Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Investigating the perspectives of Liberian frontline health workers on ethical tensions experienced during the Ebola epidemic and the COVID-19 pandemic

Parnor Madjitey
parnor.madjitey@mail.mcgill.ca

McGill University
Joseph M. Sieka
University of Liberia
Marie-Edith Nepveu-Traversy
Global Urgent and Advanced Research and Development
Gary Kobinger
Global Urgent and Advanced Research and Development
Matthew Hunt
McGill University

Research Article

Keywords: Ebola, COVID-19, Epidemic, Pandemic, Health Workers, Ethical Tensions, Primary Health Care, Liberia

Posted Date: July 15th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10210776/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Liberia's post-civil-war healthcare system lacked effective surveillance and response measures, two key structures for monitoring the threat of communicable diseases. In 2014, Liberia was one of three West African countries that experienced an Ebola epidemic. Many public health centres across the country were overwhelmed with Ebola cases, leading to intense pressure on health workers. As a result, many health workers experienced ethical tensions about their duty of care to patients, concerns about personal safety and familial responsibilities. During the COVID-19 pandemic, Liberia recorded 8090 COVID cases with 295 deaths, with health workers accounting for 424 of the confirmed cases and 9 of the deaths. While multiple studies have examined ethical issues experienced by health workers during the Ebola and COVID-19 health crises in low-resource settings, most have focused on personnel working in specialized treatment centres. Overall, less attention has been paid to the experiences of health workers stationed at Primary Health Care (PHC) centres in low-resource settings. This qualitative study aimed to explore the ethical tensions experienced by national health workers who cared for Ebola and COVID-19 patients in PHC centres in Liberia.

Methods

Guided by interpretive description methodology, data were gathered through audio-recorded interviews and by reviewing collateral documentary sources. Participants included 7 healthcare administrators for Key Informant Interviews and 45 primary health workers for In-Depth Interviews. A framework method was used to analyze the data and generate themes.

Results

Liberian health workers experienced a range of ethical tensions, including their professional duty to care for patients being at conflict with their personal safety, and the safety and well-being of their family. They reported acts of stigma and discrimination from family members, colleagues, and the larger society, as well as instances involving health facility managers during the Ebola epidemic, and described improvements during COVID-19 due to public sensitization.

Conclusions

Health workers play critical roles during health emergencies. Lessons from their lived experiences during past contagions and their suggestions on measures that will assist them to better navigate potential ethical challenges during health crises, are crucial for enhancing preparedness and reinforcing the resilience of healthcare systems.

Background

Liberia experienced two civil wars that ended in 2003 and brought the health system to near collapse.[1, 2, 3] During the conflicts, armed combatants destroyed many health facilities, while funding of the health sector steadily declined.[1, 2, 3, 4] Despite investments by subsequent democratically elected governments and the adoption of the World Health Organization's (WHO) recommended integrated disease surveillance and response (IDSR) blueprint in 2004, Liberia's post-civil-war healthcare system lacked effective surveillance and response measures, two key structures for monitoring and evaluating the threat of communicable diseases. The absence of these core elements limited the overall capacity of the country's healthcare system to detect and deploy countermeasures against infectious disease outbreaks.[5, 6, 7]

In 2014, Liberia was one of three West African countries (along with Sierra Leone and Guinea) that experienced an Ebola epidemic, which is regarded as the deadliest Ebola outbreak in history.[8] The capital and largest city, Monrovia, recorded the highest incidence of Ebola Virus Disease (EVD).[9, 10] Many public health centres across the city and other parts of the country were overwhelmed with EVD cases, leading to intense pressure on health personnel and facilities.[11] Frontline health workers across urban and rural healthcare centres reported significant challenges, including the fear of being exposed to the deadly disease and concerns about transmitting it to their families.[12, 13, 14] The ways such challenges manifested in Primary Health Care (PHC) facilities were distinctive compared to designated Ebola Treatment Units (ETUs), which received logistical and training support from governmental, intergovernmental and international organizations.[15, 16, 17, 18] In contrast, PHC facilities were generally poorly equipped, with essential materials such as personal protective equipment (PPE), case management protocols, and information on Infection Prevention & Control (IPC) either inadequate or unavailable, especially during the early and peak stages of the epidemic.[12, 15, 16, 17, 18, 19, 20] There was also a lack of psychosocial services to assist health workers in PHC facilities to address issues of personal wellbeing and familial responsibilities.[12, 21, 22] Amidst these challenges and a sluggish global response, over 370 Liberian health workers contracted EVD, with more than half of them dying.[17, 23]

The impact of the COVID-19 pandemic on Liberian health workers, like other sub-Saharan African countries, was relatively moderate compared to their counterparts in China and many High-Income Countries, despite spikes in cases during the second and third waves of the disease.[24, 25, 26, 27] Attributed reasons for this differential impact include the timely and coordinated effort of the continent's leaders and health experts to implement measures to curb the spread of the coronavirus, the youthful population with a median age of 19 years, and the experiences that individual nations like Liberia drew on from prior epidemics of Ebola and Cholera.[24, 28] While Africa as a whole avoided the catastrophic surges seen in some countries globally, a gratifying outcome amidst vaccine nationalism and failures of global solidarity, Liberia still recorded 8090 COVID-19 cases with 295 deaths with health workers accounting for 424 of the confirmed cases and 9 of the deaths.[24, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40]

Although many studies have examined ethical issues experienced by health workers during the Ebola and COVID-19 health crises in low-resource settings, most focused on personnel working in specialized treatment centers.[40, 41, 42, 43, 44, 45, 46, 47, 48] Overall, less attention has been paid to health workers stationed at PHC centres in the community, which are the first point of contact for many persons seeking care for common or other illnesses.[48, 49] These facilities do not have the clinical and diagnostic capacity to screen for suspected cases of infectious diseases for subsequent referral, yet their staff are confronted with the everyday triage decisions and exposure risks.[50, 51] This situation gives rise to distinctive challenges and risks. For example, during the Ebola outbreak in West Africa, health workers, often without PPE, attended to patients who presented with symptoms of suspected malaria which are identical to the initial symptoms of Ebola.[52, 53] The similarities in the symptoms of malaria, which is endemic in the region, and those of the early stages of EVD was cited as one of the reasons why the 2014 Ebola outbreak in West Africa went undetected for many weeks, which delayed efforts aiming at containment.[53] During the COVID-19 pandemic, health facilities in Liberia were identified as the primary source of infection with poor IPC practices and a lack of PPE, which are common features of many PHC centres, being identified as factors that contributed to this outcome.[40]

Better understanding the experiences of PHC health workers who provided care to patients who subsequently developed symptoms suspected of Ebola or COVID-19, and the managers of these facilities, in countries like Liberia is important to inform the development of contextually-relevant guidance tailored for these settings and which could guide the response to future epidemics.[54] This study consequently aimed to investigate the perspectives of PHC health workers regarding the ethical tensions they experienced during the Ebola epidemic and the COVID-19 pandemic in Liberia.

Methods

Research design

This qualitative study employed interpretive description (ID) methodology to answer the following research question: *"What are the ethical tensions that Liberian frontline health workers experienced during the Ebola outbreak and the COVID-19 pandemic, and how can these be prevented or mitigated in the event of future epidemics?"*[55, 56] Grounded in constructivist and naturalistic orientations, ID provides researchers with robust philosophical foundations and a design logic to guide the research process for addressing complex experiential phenomena.[57] ID encourages the use of triangulation amongst multiple data sources, including documentary data, to gather additional knowledge about the topic of interest.[58] Additionally, ID seeks to develop action-oriented knowledge that has the potential to improve policy and clinical practice.[55, 57]

Ethics

Ethical approval

was granted by the Institutional Review Board of the Faculty of Medicine and Health Sciences (McGill IRB), McGill University and the University of Liberia-Pacific Institute for Research and Evaluation Institutional Review Board (UL-PIRE IRB). The approval included the method of invitation, obtaining consent, data use and storage, and dissemination of research findings.

Setting

The study was conducted in Montserrado county, which is located in the northwestern portion of Liberia and hosts the seat of government in its largest city, Monrovia. The county recorded the highest incidence of both the Ebola epidemic and the COVID-19 pandemic among Liberia's fifteen counties.[3, 4, 59] Almost one-third of the over 840 health facilities in Liberia are located across the rural and urban settlements of Montserrado county, each offering various levels of healthcare services.[60] Correspondingly, the county and particularly its largest city, Monrovia has one of the highest densities (*14 per 10,000 people*) of healthcare professionals in Liberia.[61] The greater presence of health workers in Monrovia and the county, coupled with the fact that Montserrado and especially, Monrovia also experienced more Ebola and COVID-19 cases, meant that access to individuals who directly experienced the topic under inquiry was relatively higher in the county and its largest city.[61, 62, 63, 64]

Participants and sampling

Maximum variation purposive sampling followed by a snowball sampling technique were used to recruit two sets of participants for the study. The first group took part in key informant interviews (KII), and the second group participated in in-depth interviews (IDI).

Study participants for the KIIs included health facility managers and public health specialists (PHS) with responsibilities related to the management of the Ebola epidemic and/or the COVID-19 pandemic. The inclusion criteria for the health facility managers were that they worked in an administrative capacity at a PHC health facility that;

1. that admitted suspected and subsequently confirmed cases of EVD or suspected cases of COVID-19,
2. was not designated by state authorities as an Ebola or COVID-19 treatment centres, and
3. did not receive specially designed PPE from the government and/or international organizations during the early stages of the epidemic or pandemic.

For the PHS to be included, they had to have participated in special public health services related to the Ebola epidemic and/or COVID-19 pandemic, such as working with family members and the community to locate and transport suspected cases to health facilities, and supervising the burial procedures for persons suspected of dying from the disease.

Participants for IDIs were frontline health workers at PHC health facilities that admitted suspected and subsequently confirmed Ebola cases or suspected COVID-19 cases. The inclusion criteria were that the participant;

1. must have been directly involved in the care of Ebola patient(s) and/or screening suspected COVID-19 patient(s),
2. the health centre they were stationed at during the Ebola and COVID-19 crises, was not designated by state authorities as Ebola and COVID-19 treatment centres,
3. the health centre did not receive specially designed Ebola-protective equipment from the government and international organizations and
4. the health centre had no Intensive Care Unit (ICU) facility before and during the Ebola epidemic.

Efforts were made to recruit participants from a wide range of frontline healthcare worker professions including physicians (P), nurses (N), nurse aides (NA), hygienists (HG), burial team members (BTM), psychosocial workers (PW), and orthopaedic technicians (OT).

Recruitment

Through the support of a local collaborator (JS) in Liberia, contact was established with the head of the Montserrado County Health Directorate, who then wrote an introductory letter about the project to the managers of nine health facilities located across the Monrovia Metropolitan area. After discussions with each of the nine approached facility managers, five voluntarily agreed to participate in the study after they met the inclusion criteria for the KIIs. Two of the managers declined because they were temporarily replacing managers who were on statutory leave. The last two managers were not available during subsequent visits to their facility to discuss the next stage of the recruitment process. JS also assisted in contacting a public health specialist who was a member of the national Incident Management System (IMS) for both the Ebola and COVID-19 crises and they agreed to participate in the study. A snowball sampling method was then applied, where KII participants were invited to suggest others who might be interested and eligible to participate. Through this step, an additional KII participant was recruited. Thereafter, some staff at the health facilities where the introductory letters were submitted met with the research team on site for further discussions about possible participation. Following these discussions, 25 participants who fulfilled the inclusion/exclusion criteria for IDIs agreed to be interviewed. Subsequently, a snowball sampling method was used to recruit 20 additional IDI participants for the study.

Interviews

Two semi-structured qualitative interview guides were initially developed based on the findings from a literature review by the principal investigator (PM) which explored the subject of health workers and ethical tensions during contagion outbreaks in Low and Middle-Income Countries (LMICs).[65] Subsequently, the interview guides were updated with suggestions from academic supervisors (AA and MH), pilot tested with two Ghanaian frontline health workers who provided care to COVID-19 patients in Ghana during the pandemic period and small adjustments were made to enhance clarity and flow. Since the Ebola epidemic occurred between 2014–2016 and the data collection was undertaken in 2022 in the midst of the COVID pandemic, a *Grand Tour Question*, which allows participants to give an elaborate verbal tour of an event they have lived or are familiar with was posed to the participants: *"Can you tell me your entire experience with the Ebola epidemic"*.[66, 67, 68, 69] The purpose of the *Grand Tour Question* was to gain an overview of their experiences and to minimize recall bias.[68, 69] The interview guides also covered topics such as: the state of the health facilities before the Ebola outbreak and COVID-19 pandemic, emerging risks at the workplace during the epidemic, and how health workers managed those challenges. Other topics included the response of relevant authorities to issues faced by health workers during the public health emergencies, and the familial and social life of health workers during and in the aftermath of the epidemic/pandemic.

Before the start of the semi-structured interview, participants were taken through the informed consent process. All participants signed an informed consent form. PM initiated "warm-up" conversations with each participant to establish rapport before switching to the interview guide. All interviews were conducted in-person, in English, audio-recorded, and the interviewer (PM) created field notes with non-verbal cues documented during the session. Recruitment was stopped at the point where further data collection was deemed not to yield new insights pertinent to the topic of interest.

Documentary data

Upon completion of the interviews, collateral documentary materials were collected online. These documents include videos clips and audio file recordings of national health workers during the Ebola epidemic in West Africa. Three videos were sourced from YouTube and covered stories of health workers in Liberia during the epidemic, while the audio file is a collection of interviews of frontline nurses from Sierra Leone and Liberia who provided care to Ebola patients during the crisis.[70, 71, 72, 73] Relevant information from the three videos and the audio recordings of the Liberian nurses were added to the data set in order to offer additional points of view on the topic.

Data analysis

Framework analysis was employed to analyze the collected data by following the seven-step procedure outlined by Gale et al: transcription, familiarization with the interview, coding, developing a working analytical framework, applying the analytical framework, charting data into the framework matrix and interpreting the data.[74] All the interviews were transcribed verbatim by PM. Accuracy of the transcription was verified by reading through the transcript while listening to the audio and making any necessary corrections.

Subsequently, for familiarization, each transcript was read repeatedly with the accompanying field notes, and then its audio recording was listened to once again. Initial impressions were noted in reflective memos. A mixed deductive-inductive approach was utilized to code the data. Deductive codes were developed based on the previous literature review. [65] As the first transcripts were coded, additional inductively derived codes were identified by labelling

sections of the transcripts that were not covered by deductive codes and by asking the questions "*What is going on here? What is this about?*" Further inductive codes were added as the analysis of subsequent transcripts was conducted, while some codes were merged and their meanings refined. Once coding was complete for all transcripts, the codes were then aggregated into categories based on linkages and patterns based on their similarities. [74] These categories became the working analytical framework. The collateral documentary materials, especially the audio clips of Liberian interviewees, were then used to develop a triangulation mechanism whereby documentary data was compared with the analysis of interviews to assess convergence and divergence amongst sources, with the goal of testing our emerging analysis and identify elements that might have been missed in the development of the categories. This triangulation process supported the analytic structure while offering further insights about experiences of health workers during epidemics, and contributing to the rigor and depth of the research.[75] Sections of each transcript were then summarized to condense the data while maintaining the meanings and original "feel" of participants' exact words.[74, 76] This information was captured in a spreadsheet that also contained the corresponding demographic information of the participants.

Finally, interpretive themes and subthemes responding to the study's research question were developed through a process of reviewing the framework table and creating analytic memos.[65, 74, 77] The analytic memos were revised multiple times to consolidate the thematic structure and define the parameters of themes and subthemes so as to address the research question comprehensively.[74, 76] Data display tables were frequently examined to verify that sufficient data supported the themes and sub-themes and concept mapping and detailed reading of the charted texts supported refinement, merging and renaming of some themes until a final structure was established.

Results

Demographics of Participants

A total of seven individuals took part in a KII and 45 health workers in an IDI. All participants experienced both the Ebola epidemic and COVID-19 pandemic. The scope of the interview for one of the KII participants also included questions in the IDI guide as the respondent had experience in both patient care and health facility management during the Ebola epidemic and COVID-19 pandemic. Approximately 65% of the participants were female with a higher proportion for both the KIIs and IDIs. Eight different types of healthcare professionals were recruited for the study, with 54% of participants being nurses. Four of the respondents were EVD survivors and two had tested positive for COVID-19 but were not hospitalized. See Table 1 for more details about the participants.

Table 1
Aggregated demographic characteristics of the health workers interviewed, including their profession, gender, age range, marital status and religious faith

Profession	**n**		**EVD Survivor**	**Contracted COVID-19**
	KII	**IDI**		
Nurse	1	27	1	
Physician	4	6	2	2
Nurse Aide	–	4		
Psychosocial Worker	–	3		
Ambulance Driver	–	2		
Public Health Specialist	2	-	-	
Burial Team Member	–	1		
Orthopaedic Technician	–	1	1	
Hygienist	–	1		
Total	7	45	4	2
Age	**21–40**	**41–60**	**≥ 61**	
	4	47	1	
Gender	**Female**	**Male**		
	34	18		
Marital Status	**Single**	**Married**	**Other**	
	8	43	1	
Religion	**Christian**	**Muslim**	**Other**	
	47	4	1	
Dependents	**Children**	**Parents**	**Children and Parents**	
	9	1	42	

Thematic analysis

Participants described a range of motivations for providing clinical care amidst the Ebola epidemic and COVID pandemic. They were motivated to provide care, even amidst very challenging conditions, based on their commitment to come to the aid of their fellow citizens, by drawing inspiration from their professional oaths, through taking inspiration from specific patient encounters, and based on religious faith (illustrative quotations are presented in Table 2). In following through on these motivations to care for patients, participants described multiple forms and sources of ethical tensions, notably during the Ebola epidemic and to a lesser extent during the COVID-19 pandemic. The state of the health system before each outbreak and the impact of the respective contagion contributed to variation in their effects on the population and health system.[78, 79, 80, 81] Based on the analysis, we developed four themes related to these tensions: *Personal and Family Safety and Wellbeing versus Professional Responsibilities, Stigmatization, Discrimination and Psychological Trauma versus Professional Responsibilities*, *Systemic Failures*, and *Pathways to Resilience: Coping Mechanisms and Recommendations*. Relationships amongst the research question, themes, and subthemes are illustrated in the concept map (Fig. 1), while additional illustrative quotations associated with these themes also presented in Table 2.

Table 2
Illustrative quotations related to motivations and ethical tensions

Categories	Quotes
Motivation	***"It is my heart's desire to not see somebody suffering, you know……. So, my motivation was I want to get Liberia free so if I even see my friend, my colleagues are going down I was just like, oh, God, we want for this thing [EVD] to be to, to, to leave Liberia". (N3: Nurse)*** ***"What really motivated me was seeing health workers who took oath to save life and they were all shying away because nobody wanted to lose their lives as a result of other colleagues dying, I said we must have health workers who are supposed to be brave and that is how I came into the field". (N8: Ambulance Team Nurse)*** ***"But I'm not going to tell you I'm sending N27 to America because [the] American doctor and other[s] were taken to the States from here. No, we have to think about how we will take care of N27, we have to do that. That was the first time I went home and had to sit down all night reading. Just reading at random on everything on RNA virus, anything that come to my mind, every disease of the past that had to do with RNA virus [I] just kept reading randomly and just read wide and everything they use to treat RNA virus in the past, be it Ebola, Dengue fever, everything that I could, I read and then put down my notes and through that, yeah, I read until late night, late night, early morning of the night and then put down my notes and devise my own protocol [treatment]". (P5: Physician and Head of Health Facility)*** ***"I remember one time we went to a town called Limamba in Foya, where we had a dead woman, we saw a dead woman, she was in bed with two of her children, but the younger one was somewhere around one year like that, almost one year, you know. That child was breastfeeding on his dead, on the dead mother, can you imagine, when you, you and myself know that Ebola [virus] very survive [infectious] when it comes within the [body] fluids…. So, we managed to take the child and the other brother that was still alive, but their mother die [was dead] with one of their brothers in the same bed". (HG: Hygienist)*** ***"As you are asking, I say, I really don't want to take my mind back because just like what was happening and what I thought in my mind, my own daughter was also diagnosed of Ebola and along with her husband and 14 members of the family. Nine of them died from Ebola and I have to go in to treat my daughter and it was really terrifying thing for me. It was really paining me because whenever I go in, she see[s] the name written on my back. That's my mom, you are leaving me here and you know I'm going to die. You know, I am going to die, so are you going? So, then she will cry and they will have to hold her. So, they asked me to stay back, but I couldn't just get it, not going in, not because of her, but because of the commitment I have made to [with] God". (N23: Nurse)***
Four Themes	
1. Personal and Family Safety and Wellbeing versus Professional Responsibilities	*"The risks, risks were like coming in contact with body fluid. Like the first case {Ebola patient] that I attended that I saw with my eyes, the person was like vomiting and the vomitus was like flashing [splashing] and thing. We never had anything like you know to protect ourselves, no gloves. Syringes. …… Working among patients and using bare hands not using nose masks, PPE and just working poorly without preventing [protecting] yourself". (NA2: Nurse Assistant)* *"And because I'm a single, I was a single mother at that time, and I had my two girls and so I felt that they were left vulnerable too and I asked God that because of my children, He should look down on me and have mercy on me and heal me". (N28; Nurse and EVD Survivor)* *"Yes, yes. So that's, that's, that's one thing I think I've seen and the same thing came recently with the COVID-19 crisis and I was like, oh, here I am again, putting myself into COVID and the impact it will have on my family, especially when I came down with COVID and my entire family was now at risk of exposure because I already, I was already down with the disease and have been in the house for a couple of days before [testing]". (P6: Physician and Head of Health Facility)* *"During the crisis, my mother use to tell me not to take the job, this was because on the street of Monrovia, the Ebola crisis was like fighting a war. The street was isolated, and there was a Kia truck that use to move around carrying the corpses of Ebola victims and it was filled. Due to that, my mother will be crying and cautioning me to be careful, and I told her, even I will not be answering her phone calls". (N8: Ambulance Team Nurse)* *"You had some people whose families were telling them; look if you're going to that hospital today don't come home here. You know, you had people who were basically being kicked out of their homes if they were continuing to work". (P12: Physician)*
2. Stigmatization, Discrimination and Psychological Trauma versus Professional Responsibilities	*"During the COVID-19, yeah, I was also stigmatized in the sense that people said I work at hospital so I could easily bring it, you know, to my house, so those people that use to come around you know, like coming into the house, they were not really coming like before. So, everybody was like staying away because I used to come from the hospital every day. So that's how you know, I got stigmatized'. (OT: Orthopaedic Technician and EVD Survivor)* *"It affected me because my landlord even asked me out. My landlord asked me out, my neighbours never use to come around me, never. In fact, we use to eat in a cook shop [eatery] were people use to go and buy food, but because I was constant[ly] visit[ing] there, they shut the place down, because the woman was no longer making money" (HG: Hygienist).* *"My wife, yeah, my wife, my wife was stigmatized, she was, she was somebody who went through discrimination during the time of Ebola. The well that she used to draw water from, people were not happy of her drawing water, people were afraid and even they were saying that the house she was living in, the whole house is Ebola's house. So, she got dry [frail] because of the tension. She was, she was going through a lot of depression. Yeah, she was depressed. She was not to [by] herself". (OT, Orthopaedic Technician and EVD Survivor)*
3. Systemic Failures 4. Pathways to Resilience: Coping Mechanisms and Recommendations	*"Yeah, from the beginning, they, actually everybody got afraid. Actually, everybody risked their lives to go to save their fellow friends. So, a lot of health workers came down with Ebola because what, mistakenly you treating and got your PPE, if you didn't take it off properly, definitely a lot of them die from it too". (PW1: Psychosocial Worker)* *"It affected me greatly, but I did not come out [down] with Ebola, but we had one of our colleagues that came down with Ebola because one day he attended to patients with bare hands and did not wash hands properly. I do believe because we were not actually, not doing washing like get to one location, wash your hands, we were like go in, interact with the patient, face to face, bare hands and go save [retain] the washing glove" (NA2: Nurse Assistant).* *"I wasn't satisfied, but there's nothing I could do in that period. I couldn't do anything. Like sometimes you will have glove you don't have boots. Maybe you got masks you don't have goggle. You understand. So, things were not sufficient. You will have gloves, maybe no gloves it's finish. So, things were flowing in bit by bit". (N4: Nurse)*

"We're not really satisfied, especially, PPE was available, it was available. For that [PPEs] it was available, but the main thing we had problem was money, the money issue because it was a risk and we needed, what we wanted, we did not get what we wanted, but we still didn't mind it, we work, we still work". (N13: Nurse)

"Maybe the only concern we have a little bit of challenging was that the issue of you know pay. The issue of wages that was a challenge and even up to now we are left with drama. We never received any hazard benefit. Nothing was given to us, yeah, nothing. So that we, we decide to wave it and say, OK, since we work for our country, whatever we receive that is it". (NA5: Nurse Aide)

"So now is a issue of security, yeah, health security for themselves [health workers] and also health security for their family. Nobody wanted to die and leave their family behind. It was, it was a problem. Worst of all and then there was no, nothing like health insurance for the health workers. So, if you got yourself exposed, you're taking a risk. No insurance benefit at all, you would die, and that's it". (P6: Physician)

"I always used to, I always before I walk out to go, I will pray and ask God and say God my calling to become a nurse, if even I am supposed to go to church and my church day fall on a Sunday and the same serving I am going to serve God, I'm going to serve in taking care of patients, humanitarian so that's the same work, so before I walk out I will say Father in You, I put my trust who shall I be a afraid of and as I'm going to serve take care of me, be with me, protect me. if I say that prayers, when I enter, when I enter to dress, there can be no fear". (NA3: Nurse Assistant)

"Well, sometimes you know, you know, we are human, the fear will come in but I was very prayerful. One of the things believing [is] that I know in all things, God is first. So, what I did here for every time before wearing my, my PPE. I will pray and then pick up my phone, go in the corner, call my pastor and we pray along then I go back before wearing the PPE. So, I just had that faith that He took me there for a purpose and the purpose for which He took me there, it should be fulfilled and I know He has my life and no one else". (N13: Nurse)

"My mother, my mother showed me beyond this world that she loved me and loves me because she stayed there [hospital] until, she didn't leave, even though I told all of them to go, she didn't". (P7: Physician and EVD Survivor)

"Yeah, that first line response, yes. Yeah, we were satisfied because the, the administration was trying to prevent us from getting the disease and also preventing those other people, if we are vectors, from them getting the disease. Yeah. So, for that first line measure, yes, we were satisfied at the time". (N11: Nurse)

"Yeah, it was a little bit cordial even though you know I personally used to be a little bit isolated. Sometimes they [community members] use to ask me oh, NA5, but we know that you are health worker, so we can't isolate you. We did it 2014, 2016 and at the end of the day when our family got infected [with EVD], you were still there for us. You know, we will call you because you know and that was one of the things that brought us together". (NA5: Nurse Assistant)

"Always have the hospital equipped with working things that we need. Those gears, gloves, those things that we were working with, things that they know that we use because we all know without protective gear we can't work. So, before we even have an epidemic, there should be what, the hospital should be equipped with those things, that's all". (N4: Nurse)

"The other thing I would say, besides ensure [ensuring] you have the right clinical setting and diagnostic capacity, is to ensure that in the midst of pandemic that are deadly, there should be some insurance coverage, insurance policy for health workers and that will help to motivate them and also even increase their passion to work and then yes, that, that, that's to be. Then also ensure there is safety for those involved in the, for the families of those that are actively involved in, that are in the frontline attending to patients [and] who stand the risk of exposing their family to the disease". (P6: Physician and Head of Health Facility)

"So, we're just doing the Ebola work and then at the end of Ebola and COVID response, we see a lot of manuscripts and articles for people who only came and spent maybe two weeks, they went back and they wrote papers but we were here doing the work, having the experience, having the skills and everything, but then because we come from the culture of no-research, we did not have a single paper to our names. Not a single paper to our names. So that is something that I think the government should also try to invest into research and also using evidence for the policy decisions that we make because most of our policies that we have here are driven by partners, and external partners and donors. So, I think it's about time we use most of our decisions, our policies that we make based on experiences". (PHS1: Public Health Specialist)

Figure 1: Relationships amongst research question, themes and subthemes of health workers lived experiences during the Ebola epidemic and COVID-19 pandemic

Personal & Family Safety and Wellbeing versus Professional Responsibilities

A recurring concern for participants was their own safety while carrying out their professional duties towards patients. Several participants stated that during the Ebola epidemic, their main daily life struggle was the fear of exposing themselves to the virus in the line of duty. A participant who was a physician summed up this reality in the following points:

"So, he was just bleeding from everywhere until he eventually passed away, unfortunately, so that was the very first case and of course, I'll never forget it because that case, a lot of people were afraid to draw the sample, for instance, and I thought this is like Lassa fever, we've managed Lassa fever cases. So, I just wore a flimsy gown, two pairs of gloves, a mask and you know, goggles and I went to draw the sample, OK, so, but then later on when I started hearing of what was happening in Monrovia, truckloads of dead bodies and I'm thinking. OK, I think I was dancing with death, I'll never do that again". (P8)

These challenges were amplified for participants who reported that it was the first time they were encountering a deadly viral disease for which they had little or no prior experience or knowledge, while being overwhelmed by conflicting and unfounded information. Participants described how these features fuelled an atmosphere of misconceptions and made it less clear what the actual risks were in the situation and what actions they should take to protect themselves.

Several respondents also reported that since their clinical duties or field activities placed them at a greater risk of exposure to the Ebola virus, they lived with the persistent anxiety about potentially infecting family members throughout the epidemic period. A psychosocial worker expressed this concern as follows:

" So sometimes I come home and I'm thinking whether I should go straight in my house or just stay out, you know which one is safe? …….. So, I had a conflict in myself every time. You know, would I be exposing my family, my wife and my kid if I went in there, or you know, just stay out till tomorrow or something comes". (PW3)

Some respondents expressed similar concerns during the COVID-19 pandemic; however, compared to the Ebola era, these concerns were less frequent and less acute. Respondents also expressed having had worries about the welfare and wellbeing of their family members if the participant was to have become ill or died to an infection contracted during their work as a health professional.

Stigmatization, Discrimination and Psychological Trauma versus Professional Responsibilities

Many participants stated that they were viewed by people in their communities as potential vectors of the infectious disease and shunned by them, including by some people with whom the participants were closely connected. A physician captured these sentiments in this narration:

"Oh, people were always distancing, nobody, of course that was a common occurrence. Nobody wanted to interact with you. People treated you the way they treated Ebola patients. Health workers were stigmatized, all of that added to the emotional thing, post-traumatic stress, you know, some people got depressed and so forth". (P5)

According to several participants, these attitudes, including open ridicule and being denied access to public services, were hurtful and caused them to develop mental health conditions. This dynamic is illustrated by the experience of a physician who was also an Ebola-survivor. They narrated how authorities at their health facility suggested they take the rest of the year off after they had recovered and were ready to resume duty. The participant was doubtful of the motivations for this seeming generosity:

"OK, first of all, after I got well, I wanted to start work probably a month away and the hospital told me that I can take the rest of the year off, and I sensed from what, how they were saying it that they didn't [want to] have any part of it. They thought probably I was going to infect them or something like that and it, it was, it was the same feeling with the family and the neighbours". (P7)

The participant suspected that this gesture was actually a form of covert stigma by their institution against them as an EVD survivor.

Many respondents also spoke about how their immediate family members were shunned by other relatives and community members. They explained that this reaction was due to being closely connected to a health worker who provided care for Ebola patients. A physician participant explained this secondary stigmatization in the following terms:

"They stopped their children from coming to my house. They said their children should not play with my children. Even my in-laws stopped their children from coming to the house to play with my kids. So, our house was to some extent ostracized". (P6)

This respondent stated that due to this associative stigma, they experienced lasting strained relationships with some members of their family for many months during the Ebola crisis. In another instance, a respondent said that their partner left them because of the social ridicule the latter experienced from community members. Other respondents described that stigmatizing attitudes led to some community members openly expressing disapproval of the family members of health workers using communal amenities such as a well that was the main source of water for the entire community.

Systemic Failures

Infection control practices and equipment were a major concern for most participants. Several participants stated that before the outbreak of the Ebola epidemic, IPC practices were not properly established in the Liberian healthcare system, and also not a component of the curriculum for training health workers. A participant who was a physician described the situation:

"Let me be frank with you, infectious preventive control was not grounded in our health system. OK. When Ebola came, when Ebola came, that's the time we started hearing about IPC and the WHO instructed us, they told us we should include IPC into the curriculum. So, if you check all our curriculum from the medical school level, postgraduate, to the nurses, nurse aide, IPC is now integrated inside". (P2)

According to participants, the weak observance and limited knowledge about these essential clinical and public health safety protocols contributed to many health workers being exposed to the Ebola virus while providing clinical care, with some colleagues dying as a result.

Participants also reported that the government or other relevant authorities did not completely follow through with payment of the pledged hazard pay to health workers after the initial settlement. Additionally, they did not provide health workers with benefits such as disability insurance for work-related injuries or death benefit packages for family members in the event of a health worker's death resulting from an infection contracted during their clinical duties. They described the lack of these provisions as negatively impacted health workers' initial willingness to fulfil their professional obligations during the Ebola epidemic. A nurse participant captured the concerns of health workers as follows:

"I can tell you the truth, that health workers were not satisfied because it was only the materials that were being provided, but motivation, when it came to finances, they were not motivated at the time. They were not motivated, so a lot of people were complaining, why should I go [to] work, do a risky work where I would put my life on the line and I will not get anything and things like that. My family will not benefit when anything [something] happens to me". (N1)

The absence of these inducements affected the morale of many health workers, and participants described this situation as threatening the cohesiveness of the frontline at a time when the healthcare system was reeling under a deadly epidemic.

Pathways to Resilience: Coping Mechanisms and Recommendations

Many respondents said that they observed religious practices, such as frequent prayers and committing themselves to God's protection before commencing work to protect them against EVD. A respondent who was a nurse narrated their belief in the following terms:

"I know that me as a person I cannot protect myself, even the PPE, a lot of people wore PPE and they came down. Washing hands properly, it will help but I know God first in everything. That's why when I am leaving my house, I pray God, whatever sickness I'm not going with, help [me] not to return back to it, with it home. I come, I put my trust in God, I know that He is the creator, He will be, He will protect me". (N12)

Other participants expressed that their spiritual practices helped them to overcome their fears and cope with the ethical tensions that they experienced during the Ebola crisis.

Participants also described their family members as being a key source of strength during and a few months after the Ebola incident, a period they said was a particularly trying time in their lives as they lived in constant fear of exposing themselves and their loved ones to infection. A psychosocial worker participant described this relational network like this:

"You know, I had the support of my husband, especially I had the support of my kids and even some of my kids use to go to it, to my office, they will sit with the [EVD] survivors and all". (PW2)

Familial bonds enabled health workers to nurture their emotional resilience and continue working in the face of the risks and even being ostracized by some in society, ironically, for honouring their professional obligations and promoting the greater public good despite risk to their own lives.

An orthopaedic technician participant reported that after they recovered from the EVD and returned home, communal support was extended to them, which gave them a sense of acceptance by their people.

"So that's how I came home and people happily welcome me. The people from the island they came on the road, the whole road was jampack[ed]. People all raised their hands and the, the ambulance, including [the] press, they drove me into the church and I got to the church, people all standing around and jubilating". (OT)

The camaraderie shown by the townsfolk fostered good relationships and solidarity, which was vital for the welfare and wellbeing of the health workers during and post the health crisis. This posture of goodwill is contrary to the many hostile attitudes that several participants said they experienced at the hands of their community members.

In this context, many respondents were pleased that authorities at their health centre had provided health workers with psychosocial support services for their mental wellbeing during the Ebola crisis. A respondent who was a nurse stated:

"Like one good thing they put in place, we had the, the, the psychosocial workers. They will always have meeting with us there, in the morning we come to work, whether in 5 minutes, they have to talk with us, yes, to take away trauma ". (N15)

This intervention enabled the health workers to cope with the stress, trauma and mental health challenges they experienced during the epidemic.

Many participants said that the government should institutionalize periodic training in epidemic preparedness for all healthcare workers, ensuring that the entire healthcare workforce is equipped with the necessary skills to handle future outbreaks and their associated consequences. A hygienist stated:

"The first thing I would like for government to do is to come out with more training. ..... Once we are trained, you can be brave to do the work. Government should be ready to train more health workers, almost all of the workers, health workers because you can never tell." (HG)

In emphasising the importance of training, many respondents cautioned against the ad-hoc approach of providing healthcare workers with such skills while a public health crisis unfolds.

Several participants also stated that the government and relevant authorities should ensure that the necessary PPEs to safeguard the lives of health workers are readily available for personnel to access at the onset of a contagion. In addition to advocating for accessibility to protective equipment, participants also called for improving the diagnostic capabilities of health facilities to facilitate better and timely clinical judgments for the health workers and the healthcare system.

Respondents suggested that the government should institute awards to recognize and incentivize frontline healthcare workers for their continued commitment to duty during and after a public health crisis. Among the many suggestions, a physician respondent proposed an antemortem or posthumous medal decoration for health workers and explained that:

"And health workers, once you recognize the little effort made by them, they kind of appreciate it.... Some form of recognition that OK, this for all health workers who were actively involved in this pandemic or this, we want to appreciate you, we want to give you a medal for participation in the COVID, in the COVID pandemic. Just provide, you don't have to give millions but just that medal". (P6)

According to the respondents, such symbolic gestures by the government would be an enduring recognition of the sacrifices made by retired, active, or deceased healthcare professionals, which would motivate current and future personnel.

Discussion

To our knowledge, this is the first empirical study that explored the ethical tensions experienced by national health workers in Liberia who provided care to patients at health facilities that were not designated as treatment centres during two of the most important disease outbreaks in the country's history, the 2014 Ebola epidemic in West Africa and the COVID-19 pandemic.[82, 83, 84] The Ebola epidemic occurred at a time when Liberian health workers were

confronted with baseline challenges of weak healthcare systems, poor infrastructure, and limited state support.[5, 6, 7, 85, 86, 87] This situation was worsened by the lack of appropriate PPEs and health workers having to navigate the difficulty of balancing their legal obligations and moral responsibilities to patients, without resources to assist them in managing these vital issues at a critical period.[12, 85, 86, 87]

In response to the COVID-19 pandemic outbreak, the Liberian government, through its state agencies and with support from donor partners, rolled out a national pandemic preparedness strategy in January 2020.[88, 89, 90] This proactive approach drew on the lessons from the Ebola epidemic, including basic handwashing, social distancing, safe burial practices, and in-service training of healthcare workers to equip them with the requisite skills to screen and manage cases promptly.[85, 86, 87, 88, 89, 90] Our research project developed a protocol to explore the ethical tensions experienced by Liberian health workers during the 2014 West African Ebola epidemic and took initial steps towards data collection when the WHO declared COVID-19 outbreak a Public Health Emergency of International Concern (PHEIC).[91, 92] The similarities in the challenges encountered by national health workers during the 2014 Ebola epidemic and the first and subsequent waves of the COVID-19 pandemic — including high risk of nosocomial infection, severe shortages and irregular supplies of PPEs, and limited knowledge about the emerging infectious disease — elicited our interest to better understand Liberian health workers perspectives and experiences of navigating ethical tensions during these two virulent contagions.[93, 94] The decision was premised on the fact that ethical tensions experienced by frontline health workers during epidemics, especially virulent ones directly affect the health system's emergency preparedness, including containment efforts and resilience.[95, 96, 97]

Although concerns about health workers' personal safety during epidemics were not entirely new within the Liberian healthcare system due to past and periodic Cholera and Lassa fever outbreaks, the Ebola crisis considerably expanded discussion of these concerns, including issues about health workers' duty of care to patients versus their own personal and family safety and wellbeing during health emergencies.[12, 98, 99, 100, 101] The topic also extended to the reactions of family members and the public that health workers encountered while fulfilling their professional responsibilities, as well as issues related to the psychosocial challenges they faced and the absence of resources to assist them manage these difficulties.[12, 102] These ethical tensions were heightened by the facts that the West African Ebola epidemic, which the WHO described as an "*old disease in a new context*", was completely alien to the region compared to Central Africa and that health and governance structures across the affected countries lacked the experience to handle the rapid spread of EVD.[52] The transmission of EVD amongst the three countries in a context of resource limitations and systemic weakness underscores the importance of global solidarity to strengthen health systems worldwide through actions that build resilient and broad structures, to tackle a range of challenges before, during and after health emergencies.[103, 104, 105]

The results of our study demonstrate how, when it became evident that Liberia was reeling under a deadly infectious disease, participants' primary concern as they provided patient care was for their personal safety and also the safety and wellbeing of their family members. Participants' apprehensions, which sometimes conflicted with their intent to care for patients, were heightened because they lacked skills in IPC, their health facilities lacked procedures to screen and isolate suspected Ebola cases, and these centres were also poorly stocked with even basic PPE. These findings are similar to multiple studies investigating the perspectives of health workers' experiences during deadly infectious disease outbreaks in HICs and/or LMICs settings which have reported that health workers' biggest challenge was the fear of exposing themselves to the disease in the line of duty. According to this body of knowledge, health workers' concerns had a range of origins, including a lack of knowledge about the disease, poor supply or unavailability of appropriate PPEs, and the absence of incentives like risk allowances and insurance benefits, among others.[44, 65, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116] Our findings, however, revealed mixed reactions among Liberian health workers regarding the government's inability to fully honour the promised monthly hazard pay, which was reduced twice after the originally announced amount, and subsequently changed to a lump sum paid in three instalments during the Ebola crisis.[117, 118] Some participants expressed disappointment with the government over the non-payment or partial payment of this danger money, while others placed less emphasis on the proposed compensation; rather, they were concerned that the epidemic would possibly collapse the healthcare system, and potentially disrupt their livelihoods, although they wished the hazard money were paid fully or partially. Despite the divergent opinions regarding hazard pay, this issue was not among the key factors that Liberian health workers considered when deciding whether to abandon or continue their professional duties during the Ebola health crisis.[117, 118]

The historical context of Liberia's civil wars (1989–2003) deserves explicit consideration in interpreting these findings.[1, 2, 3] Health workers who trained in the immediate post-conflict period inherited a system in which 'systemic failure' was the norm.[119, 120] This may explain participants' relatively muted criticism of government compared to studies from more stable contexts.[121, 122, 123] Rather than expressing outrage at the absence of PPE or hazard pay, many participants described these deficiencies as expected, and expressed gratitude for any support received. This finding suggests that historical trauma and chronic underfunding may normalize conditions that should be understood as ethically unacceptable, with implications for how future preparedness efforts must actively reset expectations.

Participants in our study experienced acts of stigma as a result of honouring their professional responsibilities to care for patients or undertake public health duties during the Ebola epidemic. These negative behaviours originated from family members, colleagues, neighbours, the broader society and, in some instances, even involving the management of health facilities. Many studies that examined the viewpoints of health workers' experiences during contagion outbreaks in various settings reported incidents of health workers experiencing ostracization and stigmatization that affected their psychological wellbeing.[44, 65, 106, 107, 108, 110, 111, 112, 113, 116] These studies identify familial, collegial and communal circles as sources of stigma. Our participants also described situations where professional colleagues and hospital managers were sources of such discrimination. This prejudicial disposition by managers of health facilities, which was mainly directed at EVD survivors who were ready to resume their clinical duties, reflected an attitude of noncompliance with the protocol for reintegrating victims of the disease to the workplace.[124, 125, 126] Such actions may not have occurred at designated ETUs because most of them operated under joint guidance that involved the government and other entities such as larger corporations, intergovernmental and international agencies.[39, 121, 122, 123, 124, 125, 126, 127, 128] Since some of these stakeholders were involved in the development of the protocol for reintegrating EVD survivors into the workplaces and communities, it is possible that the ETUs they jointly supervised were more likely to implement these regulations.[124, 126] Further studies to explore health workers' experiences of institutional stigma at designated and non-designated health facilities, and also across similar and

diverse socioeconomic settings during epidemics, could help to inform existing and future policies on how to support health workers and better address the systemic problem of ostracism and stigmatization during public health emergencies.

Our study offers insights into the coping mechanisms that participants employed to navigate the ethical tensions they encountered during the Ebola epidemic. Religious practices and faith, as well as familial and institutional support, helped health workers as they encountered fear, loneliness, and psychological challenges arising from their work. In particular, several participants attributed their not contracting Ebola to their religious beliefs and fate, despite working in conditions that dangerously exposed them to the virus, especially during the early stages of the epidemic. A sense of divine providence became a source of refuge and motivation for these health workers to overcome their grief and continue working after witnessing some of their colleagues, including close friends, succumb to the disease in the line of duty. Various studies have highlighted how religion, social support, and institutional interventions function as coping measures that motivated health workers to continue their roles providing care for patients or undertaking public health duties.[54, 129, 130, 131, 132, 133] Our findings further reveal how Liberian health workers sought solace and a source of resilience in religion when experiencing distressful or sorrowful events like the death of a colleague or the death of a large number of patients within a short period of time. More research on the role of religion and social networks as health workers navigate ethical challenges, including moments of anguish during public health crises, will support further understanding of coping mechanisms in times of health emergencies.

This study had limitations as data collection took place six years after Liberia was declared Ebola-free and two years after the first case of COVID-19 pandemic was confirmed in the country.[10, 60] These intervals could be a factor for recall bias among participants, especially their experiences during the Ebola epidemic. Since PM's understanding of the Liberian healthcare system, cultural dimensions and access to health facilities across Monrovia were limited, assistance was sought from JS in identifying health centres that met the inclusion criteria for participant recruitment. JS provided the names of nine health centres out of the over 20 facilities in Monrovia. [134] This guidance was important because it enabled the research project to recruit participants based on the specified sampling method. However, it may have introduced selection bias into the sample, as the names JS provided were based on their experience. To mitigate this concern, PM independently confirmed with the head of the Montserrado County Health Directorate that the selected facilities met the inclusion criteria. The research team had sought to access additional collateral documentary materials from the Liberian Ministry of Health library but was not able to due to administrative procedures. Inclusion of these materials would have provided further perspectives on Liberian health workers experiences during the two contagions. Nonetheless, the research team accessed online video and audio materials that covered the experiences of Liberian health workers during the Ebola epidemic. These online documentary materials corroborated many of the responses from participants, allowing for the triangulation of data from different sources.[75]

Conclusion

This study chronicles the ethical tensions experienced by Liberian frontline health workers working in PHC. These individuals navigated risks for their health and the wellbeing of their families in contexts of limited resources, gaps in state support and social stigma, yet continued to provide care to many very sick patients. Their commitment to professional duty, which contributed to the resilience of the healthcare system, helped mitigate the two health crises. Health workers are at the core of the healthcare system and play a critical role during health emergencies. Incorporating lessons from their lived experiences during past epidemics or pandemics, and their suggestions on measures that will assist them to better navigate potential challenges arising from a health crisis, is crucial for enhancing preparedness and reinforcing the resilience of healthcare systems.

Abbreviations

BTM
Burial Team Members
COVID-19
Coronavirus Disease 2019
ETUs
Ebola Treatment Units
EVD
Ebola Virus Disease
HG
Hygienists
ICU
Intensive Care Unit
IDSR
Integrated Disease Surveillance and Response
ID
Interpretive Description
IDI
In-depth Interview
IPC
Infection Prevention and Control
KII
Key Informant Interview

LMICs
Low and Middle-Income Countries
N
Nurses
NA
Nurse Aides
OT
Orthopaedic Technicians
P
Physicians
PHC
Primary Health Care
PHS
Public Health Specialists
PPE
Personal Protective Equipment
PW
Psychosocial Workers
WHO
World Health Organization

Declarations

Ethics approval and consent to participate

This study adhered to the principles of the Declaration of Helsinki. Ethical approval was granted by the Institutional Review Board of the Faculty of Medicine and Health Sciences, McGill University (**Study Number A04-B39-21A: 21-04-042)** and the University of Liberia-Pacific Institute for Research and Evaluation Institutional Review Board (**Assurance # FWA00004853**). The approval included the method of invitation, obtaining consent, data use and storage, and dissemination of research findings. Participants were taken through the informed consent process before the start of the interview. All participants provided written informed consent.

Consent for publication

Not applicable

Competing interests

The authors declare none

Funding

Parnor Madjitey is extremely indebted to the Ghana Education Trust Fund for the award of a doctoral scholarship. This work was funded by the International Development Research Centre (grant 109075-001), the Canadian Department of Global Affairs (grant BIO-2019-005), and the Canadian Institutes of Health Research (CIHR), through grants awarded to Global Urgent and Advanced Research and Development (GUARD). Additional funding support was received from the National Institute for Health and Care Research (NIHR 2021136)/Royal Society of Tropical Medicine and Hygiene (RSTMH) - Early Career Grants Programme, and the McGill University Graduate Mobility Award (Global Health Scholars Program). Financial support for the publication of this article was also provided by GUARD. The funding agencies and the institution had no role in the experimental design, analysis, or the decision to submit the current manuscript.

Author Contribution

Conception and design were completed by PM, with input from MH, GK, JS (and Anne Andermann). Material preparation, data collection, and analysis were performed by PM. Analysis was reviewed by MH. Initial manuscript draft was prepared by PM and subsequently revised by MH, JS and MENT. All authors read and approved the final manuscript.

Acknowledgement

Parnor Madjitey would like to express his gratitude to Anne Andermann for her invaluable guidance and support as his doctoral supervisor from the beginning of his doctoral journey until she withdrew from this role. Parnor Madjitey would also like to express his sincere gratitude to Hugues Fausther-Bovendo for his support during the conceptualisation of the research and data collection, and to thesis committee members, Nicholas King and John Pringle,

for their critical insights and constructive input. The authors would like to gratefully thank Dr Yatta Wapoe, County Health Officer, Montserrado, Liberia, for their valuable assistance in facilitating data collection. Our deep appreciation goes to all participants for offering their time and insights into the topic, and to Joana Madjitey and Isabella Madjitey for their assistance during the data transcription process.

Data Availability

The datasets generated and analysed during the current study are not publicly available due to the protection of participants' privacy and adherence to research ethics boards requirements, but excerpts are available from the corresponding author upon reasonable request.

References

1. LIBERIA'S HEALTHCARE SYSTEM- WHAT IS WORKING? FORMAL AND INFORMAL SECTORS | LinkedIn. 2017. Available from: https://www.linkedin.com/pulse/liberias-healthcare-system-what-working-formal-neiger-green-pmp/
2. Shoman H, Karafillakis E, Rawaf S. The link between the West African Ebola outbreak and health systems in Guinea, Liberia and Sierra Leone: a systematic review. Global Health. 2017;13:1. https://doi.org/10.1186/s12992-016-0224-2.
3. Kruk ME, Rockers PC, Williams EH, Varpilah ST, Macauley R, Saydee G, Galea S. Availability of essential health services in post-conflict Liberia. Bull World Health Organ. 2010;88:527–34. 10.2471/BLT.09.071068. https://www.who.int/bulletin/volumes/88/7/09-071068/en/.
4. Health in Liberia. https://en.wikipedia.org/wiki/Health_in_Liberia
5. WHO. Communicable disease surveillance and response systems Guide to monitoring and evaluating. WHO/CDS/EPR/LYO/2006.2 https://www.who.int/csr/resources/publications/surveillance/WHO_CDS_EPR_LYO_2006_2.pdf
6. Nyenswah TG, Skrip L, Stone M, Schue JL, Peters DH, Brieger WR. Documenting the development, adoption and pre-ebola implementation of Liberia's integrated disease surveillance and response (IDSR) strategy. BMC Public Health [Internet]. 2023;23(1):2093. Available from: https://doi.org/10.1186/s12889-023-17006-7
7. Kieny MP, Evans DB, Schmets G, Kadandale S. Health-system resilience: reflections on the Ebola crisis in western Africa. Bulletin of the World Health Organization [Internet]. 2014;92(12):850. Available from: https://doi.org/10.2471/blt.14.149278
8. Western African Ebola virus epidemic. https://en.wikipedia.org/wiki/Western_African_Ebola_virus_epidemic
9. Stanturf JA, Goodrick SL, Warren ML Jr., Charnley S, Stegall CM. Social Vulnerability and Ebola Virus Disease in Rural Liberia. PLoS ONE. 2015;10(9):e0137208. 10.1371/journal.pone.0137208. . Accessed 13 November 2019.
10. Nyenswah TG, Kateh F, Bawo L, Massaquoi M, Gbanyan M, Fallah M, De Cock KM. Ebola and Its Control in Liberia, 2014–2015. Emerg Infect Dis. 2016;22(2):169–77. 10.3201/eid2202.151456.
11. Ibe O, Kapeu A, Boima T, Horace J. Collective impact for universal Coverage: Liberia's health system on the rise - [Internet]. -. 2019 [cited 2025 Jun 12]. Available from: https://mcsprogram.org/collective-impact-for-universal-coverage-liberias-health-system-on-the-rise/ Accessed 12 June 2025.
12. Kollie ES, Winslow BJ, Pothier P, Gaede D. Deciding to work during the Ebola outbreak: The voices and experiences of nurses and midwives in Liberia. International Journal of Africa Nursing Sciences [Internet]. 2017;7:75–81. Available from: https://doi.org/10.1016/j.ijans.2017.09.002
13. Zambon K, American Association for the Advancement of Science (AAAS). As healthcare workers struggle against Ebola, other problems also demand their attention | American Association for the Advancement of Science (AAAS) [Internet]. 2014 [cited 2025 Sep 13]. Available from: https://www.aaas.org/news/healthcare-workers-struggle-against-ebola-other-problems-also-demand-their-attention. Accessed 13 September 2025.
14. World Bank Group. Health workers on Ebola frontlines serve countries, risk own lives [Internet], World Bank. 2015. Available from: https://www.worldbank.org/en/news/feature/2015/04/06/healt-workers-on-ebola-frontlines-serve-countries-risk-own-lives#:~:text=Early%20Losses,subsequently%20died%20of%20the%20disease
15. The White House [Office of the Press Secretary]. FACT SHEET: Progress in our Ebola response at home and abroad [Internet]. whitehouse.gov. 2015 [cited 2025 Sep 14]. Available from: https://obamawhitehouse.archives.gov/the-press-office/2015/02/11/fact-sheet-progress-our-ebola-response-home-and-abroad#:~:text=In%20Liberia%2C%20U.S.%20personnel%2C%20both,personnel%20and%20wide%2Dranging%20resources
16. CDC Museum. Treatment centers · EBOLA: People + Public Health + Political will · CDC Museum Digital Exhibits [Internet]. [cited 2025 Sep 14]. Available from: https://cdcmuseum.org/exhibits/show/ebola/public-health/isolation-treatment/treatment-centers
17. WHO. The Ebola outbreak in Liberia is over | WHO | Regional Office for Africa [Internet]. WHO | Regional Office for Africa. 2015 [cited 2025 Sep 14]. Available from: https://www.afro.who.int/news/ebola-outbreak-liberia-over
18. International Medical Corps. Ebola | International Medical Corps [Internet]. International Medical Corps. [cited 2025 Sep 14]. Available from: https://internationalmedicalcorps.org/emergency-response/ebola/
19. Bell SA, Munro-Kramer ML, Eisenberg MC, Williams G, Amarah P, Lori JR. Ebola kills generations: Qualitative discussions with Liberian healthcare providers. Midwifery [Internet]. 2016;45:44–9. Available from: https://doi.org/10.1016/j.midw.2016.12.005
20. Cooper C, Fisher D, Gupta N, MaCauley R, Pessoa-Silva CL. Infection prevention and control of the Ebola outbreak in Liberia, 2014–2015: key challenges and successes. BMC Medicine [Internet]. 2016;14(1). Available from: https://doi.org/10.1186/s12916-015-0548-4
21. Shultz JM, Baingana F, Neria Y. The 2014 Ebola outbreak and mental health. JAMA [Internet]. 2014;313(6):567. Available from: https://doi.org/10.1001/jama.2014.17934
22. Wirsiy FS, Tahmo NB, Tatah L, Brett-Major DM. Resilience of mental health services amidst Ebola disease outbreaks in Africa. Frontiers in Public Health [Internet]. 2024;12. Available from: https://doi.org/10.3389/fpubh.2024.1369306

23. McQuilkin PA, Udhayashankar K, Niescierenko M, Maranda L. Health-Care Access during the Ebola Virus Epidemic in Liberia. American Journal of Tropical Medicine and Hygiene [Internet]. 2017;97(3):931–6. Available from: https://doi.org/10.4269/ajtmh.16-0702
24. Kuehn BM. Africa succeeded against COVID-19's first wave, but the second wave brings new challenges. JAMA [Internet]. 2021;325(4):327. Available from: https://doi.org/10.1001/jama.2020.24288
25. Okeahalam C, Williams V, Otwombe K. Factors associated with COVID-19 infections and mortality in Africa: a cross-sectional study using publicly available data. BMJ Open [Internet]. 2020;10(11):e042750. Available from: https://doi.org/10.1136/bmjopen-2020-042750
26. Ndiaye AJS, Beye M, Sow A, Lo G, Padane A, Sokhna C et al. COVID-19 in 16 West African Countries: An Assessment of the Epidemiology and Genetic Diversity of SARS-CoV-2 after Four Epidemic Waves. American Journal of Tropical Medicine and Hygiene [Internet]. 2023;109(4):861–73. Available from: https://doi.org/10.4269/ajtmh.22-0469
27. Akpan GE, Bawo L, Amo-Addae M, Kennedy J, Wesseh CS, Whesseh F et al. COVID-19 reinfection in Liberia: Implication for improving disease surveillance. PLoS ONE [Internet]. 2022;17(3):e0265768. Available from: https://doi.org/10.1371/journal.pone.0265768
28. Raffle S. Responding to COVID-19 in Africa: The myths, the lessons, and the future | DNDi [Internet]. Drugs for Neglected Diseases Initiative (DNDi). 2020. Available from: https://dndi.org/events/2020/webinar-responding-covid-19-africa-myths-lessons-future/. Accessed 11June 2025.
29. Eyawo O, Viens AM, Ugoji UC. Lockdowns and low- and middle-income countries: building a feasible, effective, and ethical COVID-19 response strategy. Globalization and Health [Internet]. 2021;17(1). Available from: https://doi.org/10.1186/s12992-021-00662-y
30. Wikipedia contributors. COVID-19 pandemic by country and territory [Internet]. Wikipedia. 2025. Available from: https://en.wikipedia.org/wiki/COVID-19_pandemic_by_country_and_territory. Accessed 22 September 2025.
31. Happi CT, Nkengasong JN. Two years of COVID-19 in Africa: lessons for the world. Nature [Internet]. 2022;601(7891):22–5. Available from: https://doi.org/10.1038/d41586-021-03821-8
32. Gaobotse G, Ogbaga CC. COVID-19 in Africa: New opportunities created. Ethics Medicine and Public Health [Internet]. 2022;24:100832. Available from: https://doi.org/10.1016/j.jemep.2022.100832
33. The Brussels School of Governance. COVID-19 Success stories from the African Continent [Internet]. BSoG. 2020. Available from: https://www.brussels-school.be/research/publications/covid-19-success-stories-african-continent. Accessed 21 February 2026 2026.
34. Hirsch A. Why are Africa's coronavirus successes being overlooked? The Guardian [Internet]. 2020; Available from: https://www.theguardian.com/commentisfree/2020/may/21/africa-coronavirus-successes-innovation-europe-us. Accessed 21 February 2026.
35. Adepoju P. Lessons from Africa for Future-Proofing Global Health [Internet]. Think Global Health. 2024. Available from: https://www.thinkglobalhealth.org/article/lessons-africa-future-proofing-global-health. Accessed 21 February 2026.
36. Hafner M, Yerushalmi E, Fays C, Dufresne E, Van Stolk C. COVID-19 and the cost of vaccine nationalism. RAND Corporation eBooks [Internet]. 2020; Available from: https://doi.org/10.7249/rra769-1
37. Bollyky TJ, Bown CP. The tragedy of vaccine nationalism [Internet]. Foreign Affairs. 2020 Sep pp. 96–8. Available from: https://www.wto.org/english/tratop_e/trips_e/techsymp_290621/bown_pres2.pdf
38. Yates R. Covid's solidarity failure [Internet]. Chatham House. 2021. Available from: https://www.chathamhouse.org/publications/the-world-today/2021-12/covids-solidarity-failure. Accessed 21 February 2026.
39. Worldometer, Liberia. COVID - Coronavirus statistics - Worldometer [Internet]. Coronavirus. 2024 [cited 2026 Apr 28]. Available from: https://www.worldometers.info/coronavirus/country/liberia/
40. Lehyen DB, Ako-Egbe L, Dwalu E, Vonhm BT, Thekkur P, Zachariah R et al. Health care workers hospitalized for COVID-19 in Liberia: who were they, and what were their outcomes? F1000Research [Internet]. 2024;13:656. Available from: https://doi.org/10.12688/f1000research.149673.2
41. Liu L, Yin H, Liu D. Zero Health worker infection: Experiences from the China Ebola Treatment Unit during the Ebola epidemic in Liberia. Disaster Medicine and Public Health Preparedness [Internet]. 2016;11(2):262–6. Available from: https://doi.org/10.1017/dmp.2016.103
42. Senga M, Pringle K, Ramsay A, Brett-Major DM, Fowler RA, French I et al. Factors underlying Ebola virus infection among health workers, Kenema, Sierra Leone, 2014–2015. Clinical Infectious Diseases [Internet]. 2016;63(4):454–9. Available from: https://doi.org/10.1093/cid/ciw327
43. Williams GS, Naiene J, Gayflor J, Malibiche T, Zoogley B, Frank WG et al. Twenty-one days of isolation: A prospective observational cohort study of an Ebola-exposed hot zone community in Liberia. Journal of Infection [Internet]. 2015;71(2):150–7. Available from: https://doi.org/10.1016/j.jinf.2015.05.003
44. Cooper C, Fisher D, Gupta N, MaCauley R, Pessoa-Silva CL. Infection prevention and control of the Ebola outbreak in Liberia, 2014–2015: key challenges and successes. BMC Medicine [Internet]. 2016;14(1):2. Available from: https://doi.org/10.1186/s12916-015-0548-4
45. Kealeboga KM, Ntsayagae EI, Tsima O. Psychological impact of COVID-19 on nurses caring for patients during COVID-19 pandemic in Gaborone. Nurs Open. 2022;10(5):3084–93. 10.1002/nop2.1557.
46. Kwaghe AV, Kwaghe VG, Habib ZG, et al. Stigmatization and psychological impact of COVID-19 pandemic on frontline healthcare Workers in Nigeria: a qualitative study. BMC Psychiatry. 2021;21(1). 10.1186/s12888-021-03540-4.
47. Rathnayake S, Dasanayake D, Maithreepala SD, Ekanayake R, Basnayake PL. Nurses' perspectives of taking care of patients with Coronavirus disease 2019: A phenomenological study. PLoS ONE. 2021;16(9):e0257064. 10.1371/journal.pone.0257064.
48. Saragih ID, Tarihoran DETAU, Rasool A, Saragih IS, Tzeng H, Lin C. Global prevalence of stigmatization and violence against healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. J Nurs Scholarsh. 2022;54(6):762–71. 10.1111/jnu.12794.
49. Miller NP, Milsom P, Johnson G, Bedford J, Kapeu AS, Diallo AO et al. Community health workers during the Ebola outbreak in Guinea, Liberia, and Sierra Leone. pmc.ncbi.nlm.nih.gov [Internet]. 2018; Available from: https://doi.org/10.7189/jogh-08-020601

50. Dadzie JE, Kanagasabai U. A policy analysis of the primary health care approach in Liberia. Hygiene [Internet]. 2022;2(1):44–62. Available from: https://doi.org/10.3390/hygiene2010004
51. Simen-Kapeu A, Lewycka S, Ibe O, Yeakpalah A, Horace JM, Ehounou G et al. Strengthening the community health program in Liberia: Lessons learned from a health system approach to inform program design and better prepare for future shocks. Journal of Global Health [Internet]. 2021;11:07002. Available from: https://doi.org/10.7189/jogh.11.07002
52. Tulenko K. Reflections on the Ebola crisis: Health worker perspectives. Journal of Communications in Healthcare [Internet]. 2014;7(4):246–7. Available from: https://doi.org/10.1179/1753806814z.00000000091
53. World Health Organization. Factors that contributed to undetected spread [Internet]. 2015 [cited 2025 Nov 5]. Available from: https://www.who.int/news-room/spotlight/one-year-into-the-ebola-epidemic/factors-that-contributed-to-undetected-spread-of-the-ebola-virus-and-impeded-rapid-containment. Accessed November 5, 2025.
54. 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), 251. 10.1186/s12913-018-3072-3. Accessed July 12, 2019.
55. Hunt MR. Strengths and Challenges in the use of Interpretive Description: Reflections arising from a study of the moral experience of health professionals in humanitarian work. Qualitative Health Research [Internet]. 2009;19(9):1284–92. Available from: https://doi.org/10.1177/1049732309344612
56. Thorne S, Kirkham SR, MacDonald-Emes J. Interpretive description: A noncategorical qualitative alternative for developing nursing knowledge. Research in Nursing & Health [Internet]. 1997;20(2):169–77. Available from: https://doi.org/10.1002/(sici)1098-240x(199704)20:2%3C169::aid-nur9%3E3.3.co;2-b
57. Ocean M, Montgomery R, Jamison Z, Hicks K, Thorne S. Exploring the expansive Properties of Interpretive Description: an invitation to anti-oppressive researchers. International Journal of Qualitative Methods [Internet]. 2022;21. Available from: https://doi.org/10.1177/16094069221103665
58. Thorne S. Interpretive description [Internet]. Routledge eBooks. 2016. Available from: https://doi.org/10.4324/9781315545196 Accessed 18 June 2025.
59. Gwaikolo C, Sackie-Wapoe Y, Badio M, Glidden DV, Lindan C, Martin J. Prevalence and determinants of post-acute sequelae of COVID-19 in Liberia. International Journal of Epidemiology [Internet]. 2023;53(1). Available from: https://doi.org/10.1093/ije/dyad167
60. Babalola OJ, Sesay HW, Blebo LS, Whesseh FK, Umeokonkwo CD, Adewuyi PA et al. The influence of first wave of COVID-19 outbreak on routine healthcare services, Liberia, August 2020: a mixed study approach. BMC Health Services Research [Internet]. 2022;22(1). Available from: https://doi.org/10.1186/s12913-022-08074-3
61. Maweu DM, Davies P, Dahn LC, Karanja VM, Nyishime M, Rogers RD et al. Strategies for success: Simple education interventions to equip nursing students in rural Liberia. Annals of Global Health [Internet]. 2021;87(1). Available from: https://doi.org/10.5334/aogh.3251
62. World Health Organization. The Ebola outbreak in Liberia is over | WHO | Regional Office for Africa [Internet]. WHO | Regional Office for Africa. 2015 [cited 2025 Nov 6]. Available from: https://www.afro.who.int/news/ebola-outbreak-liberia-over#:~:text=During%20those%20two%20months%2C%20the,severe%20%E2%80%93%20permanent%20threat%20to%20health. Accessed 24 June 2025.
63. Miller NP, Luckow PW. How reinforced community health structures and capitalizing on lessons learned from the Ebola virus epidemic of 2014–16 helped the country respond to the challenge of its second major disease outbreak in five years [Internet]. Liberia. 2018. Available from: https://www.who.int/docs/default-source/coronaviruse/country-case-studies/liberia-covid-19-case-study-final-(002).pdf
64. Sheppard V. 12.4 Getting in and choosing a site [Internet]. Pressbooks. 2020. Available from: https://pressbooks.bccampus.ca/jibcresearchmethods/chapter/12-4-getting-in-and-choosing-a-site/ Accessed 19 June 2025.
65. Madjitey P, Hunt M, Andermann A. Exploring the Ethical Tensions Experienced by Health Care Workers during Infectious Disease Outbreaks in Low- and Middle-income Countries: A Critical Interpretive Review of the Literature. Disaster Med Pub Health Prep. 2025;19:e304. 10.1017/dmp.2025.10229.
66. Spradley J. Asking descriptive questions [Internet]. 1st ed. The Ethnographic Interview. Wadsworth, an imprint of the Wadsworth Group, a division of Thomson Learning; 1979. Available from: https://jan.ucc.nau.edu/~pms/cj355/readings/spradley.pdf
67. Leech BL. Asking questions: Techniques for semistructured interviews. PS Political Science & Politics [Internet]. 2002;35(04):665–8. Available from: https://doi.org/10.1017/s1049096502001129
68. Dovetail Editorial Team. What is recall bias? Overview, examples, and ways to reduce it [Internet]. 2023. Available from: https://dovetail.com/research/what-is-recall-bias/ Accessed 24 June 2025.
69. Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. Journal of Multidisciplinary Healthcare [Internet]. 2016;211. Available from: https://doi.org/10.2147/jmdh.s104807
70. PSIglobalunion. 02 - Health workers during the Ebola Crisis: canaries in the coalmine. (5mn) [Internet]. YouTube. 2017. Available from: https://www.youtube.com/watch?v=G0WqdaQc-Jk. Accessed 28 June 2025.
71. CNN. LIBERIA, EBOLA CONCERN FOR HEALTHCARE WORKERS [Internet]. : YouTube. 2016. Available from: https://www.youtube.com/watch?v=KAROLelaQOU. Accessed 28 June 2025.
72. CBC News. Ebola outbreak: Liberia's health workers face tough choices [Internet]. YouTube. 2014. Available from: https://www.youtube.com/watch?v=LgycimnOFIs Accessed 28 June 2025.
73. Columbia University. Frontline Nurses: Ebola Oral Histories [Internet]. 2020 [cited 2025 Jun 29]. Available from: https://frontlinenurses.columbia.edu/ebola/collection/ Accessed 29 June 2025.
74. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. BMC Medical Research Methodology [Internet]. 2013;13(1). Available from: https://doi.org/10.1186/1471-2288-13-117

75. Carter N, Bryant-Lukosius D, DiCenso A, Blythe J, Neville AJ. The use of triangulation in qualitative research. Oncology Nursing Forum [Internet]. 2014;41(5):545–7. Available from: https://doi.org/10.1188/14.onf.545-547
76. Frazer I, Orr C, Thielking M. Applying the framework method to qualitative psychological research: Methodological overview and worked example. Qualitative Psychology [Internet]. 2022;10(1):44–59. Available from: https://doi.org/10.1037/qup0000238
77. Dixon-Woods M, Agarwal S, Jones D, Young B, Sutton A. Synthesising qualitative and quantitative evidence: A review of possible methods. J Health Serv Res Policy. 2005;10(1):45–53. 10.1177/135581960501000110.
78. Fall IS. Ebola virus disease outbreak in Liberia: application of lessons learnt to disease surveillance and control. Pan African Medical Journal [Internet]. 2019;33(Suppl 2):1. Available from: https://doi.org/10.11604/pamj.supp.2019.33.2.19074
79. Korkoyah DT Jr, Wreh FFMA, Women UN et al. Oxfam, Ministry of Gender, Children and Social Protection, WASH Consortium,. EBOLA IMPACT REVEALED: An assessment of the differing impact of the outbreak on women and men in Liberia [Internet]. 2015. Available from: https://www-cdn.oxfam.org/s3fs-public/file_attachments/rr-ebola-impact-women-men-liberia-010715-en.pdf
80. Delamou A, Delvaux T, Ayadi AME, Beavogui AH, Okumura J, Van Damme W et al. Public health impact of the 2014–2015 Ebola outbreak in West Africa: seizing opportunities for the future. BMJ Global Health [Internet]. 2017;2(2):e000202. Available from: https://doi.org/10.1136/bmjgh-2016-000202
81. Anfaara FW, Lawson ES, Luginaah I. Similar health emergencies, different commitments: Comparative strategies to end Ebola and COVID-19 in post-conflict Liberia. Social Science & Medicine [Internet]. 2024;365:117609. Available from: https://doi.org/10.1016/j.socscimed.2024.117609
82. Klobucista C. Major pandemics of the modern era. Council on Foreign Relations [Internet]. 2025; Available from: https://www.cfr.org/timeline/major-epidemics-modern-era Accessed October 17, 2025.
83. CDC. Outbreak history [Internet]. Ebola. 2024 [cited 2025 Oct 17]. Available from: https://www.cdc.gov/ebola/outbreaks/index.html#:~:text=The%20Ebola%20virus%20is%20the,the%20Congo%2C%20and%20South%20Africa. Accessed October 17, 2025.
84. Bavinger JC, Shantha JG, Yeh S, Ebola. COVID-19, and emerging infectious disease: lessons learned and future preparedness. Current Opinion in Ophthalmology [Internet]. 2020;31(5):416–22. Available from: https://doi.org/10.1097/icu.0000000000000683
85. World Health Organization. Health worker Ebola infections in Guinea, Liberia and Sierra Leone. Preliminary report. https://www.who.int/csr/resources/publications/ebola/health-worker-infections/en/. Accessed 20 January 2026.
86. Boozary AS, Farmer PE, Jha AK. The Ebola outbreak, fragile health systems, and quality as a cure. JAMA [Internet]. 2014;312(18):1859. Available from: https://doi.org/10.1001/jama.2014.14387
87. Buseh AG, Stevens PE, Bromberg M, Kelber ST. The Ebola epidemic in West Africa: Challenges, opportunities, and policy priority areas. Nursing Outlook [Internet]. 2014;63(1):30–40. Available from: https://doi.org/10.1016/j.outlook.2014.12.013
88. Goitom H. Liberia government measures to contain the spread of COVID-19 | In custodia legis [Internet]. The Library of Congress. 2020. Available from: https://blogs.loc.gov/law/2020/05/liberia-government-measures-to-contain-the-spread-of-covid-19/ Accessed 20 January 2026.
89. Varagur K. How Ebola helped Liberia prepare for covid. MIT Technology Review [Internet]. 2020; Available from: https://www.technologyreview.com/2020/08/19/1007139/liberia-kateh-covid-coronavirus-ebola/ Accessed 20 January 2026.
90. AFRICAN REGIONAL ORGANISATION OF THE INTERNATIONAL TRADE UNION CONFEDERATION. COVID-19 - Response from Liberia | ITUC - AFRICA [Internet]. ITUC - AFRICA. Available from: https://www.ituc-africa.org/COVID-19-Response-from-Liberia.html Accessed 20 January 2026.
91. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. PubMed [Internet]. 2020;91(1):157–60. Available from: https://pubmed.ncbi.nlm.nih.gov/32191675
92. Northwestern Medicine Staff, Northwestern Medicine. When did the pandemic start and end? [Internet]. Northwestern Medicine. 2025. Available from: https://www.nm.org/healthbeat/medical-advances/new-therapies-and-drug-trials/covid-19-pandemic-timeline
93. Wilkason C, Lee C, Sauer LM, Nuzzo J, McClelland A. Assessing and reducing risk to healthcare workers in outbreaks. Health Security [Internet]. 2020;18(3):205–11. Available from: https://doi.org/10.1089/hs.2019.0131
94. Lal A, Ashworth HC, Dada S, Hoemeke L, Tambo E. Optimizing pandemic preparedness and response through health information Systems: Lessons learned From Ebola to COVID-19. Disaster Medicine and Public Health Preparedness [Internet]. 2020;16(1):333–40. Available from: https://doi.org/10.1017/dmp.2020.361
95. Filip R, Puscaselu RG, Anchidin-Norocel L, Dimian M, Savage WK. Global Challenges to Public Health Care Systems during the COVID-19 Pandemic: A Review of Pandemic Measures and Problems. Journal of Personalized Medicine [Internet]. 2022;12(8):1295. Available from: https://doi.org/10.3390/jpm12081295
96. Canadian Institute for Health Information. Health workforce: Overtime and staffing challenges in hospitals. [Internet]. Available from: https://www.cihi.ca/en/health-workforce-overtime-and-staffing-challenges-in-hospitals. Accessed February 11, 2026.
97. Doleman G, De Leo A, Bloxsome D. The impact of pandemics on healthcare providers' workloads: A scoping review. Journal of Advanced Nursing [Internet]. 2023;79(12):4434–54. Available from: https://doi.org/10.1111/jan.15690 Accessed February 11, 2026.
98. Centre for Disease Control and Prevention (CDC). Cholera epidemic after increased civil conflict–Monrovia, Liberia, June-September 2003 [Internet]. PubMed. 2003 [cited 2026 Jan 30]. Available from: https://pubmed.ncbi.nlm.nih.gov/14614405/
99. Wendo C. Cholera spreads in Liberia. The Lancet [Internet]. 2003;362(9388):966. Available from: https://doi.org/10.1016/s0140-6736(03)14401-7
100. Monath TP, Mertens PE, Patton R, Moser CR, Baum JJ, Pinneo L et al. A hospital epidemic of Lassa fever in Zorzor, Liberia, March-April 1972. American Journal of Tropical Medicine and Hygiene [Internet]. 1973;22(6):773–9. Available from: https://doi.org/10.4269/ajtmh.1973.22.773

101. Frame JD, Casals J, Dennis EA. Lassa virus antibodies in hospital personnel in western Liberia. Transactions of the Royal Society of Tropical Medicine and Hygiene [Internet]. 1979;73(2):219–24. Available from: https://doi.org/10.1016/0035-9203(79)90218-9
102. Shah N, Kuriansky J. The impact and trauma for healthcare workers facing the Ebola epidemic. In J. Kuriansky, editor, The Psychosocial Aspects of a Deadly Epidemic: What Ebola Has Taught Us About Holistic Healing (pp. 91–109). Praeger/ABC-CLIO. [Internet]. APA PsycNet. 2016 [cited 2026 Jan 30]. Available from: https://psycnet.apa.org/record/2016-51724-008
103. Osborne A. From preparedness to solidarity reimagining global health security post-COVID-19. BMJ Global Health [Internet]. 2025;10(9):e021178. Available from: https://doi.org/10.1136/bmjgh-2025-021178
104. Promote global solidarity to advance health-system resilience: proposals for the G7 meetings in Japan. The Lancet [Internet]. 2023;401(10385):1319–21. Available from: https://doi.org/10.1016/s0140-6736(23)00690-6
105. United Nations. Global solidarity key to future pandemic preparedness, says UN chief [Internet], UN News. 2024. Available from: https://news.un.org/en/story/2024/12/1158586
106. Abdulah DM, Mohammedsadiq HA, Liamputtong P. Experiences of nurses amidst giving care to COVID-19 patients in clinical settings in Iraqi Kurdistan: A qualitative descriptive study. Journal of Clinical Nursing [Internet]. 2021;31(1–2):294–308. Available from: https://doi.org/10.1111/jocn.15909
107. Billings J, Ching BCF, Gkofa V, Greene T, Bloomfield M. Experiences of frontline healthcare workers and their views about support during COVID-19 and previous pandemics: a systematic review and qualitative meta-synthesis. BMC Health Services Research [Internet]. 2021;21(1). Available from: https://doi.org/10.1186/s12913-021-06917-z
108. Galehdar N, Kamran A, Toulabi T, Heydari H. Exploring nurses' experiences of psychological distress during care of patients with COVID-19: a qualitative study. BMC Psychiatry [Internet]. 2020;20(1). Available from: https://doi.org/10.1186/s12888-020-02898-1
109. Mehedi N, Hossain MI. Experiences of the frontline healthcare professionals amid the COVID-19 health hazard: A phenomenological investigation. INQUIRY the Journal of Health Care Organization Provision and Financing [Internet]. 2022;59. Available from: https://doi.org/10.1177/00469580221111925
110. Muz G, Yüce GE. Experiences of nurses caring for patients with COVID-19 in Turkey: A phenomenological enquiry. Journal of Nursing Management [Internet]. 2021;29(5):1026–35. Available from: https://doi.org/10.1111/jonm.13240
111. Sánchez-Romero S, Ruiz-Fernández MD, Fernández-Medina IM, Del Mar Jiménez-Lasserrotte M, Del Rocío Ramos-Márquez M, Ortega-Galán ÁM. Experiences of suffering among nursing professionals during the COVID-19 pandemic: A descriptive qualitative study. Applied Nursing Research [Internet]. 2022;66:151603. Available from: https://doi.org/10.1016/j.apnr.2022.151603
112. Blanchard J, Messman AM, Bentley SK, Lall MD, Liu YT, Merritt R et al. In their own words: Experiences of emergency health care workers during the COVID-19 pandemic. Academic Emergency Medicine [Internet]. 2022;29(8):974–86. Available from: https://doi.org/10.1111/acem.14490
113. Almaghrabi RH, Alfaradi H, Hebshi WaA, Albaadani MM. Healthcare workers experience in dealing with Coronavirus (COVID-19) pandemic. Saudi Medical Journal [Internet]. 2020;41(6):657–60. Available from: https://doi.org/10.15537/smj.2020.6.25101
114. Pacheco T, Coulombe S, Kocovski NL, Carbone J. Workers' Well-being during Viral Pandemics and Epidemics: A Scoping Review. Comprehensive Psychoneuroendocrinology [Internet]. 2025;22:100286. Available from: https://doi.org/10.1016/j.cpnec.2025.100286
115. Chahley ER, Reel RM, Taylor S. The lived experience of healthcare professionals working frontline during the 2003 SARS epidemic, 2009 H1N1 pandemic, 2012 MERS outbreak, and 2014 EVD epidemic: A qualitative systematic review. SSM - Qualitative Research in Health [Internet]. 2021;1:100026. Available from: https://doi.org/10.1016/j.ssmqr.2021.100026
116. Firouzkouhi M, Abdollahimohammad A, Rezaie-Kheikhaie K, Mortazavi H, Farzi J, Masinaienezhad N et al. Nurses' caring experiences in COVID-19 pandemic: A systematic review of qualitative research. Health Sciences Review [Internet]. 2022;3:100030. Available from: https://doi.org/10.1016/j.hsr.2022.100030
117. Look A, Collins P. Liberian health workers to strike over Ebola hazard pay. Voice of America [Internet]. 2014; Available from: https://www.voanews.com/a/liberian-health-workers-to-strike-over-ebola-hazard-pay/2476701.html. Accessed December 23rd, 2025.
118. AlJazeera. Liberia nurses threaten strike over Ebola pay. AlJazeera [Internet]. 2014; Available from: https://www.aljazeera.com/news/2014/10/12/liberia-nurses-threaten-strike-over-ebola-pay#:~:text=Around%20200%20health%20workers%20are,more%20than%20any%20other%20country. Accessed December 23rd, 2025.
119. Budy F. Policy options for addressing health system and human resources for health crisis in Liberia Post-Ebola epidemic. International Journal of Maternal and Child Health and AIDS [Internet]. 2016;4(2):1–7. Available from: https://doi.org/10.21106/ijma.56
120. Downie R, CSIS Global Health Policy Center. The road to recovery: Rebuilding Liberia's health system [Internet]. 2012. Available from: https://csis-website-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/publication/120822_Downie_RoadtoRecovery_web.pdf
121. Sriram V, Rakasi M, Sharma K, Law MR, Brophy SA. Health Worker Protests in Canada: A Descriptive Analysis of Protest Events from 2021–2022. Healthcare Policy [Internet]. 2025;22(2):66–82. Available from: https://doi.org/10.12927/hcpol.2025.27564
122. Lasco G, Yunus R, Dee E, Mckee M. Health Workers on the Political Frontlines. Health Hum Rights [Internet]. 2022;24(1):121–3. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC9212833/
123. Canadian Medical Association. Health care groups call on premiers to make Canada's collapsing health system their top priority [Internet]. 2022 [cited 2026 Apr 30]. Available from: https://www.cma.ca/about-us/what-we-do/press-room/health-care-groups-call-premiers-make-canadas-collapsing-health-system-their-top-priority
124. Arwady MA, Garcia EL, Wollor B, Mabande LG, Reaves EJ, Montgomery JM. Reintegration of ebola survivors into their communities - Firestone District, Liberia, 2014. PubMed [Internet]. 2014;63(50):1207–9. Available from: https://pubmed.ncbi.nlm.nih.gov/25522091

125. Morelli M, Cyrus G, Weissbecker I, Kpangbai J, Mallow M, Leichner A et al. Recovering from the Ebola crisis: 'Social Reconnection Groups' in a rural Liberian community. Cambridge Prisms Global Mental Health [Internet]. 2019;6:e17. Available from: https://doi.org/10.1017/gmh.2019.13
126. Reaves E, Mabande L, Thoroughman D, Arwady A, Montgomery J. Control of Ebola Virus Disease — Firestone District, Liberia, 2014 [Internet]. CDC Morbidity and Mortality Weekly Report (MMWR). 2014. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6342a6.htm#:~:text=Nineteen%20(90%25)%20of%20the,low%2Drisk%20exposures%20developed%
127. Kirsch TD, Moseson H, Massaquoi M, Nyenswah TG, Goodermote R, Rodriguez-Barraquer I et al. Impact of interventions and the incidence of ebola virus disease in Liberia—implications for future epidemics. Health Policy and Planning [Internet]. 2016;32(2):205–14. Available from: https://doi.org/10.1093/heapol/czw113
128. International Search and Rescue. Summary Report and Evaluation: Installation of Ebola Treatment Units in Monrovia, Liberia [Internet]. I.S.A.R. International Search and Rescue. 2015. Available from: https://health.ec.europa.eu/document/download/df8fc5d4-10cc-43be-b4d7-313555b98952_en
129. Light T. 16 Organizations that are working to end Ebola in West Africa [Internet]. Global Citizen. 2014. Available from: https://www.globalcitizen.org/en/content/16-organizations-that-are-working-to-end-ebola-in/. Accessed February 11, 2026.
130. Htay MNN, Marzo RR, Bahari R, AlRifai A, Kamberi F, El-Abasiri RA et al. How healthcare workers are coping with mental health challenges during COVID-19 pandemic? - A cross-sectional multi-countries study. Clinical Epidemiology and Global Health [Internet]. 2021;11:100759. Available from: https://doi.org/10.1016/j.cegh.2021.100759
131. Temeng E, Hewitt R, Pattinson R, Sydor A, Whybrow D, Watts T et al. Nurses' coping strategies caring for patients during severe viral pandemics: A mixed-methods systematic review. Journal of Clinical Nursing [Internet]. 2023;33(1):242–54. Available from: https://doi.org/10.1111/jocn.16711
132. Bendau A, Ströhle A, Petzold MB. Mental health in health professionals in the COVID-19 pandemic. Advances in Experimental Medicine and Biology [Internet]. 2021;737–57. Available from: https://doi.org/10.1007/978-3-030-63761-3_41
133. Coffré JAF. De Los Ángeles Leví Aguirre P. Feelings, Stress, and Adaptation Strategies of Nurses against COVID-19 in Guayaquil. Investigación Y Educación En Enfermería [Internet]. 2020;38(3). Available from: https://doi.org/10.17533/udea.iee.v38n3e07
134. Hospaccx. Healthcare scenario in Monrovia Liberia |HospaccX Consulting [Internet]. Healthcare Consulting. 2025. Available from: https://hospaccxconsulting.com/healthcare-scenario-in-monrovia-liberia/

Figures

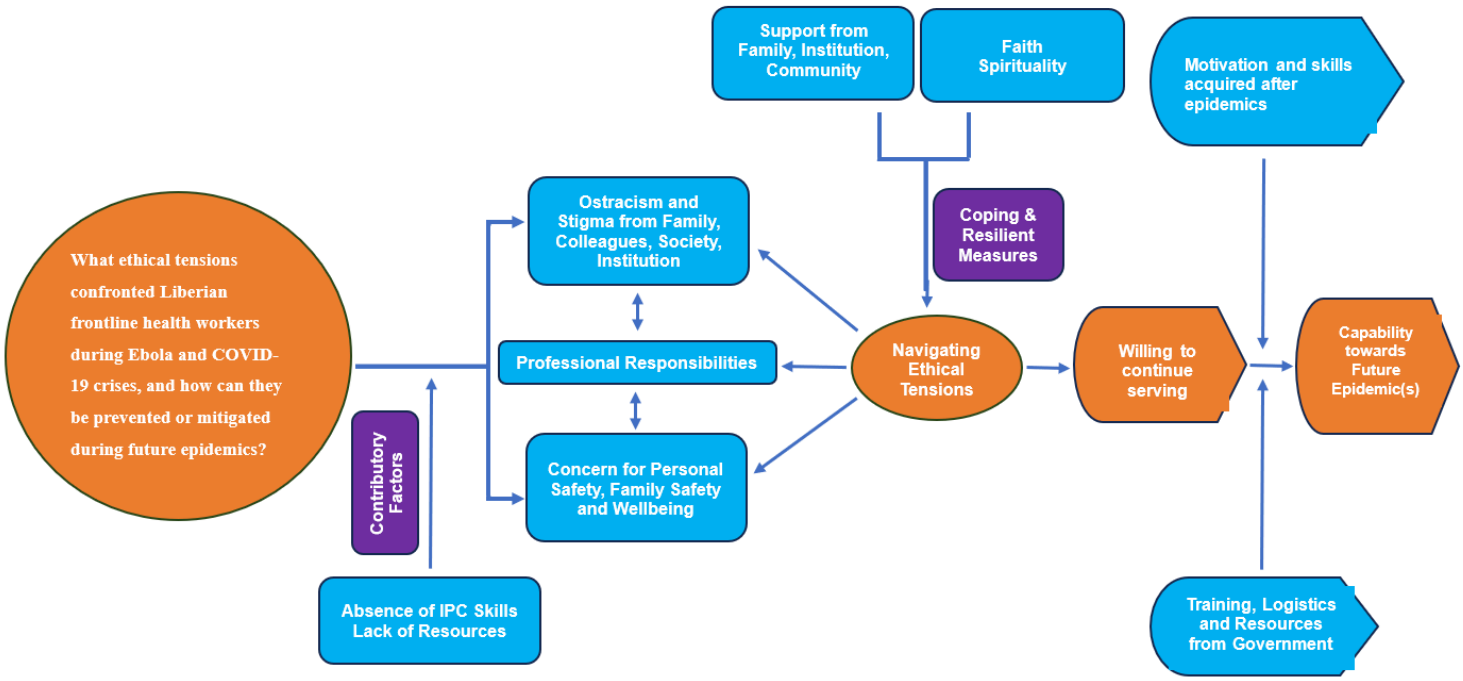


Figure 1

Relationships amongst research question, themes and subthemes of health workers lived experiences during the Ebola epidemic and COVID-19 pandemic