COVID-19 surge. *Reuters*. <https://www.reuters.com/world/africa/senegalese-doctors-cemetery-workers-battle-covid-19-surge-2021-08-06/>.
- Enria, L. (2019). The Ebola crisis in Sierra Leone: Mediating containment and engagement in humanitarian emergencies. *Development and Change*, 50(6), 1602–1623. <https://doi.org/10.1111/dech.12538>
- Enria, L., Bangura, M. H., Kamara, A. S., & Lees, S. (2020). Remembering the Future: Epidemic Anticipation in Sierra Leone. *Politique Africaine*. <https://polaf.hypotheses.org/6468>.
- Enria, L., & Lees, S. (2018). Citizens, dependents, sons of the soil. *Medicine Anthropology Theory*, 5(4), 30–55. <https://doi.org/10.17157/mat.5.4.512>
- Enria, L., & Lees, S. (2019). Context matters in fighting Ebola: lessons from West Africa for the DRC. *The Conversation*. <https://theconversation.com/context-matters-in-fighting-ebola-lessons-from-west-africa-for-the-drc-119242>.
- Enria, L., Lees, S., Smout, E., Mooney, T., Tengbeh, A. F., Leigh, B., Greenwood, B., Watson-Jones, D., & Larson, H. (2016). Power, fairness and trust: Understanding and engaging with vaccine trial participants and communities in the setting up the EBOVAC-Salone vaccine trial in Sierra Leone. *BMC Public Health*, 16(1), 1–10. <https://doi.org/10.1186/s12889-016-3799-x>
- Graham, J. E. (2019). Ebola vaccine innovation: A case study of pseudoscapes in global health. *Critical Public Health*, 29(4), 401–412. <https://doi.org/10.1080/09581596.2019.1597966>
- Graham, J. E., Lees, S., Le Marcis, F., Faye, S. L., Lorway, R. R., Ronse, M., Abramowitz, S., & Peeters Grietens, K. (2018). Prepared for the 'unexpected'? Lessons from the 2014–2016 Ebola epidemic in West Africa on integrating emergent theory designs into outbreak response. *BMJ Global Health*, 3(4), e000990. <https://doi.org/10.1136/bmjgh-2018-000990>
- Green, A. (2018). Ebola outbreak in the DR Congo: Lessons learned. *The Lancet*, 391(10135), 2096. [https://doi.org/10.1016/S0140-6736\(18\)31171-1](https://doi.org/10.1016/S0140-6736(18)31171-1)
- Grieve, T., & Mitchell, R. (2020). Promoting meaningful and equitable relationships? Exploring the UK's global challenges research fund (GCRF) funding criteria from the perspectives of African partners. *The European Journal of Development Research*, 32(3), 514–528. <https://doi.org/10.1057/s41287-020-00274-z>
- Gupta, B., & Gupta, A. (2021). Will COVID vaccine be a game changer in current pandemic situation? *IP Journal of Surgery and Allied Sciences*, 3(2), 34–38. <https://doi.org/10.18231/j.jsas.2021.010>
- Hatton, E. (2017). Mechanisms of invisibility: Rethinking the concept of invisible work. *Work, Employment and Society*, 31(2), 336–351. <https://doi.org/10.1177/0950017016674894>
- Hirsch, L. A. (2021). Race and the spatialisation of risk during the 2013–2016 West African Ebola epidemic. *Health & Place*, 67, 102499. <https://doi.org/10.1016/j.healthplace.2020.102499>
- Hoffman, D. (2016). A crouching village: Ebola and the empty gestures of quarantine in Monrovia. *City & Society*, 28(2), 246–264. <https://doi.org/10.1111/ciso.12083>
- Husaini, S. (2020). How colonialism and austerity are shaping Africa's response to the Coronavirus: an interview with Simukai Chigudu. *Jacobin*. <https://jacobin.com/2020/05/africa-coronavirus-covid-cholera-outbreak-ebola>.
- Kamara, A., & Enria, L. (2021). Surveillance on the frontline of the COVID-19 response in Sierra Leone. COVID-19 pandemic stories from the DRC and Sierra Leone. *LSE Blog*. <https://blogs.lse.ac.uk/africaatlse/2021/08/26/surveillance-the-frontline-covid19-response-sierra-leone-stigma-trust/> - comments.
- Kanu, S., James, P. B., Bah, A. J., Kabba, J. A., Kamara, M. S., Williams, C. E. E., & Kanu, J. S. (2021). Healthcare workers' knowledge, attitude, practice and perceived health facility preparedness regarding COVID-19 in Sierra Leone. *Journal of Multidisciplinary Healthcare*, 14, 67–80. <https://doi.org/10.2147/JMDH.S287156>
- Kelly, A. H. (2018). Ebola vaccines, evidentiary charisma and the rise of global health emergency research. *Economy and Society*, 47(1), 135–161. <https://doi.org/10.1080/03085147.2018.1448557>
- Kelly, A. H., Lezaun, J., & Street, A. (2022). Global health, accelerated: Rapid diagnostics and the fragile solidarities of 'emergency R&D'. *Economy and Society*, 51(2), 187–210. <https://doi.org/10.1080/03085147.2021.2014730>

- Kingori, P., & Gerrets, R. (2016). Morals, morale and motivations in data fabrication: Medical research fieldworkers views and practices in two Sub-Saharan African contexts. *Social Science & Medicine*, 166, 150–159. <https://doi.org/10.1016/j.socscimed.2016.08.019>
- Kingori, P., & Gerrets, R. (2019). The masking and making of fieldworkers and data in postcolonial Global Health research contexts. *Critical Public Health*, 29(4), 494–507. <https://doi.org/10.1080/09581596.2019.1609650>
- Korkoyah, D. T., Jr., & Wreh, F. F. (2015). Ebola Impact Revealed: An assessment of the differing impact of the outbreak on the women and men in Liberia. Policy and Practice Research Report. *Oxfam International*. <https://policy-practice.oxfam.org/resources/ebola-impact-revealed-an-assessment-of-the-differing-impact-of-the-outbreak-on-581371/#:~:text=The%20report%20finds%20that%20women,found%20to%20have%20particularly%20suffered.>
- Leach, M. (2020). Echoes of Ebola: Social and Political Warnings for the COVID-19 Response in African Settings. *Somatosphere*. Special collection: Dispatches from the pandemic. <http://somatosphere.net/forumpost/echoes-of-ebola/>.
- Leach, M., Macgregor, H., Ripoll, S., Scoones, I., & Wilkinson, A. (2021). Rethinking disease preparedness: Incertitude and the politics of knowledge. *Critical Public Health*, 32(1), 82–96. <https://doi.org/10.1080/09581596.2021.1885628>
- Lees, S., & Enria, L. (2020). Comparative ethnographies of medical research: Materiality, social relations, citizenship and hope in Tanzania and Sierra Leone. *International Health*, 12(6), 575–583. <https://doi.org/10.1093/inthealth/ihaa071>
- Lipton, J. (2017). ‘Black’ and ‘white’ death: Burials in a time of Ebola in Freetown, Sierra Leone. *Journal of the Royal Anthropological Institute*, 23(4), 801–819. <https://doi.org/10.1111/1467-9655.12696>
- Livingston, J. (2013). *Improvising medicine: An African cancer ward in an emerging cancer epidemic*. Duke University Press.
- Maxmen, A. (2020). Ebola prepared these countries for coronavirus — but now even they are floundering. *Nature News*. <https://www.nature.com/articles/d41586-020-02173-z>.
- McCarthy, M. W. (2021). At-home coronavirus testing: The next game-changer? *Expert Review of Molecular Diagnostics*, 21(1), 1–2. <https://doi.org/10.1080/14737159.2021.1873133>
- Mooney, T., Smout, E., Leigh, B., Greenwood, B., Enria, L., Ishola, D., Manno, D., Samai, M., Douoguih, M., & Watson-Jones, D. (2018). EBOVAC-Salone: Lessons learned from implementing an Ebola vaccine trial in an Ebola-affected country. *Clinical Trials*, 15(5), 436–443. <https://doi.org/10.1177/1740774518780678>
- Murphy, T. (2016). It’s not possible to innovate people out of poverty. *Humanosphere: Global Health* <https://www.humanosphere.org/basics/2016/01/not-possible-innovate-people-poverty/>.
- Nations, U. (2020). The impact of COVID-19 on women (Policy Brief).
- Nguyen, V.-K. (2019). An epidemic of suspicion — Ebola and violence in the DRC. *New England Journal of Medicine*, 380(14), 1298–1299. <https://doi.org/10.1056/NEJMp1902682>
- O’Callaghan, S. (2020). COVID-19: five lessons from Ebola. *Overseas Development Institute*. <https://odi.org/en/insights/covid-19-five-lessons-from-ebola/>.
- Ojomo, E. (2019). How Africa can “entrepreneur” its way out of bad leadership and the vital role of innovation. *Quartz Africa*. <https://qz.com/africa/1766944/africa-can-entrepreneur-itself-out-bad-leadership-infrastructure/>.
- Parker, M., Hanson, T. M., Vandi, A., Babawo, L. S., & Allen, T. (2019). Ebola and public authority: Saving loved ones in Sierra Leone. *Medical Anthropology*, 38(5), 440–454. <https://doi.org/10.1080/01459740.2019.1609472>
- Parmley, L. E., Hartsough, K., Eleeza, O., Bertin, A., Sesay, B., Njenga, A., Toure, M., Egesimba, G., Bah, H., Bayoh, A., Yakubu, A., Morrison, E. A. B., & Michaels-Strasser, S. (2021). COVID-19 preparedness at health facilities and community service points serving people living with HIV in Sierra Leone. *PLOS one*, 16(4), 1–10. <https://doi.org/10.1371/journal.pone.0250236>
- Parry, B. R., & Gordon, E. (2021). The shadow pandemic: Inequitable gendered impacts of COVID-19 in South Africa. *Gender, Work & Organization*, 28(2), 795–806. <https://doi.org/10.1111/gwao.12565>
- Paun, C. (2020). The breakthrough that could halt the pandemic, even before a vaccine. *Global Public Health Spotlight*. *POLITICO*. *Global Public Health Spotlight*. <https://www.politico.com/news/2020/08/14/the-breakthrough-that-could-halt-the-pandemic-even-before-a-vaccine-395179>.
- Raven, J., Baral, S., Wurie, H., Witter, S., Samai, M., Paudel, P., Subedi, H. N., Martineau, T., Elsey, H., & Theobald, S. (2018). What adaptation to research is needed following crises: A comparative, qualitative study of the health workforce in Sierra Leone and Nepal. *Health Research Policy and Systems*, 16(1), 1–11. <https://doi.org/10.1186/s12961-018-0285-1>
- Raven, J., Wurie, H., Idriss, A., Bah, A. J., Baba, A., Nallo, G., Kollie, K. K., Dean, L., Steege, R., Martineau, T., & Theobald, S. (2020). How should community health workers in fragile contexts be supported: Qualitative evidence from Sierra Leone, Liberia and Democratic Republic of Congo. *Human Resources for Health*, 18(1), 1–14. <https://doi.org/10.1186/s12960-020-00494-8>
- Raven, J., Wurie, H., & Witter, S. (2018). Health workers’ experiences of coping with the Ebola epidemic in Sierra Leone’s health system: A qualitative study. *BMC Health Services Research*, 18(1), 1–9. <https://doi.org/10.1186/s12913-018-3072-3>

- Ripoll, S., Gercama, I., Jones, T., & Wilkinson, A. (2019). Social Science in Epidemics: Ebola Virus Disease Lessons Learned. Social Science in Humanitarian Action Platform Evidence Reviews. *Institute of Development Studies*. <https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/14160>.
- Roe, E., & Schulman, P. R. (2012). Toward a comparative framework for measuring resilience in critical infrastructure systems. *Journal of Comparative Policy Analysis: Research and Practice*, 14(2), 114–125. <https://doi.org/10.1080/13876988.2012.664687>
- Shrivastava, S. R., Shrivastava, P. S., & Ramasamy, J. (2015). Lessons learnt from the 2014 Ebola outbreak in West-Africa. *Journal of Research in Medical Sciences*, 20(1), 107–108. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4354058/>.
- Sow, A., & Criel, B. (2020). First line response to COVID-19: community health centres and doctors' offices in Guinea. *BMJ Global Health Blog*. <https://blogs.bmj.com/bmjgh/2020/04/10/first-line-response-to-covid-19-community-health-centres-and-doctors-offices-in-guinea/>.
- Stellmach, D., Beshar, I., Bedford, J., Du Cros, P., & Stringer, B. (2018). Anthropology in public health emergencies: What is anthropology good for? *BMJ Global Health*, 3(2), e000534. <https://doi.org/10.1136/bmjgh-2017-000534>
- Street, A. (2019). The limits of medical heroism: reflections on Getting to Zero. *Somatosphere* <http://somatosphere.net/2019/the-limits-of-medical-heroism-reflections-on-getting-to-zero.html/>.
- Tengbeh, A. F., Enria, L., Smout, E., Mooney, T., Callaghan, M., Ishola, D., Leigh, B., Watson-Jones, D., Greenwood, B., Larson, H., & Lees, S. (2018). "We are the heroes because we are ready to die for this country": participants' decision-making and grounded ethics in an Ebola vaccine clinical trial. *Social Science & Medicine*, 203, 35–42. <https://doi.org/10.1016/j.socscimed.2018.03.008>
- Unruh, K. T., & Pratt, W. (2008). The invisible work of being a patient and implications for health care: "[the doctor is] my business partner in the most important business in my life, staying alive". *Ethnographic Praxis in Industry Conference Proceedings*, 2008(1), 40–50. <https://doi.org/10.1111/j.1559-8918.2008.tb00093.x>
- U.N.S.C. (2014). Resolution 2177. Security Council resolution 2177 (2014) [on outbreak of the Ebola virus in, and its impact on, West Africa] UN, 18 Sept. 2014. *United Nations*. <https://digitallibrary.un.org/record/779813?ln=en>
- Vernooij, E. (2021). Infrastructural instability, value, and laboratory work in a public hospital in Sierra Leone. *Medicine Anthropology Theory*, 8(2), 1–24. <https://doi.org/10.17157/mat.8.2.5167>
- Vernooij, E., Kelly, A., Rogers, J., Gbetuwa, M., & Street, A. (2020). Laboratory strengthening in public health emergencies: perspectives from Sierra Leone. *DiaDev Report*. <https://doi.org/10.13140/RG.2.2.22532.35202>.
- Vernooij, E., Koker, F., & Street, A. (2021). Responsibility, repair and care in Sierra Leone's health system. *Social Science & Medicine*, 300, 114260. <https://doi.org/10.1016/j.socscimed.2021.114260>
- Wanduru, P., Tetui, M., & Waiswa, P. (2020). COVID-19 response in Uganda: notes and reflections. *BMJ Global Health Blog*. <https://blogs.bmj.com/bmjgh/2020/05/02/covid-19-response-in-uganda-notes-and-reflections/>.
- Wendland, C. (2010). *A heart for work: journeys through an African Medical school*. University of Chicago Press.
- Wenham, C., Smith, J., & Morgan, R. (2020). COVID-19: The gendered impacts of the outbreak. *The Lancet*, 395 (10227), 846–848. [https://doi.org/10.1016/S0140-6736\(20\)30526-2](https://doi.org/10.1016/S0140-6736(20)30526-2)
- Weyer, J. (2021). Why Ebola is back in Guinea and why the response must be different this time. *The Conversation*. <https://theconversation.com/why-ebola-is-back-in-guinea-and-why-the-response-must-be-different-this-time-155669>.
- WHO. (2016). R&D blueprint for action to prevent epidemics. *World Health Organisation*. <https://www.who.int/publications/m/item/an-r-d-blueprint-for-action-to-prevent-epidemics>.
- WHO. (2020). Ebola then and now: Eight lessons from West Africa that were applied in the Democratic Republic of the Congo. *World Health Organisation*. <https://www.who.int/news-room/feature-stories/detail/ebola-then-and-now>.
- Wilkinson, A. (2017). Emerging disease or emerging diagnosis? Lassa fever and Ebola in Sierra Leone. *Anthropological Quarterly*, 90(2), 369–397. <http://www.jstor.org/stable/26645882>. <https://doi.org/10.1353/anq.2017.0023>