Social pathways for Ebola Virus Disease in rural Sierra Leone, and some implications for containment

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Abstract

The current outbreak of Ebola Virus Disease in Upper West Africa is the largest ever recorded. Molecular evidence suggests spread has been almost exclusively through human-to-human contact. Social factors are thus clearly important to understand the epidemic and ways in which it might be stopped, but these factors have so far been little analyzed. The present paper focuses on Sierra Leone, and provides data on the least understood part of the epidemic - the largely undocumented spread of Ebola in rural areas. Various forms of social networking in rural communities and their relevance for understanding pathways of transmission are described. Particular attention is paid to the relationship between marriage, funerals and land tenure. Funerals are known to be
a high-risk factor for infection. It is suggested that more than a shift in awareness of risks will be needed to change local patterns of behavior, especially in regard to funerals, since these are central to the consolidation of community ties. A concluding discussion relates the information presented to plans for halting the disease. Local consultation and access are seen as major challenges to be addressed.

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**Beyond zoonosis**

The present outbreak of Ebola Virus Disease (EVD) in Upper West Africa is the worst ever recorded. Currently (late September 2014) it has a case doubling rate of three weeks, and shows no signs of coming under control. The international community is alarmed, and resources are being rushed to the region to try and stem further spread. The epidemic is an outbreak of the Zaire strain of the virus, previously associated with
death rates of up to 90 per cent. Death rates in the Upper West African outbreak average 70 percent (WHO 2014).

The epidemic has been traced to a single index case - the infection of a 2 year-old boy in the village of Meliandou, in the Republic of Guinea (Baize et al 2014, Bausch and Schwarz 2014). Previous outbreaks of the disease have occurred in remote forest edge communities, and have been associated with hunting and eating of bush meat. This scenario appears not to be appropriate for the present epidemic. Human-to-human transmission appears to be the main if not sole source of infection.

In this paper we offer some data and observations relating to the Sierra Leone epidemic (Figure 1). If human-to-human contact is the main mode of transmission attention needs to be paid to underlying social factors. The paper is divided into three sections. A case-study based scenario for the spread of EVD in Sierra Leone is described (based on interviews and direct observation by two Njala-based authors of the present paper, RS and JA), and proposes greater attention should be paid to rural buffers for the disease. We then identify and explain the role of processes related to marriage, land and burials significant for spread of the disease. A concluding discussion considers what assistance might be necessary if rural communities are to reduce current transmission rates.
1. A case of EVD transmission

Fogbo is a settlement of the Kpa-Mende people located on the Taia river about 12 km. north of Taiama, the headquarters town of Kori chiefdom, in Moyamba District. Reachable only by track, the village has a population of about 500 people, larger than average for the region. Reports of Ebola in Fogbo filtered into Taiama in early August. The Community Health Officer visited the village and took a blood sample from a man suspected of having the disease.

The health worker also ascertained that the case was connected to an outbreak in Daru (Kailahun District). Ebola had reached Daru when a wife of the Paramount chief visited her sick sister, the wife of the Paramount Chief of Kissi Teng, the chiefdom including Koindu market on the Guinea border. A boy infected in Daru came to Kenema, to visit
his father, who suspected his son might have Ebola. The boy was taken to hospital, tested positive, and died.

The father had also become infected. Apparently not wanting to be hospitalized, the man left Kenema by night, evading the curfew, and travelled to his home town Fogbo, where he was cared for by his sister, a Sowei (an elder of the women's secret society - known for her medical knowledge). The town's people and the man's sister did not know he had Ebola.

A few days later the Sowei also became sick. The Community Health Officer was again informed and he took a blood sample, but the Sowei died before the result was available. The villagers concluded, without waiting for the result, that it was Ebola. The town chief called the health officials to come and take charge of the body, but they were unable to attend, and later instructed the people to bury the dead Sowei, but not to wash the corpse.

The women insisted a Sowei respected by her society should be given a fitting burial, so the women washed her and buried the body. Corpse washing is an important part of local rituals for the dead.

Thereafter, the wife of the town chief was stricken with EVD and died. Since then 16 women and one man have died, all apparently of EVD. By early-September it was reported that somebody in the village was dying everyday, and there was nobody to bury the corpses. Local officials sent a message that if the villagers buried the dead without the consent of the government the people would be fined or imprisoned. The Fogbo people waited for the burial team to come. The team had still to reach the village three weeks later.

By this time many people had left the village and gone to live on their rice farms. These farms, often several kilometers from the village, are equipped with simple shelters
against the rain, where meals are prepared. More distant farms have special sleeping platforms. Retreating to the farm for days at a time in August-September is normal, since this helps protect the ripening crop from bird and rodent damage, and deters human thieves.

Meanwhile, attendance at the woman's funeral had spread the virus to neighboring villages - Kowama and Bauya, where four people died, and six more were evacuated to an Ebola treatment facility in Kenema. Some of those infected in Kowama sought help from a retired pharmacist in the busy main-road trading center at Moyamba Junction, where the national "lockdown" recently revealed both cases and bodies. One schoolteacher in Moyamba Junction died of Ebola at his home in Mile 91, a larger trading location 16 km along the main road to Freetown.

As of 20th September six people in Moyamba Junction had died and others were sick. The case figured on the radio during the government's lockdown period (19-21st September) intended to facilitate tracing of hidden cases of Ebola. It was then reported many people had abandoned Moyamba Junction, perhaps fearing to be quarantined.

The Fogbo case seems typical for the Sierra Leone epidemic, where the disease has moved at times in large jumps along the main road system, passing from town to town, but at other times diverts into the interior to infect isolated villages, where it is little noticed, reported or acted upon, only then to burst out again in a larger town or market center. This pendulum swing between roadside locations and buffer villages in the interior needs to be stopped. Developing effective strategy for this will require close attention to the social factors that allow, or encourage, the virus to spread in more isolated villages.

2. Social factors involved in rural Ebola outbreaks
The Fogbo case introduces a number of important social factors in Ebola transmission - notably, the role of the family, marriage, funerals, migration and markets. In this section we focus on each of these factors in turn, and offer some specific data about these variables. The aim is to draw attention to issues to be considered if Ebola control is to be achieved.

We rely on data collected over the past four years during multiple rounds of detailed rural survey work intended to assess levels of rural institutional change in the post-civil war period. Four sources are used: (i) a study of household structures and food security in three isolated communities in northern Moyamba District adjacent to Fogbo, undertaken in May-June 2014, (ii) a national random sample of 2200 rural households in 117 villages in 47 chiefdoms undertaken in 2013-14, (iii) a survey of 91 villages in 7 chiefdoms around the Gola Rainforest National Park in Kenema, Kailahun and Pujehun districts undertaken in 2013, and (iv) a survey of 187 village communities and 2460 households undertaken in 2010 in the same region.

i. Family

Sierra Leonean farming villages are impoverished but self-reliant. This self-reliance was boosted by the civil war in the 1990s (ended in 2002), during which a large part of the countryside was abandoned by the state. In our national survey (ii. above) we included a module asking heads of rural households to assess their degree of trust and reliance in various kinds of institutions.

The data show that trust is highest in household members and extended family, see Figure 2. Conversely (at the local level) there is a noticeable distrust of "strangers" (persons born outside the local community). Thereafter there is a general decline in trust as the scale of the institution expands beyond the local level. Trust in central government, however, is above the trend.
When we asked about assistance (to whom would the person interviewed turn for help) the pattern was somewhat different. As the scale of institution increases outwards there is a steep decline in confidence in help coming from beyond the family. Central government is no longer above trend. In effect, rural people, across the country, seem strongly to expect to find assistance mainly their own immediate family group. In a crisis it is sensible to head for home.
This finding seems relevant to understanding the Ebola epidemic. Respect for and trust in authority is quite high. It is highest for local authorities but also reasonably high for central government. Messages from chiefs, district council representatives, parliamentarians and ministers are taken seriously. Information from government probably explains why in a recent survey in seven districts, most people said they now believed the Ebola epidemic is real, and that Ebola cases should be isolated in hospital (Focus 1000, 2014).

But there is also a widespread impression that little can be done by health professionals to alleviate the disease. The different curves in our data on trust and reliance capture the tension between what people say, and what they actually do. They say they would seek assistance from a hospital, but in practice they hesitate to go. In the final instance, it is the family, the most trusted source of reliable assistance, that will help them cope. As is apparent in the Fogbo case, the move by an Ebola sufferer back to an isolated rural home then buffers the spread of the disease.
At present, attention is focused on local opinion leaders to help change attitudes, to reduce the threat posed by burials, and to bring Ebola cases into isolation facilities. This is because opinion leaders are, indeed, widely respected. But there is also widespread skepticism about whether they can do anything. If an Ebola victim in an interior village is to be brought to an isolation facility it will be the family that makes the arrangements and does the work. Our data suggest that assistance should also to be targeted on rural families.

ii. Marriage and funerals

This then implies a need to understand Ebola risks from the perspective of family, and its notions of inescapable social obligations. This includes obligations to both the dead as well as the living. In the first instance, this double obligation arises from the system of access to land, the basic resource for survival in a peasant agrarian economy.

Sierra Leonean ethnic groups are predominantly patrilineal. Villages are formed from several patrilineal groups (typically, perhaps, 4-10 per village). Each group maintains a shared right to land for farming, and generally occupies a specific quarter within the settlement. There may be some ancestral graves or a family shrine within the quarter.

In Mende-speaking communities such as Fogbo, not all residents of a quarter, however, are members of the patrilineage (Little 1951: 102). Recent surveys (May-June 2014, details above) for three villages in northern Moyamba District, in the general neighborhood of Fogbo show that only about 40 percent of residents of each quarter belonged to the patrilineage. This is because lineage exogamy is the norm in rural Sierra Leone, and wives resident in a family quarter will come from outside the husband’s lineage.

Some wives come from other lineages in the village, while others come from other villages. Most of these outside marriages are local, but some link distant communities.
This is especially likely with ruling families (lineages with a recognized right to compete for chieftaincy). Historically, ruling families consolidated power by making advantageous unions (Murphy and Bledsoe 1987, Mokuwa et al. 2011). This practice continues today, and is relevant to the story of the spread of Ebola.

These women from other villages will be termed "stranger" (hota, in the Mende language spoken in Fogbo). While married such a woman can access land for farming from her husband's lineage, and if she becomes a widow she will be strongly encouraged to take another husband from the same lineage (text box below). But if she rejects this option, or the marriage fails and (especially) if there are no children a hota wife may be required to return to the village where her brothers maintain their own land rights.

This careful concern to avoid merging of lineage land rights through marriage is especially strongly maintained where marriage takes place across ethnic borders, in places such as Fogbo, which stands on the border between the Mende and Temne people. Funerals are important not just to mark the passing of the deceased but also as part of the process of "unmaking" a marriage at death, so that families can publicly reassert their land rights and decide whether a union is to be continued (to be "remade" through levirate marriage) or is to be finally dissolved, with the woman returning to her own natal community.

Table 1: Female origins

<table>
<thead>
<tr>
<th></th>
<th>Households</th>
<th>total population (2014)</th>
<th>Hota (born outside village)</th>
<th>% of all adults</th>
<th>Female hota</th>
<th>% of all adult hota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobai</td>
<td>53</td>
<td>348</td>
<td>60</td>
<td>25.2</td>
<td>46</td>
<td>76.7</td>
</tr>
<tr>
<td>Mogbuama</td>
<td>99</td>
<td>590</td>
<td>179</td>
<td>40.4</td>
<td>110</td>
<td>61.5</td>
</tr>
<tr>
<td>Njagbahun</td>
<td>60</td>
<td>446</td>
<td>101</td>
<td>31.2</td>
<td>71</td>
<td>70.3</td>
</tr>
</tbody>
</table>
To carry out a funeral properly a number of things need to happen. The corpse has to be washed, and this is thought to be an especial point of danger for Ebola transmission. Men wash men's bodies and women wash women's bodies. The women will include the deceased woman's sisters, and this risks spreading the Ebola virus to other lineages and (where the woman was *hota*) to other villages.

Where a man died, the wife then has to have her head shaved and be covered with mud formed from the washing of the husband's corpse (Ferme 2001: 94-97). This is part of a ritual that frees her from the attentions of the dead husband's jealous spirit, and prepares her to be remarried to one of his brothers, or to return to her own family. This also seems a likely high risk factor for Ebola transmission.

Where the deceased is an in-married *hota* wife it may be necessary for the corpse to be returned to her family living in another village. This is a possibility where the marriage payments are not yet complete. A relationship begins upon agreement that certain gifts and services will be provided for the parents and family of the woman by the husband in recognition of that lineage's gift of a bride. Certain offerings are made to initiate the relationship, but the marriage is incomplete until everything promised is fulfilled. A prospective son-in-law offers labour and material help to his partner's parents for many years before he can say the marriage is complete.

In the case of incomplete marriage, the body of the deceased may have to be returned to her village of origin. The husband will be expected to travel promptly to her village and make a settlement of outstanding marriage promises before being given permission by the family to bury the corpse. Burial will then be done in the man's village. But if he is unwilling, or cannot, then the corpse may have to be returned home for burial. This task
will fall to men, probably using a hammock, and is obviously a risky practice if Ebola was a cause of death.

Incomplete marriage is far from uncommon. In the study of three villages mentioned above data were collected on 79 current marriage partnerships (Table 2). This was a random sample of about one third of all marriages in the three settlements. The female partner was a stranger (came from another village) in 62.2% of cases (averaged over the three villages). In only 15.9% of stranger marriage was the marriage payment recognized to be complete. (The figure was even lower for citizen marriages [tali] - i.e. between lineages from the same settlement.)

Table 2: Marriage completion

<table>
<thead>
<tr>
<th></th>
<th>Married females % of all females</th>
<th>A. Stranger females, complete</th>
<th>B. Stranger females, incomplete</th>
<th>C. Citizen females, complete</th>
<th>D. Citizen females, incomplete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobai</td>
<td>51.1%</td>
<td>1</td>
<td>12</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Mogbuama</td>
<td>86.8%</td>
<td>6</td>
<td>14</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Njagbahun</td>
<td>52.4%</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Average</td>
<td>62.2%</td>
<td>15.9% (A/A+B)</td>
<td>84.1% (B/A+B)</td>
<td>8.8% (C/C+D)</td>
<td>91.2% (D/C+D)</td>
</tr>
</tbody>
</table>

Source: Survey in Mobai, Mogbuama and Njagbahun (Kamajei chiefdom) May-June 2014

Considerable efforts are often made to bring a sick or deceased woman home to her family where the marriage remains incomplete. Where this involves a ruling family the distance over which the sick person (or body) is carried may be far. Richards (unpublished field-notes) records that when working in Mogbuama in 1983 he was woken with a request to drive to a village about 60 km distant to bring home a young
woman suffering the final stages of TB. She was a daughter of one of the chiefs, and died overnight, to be buried in her father's compound next to the family ancestral shrine the following day.

In other cases where the female partner's home is distant, and there is no willing volunteer with a vehicle on hand, burial may, for practical reasons, have to take place in the husband's village, but the husband will need immediately afterwards to travel to his wife's home to make settlement. He is not fully married up until this point. If he cannot pay, or refuses, not only will he lose control of the burial arrangements, his wife's family may also claim the children from the marriage.

Without funerals, a core survival factor for village families - ordered access to farm land for staple rice production - is seen to be at risk. This explains the tenacity with which villagers defend funeral practices, even when legislation forbids unauthorized funerals. The Fogbo people waited some time, but when health workers failed to appear, they reverted to survival mode, and did what they knew to be necessary to stay alive. They washed and buried the corpse as the dignity of the deceased woman demanded. Thereby lineage rights, land tenure, and inter-family and inter-village relations were maintained.

iii. Migration

The Fogbo case study brings out the importance of long-distance social networking resulting from migration, and the importance of trading patterns and market centers. Here we assess these risk multipliers in terms of data relating to typical patterns of village inter-dependency, based on motivations for labor, education and marriage migration, and distance to markets.

Villages are not independent units scattered across the landscape, nor is it the case that villages all fall into a system based on a clear functional hierarchy of administrative or
market centers. The landscape of rural Sierra Leone bears the scars of a long, complex, and often violent, history. This heritage is apparent in the remains of stockades (known, locally, as war fences). A good half of all the settlements we surveyed have the physical evidence of a pre-colonial war fence.

Old inter-family animosities (some revived during the recent civil war) still disrupt the smooth flow of communication and interaction between neighboring settlements. Equally, unexpected patterns of cooperation link communities that might otherwise be supposed to be separated on grounds of distance. These patterns, hard to anticipate without detailed local knowledge, influence the spread of Ebola, blocking it in some areas, but in other areas opening up unanticipated channels. Cross-border networking around Koindu, among Kissi-speaking people divided by colonial boundaries into three separate states, has been a major factor behind the rapid build-up of the disease in its epicenter.

Our data are intended to convey a picture of some of this local complexity, relevant to understanding of rural Ebola transmission risks. Below, in Figure 3, we picture some typical village dependencies in seven chiefdoms bordering the Gola forest. All seven chiefdoms look to Kenema as their regional administrative and market center. The map is based on asking focus groups of village elders in 91 villages what other villages they depended on, in terms of political, social and economic relations. Arrows point to the village depended upon.
There are some obvious patterns, such as those in Tunkia chiefdom, where there are numerous small villages dependent on Golahun, the chiefdom headquarters. This is an area where settlers moved up to the forest edge and established satellites in the past half-century. But rather more unexpected is the number of villages linked in quite long lateral ties of dependency. These in particular follow the grain of a major pre-colonial trading route along the western side of the Gola forest to the coast in Pujehun district. Some of the connections cross chiefdom boundaries, and reflect ties based on the politics of elite marriage alliance.

A second set of maps, Figure 4a-c, focuses on the movements of young people into and out of villages for marriage, schooling and work. Apart from marriage, education is the single biggest cause of inter-village or village-to-town movements in rural Sierra Leone, except for the special case of movements to the mining areas (which we do not address). Here we have plotted data for 6 randomly chosen villages from the 187 villages included in the 2010 survey (iv. above), related the destinations of people who left the household.
Again, the same mixed pattern emerges. As expected, Kenema shows up as a destination for marriage, work and school, but once again there are a good number of unanticipated lateral linkages. These lateral connections are on a quite large scale, crisscrossing the entire forest-edge region.

If marriages offer a clue to the pattern of movements that funerals will one day generate, then mourners are likely to come from across the region. Thus we should not be surprised to find that a funeral of the wife of a chief in a Kissi chiefdom on the Guinea border generated an Ebola outbreak in a Mende chiefdom (Daru), where the wife of the chief, and sister to the chief’s wife in Kissi, also died from the disease. Daru was the ultimate source of the Fogbo outbreak.

In other cases, movements to and from school, or migrant workers returning from distant locations, may also have spread the disease. One such case is the outbreak in Sahn, Malen chiefdom, Pujehun District, triggered by a student from Kailahun District

**iv. Markets**

Market data show similar levels of complexity, and once again the risks of Ebola transmission can only be fully understood with some grasp of historical connectivity.

The index case for EVD in the Upper Guinean forest region is a small child who died of the disease in the village of Meliandou in early December 2013. The disease spread to Gueckedou, a city of 200,000, 8 km. distant from Meliandou, and then to neighboring cities of Macenta and Kissidougou, and along international roads crossing to Liberia (Lofa County) and Sierra Leone (Kailahun District).

The area is sometimes seen as remote and impoverished. This probably needs some qualification. Historically, the area around Gueckedou was at an important junction for intra-West African trade, carried between the coast and interior savannas along two major trade routes on the eastern and western sides of the Gola forest (Richards 1996: 61-68). Even today, traders and smugglers carry kola nuts and gold from the margins of the Gola forest and enclaves within in it (Bulte at al. 2012). In the late 19th century the area immediately north of the forest was a veritable entrepot for international trade (Fairhead et al. 2003).

Thomas Alldridge, a British travelling commissioner, who visited the region in 1893, on the eve of colonial conquest, introduced his account of what he termed an "ordinary native market" in the area with the remark that "I think I shall be able to show that these up-country people are not at all in the wretched condition often pictured by the European imagination" (Alldridge 1901: 215).
Alldridge lists the diversity of products available for sale, bought and sold in the local currency, "Kissi pennies". Elements of this regional trade survived colonial conquest, and in 1932 the British in Sierra Leone allowed a large international market to open at Koindu, very close to the Guinea border. Koindu market was closed during the 1990s because of war, but has revived since 2008.

Koindu (only 30 km from Meliandou) had a large number of cases of EVD in May-June 2014, and a further surge of cases (perhaps crossing from Liberia) has been reported recently (late September). Koindu's role as a major booster of the epidemic might have been better anticipated given its history of involvement in intense cross-border commerce.

v. Reaching help

International efforts are currently focused on establishing a more widespread network of secure, well-run isolation units. These units need to be attractive to Ebola sufferers who have hitherto shunned voluntary hospitalization. A problem of accessibility needs to be addressed. Victims in the interior villages will often need to overcome a major distance barrier in reaching such centers.

In a recent national random sample of 117 villages in 47 (out of 149) chiefdoms we ascertained how close are typical classes of village to their chiefdom headquarters. The sample compares well-connected villages where agri-business centers have been located with typical less well-connected villages without agri-business centers located within the same chiefdom section (off-site villages). The same question was also asked in the survey of 187 Gola forest edge (GFNP) villages. These are among some of the most inaccessible places in the country.

The data are tabulated in Figure 5, and show the time distance separating the village and chiefdom HQ in the three types of settlement. Even in the case of the best-connected
group (agri-business center villages), 10 per cent of settlements were more than two hours to a full day from their chiefdom headquarters. For the Gola forest villages the percentage rises to about one quarter. These distances would be insurmountable by an Ebola victim seeking voluntary hospitalization. A wealthy family might pay for a hammock. Others would be unable to afford to get their patient even to a "local" triage facility. Perhaps only helicopters could solve the problem of timely evacuation from such localities.

Figure 5a
3. Discussion and Conclusion

In the Fogbo case, discussed above, a carrier exposed to the disease in an urban location traveled towards an interior village, where family help and local remedies were sought. Distance frustrated attempts by the authorities to impose isolation and safe burial. This
set up a new incubation focus for the disease, which spread locally without attracting further attention. Traders seeking rice and other food commodities then interacted with this local rural focus of the disease and drew the virus back towards market centers and the main roads, triggering further expansion of the epidemic.

What does this pendulum swing imply for attempts to control the disease? It is generally agreed that rapid identification, removal and isolation of cases for treatment is essential. This is made more complicated if the disease periodically dives into the backcountry. Drawing it out will require some ingenuity.

The scale of the epidemic makes the active following of cases into the interior practically impossible. The alternative is for the unwell to seek out testing and treatment voluntarily, and in sufficient numbers to bring the reproduction rate of the disease below 1.0; currently in Sierra Leone it hovers around 2.0 (WHO 2014).

For this to work, our analysis above suggests there are three key tasks. First, accurate information has to be conveyed in interior settlements about the true causes of the disease and infection pathways. A recent survey of attitudes in seven districts in Sierra Leone suggested that whereas many people now accept the reality of Ebola more than 80 percent still thought it was caused by eating bush meat (Focus 1000, 2014). The role of funerals, body washing, social networking and market exchange in spreading the disease also needs to be carefully explained.

Second, the option of seeking hospitalization has to be made truly attractive to the sick. This means that evidence the disease can be survived must be made more widely known. Survival rates in treatment centers also need to be boosted beyond a current estimated 35 percent (Lamontagne et al. 2014). These authors suggest ways in which this can be done.
Local triage centers will also need to offer effective rapid testing, guaranteed medical supplies for treating other diseases, and reimbursement of travel costs incurred by the unwell and their family carers. Moving a very sick person out of an isolated village across non-motorable tracks is a major deterrent to referrals. The difficulty, expense, and ordeal is so high that it often seems better to the family not to move the patient and let God decide.

Often a hammock (perhaps three or four times more expensive than a motor bike taxi) is the only realistic transport option. The costs to families, and the risks to helpers, should be fully assessed and built into the way any triage centers work, if they are to attract cases from interior villages.

Third, attention has to be focused on how family groups in the villages can protect themselves from the disease when all other options are foreclosed. Families will not readily abandon their relatives in extremis, but they need to understand how to minimize the risks associated with cleaning sick patients and their clothing and bedding.

Risk minimization methods need to be debated by villagers, and their practical needs addressed (e.g. supplies of soap, disinfectant, protective clothing, rubber gloves and buckets). Steps should be taken to ensure that "home protection kits" announced as part of the American response plan for Ebola in Liberia are available in rural communities in Sierra Leone. Training in appropriate use needs to be organized.

In the case of burials, villagers should be encouraged to take steps to minimize the risks. Flexibility was already apparent in local burial practices even before the advent of Ebola. Where it was impracticable to bring a body home for burial the family pragmatically accepted that the funeral had to be organized in the place where death occurred. Further flexibility will be encouraged if villagers participate in focus sessions and feel they have an active hand in agreeing on the safest compromises. Corpse washing should be discouraged, but if it cannot be avoided then it should be done only with protection.
Families should agree to postpone outstanding final marriage settlements for the duration of the epidemic.

In coming together to debate these issues villagers might also be encouraged to form village health clubs, to develop informal community "bye-laws" (club rules) to regulate against the most dangerous practices. In the case of Ebola, these rules might specify acceptable funeral practices, and when, why and how to quarantine patients if no other options present. In some Ebola epidemics villagers have resorted to building temporary shelters adjacent to settlements to care for suspected Ebola victims. Similar developments might be encouraged through village health clubs in Sierra Leone. Rules governing care provision need to be agreed, e.g. to limit the number of carers to one person per family. Each volunteer would need training and protective items.

The Ebola epidemic in Upper West Africa is the largest ever seen. The international community perceives the epidemic as a threat to global security, and help is on its way to all three countries. Experts agree that with logistics in place containment should be a straightforward task. One thing that could blow this assessment off course is the persistence of rural buffers of the disease. In Sierra Leone these are not found in forest-edge communities associated with zoonotic transmission but in the kinds of off-road farming villages that incubated the rebel war of the 1990s, due to inaccessibility and poor communications. An effective approach to control of Ebola Virus Disease requires detailed knowledge of these interior rural landscapes and how they function.

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