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Scientific and non-scientific information in the uptake of health information: The case of Ebola

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The Ebola virus disease outbreak in West Africa (2013–2016) claimed over 10 000 lives in less than 18 months. Low levels of familiarity with the disease, ease of transmission, scale of infection, gruesomeness of symptoms, lack of cure and high fatality rate created a global panic. From the perspective of the social psychology of communication and content analysis, this study examines media coverage of the crisis in Africa with a view to unpacking the scientific and non-scientific information that may have framed public understanding of the disease. Findings show that accepting scientific advice was not unproblematic, because of the similarity of early symptoms with known diseases such as Lassa, dengue and malaria fevers. Cultural and religious actors and beliefs posed a paradox for believers as the public assimilated disease prevention information into existing norms and practices. Rumours and conspiracy theories about Western governments and pharmaceuticals also contributed to the rejection of the scientific explanation of its origin. Fear of the devastating effects of the disease and the lack of a cure led to the stigmatisation of the infected and treatment centres and ultimately to public revolts. Findings show the importance of non-scientific information and actors in matters of health and illness in Africa.

Significance:

- Scientific knowledge is not enough to change health behaviour. Non-scientific knowledge and actors, traditional and religious practices, rumours and conspiracy theories must all be factored into efforts to address behavioural change.

Introduction

The Ebola virus disease (EVD) outbreak of 2013–2016 in West Africa claimed over 10 000 lives in less than 18 months. Ripples were felt across the world in a contagion of fear and global panic¹ – with effects extending as far as the USA² where it influenced voter behaviour. The disease ravaged Sierra Leone, Liberia, Guinea and Mali, all sharing land borders, on a scale never experienced before and was transmitted by air travel to Nigeria.

The first major outbreak of EVD in Africa was in 1976 in the now Democratic Republic of the Congo and Sudan, which share a land border. The disease incidence had, before the 1976 outbreak, been restricted to Central and Eastern Africa. The only case in West Africa was in Cote d'Ivoire in 1994, in which the patient survived.³ Among the West African communities, therefore, experience with the symptoms and devastating effects of the disease was almost non-existent.

Studies of major health crises have shown that preventive scientific information competes in people's minds with other beliefs and practices as well as rumours and conspiracy theories.^{4,5} A multimodal approach that examines both scientific and non-scientific information circulating in society is therefore essential towards understanding the aetiology of epidemics. This understanding is of greater importance in West African communities which are characterised by strong family and community bonds; long-established traditional practices and high levels of religiosity which guide ways of life and support livelihoods; long-standing suspicions of Western interests in medical interventions⁵; and, in some rural areas, limited engagement with Western medical practices. Also, forces shaping health behaviour are more complex than individual rational decisions based on knowledge about health risks and by the extent to which broader contextual factors support the performance of such behaviour.⁶ In this study, through an analysis of storytelling in African newspapers, we sought to identify and unpack these competing messages, some of which may have delayed the early uptake of scientific information.

Theoretical approach

Risk perception and communication

Modern theories of cognitive psychology and neuroscience separate risk perception into two systems: the analytical and the experiential.⁷ The analytical uses algorithms and normative rules while the experiential relies on images and associations, linked by experience, to emotion and affect, but both systems operate in parallel, and each seems to depend on the other for guidance.⁷ We argue that both analytical (science) and experiential (common sense) systems operate as components of a social system whose elements constantly communicate with each other as scientific ideas are absorbed into everyday life. Science, as a key feature of modern common sense, changes everyday life, quite often, very fast, but the outcome of this meeting of new and old knowledge is contested by researchers. To some, it means the substitution of religion, myth and tradition in everyday life by science; to others it means the pluralisation of common sense.⁸

Also, communication between scientists and the public entails more than the transmission or extension⁹ of information. For communication to be successful, it must evolve through a social exchange between parties towards a common understanding.¹⁰ But while certain conditions may lead towards mutual understanding, we agree with Luhmann¹¹ that attaining this status does not always function to produce a consensus, but may result in an open situation of acceptance or rejection.

Social representations theory

Common sense, a structured collection of descriptions and explanations, more or less connected to each other, and which everyone uses for organising their experience or interacting with others, influences the initial direction with which social groups engage with an unfamiliar phenomenon.¹² Social representations theory proposes that the transformation of common sense by science may initially lead to three alternatives: rejection, acceptance or assimilation/accommodation, providing a third to Luhmann's two options.

In his study of the reception of psychoanalysis in France in the 1950s, Moscovici¹² showed how three distinct sub-cultures of the society responded to the challenge of psychoanalytic ideas in different ways, all informed by pre-existing thoughts about actors, events and objects. The strategy of the communist press was to enforce a 'rejection' of psychoanalysis which it described as an instrument of Western imperialism to its readers. Marxism and psychoanalysis had spread in French culture after World War II, and the ensuing ideological conflict became a tool for analysing a scientific phenomenon. The Catholic community sought to 'accommodate' certain aspects into existing religious practices (e.g. confessing to a psychoanalyst is similar to a priest and penitent scenario), while the newspapers targeting the urban elite adopted the strategy of 'diffusion'. Moscovici 'not only showed a third way between distortion and diffusion, but suggested, by updating Durkheim's concept of collective representation, that both distortion and diffusion are special cases of a generic phenomenon, that of social representation'⁸. Moscovici's study shows that the three versions were framed and empowered by different representations⁸ (Table 1).

Table 1: Social representations theory: Luhmann, Moscovici and health controversies

Luhmann ¹⁰	Rejection		Acceptance
Moscovici ¹¹	Rejection	Accommodation/ assimilation	Diffusion
Health controversies	Rumours, conspiracy/ alternative causes	Stigma, confusion, paradox as premise for behaviour	Acceptance as premise for behaviour

Social representations theory proposes that communication between science and common sense or the 'reified' and 'consensual' universes,^{13,14} can lead to pluralisation. The two formats, also referred to in risk perception literature as the analytical and the experiential⁷, are very distinct communicative formats which use different arguments and originate and enable different types of debates between spheres¹⁴. But with pluralisation, is there a hierarchy or are both in competition for recognition?¹⁵

The pluralisation of common sense informs Moscovici's thesis of cognitive polyphasia.¹² Moscovici argues that a diversity of knowledge forms can coexist within the same individual or group and this coexistence of cognitive systems is the rule rather than the exception, particularly in modern societies.^{12,16} Cognitive polyphasia manifested during the measles, mumps and rubella controversy in the UK in which scientific knowledge, common sense, magic, politics and religion were used to make sense of the vaccine.¹⁷ Cognitive polyphasia has also been found to manifest as a hierarchy, when one form is elevated over the other; as parallelity, when both serve separate functions; or as enhancement, when one empowers the other.¹⁸

Scientific and non-scientific information

Social representations theory shows the importance of non-scientific information, experience with actors, similar objects and social groups in the acceptance of new science. Non-scientific information, from experience with collectives¹⁹ and other actors, contributes to how laypeople interpret new scientific ideas and may significantly shape the perception of the idea. Non-scientific information may also be in the form of rumours and conspiracy theories which have trailed public health issues since the Tuskegee²⁰ and human radiation experiments²¹. Ethical issues in drug trials have eroded trust and created negative

stereotypes about Western collectives and actors symbolised in a 'Western conspiracy' and these are drawn upon by the public to make sense of global health interventions.

Rumours and conspiracy theories originate in periods of social duress from popular culture, stereotypes and preconceptions about people, issues and events. They express fears and suspicion and counter official explanations by bringing together seemingly unrelated issues or errant data in common sense to interpret events.^{22,23} Wagner and Hayes²⁴ argue that it is not the historical truths of past events, compressed in images and metaphors, that make them useful in everyday discourse, but their symbolic truth in dealing with everyday issues. Rumours and conspiracy theories proffer reasons for the public to reject a Western explanation on the origin of disease and have in the past ignited public revolts in health controversies.⁵

Stigmatisation

Research into social representations of mental health²⁵ and HIV/AIDS²⁶ have also shown that representations of diseases often lead to stigmatisation²⁷ – a negative consequence of assimilation into existing knowledge systems. Stigmatisation, informed by fears of inherent dangers in associating with infected persons and objects associated with them, often leads to attempts at distancing self and loved ones from, or social isolation of, the infected and associated objects.

Research objectives

Wang et al.²⁸ studied the epidemiology of Ebola in West Africa while Mondragon et al.²⁹ looked at representations of Ebola in Spain. Other researchers have examined the roles of fear³⁰ and lack of trust³¹ in containing the virus. We examined the representations of Ebola in West Africa through storytelling by African newspapers with a view to expanding knowledge of the psychosocial factors that contributed to the spread of the disease. Specifically:

- To correlate the intensity of coverage of EVD in newspapers to the disease-related fatalities as a measure of public anxiety.
- To identify the actors and countries or collectives that shape risk information about the EVD.
- To identify, categorise and analyse the interplay of scientific and non-scientific information on Ebola.

Methods

Computer-assisted content analysis of newspapers

The media provide a researchable social space for the variety of views, actors and collectives involved in a public debate. Mayor et al.³² found that findings from media text analysis are similar to interviews and Joffe and Haarhof³³ identified similarities and differences. Media text corpora have been used to study health controversies such as methicillin-resistant *Staphylococcus aureus*.³⁴

For this research, the traditional content analysis cost-benefit approach³⁵ was enhanced with computerisation using the software QDA Miner/WordStat. The complexity of language, however, implies that the software will not replace but only augment careful reading and thoughtful analysis.³⁶ It has been used for media text analysis.³⁷

A user-defined dictionary approach was adopted for its simplicity and cost-effectiveness over supervised machine learning.^{36,38} The user-defined dictionary, created in WordStat, was used for a bottom-up approach to the qualitative analysis and arranged in categories for the quantification. The combination of qualitative and quantitative approaches enhances the study of relatively complex processes of communication.¹² A country dictionary was also created in WordStat.

Corpus construction

A total of 4201 articles from 17 newspapers published in 12 African countries were downloaded from NEXIS UK in June 2015 using the keyword 'Ebola' and the index for African newspapers (Table 2). The articles spanned 29 months from January 2013 to May 2015. We

created variables to filter for country and relevance. 'Relevance three' are those articles with at least three mentions of Ebola and one newspaper per country.

Table 2: Newspaper and frequency of occurrence of the keyword 'Ebola'

	2013	2014	2015	Total	Relevance three
West Africa					
<i>This Day</i> (Nigeria)		804	112	916	
<i>Vanguard</i> (Nigeria)		699	102	801	438
<i>The Inquirer</i> (Liberia)		559	221	780	566
<i>Concord Times</i> (Sierra Leone)		85	349	434	282
<i>The Analyst</i> (Liberia)		237	3	240	
<i>Daily Observer</i> (The Gambia)		130	24	154	92
<i>FOROYAA</i> (The Gambia)		44	22	66	
<i>Cameroon Tribune</i> (Cameroon)		34	15	49	15
<i>Ghanaian Chronicle</i> (Ghana)		20	16	36	12
East/Southern Africa					
<i>The Star</i> (Kenya)		191	51	242	111
<i>The New Times</i> (Rwanda)	3	121	32	156	83
<i>The Herald</i> (Zimbabwe)		101	32	133	60
<i>The Times of Zambia</i> (Zambia)		55	18	73	35
<i>New Era</i> (Namibia)	1	44	6	51	31
<i>The Namibian</i> (Namibia)	3	31	6	40	
<i>The Independent</i> (Uganda)	6	10	7	23	10
<i>Zimbabwe Independent</i> (Zimbabwe)		4	3	7	
Total	13	3169	1019	4201	1735

We observed that between September and November 2014, no articles were available for the *Concord Times* of Sierra Leone. We are, however, of the opinion that this does not have a significant influence on the findings. Also, the user-defined dictionary approach does not recognise context, metaphors, etc. Its use in the thematic analysis was limited to extraction and weighting of keywords.

Findings

Intensity of coverage as a measure of public anxiety

Figure 1 shows that coverage peaked in August 2014 for Nigeria's *Vanguard* newspaper while for Liberia's *The Inquirer*, the crest was in September 2014. The virus was transmitted to Nigeria on 20 July 2014 and the country was declared free on 20 October 2014. The *Vanguard* peak thus reflects the period of extreme anxiety in Nigeria. The reported deaths from Liberia, Sierra Leone and Guinea combined³ peaked in October 2014, followed by a second peak in December 2014.

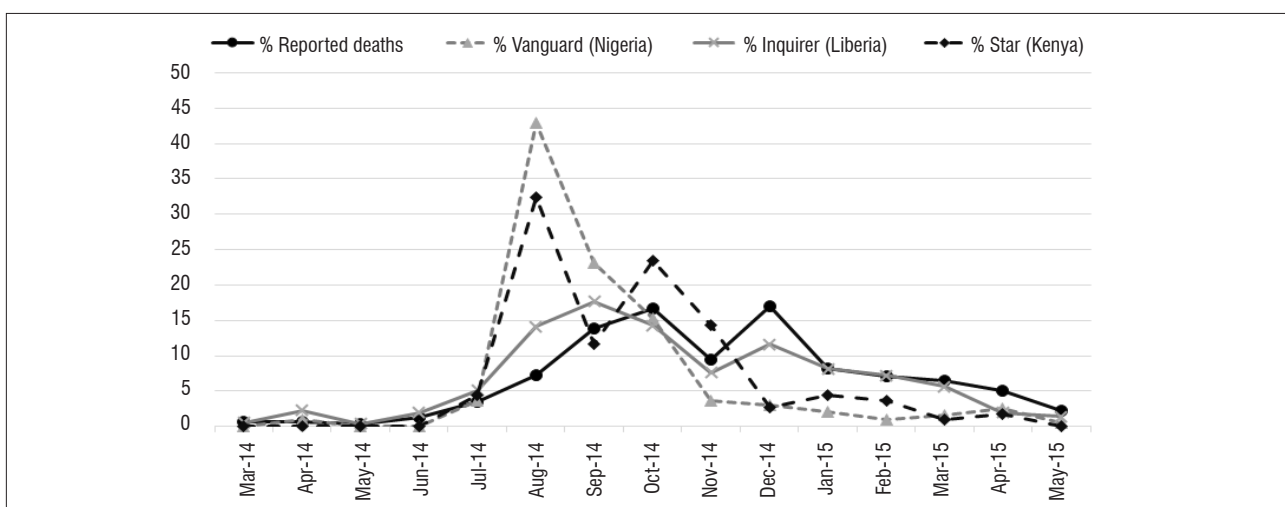
The Kendall's tau_b correlation coefficient shows significant correlations between recorded deaths and coverage statistics between March 2014 and May 2015. The correlation (*r*) between deaths and *Vanguard* coverage was 0.545 at a 0.5 level of significance; *The Star* 0.615 at 0.01; *The Inquirer* 0.760 at 0.01; the *n*=1735 sub-sample 0.823 at 0.01 and the entire corpus of 4201 was 0.804 at 0.01. We can thus confirm a significant association between coverage and the number of recorded deaths and make reasonable conclusions that the African media mirrored public anxiety over the outbreak.

Actors and countries

The actors were categorised based on their social functions as follows:

- Science actors: doctors, nurses, researchers, UNICEF, Doctors Without Borders, World Health Organization, pharmaceutical companies, scientists
- Cultural actors: bishops, church leaders, community leaders, elders, herbalists, imams, pastors, religious leaders, reverends, spiritual healers, traditional chiefs, traditional healers, traditional rulers, traditional leaders
- Government actors: commissioners, government officials, governors, ministers, presidents, senators

We report the term 'frequency-inverse document frequency' (tf-idf) – a weighted measure of the statistical relevance of words, which represents a fair balance between popularity and specificity.³⁹ For the 1735 sub-corpus ('relevance three'), government actors appear in 58% of articles with a tf-idf of 957; scientists in 40% of articles with a tf-idf of 798 and cultural actors in 10% of articles with a tf-idf of 392.



Coverage/reported deaths for the month was divided by the total coverage for the period.

Figure 1: Newspaper coverage of Ebola and reported deaths (*n*=1735 articles).

Table 3 shows countries based on a tf-idf (also see the supplementary material). Liberia with a tf-idf of 821 appears in 55% of cases, Sierra Leone with 685 appears in 39% and Nigeria with 999 appears in 28%. Nigeria is the regional power in West Africa and has been actively involved in Sierra Leone and Liberia for many years helping to quell gruesome civil wars, and again intervened significantly in the Ebola crisis with finance and equipment. Gambia is geographically close to Liberia and Sierra Leone while Kenya Airways operates regular flights to West African countries. The USA with the highest td-idf for non-African countries appears in 15.6% of cases, China in 5% and the UK in 3.6%. Liberia is a previous settlement of the American Colonization Society. The late response of the USA was not lost on the public, nor was the early response of China. Alfred Sirleaf's *The Daily Talk*, depicted the score line as 'China 2: US/West 1'⁴⁰.

Table 3: Countries and number of articles ($n=1735$)

Africa (infected)	tf-idf	Africa (non-infected)	tf-idf	Non-African	tf-idf
Nigeria	999.9	Gambia	455.8	USA	376.6
Liberia	821.1	Kenya	420.1	China	356.2
Sierra Leone*	685.6	Zimbabwe	305.5	UK	127.3
Guinea	515.9	Zambia	273.4	India	102.4
Mali	89	Rwanda	272.8	France	98.5
		Namibia	230.6	Spain	79.3
		Uganda	210.1	Iran	77.3
		Ghana	199.9	Cuba	67.2

tf-idf, term frequency-inverse document frequency
*Some missing data.
See supplementary material for more details.

Categorisation

The categorisation combines theory with automated text analysis. The theoretical approach (top-down) divides the issues into risk and non-risk information, while bottom-up looks at the 'keywords in context' for interpretational frames. The researchers worked together to agree on the meaning units and frames. We used the 1735 sub-corpus and discussed each group in turn, citing text from articles. Religious beliefs were separated from traditional and spiritual beliefs because the latter are often associated with ritualistic practices of sacrifice to appease gods and spirits while the former, of the Abrahamic faith, generally do not involve rituals but do include a belief in spirits. Table 4 shows the framework of the analysis. (See the supplementary material for more detail.)

The category of keywords with the strongest relevance was 'religious belief' with a tf-idf of 716 appearing in 18% of cases. This category was followed by 'rumours and conspiracy theories' with a td-idf of 456 from 15% of cases; 'risk information' with 400 from 93% and the lowest was 'traditions' with a score of 259 from 8%. At the level of the two communicative modalities, the universe of risk information was less discriminating overall with a td-idf of 400 from 93% of cases while the non-risk consensual discourse was more important with a td-idf of 848 from 33%. Also, we found a significant correlation between scientific and non-scientific information in the same newspaper: Nigeria's *Vanguard* newspaper ($r=0.86$; $p<0.001$; $n=801$), Liberia's *The Inquirer* ($r=0.84$; $p<0.001$; $n=780$) and Kenya's *Star* ($r=0.73$; $p<0.003$; $n=242$). There was also a significant association for the 'relevance three' corpus ($r=0.91$; $p<0.001$; $n=1735$) and the full corpus comprising all African dailies ($r=0.96$; $p<0.001$; $n=4201$).

Table 4: Content categorisation from keywords to scientific and non-scientific information

Keywords	Bottom-up		Top-down	
	Meaning units	Interpretation/frame	Theory	
Contracted, disease, infection, risk, transmit, vaccine, virus, viral disease	Ebola symptoms: fever, vomiting, headache, muscle pain, diarrhoea, nausea, bleeding, etc. Hygiene measures	Containment/ diffusion	Risk information 93% cases tf-idf = 400	Risk information 93% cases tf-idf = 400
	The 'uneducated' vs inadequate government responses	Obstacle		
	Dengue, Lassa, malaria symptoms: fever, vomiting, headache, muscle pain, diarrhoea, nausea, bleeding	Obstacle		
Tradition, mourning, mats, traditional healers, spiritual healers	Mourning, hugging, washing	Obstacle	Traditions 7.7% cases tf-idf = 259	
	Claims to cure			
Christian, religion, church, mosque, Muslim, prayer, spirit	Suspension of mourning, hugging, etc.	Containment/accommodation	Religious belief 17.8% cases tf-idf = 716	Non-risk information 33% cases tf-idf = 848
	Laying of hands, praying for healing	Obstacle		
	Religious beliefs and gatherings	Paradoxical accommodation		
Rumour, corruption	Care for the sick	Containment/accommodation	Rumours and conspiracy theories 15% cases tf-idf = 456	
	Suspension of shaking hands, touching			
Conspiracy, depopulation, racism, racist, stigma, terrorist, New World Order	Corruption, diversion, accountability	Obstacle		
	Local remedy			
	Rumours of spread of disease	Accommodation/ stigma/ revolt		
	Conspiracy theories about disease spread			
	Economics of an African disease	Obstacle/rejection		
	Viral terrorism			
	Bioterrorism, depopulation, New World Order, racist and racism			

tf-idf, term frequency-inverse document frequency
See supplementary material for more details.

Risk information

Several articles provided detailed descriptions of EVD: mode of transmission, symptoms and preventive measures. In the early months, such descriptions often used emotive language: 'The Ebola virus can kill its victims within days, causing severe fever and muscle pain, weakness, vomiting and diarrhoea – in some cases shutting down organs and causing unstoppable bleeding'⁴¹. The public were asked to avoid shaking hands, to wash hands frequently and avoid bush meat such as bats and monkeys – the vectors of the disease. National government representatives positioned uneducated families and communities as the greatest obstacle. Drawing on metaphors from deficit-knowledge frames, they called on people to take responsibility for educating others and to join the fight against the virus.

However, risk information was not unproblematic because of the similarity of symptoms with Lassa and dengue fevers which also cause fever, body aches, vomiting, diarrhoea, bleeding, etc.; malaria also causes high fevers and vomiting, and cholera causes vomiting and diarrhoea – all are diseases which are common in Africa. The similarity confused the public and medical personnel, which lead to panic in several countries, even as far away as Zimbabwe.⁴²

Also, understanding the need for and wearing of protective clothing was not enough to be protected, as 120 of the 240 healthcare workers who contracted the disease from patients died (as at August 2014).⁴³

Religious beliefs and science

The roles played by religious institutions and actors were distinguishable as three sub-categories: those that presented obstacles by upholding the sanctity of faith in God to cure all ailments (rejection of science); the paradoxical which gave conflicting directives on science and religion (accommodation); and those activities that aided its containment (diffusion). Accommodation of science by religion indicates cognitive polyphasia – the coexistence of different forms of knowing.

'Ebola the evil spirit'

Liberia's *The Inquirer* cites the story of a church in Monrovia⁴⁴ where pastors were laying hands on the sick to cure them of 'spiritual attacks', following which four people died, including a pastor's wife, and the pastor himself was later admitted to the Ebola Treatment Unit. Another church leader in Nigeria told his followers that Ebola is not a disease but an evil spirit.

Paradoxical accommodations and 'tangled hierarchies'

A church leader told pastors⁴⁵ that all those who had fasted for 100 days should have no fear of Ebola, but he also warned them to avoid laying hands on anybody they suspected of having the disease. In Sierra Leone, a Muslim argued that believers can only be infected if God permits but warned them to avoid contact⁴⁶:

The Prophet said: (There is no 'Adwa') i.e. transfer of a disease by itself, but with the permission of Allah ... we must keep away from Ebola as we do from a lion.

Accommodation of science by religion

Many churches ordered the suspension of the practice of shaking hands as a sign of peace and the serving of Holy Communion in the mouth. A religious leader in Liberia⁴⁷ called on fellow men of God to stop laying hands as a means of healing persons and imams to stop bathing dead bodies:

I beg you in the Name of Jesus ... please stop laying hands on people in order to cure them of Ebola. To our venerable imams, I respectfully appeal to you in the name of Allah ... please stop bathing dead bodies.

The church was also a source of medical aid. Several religious institutions in Sierra Leone, including the United Brethren in Christ Church Conference, received funds from abroad for medical equipment

and the Abundant Life Chapel Home in Liberia served as an orphanage for children who lost their parents to the disease.

Traditional and spiritual practices

The West African crisis, according to WHO⁴⁸, may have started in Guinea following the burial of a young boy, from whom it spread to family members, as it is customary to embrace the body of the deceased as a sign of love and affection. So was a chain reaction of cases sparked, which spread to neighbouring countries. In many communities it is tradition to wash the body of the dead and to sit on mats to mourn⁴⁸:

Bassonians, like other Kwa-speaking groups including Kru and Grebo, are better known for spending time on mats to mourn their dead ones. They are also known for bathing (washing) dead bodies as part of traditional rites which were long practised by their ancestors.

Liberia's Ministry of Information⁴⁹ describes how Ebola changed their way of life:

We who are afforded divine blessings by caring for our elderly ... and believe our duties to each other extend to burying our dearly departed through traditional rituals and religious practices ... were often limited to watching and restricted from touching, as our forefathers taught us to do.

Some traditional secret societies believed that a dead member's ghost will torment others if they failed to observe the traditional rites of passage.⁵⁰

Some traditional healers also placed advertisements on radio and television announcing their capability to cure the disease.

Some Nigerians⁵¹ did not believe that bats transmit the virus, as they had hunted them for generations for their meat, and, in some cultures, hunting bats was a requirement to 'move up an age group':

If you want to graduate from that [age] group, you...go into the forest to find a very special kind of bat and kill it...if you can do it, you bring the carcass and the elders share the meat, you'll be promoted.

Accommodation of science by traditions

At the peak of the outbreak in September 2014, Liberia's President, Ellen Johnson-Sirleaf, made a passionate plea⁴⁸ to the public to 'stop the mat business'. Sierra Leone's Vice President, Samuel Sam-Sumana, also called for the suspension of traditional practices⁵²: '...[A]t this moment, all cultural and traditional practices are suspended until we are declared Ebola free; then and only then can we go back.'

The need to show love for lost family members, friends and associates by mourning as dictated by traditions aided the spread of the disease. Ebola thus qualifies as the plague of love and traditions. The accommodation of science by traditions also indicates the coexistence of different forms of knowledge.

Rumours, stigma, revolt and conspiracies

There were rumours that drinking and bathing in salt water or eating bitter kola can prevent the disease.⁵³ These rumours were informed by preconceptions about the efficacy of traditional medicine among a public confronted with the failure of its Western counterpart. Rumours of corruption or the disbursement of funds were also common. The *Wall Street Journal*⁵⁴ also reported that some body collectors collected bribes instead of corpses. A community outreach worker said:

They say ... 'we can give you a certificate from the Ministry of Health that it wasn't Ebola.' Sometimes it is \$40. Sometimes it is \$50. Then, they offer bags to them and [the family] carry on their own thing.

West Point, one of Liberia's slums, was engulfed in a revolt during which a treatment centre was ransacked. Some residents⁵⁵ were said to be opposed to the influx of patients from other places out of fear they would spread the disease in the area. In some parts of Guinea, eight awareness officials were killed by villagers who accused them of spreading the disease.⁵⁶ These actions evolved from the tying together of 'errant data'²³ and represent the negative effects of stigmatisation. Economic factors may have also contributed to the looting and revolt as residents criticised government's actions which restricted people's movement as a containment measure, but which also left many with few survival options.

The public revolts have been attributed to a denial of the existence of the disease. We argue that revolts may have been informed by economic factors, fear³⁰ and stigmatisation²⁷ of the infected and treatment centres and not from ignoring risk information. The public were acting on risk information, albeit in their own way, by distancing themselves from all persons and institutions associated with the virus. A homeless man⁵⁷ said his friends drove him away when he was sick fearing he might have been infected with EVD and still refused to admit him even when his health improved.

Conspiracy against Africa

A writer argues that it is not in the business interest of Western pharmaceutical conglomerates to have a simple solution such as bitter kola produced locally in Africa. Gambia's president, Yahya Jammeh⁵⁸, describes the treatment of Westerners with new drugs and the neglect of Africans as racism:

*The same thing was also done for HIV/AIDS ...
Then who created the virus. They have now
treated four Westerners who contracted this
virus, why can't they use the same treatment
for Africans?*

Patrick Sawyer – Nigeria's index case – was a Liberian-American who attended his sister's burial ceremony after she died from Ebola in Liberia but told doctors in Nigeria that he had had no previous contact with EVD. Hospital management described him as a bioterrorist and the Nigerian authorities said the import of Ebola to Nigeria was 'viral terrorism'.⁵⁹ A newspaper columnist argues that Sawyer did not work alone and was sent to prepare grounds for a new wonder drug for massive profits and to establish a New World Order.

A street vendor⁴⁰ argues that Western powers created Ebola to fight China out of Africa. An article describes Ebola as a grand conspiracy against Africa⁶⁰, like HIV/AIDS, citing trials on humans which started a few weeks before the outbreak in Guinea and Sierra Leone. Another article⁶¹ cites health workers as saying that the most serious impediment to containing the virus is the depth of scepticism about the disease and its origins:

*Africans are whispering that it is a disease made
in the laboratory for depopulation and control.
The most colourful yet is that Ebola and the
militarization of America's health intervention
gives the US leverage to establish its military bases
through the backdoor.*

The conspiratorial arguments above were informed by errant scientific data, thus the non-scientific information was not completely devoid of reification.¹³

Limitations of content analysis

The content analysis allows the researcher to identify the different stories told about EVD and chart their relationships with the theoretical model. It does not indicate how many in the public share these views or if they acted on them. Such analysis will require surveys of the communities in West Africa, which was not covered by this research.

Conclusions

We conclude that media coverage is a good measure of public anxiety about the spread and containment of Ebola in West Africa, as shown by the intensity and disease fatalities graph in which the trough and peak show similar patterns; and the debate was not by health agencies and national government officials alone, as cultural and religious actors, international governments and non-governmental organisations played significant roles. Also, non-scientific discourse showed very strong relevance in the debate and was significantly associated with risk information in the newspapers.

Risk information about EVD was not simple to understand as it could be easily confused with symptoms of dengue, Lassa and malaria fevers or cholera. Even when understood, the disease claimed many lives – including those of trained medical staff. Its assimilation¹² into common sense led to stigmatisation²⁷ and the distancing of sick and recovered patients, by both medical staff in hospitals and laypeople on the streets. The ensuing crises peaked in revolts, leading to the killing of members of an Ebola response team in Guinea and the looting of a treatment unit at West Point in Monrovia, Liberia.

The cultural expression of love – deep-seated in traditions which encourage mourners to embrace and wash corpses of relatives – provided a stream of new hosts for the virus to propagate itself. Ebola can thus be referred to as a disease of love and traditions in West Africa. Also, religion was both a constraint and a facilitator to containment and posed a paradox to believers between their faith in God and scientific advice. Some pastors described EVD as a 'spiritual attack' while imams argued that diseases come from God. Religious groups deployed the three communication strategies: rejection, accommodation and diffusion.¹² In accommodation, believers were told they cannot be infected, yet at the same time were told to avoid contact with others and to pray against the disease. The accommodation of risk information by religion and tradition shows strong evidence of cognitive polyphasia as scientific information coexisted with other forms of knowledge.

Rumours of Ebola as 'man-made' and a 'Western conspiracy' – a rejection¹² of scientific explanation – were rife and some medical workers confirmed that these rumours were an obstacle to their work in the field. Experience with Western countries on drug trials, rumours of unethical vaccine trials and the spread of the virus to Nigeria by a Liberian-American, Patrick Sawyer, provided errant data to claims of bioterrorism. The lack of a cure led to allegations of racism and there were also suspicions about the economic interests of Western governments and pharmaceutical companies. These arguments also show that non-scientific discourse is not devoid of scientific arguments and that the reified and consensual universes are not sharply differentiated.¹³

Thus, our conceptual approach, premised on behaviour being informed by a host of social psychological factors in addition to scientific information, has provided a platform to examine public debate about the spread and containment of Ebola in Africa. From our findings, our recommendations for the planning and execution of future health intervention projects are as follows.

1. Science communication needs to evolve processes of engagement with experiential knowledge forms, particularly in emergency settings in which fear is expected and/or normalised practices and values are a risk factor.
2. In settings in which there is long-held distrust between communities and scientists and/or Western donor agencies (such as is the case in many African contexts), active efforts of trust-building need to be built into communication activities.
3. More pre-emptive engagement needs to occur between global health agencies and at-risk communities so that emergency preparedness structures of communication can be established.

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Authors' contributions

B.A.F. was responsible for the study conception and design and the collection of data; B.A.F. and C.J.C. were responsible the analysis and interpretation of data; and writing and revising the manuscript.

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