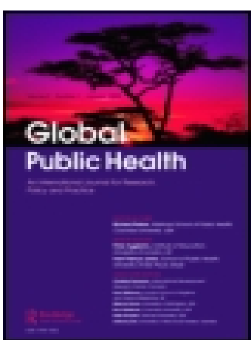

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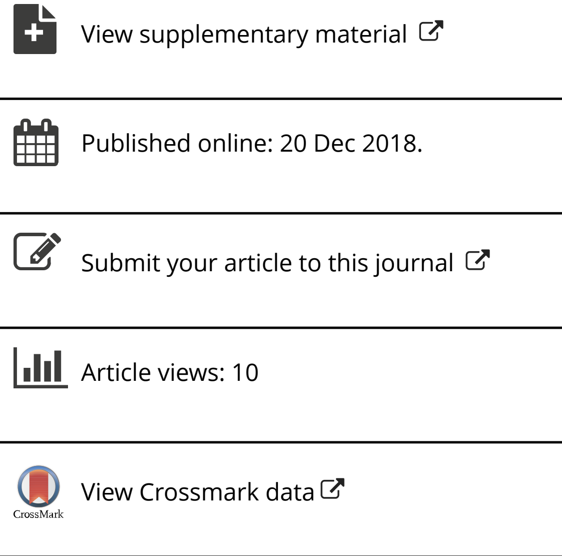

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‘When I die, let me be the last.’ Community health worker perspectives on past Ebola and Marburg outbreaks in Uganda

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ABSTRACT
Uganda suffered four Ebola and five Marburg virus outbreaks from 2000 to 2012 with significant health worker mortality. This paper describes findings from 41 interviews with health workers from three outbreaks. Interviewees frequently encountered stigma from their communities, sometimes accompanied by mistrust and violence. These difficulties were defined as ‘challenges of society.’ Health workers also suffered emotional trauma, depressive symptoms, and fear classified as ‘challenges of psyche.’ As the incidence of such outbreaks will likely increase due to ecological and economic trends, health workers require greater access to personal protective equipment (PPE) and knowledge of viral containment. Such improvements would create an optimal psychosocial climate for managing infectious patients ultimately decreasing the severity of future outbreaks.

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Uganda; Ebola virus; Marburg virus; health worker; psychosocial

Introduction

‘Ebola’ immediately captures public attention evoking images of an exotic killer. The media follows epidemics until the outbreak is contained, and the public turns to the next spectacle. This pattern neglects an integral population whose suffering persists after the cameras leave, health workers. As such individuals risk their lives and livelihoods to play an integral role in limiting the morbidity and mortality of filovirus outbreaks, it is imperative to better understand their needs and challenges. To highlight their perspectives, this paper describes Ebola and Marburg outbreaks in Uganda from 2000 to 2012 using the social process as a framework for analysis. In a 2012 article, Kinsman identifies two processes that transpire during outbreaks. The epidemiological process describes how domestic and international authorities contain the epidemic; the social process describes the psychological impact on health workers and the community (Kinsman, 2012).

The Ebola and Marburg viruses make up the *filovirus* family and are known for their mortality of 25–90% (Center for Disease Control, 2014; MacNeil et al., 2011; MacNeil & Rollin, 2012; Roddy et al., 2012; World Health Organization, 2014; World Health Organization, 2017). Outbreaks follow zoonotic transmissions leading to extended person-to-person spread. Accordingly, epidemics transpire in regions with limited medical infrastructure (Funk & Kumar, 2015; MacNeil et al., 2011; MacNeil & Rollin, 2012). Due to the infectious nature of filoviruses and PPE shortages, health workers frequently become infected (Khalafallah, Aboshady, Moawed, & Ramadan, 2017; MacNeil & Rollin, 2012).

As demonstrated in Table 1, Uganda has suffered four Ebola and five Marburg outbreaks with 48 health workers infected and 25 deceased since 2000. Uganda’s first filovirus outbreak, Gulu’s 2000

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Table 1 . Overall and health worker mortality from filovirus outbreaks in Uganda.

Year	District	Virus	Infected	Dead	Mortality	HW Infected	HW Dead	HW Mortality
2000	Gulu	Ebola SUDV	425	224	52.7%	31	17	54.8%
2007	Kamwenge	Marburg	4	2	50.0%	0	0	0.0%
2007	Bundibugyo	Ebola BDBC	131	42	32.0%	14	5	35.7%
2008	Bushenyi	Marburg	2	1	50.0%	0	0	0.0%
2011	Luwero	Ebola SUDV	1	1	100.0%	0	0	0.0%
2012	Kibaale	Ebola SUDV	24	17	70.8%	1	1	100.0%
2012	Kabale	Marburg	14	7	50.0%	1	1	100.0%
2014	Mpigi	Marburg	1	1	100.0%	1	1	100.0%
2017	Kween	Marburg	3	3	100.0%	0	0	0.0%
Total			605	298	49.3%	48	25	52.0%

Ebola epidemic, was also its largest. After spreading to Masindi and Mbarara, the virus infected 425 individuals and claimed 224 lives. Health workers were overwhelmed by this new disease that swiftly killed those infected. Thirty-one such individuals were infected, and 17 perished (Hewlett & Amola, 2003; Kinsman, 2012; MacNeil et al., 2011; Wendo, 2001).

Uganda's second Ebola outbreak began August 2007 in Bundibugyo as a mysterious illness; the disease was eventually identified as a novel Ebola species in November by the Center for Disease Control (MacNeil et al., 2010; MacNeil et al., 2011; Roddy et al., 2012). By the time the outbreak was contained, 131 individuals were infected with 42 deaths. Fourteen health workers fell ill, and five perished (MacNeil et al., 2010; MacNeil et al., 2011; Nafula, 2008).

Uganda's largest Marburg epidemic occurred in Kabale in October 2012. Although containment was complicated by a depleted budget from a recent Ebola outbreak, viral diagnosis at the new Uganda Virus Research Institute (UVRI) hastened intervention. Experts travelling from Kibaale to Kabale also proved beneficial. During the outbreak, 14 individuals were infected with 7 deaths (Green, 2012; Mbonye et al., 2012).

The nation's robust history of filoviruses permits investigation into health worker experiences across space and time. This paper describes the perspectives and actions of health workers in the three aforementioned filovirus outbreaks.

Materials and methods

Study setting

Fifteen health workers were interviewed at Lacor Hospital in Gulu. Seven interviews were conducted at Bundibugyo District Hospital, Kikyo Health Centre 4, and Ngamba Health Centre 2 around Bundibugyo. Nineteen interviews were conducted at Kabale Regional Referral Hospital. Interviews took place in May and June of 2014.

Study population

The World Health Organization defines health workers as 'people engaged in actions whose primary intent is to enhance health' (Guilbert, 2006). This definition formed the basis of our target population. As demonstrated in Table 2, we interviewed individuals who worked at hospitals and clinics that managed filovirus patients during each outbreak. This totalled 41 interviews and included 22 clinical individuals who came in direct contact with filovirus patients and/or their bodily fluids and 19 individuals without exposure to infected patients including administrators and clinicians treating patients for other ailments.

Data collection

Questions were formulated to explore components of outbreaks described by primary sources and prior research. The list of questions used by interviewers to guide discussion can be found in the

Table 2. Interviewee gender and position by outbreak (Although 41 health workers were interviewed, one health worker in Kabale was also present for the 2007 Ebola outbreak in Bundibugyo. Accordingly, he is counted twice).

Outbreak	Male	Female	Nurse	Clinic Officer	Nurse Aide or Assist.	Physician	Students	Health Edu.	Pharm.	Admin.	Caregiver	Lab. Tech	Direct Exposure	Total
Gulu	3	12	5	0	2	0	3	2	2	0	1	0	7	15
Bundibugyo	6	2	5	1	2	0	0	0	0	0	0	0	8	8
Kabale	15	4	8	5	0	4	0	0	0	1	0	1	7	19
Total	24	18	18	6	4	4	3	2	2	1	1	1	22	42

online supplement. Included were questions inquiring about depressed mood and other symptoms of depression such as changes in appetite and difficulty sleeping. The semi-structured interview format permitted interviewees to make additional comments regarding their experiences.

Data sampling

Chain sampling was used to recruit participants for this study. A contact in each region identified health workers who were present for the outbreak. After their interviews, participants suggested other individuals to contact.

Approvals

The University of Notre Dame's Institutional Review Board and the Uganda National Council for Science and Technology granted approval for this study.

Analysis

The lead and Uganda-based researchers utilised Elo & Kyngäs's qualitative content analysis to identify themes within and across responses (Elo & Kyngas, 2008). This analysis focused on the content and contextual meaning derived from interviews. Following this inductive stage, researchers utilised Kinsman's social process to guide further interpretation of health worker perspectives. In doing so, we focused our analysis on data reflecting health workers' psychosocial status rather than macro outbreak containment strategies.

Given the data variety, numeric percentages were generated to characterise two identified themes which reflected the hardships health workers encountered. On a personal level, health workers suffered 'challenges of psyche'; these include fear of infection, arduous working conditions, and the psychologic ramifications of witnessing colleagues die. The second theme to emerge was 'challenges of society'. Health workers commonly received negative reactions from their communities ranging from fear and avoidance to stigmatisation and violence. In this paper, we will explore the manifestation of these themes in each outbreak.

Results

Ebola in Gulu

No interviewee initially possessed knowledge of Ebola or had adequate PPE. Six health workers described Ebola as a punishment of the Acholi people, the primary ethnic group in Gulu. A nurse described how many linked the outbreak to the Lord's Resistance Army as 'both would kill you for no apparent reason.' One pharmacist described how many feared Ebola would destroy Acholi culture due to its transmission at traditional washings and funerals. Infectious corpses were sealed in body bags and buried in a military airfield without family present. Health worker discouragement of communal hand washing, sharing plates, and hand shaking was challenging as the Acholi

emphasised these practices. Quarantining patients was also difficult as the Acholi traditionally surround ill family members.

Challenges of psyche

As demonstrated below in Table 3, 93% of interviewees described being fearful while 87% reported depressed mood and difficulty eating/sleeping. A Catholic nun/nurse depicted life as 'having no meaning and everything being dark.' Although 40% of interviewees worked longer hours, 20% had lighter workloads due to non-Ebola patients discharging themselves from the hospital. Despite the hospital implementing shorter shifts, one health worker complained these were still too long as PPE was hot and uncomfortable. Three interviewees suffered persisting emotional distress. One nurse, 'broke down' years later and required extensive counselling. A caregiver/data clerk lost multiple family members leaving her 16 orphans to adopt. She was later diagnosed with 'depression and trauma'. After becoming 'a little crazy' and not sleeping for months, she attended an inner healing programme in Kampala and 'stabilised.' When asked what brought comfort, several interviewees described PPE alleviating fear. Prayer, counselling, and knowledge of Ebola were also cited. Vaccine development, increased PPE availability, earlier diagnostic tools, and a task force with established protocols were suggested as ways to improve future containment efforts.

Morale significantly influenced response efforts. Seventy-three percentage of interviewees lauded the leadership of Dr Lukwiya as he led prayers, trained staff, and encouraged health workers not to flee. When nurses threatened to strike, he sang the nurses anthem and marched to the hospital. 'If not us, who else?' he would ask. Near the end, Dr Lukwiya fell ill-treating an infected health worker. His final words, as immortalised by a monument at Lacor Hospital, were 'Oh God, I'm dying in my service. When I die, let me be the last.' Upon his death, 'there was much weeping in the hospital, and operations halted.' Several interviewees suggested his prayer must have worked as he was the last health worker fatality in Gulu.

Challenges of society

Seventy-five percentage and 25% of health workers were avoided by society and family respectively. One pharmacist technician was forbidden by her husband to return as she would bring Ebola and kill their baby. Many interviewees were unable to use public transport and travelled to other villages to shop in anonymity. One nursing student was chased from her hometown. A nurse had a baby during the Ebola outbreak. Although she did not work in the Ebola ward, she stayed at Lacor Hospital. When briefly visiting her farm, her neighbours refused to watch her baby. Isolation was often self-imposed to protect family.

Two interviewees who received blame from the community were health educators. They described how many believed health workers were intentionally killing patients by burying them alive in body bags to prevent viral transmission. One health educator indicated that although the war complicated containment efforts, some rebels appreciated health workers as fear of infection forced them to temporarily cease kidnapping. Initially, members of the community attributed the outbreak to food poisoning, intentional poisoning, curses, witchcraft, or 'punishment from God,' Although the community was initially uncooperative by hiding the infected and preventing burial teams from collecting corpses, 'health education won over.' By the end, the public accepted it was a virus and assisted response efforts.

Ebola in Bundibugyo

Per a nursing officer, three of the five health workers who remained in Bundibugyo at the start of the outbreak were infected. When the senior nursing officer died, he assumed leadership of the unit for two months. The remaining staff desperately sought supplies with theatre aprons being used as PPE. The interviewee struggled to eat as restaurants refused him service. He 'survived on soda and biscuits' and became 'as skinny as a mosquito.' He was finally relieved once Doctors without Borders (MSF)

Table 3. Health worker experiences in Gulu, Bundibugyo, and Kabale categorised by degree of exposure to infected patients. As all interviewees in Bundibugyo were exposed, individuals are categorised by infection status.

	Gulu Ebola Outbreak (2000)									Bundibugyo Ebola Outbreak (2007)									Kabale Marburg Outbreak (2012)								
	Direct Exposure ($n=7$)			No Direct Exposure ($n=8$)			Total ($n=15$)			Survivor ($n=4$)			Uninfected ($n=4$)			Total ($n=8$)			Direct Exposure ($n=7$)			Not Direct Exposure ($n=12$)			Total ($n=19$)		
	Yes	No	No Reply	Yes	No	No Reply	Yes	No	No Reply	Yes	No	No Reply	Yes	No	No Reply	Yes	No	No Reply	Yes	No	No Reply	Yes	No	No Reply	Yes	No	No Reply
Survivor	0	7	0	0	8	0	0	15	0	4	0	0	0	4	0	4	4	0	0	7	0	0	12	0	0	19	0
	0%	100%	0%	0%	100%	0%	0%	100%	0%	100%	0%	0%	0%	100%	0%	50%	50%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%
Prior knowledge	0	7	0	0	7	1	0	14	1	1	2	1	1	3	0	2	5	1	4	2	1	3	8	1	7	10	2
	0%	100%	0%	0%	88%	13%	0%	93%	7%	25%	50%	25%	25%	75%	0%	25%	63%	13%	57%	29%	14%	25%	67%	8%	37%	53%	11%
Necessary Equipment	0	6	1	0	5	3	0	11	4	0	2	2	0	3	1	0	5	3	0	2	5	2	3	7	2	5	12
	0%	86%	14%	0%	63%	38%	0%	73%	27%	0%	50%	50%	0%	75%	25%	0%	63%	38%	0%	29%	71%	17%	25%	58%	11%	26%	63%
Direct Exposure	7	0	0	0	8	0	7	8	0	4	0	0	4	0	0	8	0	0	7	0	0	0	12	0	7	12	0
	100%	0%	0%	0%	100%	0%	47%	53%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%	0%	100%	0%	37%	63%	0%
Family Avoidance	4	3	0	7	1	0	11	4	0	0	3	1	2	1	1	2	4	2	4	3	0	3	5	4	7	8	4
	57%	43%	0%	88%	13%	0%	73%	27%	0%	0%	75%	25%	50%	25%	25%	25%	50%	25%	57%	43%	0%	25%	42%	33%	37%	42%	21%
Society Avoidance	6	1	0	8	0	0	14	1	0	3	1	0	3	0	1	6	1	1	3	2	2	4	6	2	7	8	4
	86%	14%	0%	100%	0%	0%	93%	7%	0%	75%	25%	0%	75%	0%	25%	75%	13%	13%	43%	29%	29%	33%	50%	17%	37%	42%	21%
Fear	7	0	0	7	1	0	14	1	0	4	0	0	3	1	0	7	1	0	5	2	0	8	2	2	13	4	2
	100%	0%	0%	88%	13%	0%	93%	7%	0%	100%	0%	0%	75%	25%	0%	88%	13%	0%	71%	29%	0%	67%	17%	17%	68%	21%	11%
Depressive Symptoms	6	1	0	7	1	0	13	2	0	4	0	0	1	3	0	5	3	0	0	5	2	3	6	3	3	11	5
	86%	14%	0%	88%	13%	0%	87%	13%	0%	100%	0%	0%	25%	75%	0%	63%	38%	0%	0%	71%	29%	25%	50%	25%	16%	58%	26%
Blamed	1	6	0	2	6	0	3	12	0	0	2	2	1	1	2	1	3	4	1	6	0	3	6	3	4	12	3
	14%	86%	0%	25%	75%	0%	20%	80%	0%	0%	50%	50%	25%	25%	50%	13%	38%	50%	14%	86%	0%	25%	50%	25%	21%	63%	16%
Overworked	3	3	1	3	2	3	6	5	4	0	1	3	2	2	0	2	3	3	2	3	2	6	3	3	8	6	5
	43%	43%	14%	38%	25%	38%	40%	33%	27%	0%	25%	75%	50%	50%	0%	25%	38%	38%	29%	43%	29%	50%	25%	25%	42%	32%	26%
Threatened or Attacked	0	7	0	1	6	1	1	13	1	0	1	3	0	0	4	0	1	7	1	1	5	4	3	5	5	4	10
	0%	100%	0%	13%	75%	13%	7%	87%	7%	0%	25%	75%	0%	0%	100%	0%	13%	88%	14%	14%	71%	33%	25%	42%	26%	21%	53%
Long Term Distress	2	5	0	1	7	0	3	12	0	4	0	0	1	3	0	5	3	0	0	7	0	0	12	0	0	19	0
	29%	71%	0%	13%	88%	0%	20%	80%	0%	100%	0%	0%	25%	75%	0%	63%	38%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%

and the Ministry of Health (MOH) dispatched teams. Twenty-five percentage of interviewees possessed prior knowledge of Ebola. No individual had adequate PPE. Fifty percentage of interviewees were survivors. These individuals were infected drawing blood, repositioning a patient, treating a colleague, and caring for family.

Challenges of psyche

All survivors experienced fear, depressed mood, and difficulty eating/sleeping. Meanwhile, 75% and 25% of the non-infected experienced fear and depressed mood with difficulty eating/sleeping respectively. Survivors felt 'very alone in the world' and 'admired and envied those [they] saw walking around outside.' Two interviewees denied fear due to MSF experience. A nursing officer suffered 'emotional diarrhoea' for two days. A clinical officer who was present in Bundibugyo and Kabale described the former as more frightening as he 'saw entire families die in Bundibugyo.' His wife was glad when he returned but feared him for weeks.

One nurse worked shorter hours as non-Ebola patients stopped visiting the hospital. Meanwhile, a nursing officer 'worked day and night without rest' until the MSF established a shift schedule. Three interviewees indicated PPE alleviated their fears. One survivor still suffers recurrent abdominal pain and headaches. Another developed vision problems and chest pain. A third suffers poor vision, headaches, and the 'loss of his manhood' (erectile dysfunction). All survivors described persisting emotional distress compared to 25% of the non-infected.

According to five interviewees, most health workers initially fled but later returned after hazard pay was increased. In Bundibugyo, survivors and victims' families received compensation; interviewees did not believe their hazard pay was sufficient and perceived this exit strategy as 'disregarding those who risked their lives.' One survivor also complained his compensation failed to cover his clothes and bedding which were burned. Interviewees suggested continuous education, improved laboratories, and accessible PPE would be beneficial.

Challenges of society

One nurse was infected but later returned to work in the isolation ward. After his recovery, the community called him 'Ebolaman' until he explained he was no longer infectious via radio broadcast. Fear of those infected lasted from three months to a year. The families of survivors were treated similarly. The community initially attributed the outbreak to malaria and typhoid. When patients began dying, the community considered charms, witchcraft, tribal warfare, worms, and poisoning. By the conclusion, most accepted Ebola as the cause. Fifty percentage and 13% of interviewees described the community as cooperative and felt blamed respectively.

Marburg in Kabale

Thirty-seven percentage of interviewees possessed prior knowledge of filoviruses. Three interviewees googled Marburg, and three physicians studied Marburg in school. Per a lab technician, the hospital had four incomplete sets of PPE but received more. Patient management lasted two weeks with discharges occurring during week three. Only one health worker, a mortuary assistant, was infected and perished.

Challenges of psyche

Sixty-eight percentage and 16% of interviewees reported fear and depressed mood with difficulty eating/sleeping respectively. A nursing officer who screened patients was fearful after encountering an infected patient. He developed nonspecific symptoms; however, the incubation period passed without him falling ill. Another interviewee was not afraid because the isolation camp was established outside the hospital. PPE commonly alleviated fear. The principal psychiatric clinical officer who led the psychosocial team indicated depression was common in the community. Some caregivers were prescribed anti-depressants while others received counselling. Many health workers avoided

certain patients. Isolation camp participation was voluntary; one interviewee estimated that 20% of employees enrolled. Many non-Marburg patients 'discharged themselves' which decreased the workload of other providers. Some interviews enjoyed the outbreak reporting it was 'a unique opportunity to learn about management of a rare condition' and 'a very good time' working with MSF. When reviewing motivations to volunteer, four interviewees discussed hazard pay. No interviewee experienced persisting emotional distress. Many interviewees found screening difficult as patients presented differently from classic Marburg. Interviewees suggested more robust public education and Marburg-specific training would prove beneficial for future outbreaks.

Challenges of society

Thirty-seven percentage of interviewees were avoided by family and society. A senior lab technologist could not use public transport because everyone feared him. His family viewed him as a 'very infectious man.' A nursing officer recalled being pointed at when leaving the hospital each day. A psychiatric officer counselled a teacher who chased his wife (a nurse) from home for working in the unit. A clinician feared he was exposed when treating the index patient. He was quarantined for 21 days but admitted 'isolation' was somewhat futile as he could leave to purchase supplies. This interviewee also drew parallels between community relations in Kabale and West Africa which at the time was suffering an Ebola outbreak. 'When people do not see health workers dying, they become sceptical and mistrustful toward them.' Twenty-one percentage of interviewees felt blamed by society. Interviewees described the public as initially being unappreciative because they thought the outbreak was magic, demonic spirits, witchcraft, or health workers perpetuating a hoax for profit. One lab technologist characterised the public response as 'total population denial;' however, public sensitisation and civil service involvement led to positive community responses. A doctor attributed cooperation to public awareness of past Ebola outbreaks.

Twenty-six percentage of interviewees were threatened/attacked (although replies were not available for 58%). A psychiatric officer described travelling with colleagues to share the news of a patient's death with family. The patient's body was placed on the floor before burial preparations. The deceased's friend snuck into the unit, discovered the corpse, and told the village the patient died from neglect. Before the interviewee arrived, a colleague travelled ahead. She overheard a group making plans to attack the team. Her warning allowed the interviewee to reschedule his visit. Later, a mob attacked the burial team bringing the corpse sealed in a body bag. The team fled as the mob smashed the car and hijacked the body.

Discussion

Challenges of psyche

Fear and depressive symptoms were encountered most frequently in Gulu followed by Bundibugyo and Kabale which corresponds to health worker fatalities. Our results paralleled those of a prior study in Gulu that concluded the psychologic morbidity experienced by health workers reflected the emotional strain of witnessing colleagues die. This same study found similarly high rates of fear among health workers in Gulu that partially stemmed from mistrust of patients who did not answer truthfully about their symptoms at triage (Witter et al., 2017). These 'challenges of psyche' are evident in other epidemics with rapid transmission and high mortality. One study identified psychiatric morbidity in 75% of health workers during SARS outbreaks in Asia (Chong et al., 2004). The difficulties associated with co-worker mortality were also experienced by health workers during the 2013 Ebola outbreak in West Africa. Disruption of social structures that permit grieving such as funerals and cultural gatherings further destabilised health workers (Greenberg, Wessely, & Wykes, 2015; Hall, Hall, & Chapman, 2008; McMahon et al., 2016; Van Bortel et al., 2016).

PPE was frequently described as alleviating fear. Interestingly, studies from the 2014 Ebola outbreak in West Africa suggests working in isolation units was safer than other areas due to more

robust protection from infection (Cohen, 2014; Funk & Kumar, 2015); however, protection offered by PPE must be weighed against the resulting fatigue. During the 2000 outbreak, 14 of 22 health workers infected in Gulu fell ill after isolation units were established. Five of six health workers infected in Masindi were using barrier nursing (Borchert et al., 2011; Kinsman, 2012). The presence of role models and experts also reassured health workers. Dr Lukwiya epitomised the benefits of charismatic leaders during the Gulu outbreak by inspiring his colleagues. Later, once Masindi Hospital approached collapse, a team from Gulu 'turned the tide by fearlessly clearing the Ebola ward of dead bodies, thus acting as role models' (Borchert et al., 2011). Of note, Bundibugyo had neither charismatic leaders nor experts when the 2007 outbreak began which could partially explain health workers initially fleeing but returning after experts from MSF and MOH arrived.

Challenges of society

Interviewees identified a range of community responses which defined the 'challenges of society.' Outbreak severity, especially regarding health worker mortality, strongly influenced public perception. Mistrust and aggression toward health workers inversely corresponded to health worker fatalities. Kabale's Marburg outbreak had only one health worker death but the greatest incidence of threats and attacks. One interviewee in Kabale described the public waiting for a health worker to die before believing that Marburg was not a hoax. Studies from other Ebola outbreaks such as the 2013 outbreak in West Africa and the 1995 outbreak in Kikwit described similar rumours that health workers perpetuated outbreaks (Greenberg et al., 2015; Hall et al., 2008; Hewlett & Hewlett, 2005; McMahon et al., 2016; Van Bortel et al., 2016).

Meanwhile, avoidance and isolation from family was greatest in Gulu which suffered the most health worker fatalities. One prior study found similar instances of female staff being forbidden by their male partners from performing their duties at the hospital and health worker having difficulty using public transportation (Witter et al., 2017). A study from Masindi found that health workers were banned from the market place. Violent protests transpired when demonstrators discovered Ebola patients being treated at Masindi Hospital (Borchert et al., 2011). These issues are not limited to African villages. American, British, and German health personnel experienced stigma upon returning from the West African outbreak and when treating Ebola patients at home. Stigma was most profoundly seen in infected practitioners which is consistent with reports from West Africa. Interestingly, this stigma disappeared with time (Chalk, 2017; Lehmann et al., 2015; Smith, Smith, Kratochvil, & Schwedhelm, 2017; Sow, Desclaux, Taverne, & Groupe d'etude, 2016).

Many interviewees described containment practices clashing with cultural norms, especially in Gulu. *Hewlett & Amola* explored this phenomenon by describing the various explanatory models held by the Acholi people. Although the biomedical explanatory model was widely accepted, the Acholi also held indigenous beliefs. While certain models, such as *Gemo,* emphasised quarantine-like practices, other traditions proved detrimental to containment including families surrounding infected loved ones (Borchert et al., 2011; Hewlett & Amola, 2003). At funerals, women washed and dressed corpses. Friends and family commonly placed 'love touches' on the deceased and would clean their hands in a communal bowl. Such exposure frequently amplified transmission (Hewlett & Amola, 2003). Accordingly, health workers discouraged such activities furthering their alienation. Patients that died in isolation wards were immediately sealed in body bags and buried in guarded cemeteries fuelling public mistrust. Accordingly, burial teams were attacked in Kabale, Masindi, and West Africa (Borchert et al., 2011; Funk & Kumar, 2015; Kinsman, 2012; MacNeil & Rollin, 2012; McMahon et al., 2016; Van Bortel et al., 2016).

Future containment efforts

Over time, filovirus outbreaks in Uganda have become less severe. Innovations such as the UVRI have hastened diagnosis and containment which limits transmission (Green, 2012). Unfortunately,

the frequency of filovirus outbreaks is increasing. This reflects increased contact between animal reservoirs and humans secondary to deforestation and the 'bush meat crisis.' Climate change is also contributory by altering human and animal migrations (Leach, 2008; Sanders, Sengupta, & Scott, 2015; Solomons, 2014). As these trends will likely continue, more health workers will encounter filoviruses.

One improvement suggested by interviewees was increased PPE access. Furthermore, interviewees identified the need for filovirus education, containment protocols, and laboratories echoing recommendations of global health practitioners. In 2014, Paul Farmer described the West African Ebola outbreak as a 'battle of basic medical care;' many lives could have been saved if providers had possessed basic supplies such as gloves, gowns, and straightforward protocols (Boozary, Farmer, & Jha, 2014; Hewlett & Hewlett, 2005). A recent study interviewing health workers from Sierra Leone identified similar motivators to those described by our interviewees including as an intrinsic sense of serving their community, PPE, and barrier training. Novel support structures identified by that study included social media platforms, workshops on how to shed stigma, and programmes for rebuilding trust with community structures (Raven, Wurie, & Witter, 2018).

Interviewees frequently alluded to compensation. This topic invocates Kinsman's discussion of altruism, 'the most selfless actors in this outbreak were clearly those who had, and who knew they had, the most to lose … the health workers' (Kinsman, 2012). He explores the impact of secondary gains such as financial and social benefits. When applying this to our interviews, we find that an internal calculus may have shaped health workers' motivations. Interviewees frequently described an intrinsic desire to serve reflecting the rhetoric used by Dr Lukwiya. Opposing altruism were challenges of psyche and society. Accordingly, compensation possibly tipped the balance when deciding to treat patients. Support can be found when examining the economic context of each outbreak. The 1999 Gulu poverty rate ranged from 30-50%. The 2004 Bundibugyo poverty rate was 43.6%. The 2012 Kabale poverty rate was 7.6% (Emwanu, Okwi, Hoogeveen, & Kristjanson, 2003; Mango, 2008; Poverty Status Report, 2014*: Structural Change and Poverty Reduction in Uganda*). Due to increased poverty in Gulu and Bundibugyo, health workers in these regions may have more strongly considered compensation when deciding whether to work. Hazard pay has already been demonstrated to be an important motivator for health workers in Sierra Leone in choosing whether or not to participate in Ebola containment efforts (Raven et al., 2018). If such a calculus exists, implementing measures to reduce challenges of psyche and social may increase health worker participation thus leading to more robust containment efforts decreasing outbreak amplification and overall mortality.

Limitations

One limitation of this study is the lack of responses for certain questions due to interviewees' availability. Social desirability possibly influenced responses; health workers may have exaggerated challenges to secure more funding. Interviewees possibly understated challenges to appear strong. Other issues arise from performing this study years after outbreaks. Participants' memories may have changed from discussing their experiences. While the content analysis approach proved useful in describing themes in this exploratory study, the absence of phenomenological or inquiry-oriented analyses highlights the potential for future work examining contextual and practical meaning. Finally, by sampling health workers in the region, this study excluded health workers who have relocated or retired.

Conclusion

Health workers responding to filovirus outbreaks have frequently encountered isolation and stigma from their communities; this avoidance was sometimes accompanied by mistrust and, in rare instances, violence. Health workers also suffered emotional trauma, depressive symptoms, and

fear from witnessing colleagues suffer violent deaths. As the incidence of such outbreaks will likely increase, health workers require greater PPE access, instruction on filovirus containment, and continuous community education. Such improvements would protect health workers from infection, create a psychosocial climate optimal for containing outbreaks, and resultantly decrease the severity of future epidemics.

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