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W. Shrum
shrum@lsu.edu

J. Aggrey

A. Campos

J. Pamplona da Costa

J. Joseph

See next page for additional authors

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Who's afraid of Ebola? Epidemic fires and locative fears in the Information Age

Wesley Shrum,[1] John Aggrey,[1] Andre Campos,[2] Janaina Pamplona da Costa,[2] Jan Joseph,[3] Pablo Kreimer,[4] Rhiannon Kroeger,[1] Leandro Rodriguez Medina,[5] Paige Miller,[6] Antony Palackal,[3] Ana Pandal de la Peza,[5] Abou Traore[7]

Abstract

Epidemics have traditionally been viewed as the widespread occurrence of infectious disease within a community, or a sudden increase above what is typical. But modern epidemics are both more and less than the diffusion of viral entities. We argue that epidemics are 'fire objects', using a term coined by Law and Singleton: They generate locative fears through encounters that focus attention on entities that are unknown or imprecisely known, transforming spaces and humans into indeterminate dangers, alternating appearance and absence. The Ebola epidemic of 2014 had more complex impacts than the number of infections would suggest. We employ multi-sited qualitative interviews to argue that *locative* fear is the essence of modern global epidemics. In the discussion we contrast Ebola with both the Zika epidemic that followed and the ongoing coronavirus (COVID-19) pandemic.

Keywords

COVID-19, coronavirus, Ebola, epidemic, fire-object, fear, infectious-disease, Zika

[1]Louisiana State University, USA
[2]State University of Campinas, Brazil
[3]University of Kerala, India
[4]Universidad Nacional des Quilmas, Argentina
[5]Universidad de las Americas Puebla, Mexico
[6]University of Wisconsin River Falls, USA
[7]Penn State University, USA

Correspondence to:
Wesley Shrum, Department of Sociology, Louisiana State University, 126 Stubbs Hall, Baton Rouge, LA 70803 USA.
Email: shrum@lsu.edu

> The connective tissue in his face is dissolving, and his face appears to hang from the underlying bone, as if the face is detaching itself from the skull. He opens his mouth and gasps into the bag, and the vomiting goes on endlessly … the body is partly transformed into virus particles … the host is possessed by a life form that is attempting to convert the host into itself … He is becoming an automaton…the higher functions of consciousness are winking out first, leaving the deeper parts of the brain stem (the primitive rat brain, the lizard brain) … When a man is getting sick in an airline seat next to you, you may not want to embarrass him by calling attention to the problem. (Preston, 1994: 17–18)

One of the most horrifying depictions of epidemic disease in recent literature, Richard Preston's 1994 bestseller, *The Hot Zone*, remains the classic introduction to Ebola. The opening scene, in which a small aircraft crosses the Rift Valley to Nairobi while the body of a passenger transforms into a virus, reads like a script for a horror film about demonic possession. Yet it was crafted as an account of an extended episode of medical discovery, dating to 1976, when Peter Piot and a team from the Centers for Disease Control identified a new virus near the Ebola river in Zaire. Ebola is the most terrifying infectious disease of modern times. The West African epidemic of 2014 was larger and deadlier than all previous outbreaks combined.

The aim of this essay is to highlight the epidemic as a generator of global fear and the 'epidemic encounter' as a strategic research site for the understanding of the relations between humans, non-humans, and transitional beings. Extending Oikkonen's analysis of the Zika epidemic as a 'multi-sited technoscientific phenomenon deeply entangled with anxieties, fears, hopes, and anticipation', (2017: 682) we argue that the Ebola epidemic is best viewed from the perspective of the *risk-based* experience of health (Aronowitz, 2015). An epidemic may be seen as a 'fire object': a series of encounters involving entities that are known imprecisely, a shifting pattern of presence and absence, in which the reality of unknown or distant objects is constituted by and through interaction (Law and Singleton, 2005). Actors and spaces are transformed into indeterminate threats. In their original study of alcoholic liver disease, Law and Singleton conceptualized a complex and 'messy' object displaying no fixed trajectory. What kind of disease was this, they asked, that could not be defined in any specific way?

During the 2014-2016 epidemic, most of the locations in which we conducted interviews had relatively few, if any, cases of the nominal disease – or at least not above the ordinary slew of viral sniffles, body aches and exhaustion. Of our research locations, instances of one or more of the five dreaded particle causes of human Ebola disease (*Zaire ebolavirus, Sudan ebolavirus, Taï Forest ebolavirus, Bundibugyo ebolavirus, Reston ebolavirus*) were found in Guinea, Mali and the United States, and not in Ghana and Kenya. In the US, the only fatal cases were a single infection in Dallas, which was followed by rapid death, and one doctor who contracted it outside the country.

We propose that the complexity of sociotechnical reality requires a reconsideration of epidemic objects. We consider and reject the notion that an epidemic is best viewed as a moral panic or urban legend, suggesting instead that Law and Singleton's notion of fire objects best captures the patchiness or sparseness of epidemics as well as their indeterminate presence in space. We introduce a concept of fear appropriate for modern, rapidly shifting information regimes. Central to fire objects are concerns about actors and their

movements through space, generating *locative* fears that are notable for their reflexive intensity. Epidemic fear is based on the circulation of stories about threatening symptoms, proximities to infectious agents, and negotiations with transitional beings, as attention focuses on invisible microbial threats. We address the variability in locative fear by comparing Ebola with the Zika epidemic that followed and the ongoing coronavirus pandemic.

Method

We conducted interviews in 2015-2016 in Guinea, Mali, Ghana, Kenya and the US. Guinea is the site consensually viewed as the source of the 2014 outbreak, variously known as Ground Zero, the Index Case, or Patient Zero, from whom viral infections spread. Our interviews included health care workers, students, small entrepreneurs, medical officials, schoolteachers, youth and volunteers. The argument in this essay was not developed solely from analysis of interviews, but also relies on our research experiences. Whether the authors were exposed to viruses – or perhaps contracted them – was certainly a matter of concern and discussion. Interviews focused primarily on Ebola, but with much discussion of Zika, dengue, chikungunya and malaria as well. Our study sites, with one exception, had none or very few confirmed cases of Ebola. While not the focus of this paper, we also conducted interviews in Brazil, Mexico, Argentina and India on the Zika epidemic that followed on the heels of Ebola.

(1) *Guinea*. In the country where the West African epidemic began, 3814 Ebola cases were confirmed, suspected or probable, including 2544 deaths.[1] An 18-month-old boy in Meliandou, who died in December, 2013, is usually described as the first case of the outbreak. We conducted 56 interviews in 2015 in the northern region, with health care professionals, medical officials, school teachers, youth, Red Cross volunteers and Ebola patients. In 2016 seven additional interviews were completed, all in local languages.
(2) *Mali*. With eight total cases and six deaths from Ebola, Mali was a minor country in the outbreak. Fifty interviews were completed, largely in French.
(3) *Ghana*. Ghana had no confirmed cases of Ebola. Interviews were conducted in two phases. We conducted 28 interviews in Accra and surrounding rural areas in 2015. Those interviewed included professionals, the elderly, clergy, low-income earners and university students. A second phase of 61 interviews was completed in 2016 a village northeast of Accra, selected owing to Ebola vaccine trials that were planned but terminated after local protests.
(4) *Kenya*. We conducted 51 interviews in 2015 and 42 in 2016 with college students, unemployed youth, nurses, health workers and professionals.
(5) *United States*. Interviews were conducted in two locations. In Baton Rouge, Louisiana, we conducted sixty interviews with doctors, nurses, professionals, students and African immigrants. Our second location in Minneapolis is the home of the world's largest Liberian immigrant community; we completed twenty interviews with employees of the Minnesota Department of Health and the non-profit African Immigrant Services.

Following the primary period of data collection, the team of collaborators met online monthly to discuss experiences and findings in these interviews. The framework below is our attempt to conceptualize the commonality of experience across divergent country contexts.

Fire, panic and legend

In all but the most remote areas of the world, medical and development institutions have fostered a risk-dominated experience of health, 'characterized by fear, uncertainty, and lack of control, whereas in the past, pain, loss of function, and other symptoms were more central' (Aronowitz, 2015: 60-61). Our interviews were characterized by discussions of precisely these features of risk. While this model is relatively new, it has largely been applied to chronic conditions such as aging, cancer and heart disease rather than infectious disease. The risk model of health does not require that humans actually *experience* adverse impacts to be unhealthy, only that their internal and external conditions (e.g. high cholesterol, exposure to pollutants) are characterized by factors *associated with* negative health consequences. We show that social interactions during epidemics involve some level of risk, and take on much the same character, as fear of symptoms induces fear of infectious agents in socially configured space.

While it was always clear that our interviews were on the topic of infectious disease, our informants (1) were not always certain what kind of danger they, or we, were discussing, even as they articulated extreme personal concerns, and (2) understood infectious disease and the appropriate response to it in a comparative framework. Informants often referred to current or historical diseases, understanding these new situations in terms of other infectious diseases with which they had greater familiarity. Ebola was understood through comparison with HIV-AIDS, tuberculosis, chicken pox, pancreatic cancer, swine flu, the plague, leprosy, measles, SARS and 'little fevers and flus'. One US informant admitted confusing Ebola with E. coli: 'That may be part of why I am so afraid of undercooked foods. I think they also have similar symptoms'. Probed for the symptoms, she indicated fever and vomiting, common symptoms of many conditions.

Were these different viruses part of some continuous epidemic? The concept of an 'immutable mobile', popularized by early Actor-Network Theory, refers to an object that moves yet holds shape in physical space, stabilized through a network of associations. This mobile functions as a device of control over distance, long or short, fetched through narrow networks that serve to hold form, whether text or picture, ship or instrument.

Ebola is not such an object. It is neither visible nor stable. One might be tempted to view it, following de Laet and Mol (2000), as a *fluid object* like their now classic Zimbabwean water pump, a core handle and lever, together with a constantly shifting set of relational ties, gently changing its role and structure and operation. That change, however, was gentle and gradual – not abrupt – because the object was recognizable as the same kind of thing, though constantly shifting, fluidly adaptable, mutably mobile. The fluid object has a conceptual advantage in cases where centralized control is not an issue, where networks are relaxed rather than rigid, though the sameness of the object is not questioned by participants. Such a possibility is considered by Law and Singleton (2005) in their examination of alcoholic liver disease, where no consensual definition was

observed, the object of inquiry changing shape with each patient and physician. They concluded the disease is not a fluid but a fire.

An epidemic may also be viewed as a fire object. We view exposure as proximity to the fire, a series of encounters in space with various actors, human and non-human. While epidemiological perspectives generally focus on microbial agents (viruses or bacteria, even fungi, parasites and prions), distressing and absorbing encounters are often located far from any such agent. Partly a response to disorganization ('messiness') and partly a metaphysics of presence, a fire object is a shifting pattern of presence and absence, one that 'manifests in dramatically different ways from one location to another. Rather than the more or less smooth transitions of fluids, these "fire objects" move as in a bush fire – in fits and starts across locations, sometimes they are creative, sometimes destructive' (Michael, 2017: 157). A fire object may be understood as a set of present dynamics 'generated in, and generative of, realities that are necessarily absent' (Law and Singleton, 2010: 343). As contrasted with fluids, fires are characterized by discontinuities, jumps and transformations, juxtaposing and transforming realities that are not often brought to presence.[2] Since the concept was introduced, it has been used to analyze such diverse topics as a high profile murder case (Jong and M'charek, 2018), tourism (Johannesson, 2005), and information infrastructure projects (Whitley and Darking, 2006). The core idea of a fire, in each of these cases, is that of the discontinuities created by the absent presence of an object.

The general process is illustrated by our own experiences near the beginning of the epidemic. In July, two of the authors left East Africa when the Ebola epidemic was raging. One was on the way to Ghana to meet a PhD student. Absent an internet connection, he missed several emails, including a warning from the student *not* to travel to Ghana. On arrival in Accra, he learned the student had just left the country. The epidemic had become too frightening and the student was unable to continue. During the following month, the researcher was exposed to daily stories in local newspapers as well as tales from project colleagues and acquaintances. He learned of attacks on refugees arriving by car from Liberia, which had confirmed cases. Positive tests for Ebola were said to have occurred at local hospitals. Life in Accra, even as he sought to keep an ordinary routine, involved continuous *exposure*, not to a virus particle but to a fire, flaring first in one place, then another. It seemed Ebola surrounded him, or at least it was very near, though there was nothing to see. During this period there emerged an enormous variety of stories, warnings, calls for action and preparedness, daily news items, broadcasts involving risks, biological and chemical treatments, witchcraft, government information, misinformation and other calls to panic or recovery. One might reasonably say that there were no Ebola infections in Ghana in the summer of 2014, but it seems peculiar to say there was no epidemic. In the summer of 2014, the vast majority of Ghanaian health specialists would not have said it.

Another author returned from East Africa to Louisiana at the same time. He was asked to bear first person witness to the Ebola outbreak by undergraduates at Louisiana State University (LSU), as news media reported increasing fatalities in West Africa, while US citizens were returning home for specialized treatment. The death of Eric Duncan in Dallas coincided with reports circulating in Baton Rouge about an LSU doctor who infected 14 emergency medical technicians and police officers, all in quarantine.[3] The

complexity involved in these efforts to make sense of the Ebola outbreak supports our conceptual preference for a fire object rather than a scarce – in this case, nonexistent – viral particle.

One reason the doctoral student escaped Ghana for the US was his exposure profile, his proximity to epidemic fires throughout the city. It was as if Ebola was continuously present in the Accra internet cafés where he had been conducting interviews. Here, information circulated rapidly in both online and face-to-face interactions. The patrons of these cafés were interacting frequently and seeking information about this novel, strange terror. The student's wife, a nurse in New Orleans, implored him to return, using the image of a Category 5 epidemic, the familiar Louisiana analogy of a worst-case hurricane. He discovered that an American businessman had returned from Liberia, where cases were rapidly increasing, then checked into a clinic and died. Day by day, he spent less time in internet cafés and more time in his room, until small spots on his hands took on great significance. In a conventional sense, his risk might be viewed as insignificant, but epidemic fire is not merely an infectious virus. The internet cafés of Accra were hotspots for Wi-Fi and much more.

Attempts to broaden the focus of analysis beyond disease agents have sometimes viewed epidemics as moral panics and urban legends. These concepts point to traditional moralistic discourse and exaggerated threats of epidemic periods. The idea of a moral panic, employed by Cohen (1972) in an analysis of deviant youth, focuses on the relationship between media responses, social control agents, and the public. 'Folk devils', whether British mods, Satan worshipers, child molesters, and even gays have been associated by the media – sometimes with the assistance of state and moral entrepreneurs – with consensual public fears. Fears and devils have been precipitated by public health concerns (AIDS, SARS), particularly where immigration and ethnicity are available causal labels. Accordingly, a moral panic was at issue in the proposal to bar travelers from any Ebola-infected countries from entering the US (Quartey, 2014): disproportionate fear and the 'anticipated invasion of the folk devils', in this case, virus-ridden Africans.

Disproportionality is the common thread of panics and legends. Preston's *Hot Zone*, which provides our epigraph, was a principal actor in this drama. Exaggerations of the threat lead Weldon (2001) to analyze Ebola as an 'urban legend', which has features of a true story but is not: *If a virus ever become aerosol, it could sweep through our rapid transit system around the globe in a matter of hours, killing millions.* How could people believe such claims, she wondered, when they were clearly sensationalized (Weldon, 2001)? Long-lived, with a distinctive theme, told and retold, these narratives provide for a 'predatorial virus, demonstrating how events are constructed as social problems via media representations, and reality is transformed into legend'.

Following 11,000 deaths in West Africa, the legendary aspect of Ebola took on new meaning and requires an alternative analysis, as does the notion of *dis*proportionate threat and response. By what standards are proportions established and rendered excessive? Moral panic originally included the idea of a *model* that could be adopted by outsiders, recently extended to 'panic by design' to analyze of the folk devils of terrorism (Walsh, 2017). For epidemic encounters, the situation is quite the opposite.

As we argue, a folk devil may look exactly like you. Fact or legend, the folk devil might be you.

Epidemic exposure

Epidemic exposure is a series of spatial encounters with a fire object, an object whose absent presence in a particular area changes the behavior of social actors. How, then, should we conceptualize space? Perhaps in terms of the fear that is widespread, if not essential, for epidemics. Scholarly treatments of fear spiked in popularity two decades ago with treatises by Furedi (1997) and Glassner (1999). Their 'culture of fear' approach lacked the situational specificity required for the analysis of epidemics. Specificity is provided by Tudor's (2003) approach, which views the fear response as a joint product of several dimensions, some macro (environment, social structure, culture) and some micro (bodies, personalities, social subjects) in orientation. Tudor incorporates both physical and social dimensions. Fears and anxieties are inherently part of the sociotechnical fabric, embedded in social relationships from Facebook to farting. Epidemic fear, as a response to informational encounters, is not distinguished by its mere existence – we fear cancer as well as microbes, fake news as well as infection rumors. Epidemics such as Ebola exhibit reflexive intensity, the tendency for social actors to create, clarify and augment mutual fears by telling stories about the disease and modifying their behavior – strategizing, planning, seeking confirmation and disproof, and relieving stress with gallows humor. Fear is manufactured through storytelling, blending personal, heard and 'friendly' experiences with news from traditional print and broadcast sources, social media, blogs and Twitter feeds.

We catalogued a diverse array of fears expressed by informants in our study areas. These ranged from infection itself, through numerous possibilities for contraction, government and media manipulations, through evil or incompetent medical personnel and (West) African mobilities, to biotechnical and network fears, ignorance and knowledge itself. An inductive catalog is useful to begin theorizing, but here we reduce the complexity to a triumvirate of related fears. The typology is neither exhaustive nor mutually exclusive, but a concise summary of common elements we found in all countries. The underlying principle is spatial, based on personal proximities rather than physical coordinates. Epidemic fear is based on stories of symptoms, proximities to agents of infection, and ideas of transitional beings, as attention focuses on the presence or absence of invisible microbial threats.

We call fear of close contact or co-location *locative*, as in grammatical constructions denoting place by terms such as 'front' or 'left'. In epidemics, positioning is relative to actors that are and are not infectious. Locative fear is the most distinctive feature of the Ebola epidemic, as a flare-up in a specific place. As an individual level dimension, it may be defined as concern for one's personal well-being in spaces where microbial threats are, have been or might be. This absent presence is characteristic of a fire object. How does one assess the presence of such dangers[4] without the immediate presence of those who are clearly ill? Therein lies the practical problem for social actors and scholars.

Our informant accounts emphasize fear of symptoms, agents and transitionality: (1) fear of *symptoms* includes pain and physical expressions or presentations of disease, (2)

fear of *infectious agents* is expressed in concern for entities of transmission, whether human, animal or microbial,[5] and (c) lastly, fear of being or becoming *transitional* is an indeterminate state that might soon, but does not yet involve symptoms and pain, together with the potential to infect others and prolong the epidemic. These fears of symptoms, agents, and transitions involve both self and other, in relation to proximities tied to bodies and events rather than physical coordinates. Who is infected? What are their indications? What space have they occupied? And for how long?

Stories and exposure

Health specialists examine exposure to microbial threats among publics that are both knowing and incognizant of threat. But for STS analysis, stories (such as news, rumors, gossip and media feeds) are a critical dimension of epidemic exposure, given that epidemics are a sociotechnical process and not merely a disease process. It is both reasonable and productive for analytical purposes to speak of involvement in epidemics without the presence of infectious agents. Knowledge of threats during epidemics is not of any single entity, nor the possession of one collectivity, nor even of any consistent substance. It is acquired and assessed by individuals in the context of prior experience and current encounters. Encounters may be interpersonal interactions or private consumption of broadcast and web-based content. By insisting on the distinction between unknown proximity to virus particles and the observable negotiation of information in epidemic interactions, a structure of fear emerges, beginning with fear of symptoms, focusing attention on the presence of agents, and finally, in extreme cases, to fear of transformation, from health to illness to death.

Awareness of Ebola was traced both to new communication technologies and face-to-face ties. One of our informants remembered her first experiences with Ebola at the age of eight:

> I had a lot of unrestricted internet access and read voraciously and only the saddest, scariest, and most depressing of things would do … Probably some age-inappropriate book saying that the liquefying of insides was an Ebola-like trait of some plague or something.

Living in a rural area of Louisiana whose schools were litigating their refusal to teach evolution, she became an avid reader of the *Guardian* and listener to the BBC. To what extent was the phenomenology of her experience different from that of a US graduate student who played through over twenty *Resident Evil* video games?[6] Web searches for the history of Ebola virus reveal, among the top sites, the Resident Evil Blog describing the evolution of the virus, including its variations. Video game histories are relevant to Ebola exposure, insofar as they clarify to players that the t-virus is a 'manufactured' strain of Ebola virus causing zombies.

In Guinea, the fire flared when it was widely circulated through print media and informal interactions that drinking tea made of hibiscus leaves could be used to 'vomit blood', or rather a red liquid that appeared to be blood. A person could be seen to vomit without any viral infection. Induced vomiting was used by thieves to scare victims away from the scene before stealing their possessions. One co-author learned that a store was

ransacked and emptied after a group of robbers simulated bloody vomit and panicked the owners. Frauds and hoaxes are viewed as threats, but are not topologically different from the roleplay reported at public New York hospitals in the fall of 2014 (Corcoran, 2014). Actors were alleged to be sent in secret to simulate symptoms into emergency rooms to test the abilities of staff to isolate these patients. Such reports are quite plausible for an epidemic object, deforming, stretching, twisting as it preserves a shifting set of properties.

How could such an unusual and terrifying disease be unleashed, so widespread, without warning? A Red Cross worker in Guinea volunteered three versions of early events: (1) witchcraft, (2) 'politics that the government put in place to make money [from development aid],' or its very opposite, (3) work by 'opponents to the President to manifest against the regime'. All are stories of interest-based action, but more important, conspiratorial theories completely consistent with prevailing West African views of social action (Benton and Dionne, 2015). If anything, medical diagnosis generated more skepticism and required explanation.

Symptoms

Expressions such as bleeding from the eyes, vomiting blood or becoming a zombie are extreme – rare to non-existent for most infected patients – but were widely circulated, along with 'Ebola kills' messaging that may have caused infected persons to avoid treatment.[7] Insight into the importance of symptoms from a health perspective was provided by one U.S. informant with responsibility for coordinating medical responses across all area hospitals. An infectious disease nurse for two decades, she spoke with familiarity about the 'fact-fiction-fear' syndrome, a reflexive ramping of emotion in which one begins to fear the fear. Ebola was said to be a disease without vaccine or cure:

> All you see from the public perspective is there's this disease, thousands of people in Africa are dying, it is a horrible death … Even in the United States for Mr Duncan, it was a horrible death. He was losing ten liters. Do you know what a two-liter bottle of Coke looks like? Multiple that times five, and imagine losing that much diarrhea from your body every day.

But she viewed this extreme situation as both treatable and controllable. It was unimaginable that her own healthcare system could not respond to such a contingency: 'people react more to the fear of getting a disease'. Not every informant admitted fear of Ebola, but this was minority sentiment. As one said: 'Is anybody really serious about never being scared about Ebola?'

While fear of death from Ebola is reasonable, fear of symptoms, or physiological expressions of disease, was often more significant. Preston's airline story, which began this essay, continues:

> The brain becomes clogged with dead blood cells, a condition known as sludging of the brain. Ebola attacks the lining of the eyeball, and the eyeballs may fill up with blood: you may go blind. Droplets of blood stand out on the eyelids: you may weep blood. The blood runs from your eyes down your cheeks and refuses to coagulate.

Prominent in our informant accounts were images of the symptoms, blood, sweat and tears that accompany infection, conveyed with breathless relish by broadcast and web media. A West African woman described her fear in the early stage of the epidemic, when it seemed 'the only solution was to die'.

Agents

From 2014, fear of Ebola symptoms was widespread. Locative fear, of co-location with infectious agents, became the overriding theme of this epidemic fire, with its absent presence. Where, exactly, was the danger? Where precisely was it located, since the virus was invisible? Was it within a human body, the space around the body, the space a body had been? Throughout West Africa, public messaging and informal transmission provided a primary fact: Ebola spread through bodily fluids – vomit and feces, tears and blood, sweat and saliva. It was widely reported that cultural practices of greeting had begun to shift (Cooper, 2014). Handshaking, hugging and kissing became less common, as Guineans, Ghanaians and Malians worried about touching their relatives and children. The awkward moment of not-handshaking reminded them of Ebola.

Most informants paid little attention to the distinction between microbes, without which a disease cannot be contracted, and the human that is their host. A host-virus with symptoms is an entity to be avoided, that is, a patient with obvious Ebola. But not everyone responds in the same way to a fire. According to the physician in charge of the receiving ward of the primary emergency hospital in Ghana, her nurses were trained to 'run towards the disease, not away from it'. Yet in the summer of 2014, all of the nurses evacuated upon hearing that a patient with Ebola was due to arrive. Their fear was simply proximity to a patient who had symptoms similar to Ebola,[8] a concern of health professionals demonstrated systematically by Broom and Broom (2017) in the Australian context.[9]

As we were to learn, a hospital ward is a relatively small space for prospective fear. For many informants, spatial avoidance was much broader and less restrictive. Who knows where infected agents have been, or might be coming? And with whom might they have been in contact along their way? For many, including this woman from a small town on the Texas border, generalized commonsense suggested the best way to stay safe was simply to avoid places where infectious agents might be.

> Come on, man … now we need to know everywhere you were and what toilet you sat on and who was on your plane. We are crazy and panicking and need you to remember we might just burn you at the stake if you so much as cough.

Time and effort were devoted to contingent and negotiable ideas of place, entering into appraisals and social negotiation. In Louisiana, parents removed one girl from school, fearful she might be exposed, though the area never had Ebola cases. Locative fear intensifies and expands to strangers, their potential infections, and possible positioning, such that even air travel became a matter of concern:

> The biggest fear is plane travel because you don't know who has it on the plane with you or if anyone had it that was on the plane before you, so it is fluids to fluid, but there's that slight

> possibility that someone could have coughed or sneezed or somewhere around there and somebody could have a cut in their arm and get it on that.

At the height of epidemic exposure, locative fear includes an expansive list of places fearsome for the bodies that may have been, are, or might soon be present: planes, clinics, schools and even wider areas. A fire object, generating locative fear, flared from many fronts – face masks, Texans, large universities, and bathrooms were indicative of concern in south Louisiana. Masks were noticed at airports, but now appeared in unusual places such as schools. Locative fears could be extremely broad, nearly indefinable in terms of simple distance:

> Here in Louisiana, so close to Texas … a lot of [university] people had just been there at the end of August for an away game, myself included…The whole football team, all the cheerleaders, all of the band, so I think there was a reason to be concerned.

This Ebola framework provides connections between sites – a single infected person in Texas, the largest US state – and a single day visit by a group of students at a university from a neighboring state. Not everyone was convinced by such remote associations. Two individuals discussed their road trip in similar fashion:

T: I remember, I was driving through Atlanta at the same time that they had one of the patients there …
G: Oh, yeah. People didn't even want to be driving there.
T: My friend was like, 'be careful,' and I was like, 'that's crazy, there's no way' …

Here the fire flared briefly but required them to adapt, one way or another, to passenger concerns, driving through a distant city. As the social context shifted from routine to epidemic, concerns with restrooms emerged.

> You never know, what if there had been someone they missed that he had passed in the bathroom or getting off the plane and that person had just happened to … [you] see my mother's a chatty Kathy. She makes friends in the bathroom all the time. You know, what if it was that one person.

What if? Indeed, it is possible that an infectious person entered your aircraft or public toilet. An epidemic fire is unpredictable and rapid. A stranger in the bathroom could kill you.

Close contact and co-location typically refer to the proximity of human bodies in space, but epidemic talk in 2014 brought a temporal dimension to the fore. While absent presence is a characteristic of fire objects, mobile communication studies have discussed the problem of 'absent presence' as a diversion or misplacement of *consciousness*, of not being fully engaged in one's present space. Contemporary concern with screens and devices is that they draw attention away from the intimacy of face-to-face relationships into a 'technologically mediated world of elsewhere' (Gergen, 2002: 227). Yet there is a close connection. Devices were often the conveyors of Ebola news, and locative fear inverts the process. Fully engaged in our space, we imagine the ghostly residue of those who have shared it, their absent presence. What lingers? Their fluid? Their breath?

A critical divergence between medical and non-medical personnel emerged during the time of Ebola, one with significant implications for understanding the danger of close contact. This

difference resulted from the non-intuitive, medical usage of 'airborne'. Are there unseen particles on surfaces, in airspace? If so, we need to know where these infectious bodies are, have been, and whether we are endangered? A nurse described the medical consensus:

> Chicken pox would spread very easily because it spreads in the air. So if I talk to you, I'm exposing you to chicken pox. But that doesn't work with Ebola and even if I'm talking to you, this close with Ebola, I actually have to get my secretions into your mucus membranes.

At the height of the Ebola epidemic in October 2014, the media center of the World Health Organization emphasized that the disease is not an airborne infection: 'Airborne spread among humans implies inhalation of an infectious dose of virus from a suspended cloud of small dried droplets. This mode of transmission has not been observed during extensive studies of the Ebola virus over several decades. The Mayo Clinic (2016) went further, saying that the disease 'is not transmitted through the air and does not spread through casual contact, such as being near an infected person'.

Yet cross-culturally, commonsense understanding is that coughing or sneezing obviously produces airborne material – quite simply, particles that move through airspace. Our informants were generally unaware and unconcerned about the difference, such as this U.S. teacher of autistic children:

> I think its airborne, if you was to cough on someone or if because I know like they stopped the planes from going to and from that part of Africa where the Ebola outbreak was severe because people were at risk of contracting it on a plane if someone was coughing and they had it.

Particles might conceivably infect another person. Secretions travelling *through* the air, which might land and remain on surfaces, were considered reason enough to avoid the ghosts of place.[10]

Locative fear depends on the understanding of particular diseases. In rare cases, mostly in West Africa, our informants did not understand the danger as viral. One Guinean tailor told of a terrifying and deadly epidemic ('Evola'), but disbelieved the rumor that it was a disease. Rather, it was an invention of his government, which wanted to massacre people. Still, he agreed wholeheartedly with the idea that people were to be feared – out of 'fear to be attacked' – and spaces, particularly hospitals, were to be avoided: 'it is doctors who kill the patients, not Evola'. Hospitals, of course, are haunted by doctors.

Transitionality

> *'Avoid people who are obviously sick'.*
>
> –Bureau of Consular Affairs, US Department of State

The idea of epidemic exposure through stories resonates throughout our interviews in West Africa and the US. While culturally specific modes of emotionality characterize the process of fearing, our research suggests an underlying principle: fear of spaces where bodies co-locate with infectious agents, together with social assessment of threat levels. Microbes are invisible but persons are their proxies. In the case of Ebola, locative fear

rarely depended on testing, owing to its symptomatic visuality. The greatest fear was often simply people who might have it and not know it, the 'healthy carriers' discussed by scholars such as Wald (2008).

Conventional international travel alerts, such as those by the US State department, were of minor interest, which is why later health advisories proclaimed the opposite. The Centers for Disease Control warned passengers in Mexican airports: 'You could have Ebola, even if you aren't sick.' Obvious sickness requires no special notice. But locative fear of symptoms extends to those who seem healthy, since microbial agents may be harbored in the body for long periods of time without obviously sick manifestations. Asymptomatic persons, therefore, are potential threats. Such indeterminate agents are particularly interesting for future research on questions of how threat of infection is perceived. A dead body, handled and washed by close relatives in some West African traditions, was eventually accepted as fearsome, through persistent communications from public health services. Like 'obviously sick' patients, the danger was then clear, and implied responses such as wearing protective gear or not touching the dead during burials (Richards, 2016).

Transitional beings are not symptomatic or dead, but might soon be. The condition of indeterminacy became the source of generalized anxiety during the height of epidemic encounters. It was not readily knowable whether a particular person with a slight but common condition harbored an infection. One may have been attacked, invaded, unbeknownst to themselves, by an invisible entity, lurking beneath the skin for days, replicating rapidly, soon to produce a bodily transformation from health to sickness, with lethal consequences. Where, in whom, are viral suspects lurking?

In the epidemic context, fear, whatever its situational and temporal object, is often fear of contact with an *indeterminate, transitional category of being*, between health and illness, life and death. The reflexive intensity of epidemic encounters produced vivid scenarios of what might happen to the self or family, 'over-dramatization' according to one informant, imaginings of what was to come. 'Contact' frequently serves as synonym for social media interaction,[11] 'going viral' a reference to mass diffusion. But Ebola diffusion was concrete and personal. Informants often recognized that media were instigating fear responses, heightened by rumor and storytelling. Online discussions fueled the fire, but locative fears were specific and spatial. Digital fear was touching a cell phone that had been held by a possible transitional agent. Symptomatic fear spurred imaginations of transition, from health to something menacing. One undergraduate woman described it as follows:

> I would probably come to the terms with the fact that I was going to die because of the 90 percent fatality rate. I would honestly be in serious shock and my brain would just shut down immediately … It would just be coming to terms with the fact that I was going to die and it is not like I could run around and do my last wishes, go skydiving or whatever, because I would infect other people. I would be freaking out.

Anticipated futures – such as 'coming to terms' with one's inability to fulfill a prospective last wish owing to a disease one does not have – are Kierkegaardean as a measure of what it means to be human. At the same time, they represent the awareness of the extreme possibilities produced by epidemic encounters. The temporality of fear – present and

future – reinforces its object, 'fear itself'.[12] The emotion is targeted towards a perceived negative outcome (quarantine; inability to skydive), a possible sequence of development, rather than simply a perilous agent (Barbalet, 1998; Tudor, 2003). The present state of fear is, then, 'constitutive of further danger', (Tudor, 2003: 241). William James (1979) famously argued that the mountaineer who must make a 'leap of faith' across a chasm is justified in believing she can successfully achieve her goal even without sufficient warrant, owing to the fact that she is more likely to leap well, believing in her ability. The 'terrible leap' occurs in the time of Ebola as well, when evil doctors and threatening bodies abound, whether or not malicious, owing to the practical action dictated by risk assessment tinged with terror.

A surprisingly large number of our informants knew that Ebola had an incubation period of up to twenty-one days. Standard medical wisdom was that humans are not infectious until they develop symptoms. But symptoms included such conditions as fatigue, muscle pain, headache and sore throat, complaints so common as to include a significant proportion of the population on any given day. During epidemic encounters, minor characteristics come under extreme scrutiny, not only for others, but for oneself. A young American woman put it bluntly: 'The second my head started hurting I would be, like, "momma I'm dying".'

In sum, socially defined spaces, sometimes extensive, were strategized, negotiated, and often avoided during the time of Ebola, not because human bodies were infected, but because humans might be infected *without* their awareness. Quarantine, the practice of sequestering an infected or exposed individual in a special location, was rare, yet it was the one space people found *comforting* to imagine. For bodies that were previously located in dangerous spaces, for example, frontline work in Guinea, quarantine was widely debated but rarely practiced. But in our interviews, quarantine of suspected cases at national borders, or at their homes, was extremely popular. When asked directly and privately, the vast majority of individuals were in favor of the practice of quarantine – under which specific exposure profiles would be difficult to say without further research.

Discussion

This approach to fires and fears has implications for the social analysis of epidemics, the epidemiological transition characteristic of the last century, and the nature of fire objects. We reflect on these issues and contrast Ebola with both the Zika epidemic that followed and the ongoing coronavirus (COVID-19) pandemic.

Humans struggle against unseen entities that undermine health, both spiritual and microbial (Hardt, 2016). Conventionally, these are called epidemic when they are widespread or suddenly increase above normal levels. From an STS perspective, the distinction between outbreaks, epidemics and pandemics constitutes a topic for investigation, rather than an explanatory resource. Our argument implies the West African epidemic of 2014 could have readily been classified as a pandemic, that is, an epidemic of worldwide scope even though infections outside West Africa were few. Epidemic fires can be global, though patchy and uneven, when they create grave concerns and behavior change in widely disparate areas.[13] Epidemics are fire objects, arriving in unpredictable ways, flaring through private and social encounters. The notion of an epidemic fire in no way

undermines conventional historical or structural approaches to disease, which rely on social conditions as well as political-commercial interests as determinants of vulnerability (Dzingirai et al., 2017). It does, however, require greater attention to both the circulation of information and interactional dynamics in order to understand the causes and conditions of exposure for a variety of microbial agents and human populations – as well as the gaps between flare-ups.[14]

We have argued that locative fear characterizes the 2014 Ebola epidemic where fear of symptoms, agents and transitionality was high. To what extent does it figure in the interactional dynamics of other epidemics? In early 2016, as new cases of Ebola diminished and the atmosphere of crisis waned, the World Health Organization announced that Zika virus was spreading explosively in the Americas and declared a public health emergency. Their rapid response was influenced by widespread criticism of their handling of the Ebola crisis and the imminence of summer Olympic Games in Brazil. Before one epidemic was over, the next had begun.

The Zika epidemic shows that locative fear is variable not constant.[15] Zika was not widely feared, owing to its symptoms, sometimes described as similar to those of a common cold or flu. These can occur below the threshold of awareness and remain unreported. All medical accounts describe Zika as a mosquito-borne disease. Like Ebola, it was understood in a comparative framework. Primarily affecting Latin America, Zika was considered similar to dengue fever, yellow fever or chikungunya, other diseases transmitted by mosquitoes. Unlike Ebola infections, which were not actually observed in most of our study locations, Zika infections were common, including in the US.[16] As in the Ebola epidemic, personal and family security were assessed in terms of the likelihood of co-location with infectious agents, but encounters did not summon a high level of fear. Based on stories of symptoms and proximity to agents of infection, attention focused dynamically on the presence or absence of invisible microbial threats in social spaces. However, symptoms, agents and transitionality were all experienced differently.

Less feared than Ebola, Zika concerns were nonetheless human-centered. The avoidance of *Aedes Aegypti*, the primary insect culprit, was often not a major concern. Residents in warmer climates were familiar with mosquito issues, including means of mitigation (not storing water, using repellent, fumigating). They are accustomed to dealing with parasitical diseases like malaria, or viral diseases such as chikungunya and dengue, which have higher mortality than Zika. While public health messages with Zika warnings reached all our study locations, most residents in these areas found no reason to change their activities dramatically. Habituated to mosquitoes, their way of life was adapted to diseases worse than this newcomer.

Two populations did report moderate levels of fear. Since Zika infection during pregnancy is associated with newborn microcephaly, women who considered pregnancy worried mostly about infection from sexual partners.[17] Even in Mexico, where there were no confirmed cases of microcephaly, women of childbearing age expressed this concern. The poor who depended on daily income worried about losing work. But Zika identities were not transitional for two reasons. First, the virus was not generally viewed as deadly, but also because it was commonly believed symptoms occurred from the moment of infection. While health professionals regard the period of incubation as three to twelve

days after an infected mosquito bite, our informants did not recognize a period between contagion and symptoms.

This essay was finished in southeastern Louisiana, the area with, at the time of writing, the highest coronavirus death rate in the US, at an apparent peak of new COVID-19 infections. The coronavirus outbreak is a different order of magnitude in terms of global impact on health and economic outcomes. When the World Health Organization declared COVID-19 the first pandemic since 2009, our team of collaborators wondered how this new viral threat would develop and whether it would be similar to those we had studied. The phenomena of epidemic fire and locative fear were not simply discussed by our informants but *experienced* by our team during Ebola and Zika fieldwork. Since then, Ebola has been raging in the Congo, now the second largest outbreak in history, while the Pan American Health Organization recorded nearly 32,000 cases of Zika in 2019. Currently these epidemics are not newsworthy, their cinders but ashes as coronavirus spreads. Encounters where people discuss symptoms of coronavirus, broadcasts, gossip and strategize avoidance are common. Stay-at-home orders are in effect in nearly all of the nine countries where we conducted Ebola and Zika interviews.

In an epidemic context, a fire object is more than a graph of contagion. Even a global pandemic in 2020 is reported as occurring in clusters, distributed in distant locations. As the bush fire metaphor suggests, it is uneven, inconsistent, patchy. In terms of the lived experience of most infected people, coronavirus is not unlike Zika, with few or unnoticeable symptoms. The pandemic in April 2020 is often described as much more extensive than known or counted, owing to the low level of testing and mild symptoms. Yet COVID-19, with its far lower death rate, bears comparison to Ebola in terms of locative fear. Three interdependent factors are at work.

First, the rapid circulation of coronavirus information through new communication technology makes *what happens elsewhere* immediately available for strategic interpersonal negotiations over reactive and proactive responses. One often does not know how close one is, whether one is within the epidemic fire or soon to be. Second, state interventions such as quarantine, stay-at-home decrees and mask-wearing recommendations have altered behavior in ways that symbolize epidemic threat and nurture continuous awareness of invisible agents. Third, scientific and medical controversies over infectious pathways and probabilities have reinforced locative fears of symptoms, people and spaces.

Nowhere is this clearer than in the current controversy over whether coronavirus can be spread through the air by inhalation. The Ebola controversy discussed above centered on what medical professionals generally viewed as a knowledge deficit: the public 'inability' to understand that the virus is not transmitted through air. Being near an infected person would not cause one to become infected. In the present moment, early experimental and observational studies produced conflicting results and no consensus on whether tiny droplets of novel coronavirus could remain in the air long enough and carry a quantity of viable particles sufficient to *infect us by simply breathing*. Who is here? Who has been in this place? Were they sick or about to be? The ghosts of place surround us as never before.

Locative fear, engendered by epidemic fire, requires more specific studies of its operation in other disease contexts, variability by gender and social class, and the types of

encounter that widen or decrease its scope. One implication of the argument is that there should be a variety of responses to transitional identities. The incubation time frame of 21 days for Ebola serves as a window of transitionality, within which relationships shift, where actions acquire frightening expressive meanings, ranging from disdain for the collectivity to self-loathing. One infamous event of the US epidemic occurred when a nurse who had treated patients in West Africa was allowed to return to her Maine home under a voluntary quarantine. She vowed publicly to disregard the order and went on a bike ride with her boyfriend after only one week, leading to public condemnations and attempts by the state to impose legal sanctions (Berman, 2014). Yet another possible outcome of exposure that deserves exploration is fear of self. While we lack sufficient evidence in our interviews, there should be instances such as that reported in the HIV epidemic by the artist Barton Benes in the early 1990s. Chopping parsley one night, he cut his hand and began to drip blood. He immediately sought bleach and rubber gloves, so accustomed was he to viewing his *own* body as toxic: 'I was terrified I would infect myself' (Groff, 1999).

Another implication concerns the nature of our experience of health. Demographers view the mid-twentieth century as an epidemiological transition, owing to the shift from infectious to chronic disease as the leading cause of death. Our multi-sited examination of accounts suggests the continuing importance of infectious disease, even with the shift from symptoms and suffering to risk-based health. An analysis of epidemics should be conceptualized in terms of constructed dangers, rather than frequency of infection, fire objects that flare and die away with the character of social encounters, transforming actors and spaces into indeterminate threats. If we are to take seriously the notion of risk-dominated health, then infectious diseases may still exceed chronic diseases in importance. Unlike cancer and heart disease, it is not the body alone, its conditions and metrics, that generates concern, but relationships with other bodies and spaces. The culture-of-fear perspective sometimes assumes resignation or fatalism, which is far from the case here. Locative fear is not a resigned experience in which people are unwilling to take risks or powerless against infection, but a matter for strategic avoidance and positioning. Even in a low-fear epidemic such as Zika, both urban and rural dwellers try to avoid or eliminate mosquitoes. In a high fear epidemic such as coronavirus, an unmasked customer who changes the direction of her shopping cart causes flinching, apologies, backtracking.

During the Ebola epidemic, many interpreted the fear factor as harmful, 'amplifying the spread of disease, impeding life-saving medical care for Ebola-infected persons and patients with other serious medical conditions, increasing psychological distress and disorder, and exacerbating social problems' (Shultz et al., 2016: 304). In this view, fear was destructive, since an Ebola epidemic in places such as the US was very unlikely. But fire objects, as Law and Singleton argue, are novel and creative as well as destructive (2005: 349). It is quite possible that locative fear had some role to play in the low incidence outside Ebola's West African origin. During the key period of locative fear, an Ebola utterance was an instant moment of connection, a shared interest of friends, acquaintances and even strangers across any social boundary. In the time of coronavirus, it may be said that here, too, death is in the offing. But not only death. Ebola was a creative opportunity at the moment of fear – having fun with the epidemic, with jokes, songs or

special handshakes, expressing both fear and gratitude. With coronavirus yet to subside, stay-at-home orders are creating unprecedented opportunities for connections between cohabitants and digital acquaintances in the absence of physical proximity. Epidemic encounters are moments of fear and the shared celebration of life.

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ORCID iDs

Wesley Shrum https://orcid.org/0000-0001-5040-6584
Andre Campos https://orcid.org/0000-0002-6801-0454
Rhiannon Kroeger https://orcid.org/0000-0002-3146-6589

Notes

1. Country figures are drawn from the website of the Centers for Disease Control on 13 April, 2016, as the epidemic drew to a close (2019a).
2. We depart from Law and Singleton's claim that these realities 'cannot' be present. Scientists observing *Zaire ebolavirus* in a laboratory are certainly correct when they claim to see Ebola directly, but would be wrong to claim that that is the only manifestation of Ebola.
3. This was unsubstantiated rumor. However, Dallas is approximately the same geographic distance from Baton Rouge as Accra is to the three West African countries that had significant numbers of Ebola cases.
4. We emphasize danger or threat rather than risk, following Battistelli and Galantino (2018) in viewing risks as attributable to human intentions.
5. Microbes are simply micro-organisms or biologic agents that can replicate in humans, while microbial threats refer to both the organism and the disease.
6. This Japanese survival-horror game is loosely based on the manipulation of the Ebola virus. A biological weapon has been created and mass produced by the Umbrella Corporation, then leaked, causing a zombie outbreak.
7. In their analysis, Médicins Sans Frontières authors of an internal report write that 'dramatic, noncontextualized public health messages' like this one had the unintended effect of emphasizing the futility of treatment (Hofman and Au, 2017).
8. As indicated, there were never any Ebola cases in Ghana, to the best of our knowledge.
9. Based on an analysis of risk and dread narratives of 21 health professionals in an Australia hospital in early 2015, they conclude that the most significant continuing influence of Ebola was 'that it was never effectively understood or calculable in terms of its actual threat for the "treating" health professional'. This led to a crisis in which workers were making decisions about their levels of benevolence and the amount of care they would provide (Broom and Broom, 2017: 213).
10. While we refer to ghosts of place as the feared residues of infectious agents, Bell's original theory referred to memories (1997). A third usage of the idea was implied by a Ghanaian theory that Ebola spread from those killed in civil wars, whose bodies were left to rot and

contaminated the air.

11. Following the proliferation of new media of communication and the extension of face-to-face encounters through digital devices and protocols, extended meanings have accrued to terms such as interaction, co-presence, relationship and linkage.
12. Note the difference in the usage from Franklin D Roosevelt's inaugural address. The famous 'we have nothing to fear but fear itself' enjoined the nation not to retreat, but rather attack, while the reflexive process here is a reinforcement process in which fear leads to storytelling, repetition and enhanced fear until the emotion is recognized as social and self-perpetuating.
13. The most recent estimate of the comprehensive social and economic costs of the 2014 outbreak is $53.18 billion (Huber et al., 2018).
14. Puzzling evidence for past Ebola epidemics comes from recent re-analysis of older human blood samples in Sierra Leone. This indicates the presence of antibodies to Ebola and the possibility that earlier epidemics were not only present but contained by local populations (Schoepp et al., 2014).
15. Our Zika interviews from 2016-2018 were accomplished by teams in Mexico, Brazil, Argentina and India.
16. In the US and territories, over 43,000 cases were reported, nearly 6,000 of which were in the states (Centers for Disease Control and Prevention, 2019b).
17. Travelers were enjoined at airports not only to 'protect your sex partners' by using condoms but, in an interesting twist, to protect the mosquitoes themselves: 'don't give Zika to mosquitoes'.

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Author biographies

Wesley Shrum is Professor of Sociology at Louisiana State University, Program Officer for the Society for Social Studies of Science, and Director of the Ethnografilm Festival in Paris. His primary research sites since 1994 are Kenya, Ghana, and Kerala, with a focus on communication technology and social networks. The co-authors of this paper have collaborated since 2014 to investigate the Ebola and Zika epidemics.