



Learning from the Ebola Response in cities

Population movement

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Front cover photo: People on the streets of Freetown, Sierra Leone during the Ebola outbreak;

Credit: Simon Davis/DFID

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Executive Summary

Population mobility is a critical area of concern in any infectious disease crisis, and particularly in those spread through human-to-human contact, such as Ebola. During the West African Ebola Virus Disease (EVD) outbreak in 2014/15, population mobility within and between urban and rural areas became a key challenge for humanitarian response. Despite restrictions at border crossings, attempts to control population mobility proved largely unsuccessful. This paper explores the urban dimensions of population mobility, including forces for and drivers of mobility as well as the implications for humanitarian response.

As part of ALNAP's **Learning from the Ebola response in cities** project, this paper identifies the following key messages to take forward into future public health crises in urban environments:

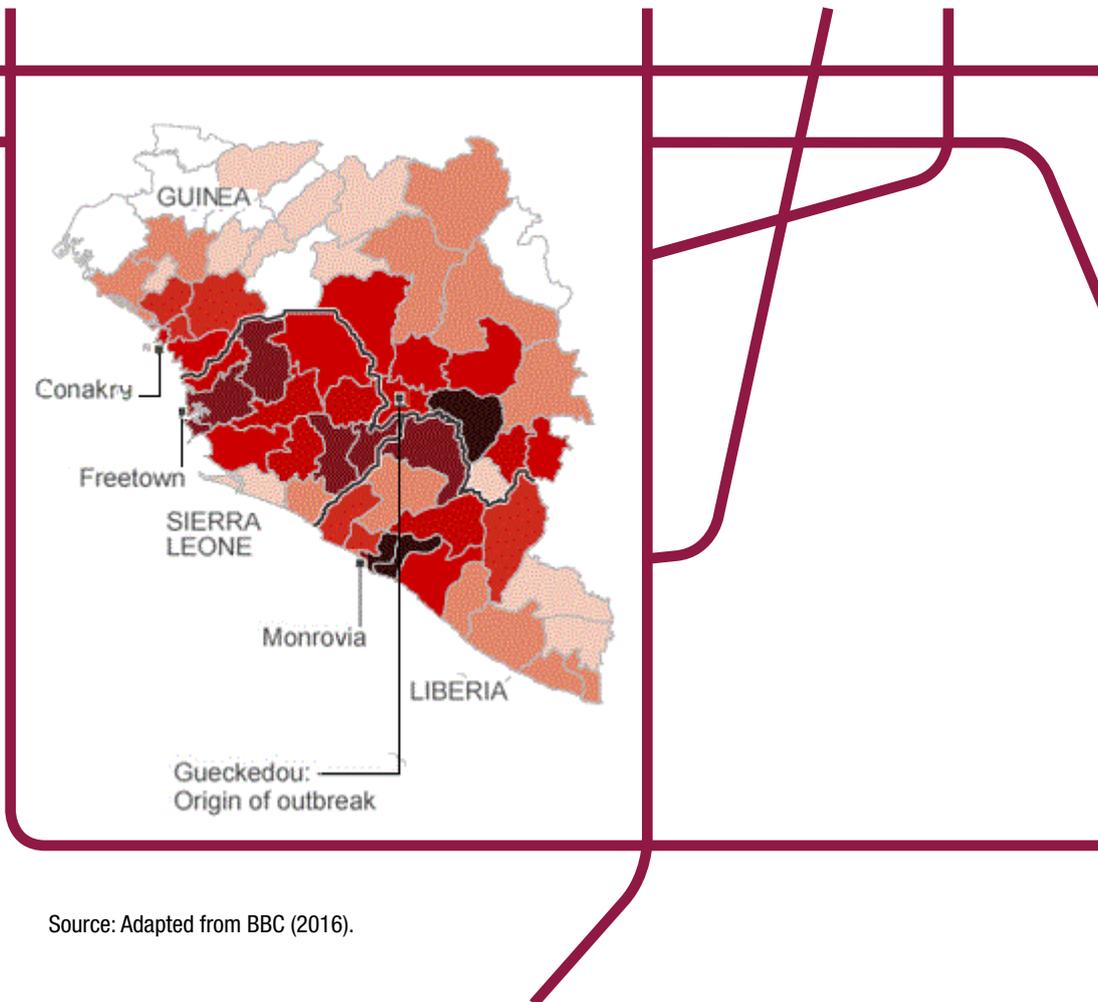
- Urban spaces see a high number of anonymous, untraceable interactions every day, and it is easy for people to disappear. This problematises contact tracing and surveillance efforts.
- People move across porous and fluid national and urban borders quickly and easily.
- The drivers of population movement are diverse, encompassing labour, livelihoods, social and familiar connections, cultural activity, legal differentiation and fear. Research about the drivers and motivations behind population mobility in urban areas could enhance future public health responses.
- The success of small-scale community-level surveillance and self-reporting suggests this may be a more effective area towards which to direct efforts. As such, we should pay more attention to ways of incorporating communities in surveillance and encouraging self-monitoring behaviour.

1. Introduction

Looking at the map of Ebola Virus Disease (EVD) outbreaks in West Africa (Figure 1), the patterns of movement – of populations and of disease – are easy to spot. EVD outbreaks were concentrated in large cities, and along routes between urban centres and their peripheries. It may now seem obvious to point out that population movement would have impacts on a disease like EVD, which is spread by people. However, an understanding of how and why people move was largely missing throughout the EVD response in West Africa. How much did organisations attempt to understand population movement? Did this affect the response? What could responders have done differently, if they had known more about rural–urban and inter–urban movement?

As part of ALNAP's research project **Learning from the Ebola Response in cities**, this paper examines issues around population movement in the response to Ebola in cities. It does so to capture learning that can be drawn upon in future public health responses in urban contexts.

Figure 1. The outbreak of EVD across West Africa as of February 2015



Source: Adapted from BBC (2016).

What is population movement?

Population movement refers to movement within and between cities, between rural and urban areas and between countries. This paper uses a broad definition, considering the impact of both mass population movement, such as conflict-driven displacement and seasonal livelihood movement, and the daily mobility of individuals. When considering the mobility of people, we can look at patterns of movement (where did people move?) as well as drivers (why did they move there?), which can arise for a number of reasons, including social and economic ties, poverty, access to services and conflict.

2. Population movement in West Africa

West Africa is a region of movement. A total of 11% of West Africans live outside their country of birth, with 30–40% living outside the district/village of their birth (Alexander et al., 2015). In Liberia, 54% of the population over 14 can be considered ‘internally displaced’ for one reason or another (ibid.). The UN Refugee Agency has noted that there are 10 times more migration movements within West Africa than there are towards Europe (Charriere and Frésia, 2008), and the World Health Organization (WHO) has presented studies showing that population mobility in the region is seven times higher than in other parts of the world (WHO, 2015a). In addition to these ‘long-term’ movements, large numbers of people move seasonally and daily.

Table 1. Percentage of migration from West African countries in 2015 (% change since 2010)

Destination	Guinea	Liberia	Sierra Leone	Togo	Senegal
Within West Africa	75.1% (-2.1%)	63.7% (-0.4%)	41.6% (+1.2%)	83.5% (+1.1%)	38.9% (-0.3%)
To rest of the world	3.4% (-2.5%)	6.1% (-0.5%)	2.2% (-0.1%)	6.1% (+0.1%)	3.9% (-0.4%)
Total population	12,608,590 (+14.5%)	4,503,438 (+13.8%)	6,453,184 (+11.7%)	7,304,578 (+14.3%)	15,129,273 (+16.8%)
Urban population	37.1% (+2.2%)	49.7% (+1.9%)	39.9% (+1.7%)	43.7% (+6.2%)	43.7% (+1.5%)

Source: UNDESA Population Division (2015); World Bank (2015).

Population movement can occur at a number of scales. There are large, one-off, movements when populations are displaced as a result of conflict or disaster. Seasonal movement occurs according to the climate and agricultural patterns in the region. People move seeking waged labour and trade opportunities, often following weather and agricultural changes. Day-to-day movement is also important, with people regularly on the move to go to the market, to visit friends and relatives and to join in cultural celebrations.

With this in mind, there are many drivers of population movement in West Africa, some of which are discussed below.

2.1. Labour and livelihoods

Mobility for labour and trade has existed and shaped the region over centuries (Wilkinson and Leach, 2014). Economic border crossing is a frequent practice for traders, who typically make short visits

to purchase goods for resale in their home country (Awumbila, 2014). Seasonal waged labour is common to, particularly in the mining, logging and cocoa sectors (Bedford, 2014), with the post-harvest migration ‘a prime example of the high mobility of the region’s population’ (Roos, 2014). This seasonal movement occurs in response to changes in weather and in turn road conditions, crop cycles and labour opportunities. For many, movement is an economic essential; as such, Bedford (2014) has noted that ‘It is likely that attempts to prevent such migration and the flow of work and wages will be bypassed or resisted.’

2.2. Social and familial connections

Social connections are also significant drivers of movement. As one interviewee explained, ‘You have a lot of populations that have migrated into the city. They were not born in the city, so they’re coming from somewhere else, and they keep the links with the area that they’re coming from. They have relatives in the country and they go to visit them and the relatives come to visit them.’

Family groups are also often split across borders. For example, Forecariah in Guinea has a large market visited by 10,000 people a week. It is just 35 km from the Sierra Leonean border and one interviewee noted that market visitors ‘cross the border back and forth – it’s incredibly fluid, people will live on one side, family on the other. They cross for school, jobs and employment, trade and everything.’

2.3. Cultural ceremonies

Cultural celebrations and annual rituals, including weddings, funerals and seasonal holidays, are significant across West Africa, and often drive movement as people come together from various locations.

2.4. Conflict/disaster

West Africa has experienced several civil wars, armed conflicts and significant floodings and droughts over the decades (Alexander et al., 2015; see also Ferris and Stark, 2012). These events have resulted in instances of mass displacement within the region. Each instance results in population movement, as people move to avoid conflict, violence and climate disasters. Movement can also be triggered later on, as populations may shift again once crises events have ended.

2.5. Legal bylaws

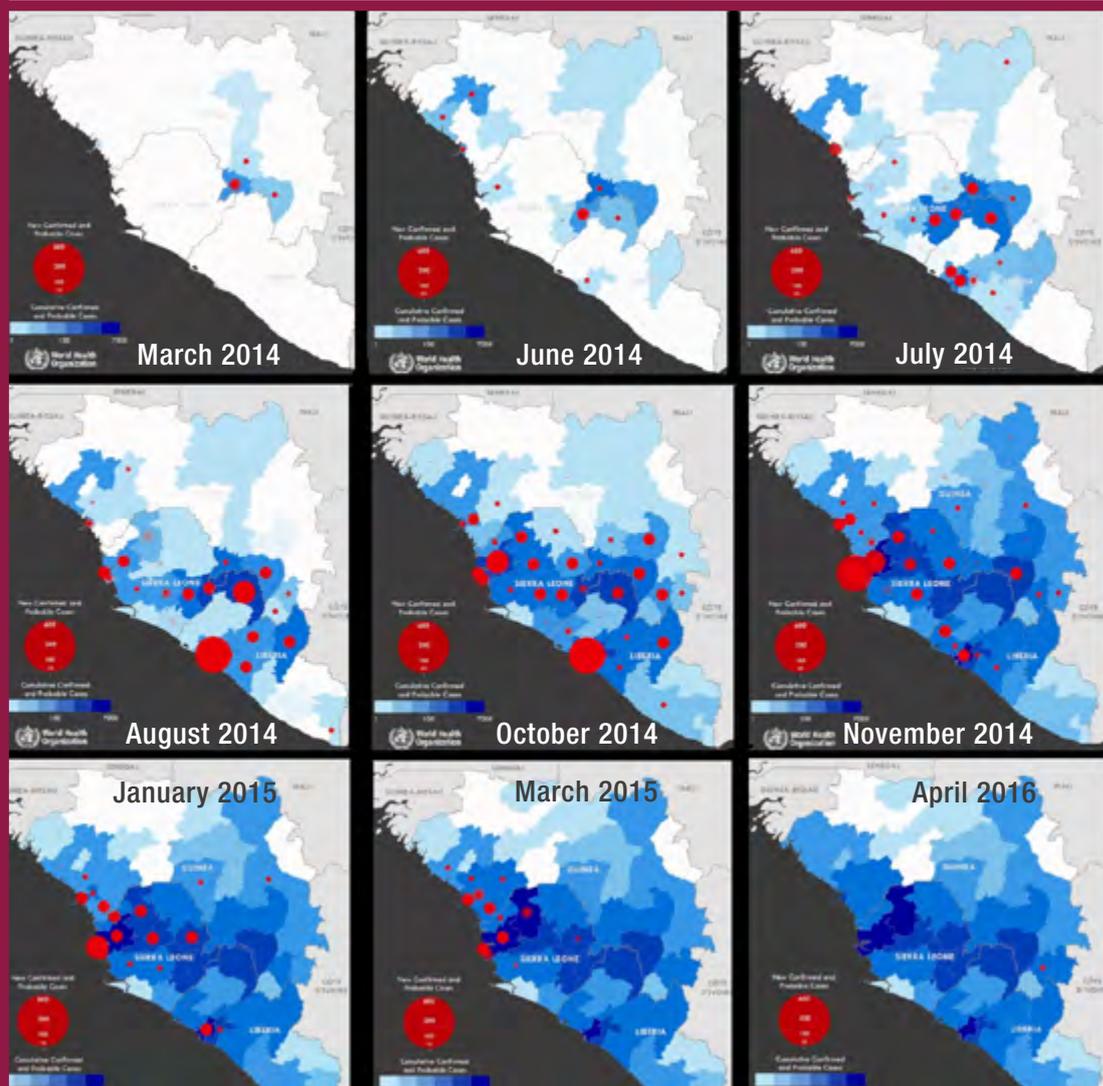
The amount of movement in the region has instilled a sense of fluidity, and people often move to take advantage of preferential legal arrangements. One interviewee noted that, ‘People were moving across the border from Kambia [Sierra Leone] into Forecariah, Guinea to avoid some of the bylaws and that kind of movement has happened across generations.’

3. Population movement during the West African EVD epidemic

Population movement shaped the EVD epidemic in a number of ways. Historical trends of population movement in the region fuelled it. New movements directly resulting from the epidemic also occurred, as affected people sought health care, attended burials and celebrations, travelled home to the comfort of family and friends and fled stigma, quarantine and rights abuses (IDMC, 2014).

Much of this movement occurred within and between urban centres, as highlighted by the way EVD spread within and between urban hubs.

Figure 2. EVD cases across West Africa over time



Source: Adapted from WHO (2016).

Fear was a significant driver of population movement during the epidemic. People often faced stigmatisation in rural communities, and treatment was consolidated in urban centres. 'Conakry was one of the few places with available health services' (in the country), explained one humanitarian working in Guinea. The combination of the need to access health care and either wanting or being forced to leave a rural area drove people into urban centres.

During the EVD outbreak in West Africa, population movement was recognised as a critical issue. However, focus was placed on restricting movement, while the drivers behind movement were not sufficiently understood. This lack of understanding limited the effectiveness of measures taken. Onoma (2016) describes these drivers as the rites and rituals in which movement is often immersed, and notes that there is no such thing as mobility without meaning. Lack of understanding resulted in the assumption that movement restrictions (curfews, border controls, quarantine, etc.) would stop movement, which they did not. Rather, in several cases, they resulted in confrontation, following the socioeconomic impact, frustration and resentment of movement restrictions (Bedford, 2014). Better understanding of the drivers behind movement would also have improved prediction, and informed better preparedness and anticipation in the response.

As people moved throughout the response, they were exposed and carried EVD with them. One interviewee explained, 'Sometimes it was because of the fear, sometimes it was because of attending funerals of relatives, and basically getting infected in the process and then moving in and out of the city.' This movement, combined with the absence of effective reporting and surveillance methods, means outbreaks can become epidemics in a very short amount of time (Machalaba and Porter, 2015).

Most people, when unwell, want to be with family. During the EVD response, population movement continued even as people became very ill. Many people travelled to be home with relatives in their final days. Interviewees noted that, 'In the cultural context, there's a ceremony around the burial and if you died in an urban area, you have to be transported to your village to be buried.' Another interviewee explained that, if 'someone got sick in Monrovia, they would want to die in their rural community so they would take public transportation to go back home'. We were also told a story about 'the infamous case where a family in Guinea tried to take a body from Forecariah back to Conakry in a taxi... for his funeral. So they dressed him in jeans and a t-shirt and dark glasses, sat him in the back of a taxi and all got in the taxi, propping him up in the back seat. They went through numerous road blocks before this was discovered.'

As the outbreak progressed, West African countries began to close their international borders in an effort to reduce transmissions. Sierra Leone was first, closing borders with Liberia and Guinea in June 2014 (Reuters, 2014). Liberia followed soon after in July, declaring a 90-day state of emergency and enacting a nationwide curfew as well as ordering non-essential workers to stay at home (Ikenye, 2014; ICRC, 2014; UNDP, 2014). Lastly, Guinea shut its borders with Liberia and Sierra Leone in August and implemented a non-specific 'cordon sanitaire' while banning the movement of bodies between towns (McNeil Jr, 2014). During this time, all three countries imposed a 'cross-border isolation zone'

The missed opportunity of call detail records and big data

Understanding where people were moving to, when and where they might move to next would have provided critical information to inform the EVD response. The importance of this was recognised mid-2014 as responders started to explore the possibility of using data from mobile phone companies to understand mobility in the affected countries.

This kind of 'big data' has been used in a number of other humanitarian responses, including the Haiti earthquake and outbreaks of malaria in Kenya and H1N1 flu in Mexico (see Global Pulse, 2013 for more). Call detail record (CDR) data can show where people have been when, and perhaps also where they are headed, based on their past movements' (The Economist, 2014).

Mid-2014, researchers at Flowminder who had pioneered the use of CDR in humanitarian and public health crises started discussions with the phone companies and government regulators in the affected countries. Unfortunately, these broke down and ultimately this data was not made available for analysis during the response. As The Economist (2014) reported, given 'no precedent for using CDRs in an emergency like Ebola, it is hard to bring the parties together at a high enough political or management level to make decisions'. The biggest barriers appear to be privacy concerns around the use of big data as well as commercial sensitivities around sharing proprietary information (ibid.).

Despite CDR data being unavailable, information technology was used in other ways during the response. The Centers for Disease Control (CDC) was able to work with the Liberian Ministry of Health to track the location of calls made to Ebola hotlines, which helped predict the onset and spread of outbreaks in different areas (Sternstein, 2014). And several organisations used mobile phone technology to conduct surveys and assessments, and to rapidly report data on cases (see James, 2015).

However, despite the potential utility of big data such as CDR, and other information technology data, it is important to note that, even though the affected population was largely urban, mobile phone use rates in the region are still low. Only 57% of Sierra Leoneans have access to mobile phones, and Guinea came 168th of 196 countries for their mobile phone usage in 2012 (Shacklett, 2015). Researchers have suggested other types of 'big data' may help fill information gaps in public health crises such as Ebola, including genomic surveillance data, more complete data on routes taken by trucks and buses and more careful study of recurrent seasonal migration for livelihood and cultural events (Halloran et al., 2014).

at the outbreak epicentre (ICRC 2014). Schools were closed in all countries, and Sierra Leone joined Liberia by declaring a state of emergency (*ibid.*). The state enacted laws in late August forbidding residents from harbouring EVD victims and imposing a jail sentence for entering or leaving an EVD-affected area without medical authorisation. Urban-specific mobility restrictions included Macenta City in Guinea, quarantine of several districts in Sierra Leone and forced quarantine of the Westpoint informal settlement in Liberia (Schwartz, 2014; ICRC, 2014; O’Carroll, 2014).

Despite these restrictions, population movement continued to play a role in the epidemic, as people continued to move within and between urban areas and their peripheries in search of health care, comfort and safety.

4. Challenges of population movement for an urban epidemic response

Population movement is an urban issue, interwoven with the urban dynamics of scale and density and illustrative of the economic, service and social links between urban and rural environments.

Population movement affected the response to EVD in West Africa’s cities in a number of ways. These issues are explored below, along with reflections on how humanitarians responded and what learning can be taken forward to future urban public health responses.

4.1. Daily population movement within cities

In cities, people are constantly on the move. They move from their home to their place of work, to social and religious meetings, to visit friends and family both within and outside of the urban centre. This frequent daily population movement had several impacts on the spread of and response to EVD.

EVD is spread by people

Unlike viruses and bacteria, which are primarily vector-borne or water-borne, Ebola is fundamentally a disease of interaction between people (Morse, 1995). It is spread by means of physical contact with the bodily fluids of those who have already had symptoms of the virus, through direct person-to-person contact or indirectly through contact with infected materials such as bedding (Onoma, 2016).

Urban populations have a high number of anonymous interactions each day

Each day, people living in an urban environment come into contact with many others – at work, in transit, at the shops and so on. These interactions are nearly all anonymous and untraceable. In a public health crisis, the sheer number of unidentifiable contacts each urban dweller makes every single day poses an incredible challenge to stopping the spread of infection.

It is easy for people to disappear

Urban environments provide a near-endless, dense environment within which individuals are constantly moving. There are large numbers of people, many routes they can take and many areas that experience large crowds and even overcrowding. People leave their homes to take their children to school, go to work, visit friends, meet a religious or social group or eat meals, all before returning home. These movements are often unpredictable, particularly given the nature of transportation in urban areas, which involves traffic, queues and multiple routes and modes of transport. This constant, unpredictable, movement can make it difficult to keep repeated contact with an individual, who may be found in multiple places throughout one day. It also provides an opportunity to disappear within the crowds for anyone who wishes to do so.

As explained by one interviewee working in Guinea, ‘In urban areas... people are so close together, and they ride in taxis that are completely packed. There’s so much interaction between the people... here in Conakry the taxis carry up to 10 people... when you come to Conakry it’s very easy to disappear from sight, so the fact that you can disappear in the urban area carries a much bigger threat of propagation of the virus.’



People returning back to their homes after the end of quarantine in Bombali, Sierra Leone with DERC support; Photo: National Emergency Report Center (NERC) (2015)

These anonymous connections make accurate and complete contact tracing extremely difficult in urban contexts

One of the most effective ways to control the spread of infections such as EVD is through contact tracing. Contact tracing is where those who have been infected identify anyone they have come into contact with, who may have also been exposed to the disease (for more information see WHO, 2015b).

These people can then be contacted and their symptoms monitored, or quarantine enacted, in order to catch any infection early on and reduce further spread. As contact tracing relies on the ability of the infected to identify those with whom they have come into contact, the anonymous interactions that are commonplace in an urban environment pose challenges to this process. As there are so many people making untraceable movements, it becomes impossible to follow any one individual.

4.2. Porous borders and boundaries in West Africa

The national borders within West Africa are highly porous. In many cases, they represent relatively recent divisions, drawn by Europeans during colonisation, often in conflict with the cultural ties existing in the area (Roos, 2014). Boundaries within the region, between rural and urban spaces, are also fluid and regularly crossed. Long-standing economic and social ties and the need to access health care and other services, as well as livelihood patterns, all contribute to the fluidity between cities and countries.

One person we spoke with noted that, ‘These are porous borders and people move. You’ve got the same family living on one side of the border as the next, so there wasn’t a sense of borders, and there was a lot of movement on bicycles, on foot and on motorcycles.’ Another person, working in Liberia, noted, ‘We had very porous borders with Guinea and Sierra Leone... their families would go visit people in Sierra Leone or Guinea or they would have family members that live in those countries and come back in.’

Porous borders and fluidity of movement complicated the EVD response in a number of ways. As people moved, so did the disease, and yet the response was much less mobile. The fluidity of movement across the region accelerated the transmission of EVD and complicated efforts to monitor and track the disease and stop it from spreading.

Cities are hubs of population movement and incubators of disease

The density of urban environments combined with the mobility of people and increased rates of contact make disease transmission a high risk in urban contexts (Alirol et al., 2011). Urban centres are hubs of both local and international transportation, and are the entry and exit points for most travellers (Alirol et al., 2011; Wesolowski et al., 2014). As hosts of air and sea ports, ‘in an interconnected world, cities become gateways for the worldwide spread of infection’ (Alirol et al.,

2011). During the EVD outbreak, infected people arrived in Nigeria, Mali, Senegal, the UK, Spain and the US following transportation out of the urban centres of Guinea, Liberia and Sierra Leone.

The speed at which people could move was underestimated

Perhaps one reason why little emphasis was put on understanding population movement, particularly early in the response, is that no one realised how quickly populations could move between areas. One person we spoke with in Guinea noted that, ‘There was an underestimation regarding how quickly people could get from [remote rural area with rough roads] to Conakry.’ Another spoke of the ease with which people moved between Forecariah and Conakry, where there were long routes without roadblocks.

It would be near impossible to monitor movement, given the wide range of options available

In an environment where people are constantly on the move, it is difficult to accurately monitor the extent of any one individual’s movement, let alone that of the entire urban population.

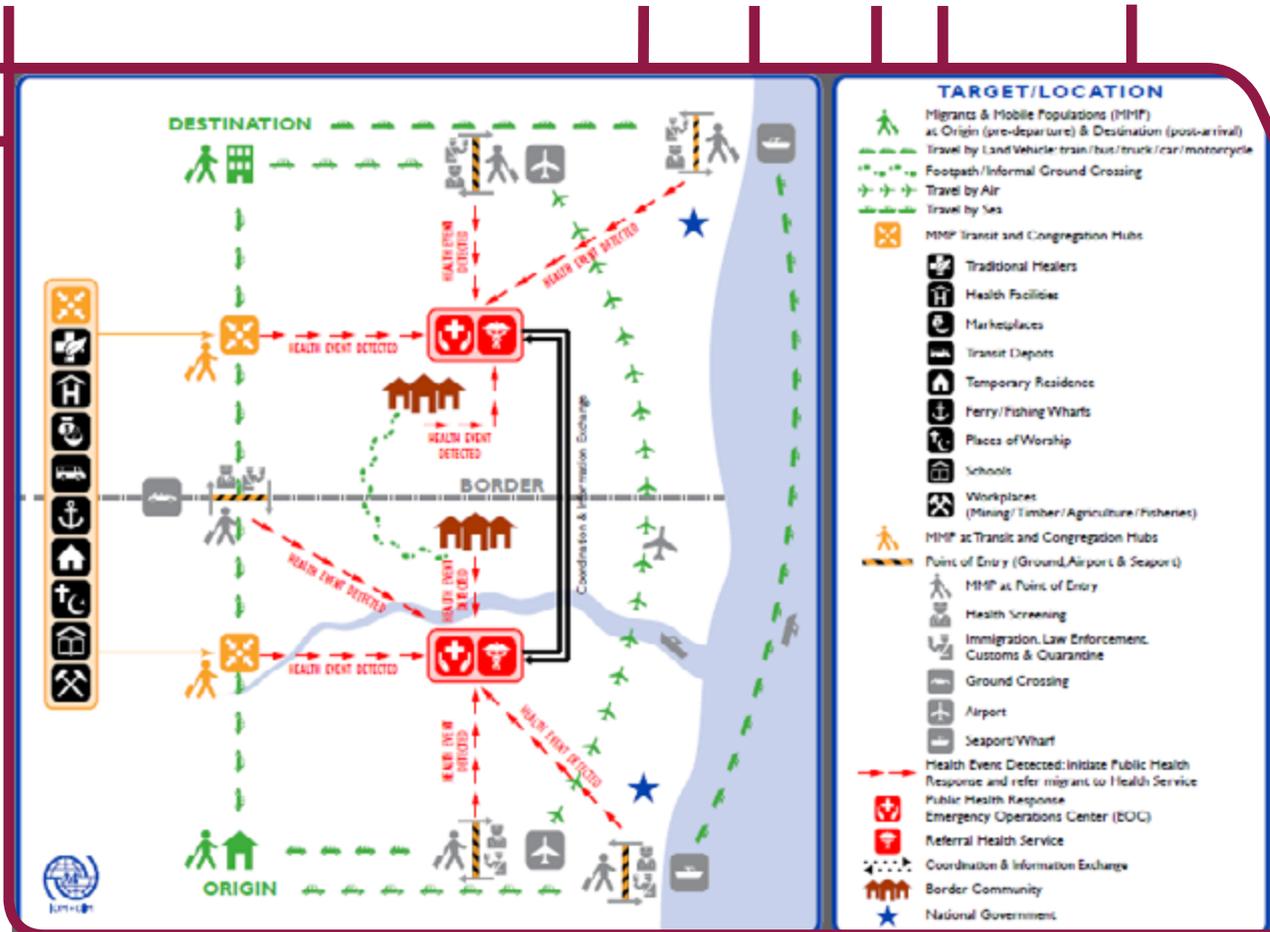
There were efforts to monitor population movement during the response. For example, the International Organization for Migration (IOM) and WHO worked closely with governments of all three affected countries to institute surveillance and health screening checks at land and sea borders starting in December 2014. They considered movement along a ‘mobility continuum’ (see image below), which ‘depicts the key population movements, taking into account the various modes of travel and transit and congregation points along the way, as well as the interconnectivity between them’ (IOM, 2016).

However, there are many options for those wishing to move within and between urban areas in West Africa. As well as official highways, sea routes and flight paths, there are footpaths and rivers, and options to use public buses, motorbikes and taxis and even go on foot. The amount of options available, as well as the ease with which people can blend into the urban crowd, as explored above, make it ‘difficult for anyone to be able to fully track’ this movement, as one interviewee noted

Despite efforts to track movement, the response did not recognise the fluidity of movement in the region and the drivers behind this

During the response, the inevitability of movement was not accounted for (Laverack and Manoncourt, 2015). Efforts were made to track movement in all three of the EVD-affected countries in West Africa, but interviewees noted that insufficient attention had been paid to understanding the whys and hows behind population movement during the response. Some suggested that trying to understand population movement during the response would have been seen as contradicting government orders, which had restricted movement. Some responders feared this might highlight disobedience among the population and so may have been negatively received by authorities.

Figure 3. The mobility continuum



Source: IOM (2016).

One interviewee explained, ‘There was a national quarantine going on so people weren’t supposed to move. So I think people didn’t really acknowledge the fact that there was a bit of movement going around and had an organisation decided to look at the untracked movement, they might have gotten into trouble but not acknowledging the national remit by the president wasn’t actually working.’

Focusing on national borders limited the effectiveness of efforts to monitor and restrict movement

Given the various established connections across national borders in West Africa, population movement continued throughout the EVD outbreak despite restrictions on borders (for more on this, see the section below). While coordination between countries did occur, both between governments and carried out by the UN Mission for Ebola Emergency Response (UNMEER), the response strategy within each country was different. Given the amount that populations moved between

national borders, more could have been done to harmonise approaches and to acknowledge the population movement that was occurring.

Wilkinson and Leach (2014) note that, ‘The idea that a containment strategy, which had worked in single countries in central and east Africa, would work on highly mobile border areas is one example... [of]... a number of incorrect assumptions... Conceiving of the epidemic as something that could be contained through national borders was naïve.’

The UN Development Group (2015) advises that, ‘When there are simultaneous outbreaks in multiple countries that are contiguous to each other, joint cross-border contact tracing, joint treatment and holding centres should become more effective. National actions then become complementary. The outbreak in Guinea, Liberia and Sierra Leone is a warning to others in the region because the health systems and their vulnerabilities are the same. EVD does not know boundaries.’

4.3. The unstoppable nature of population movement

In dense urban areas like the EVD-affected cities of West Africa, the amount of people moving so closely together in so many different, untraceable, ways, means movement, within and outside of city centres, is realistically unstoppable. If anything, movement increased during the EVD epidemic. This has several implications for response.

There was more movement, not less, during the epidemic

While movement was commonplace across West Africa well before EVD appeared, it increased as people became ill. One interviewee noted that, ‘The movement caused by Ebola was just the latest in a long line of external influences that were causing movement.’ Whether moving to urban centres to seek treatment, or from urban to rural communities to die among family, as one interviewee said, ‘The increased frequency of movement... I think contributed to the sharp increase of cases, especially from July to end of 2014.’

Another interviewee explained, ‘That means if the person is sick in the rural area, they may come to the city to seek better care, hospitals or thinking there will be better doctors. If the people are in the city, but their parents or relatives or people they trust are in the rural areas, they may decide to go back to the rural community so that they can be taken care of by their relatives.’ Another reflected, ‘When they feel sick, who is going to take care of them? Well the closest relatives, the people they trust, and if those people are not in the same house and living with them, they will go to look for them.’

The lack of physical space for burials in urban centres also contributed to the most risky of movements, with family members transporting very ill, and sometimes already dead, relatives to rural homes to be buried according to customs. One interviewee explained that, in Freetown, lack of space in existing cemeteries, which had filled up, meant burials were now being scheduled ‘an hour’s drive outside of Freetown, which is problematic for people without transport’. While eventually the EVD

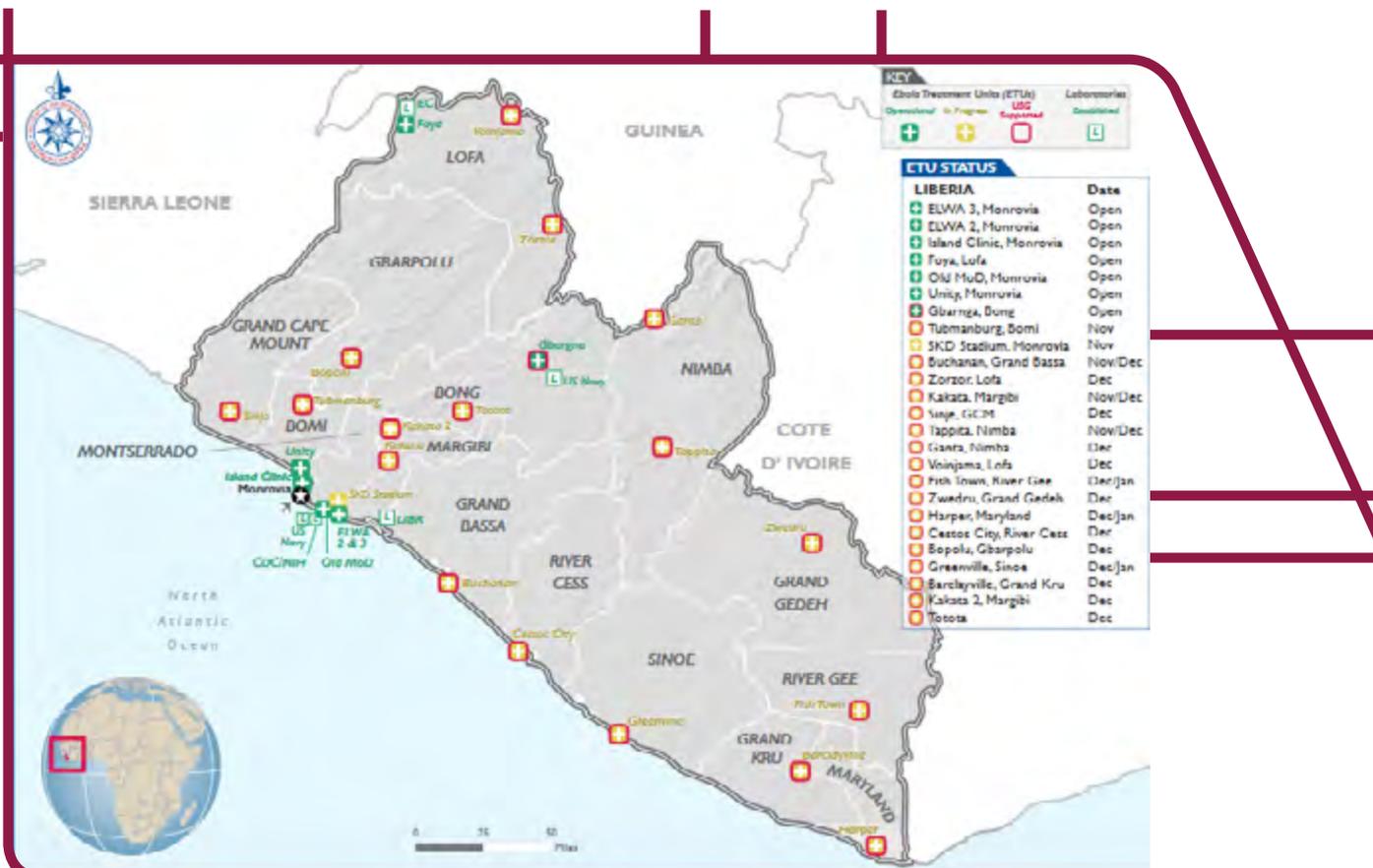
burial protocols were amended in Freetown and other urban areas in order to ‘work with community and religious leaders in order to convince the different neighbourhoods... that what they were doing, they were doing not as punishment as protection’, this occurred later in the response.

Risk did not stop mobile populations from moving, nor did ‘social distancing’ efforts

One of the measures introduced to reduce transmissions was to encourage ‘social distance’ among populations at risk of infection. Social distancing asks populations not to meet in groups, to avoid social gatherings and to stay away from others, particularly those who have been exposed to EVD. Social distancing had perhaps unintended consequences, however, in that it heightened fear and confusion. It also did not address the reality that those who fell ill needed to get to treatment, most of which was concentrated in urban areas. Torn between wanting loved ones to receive care and knowing they had been warned to stay away, interviewees we spoke with described a situation where infected individuals were being taken to Ebola treatment units (ETUs) when they became ill, in some cases spending long journeys with their loved ones, who would then drop them off anonymously and drive back home.

Figure 4 below illustrates that from mid-November 2014, although a number of ETUs were under construction across Liberia, those operational were centred around Monrovia.

Figure 4. Liberia ETU status in the West Africa Ebola outbreak

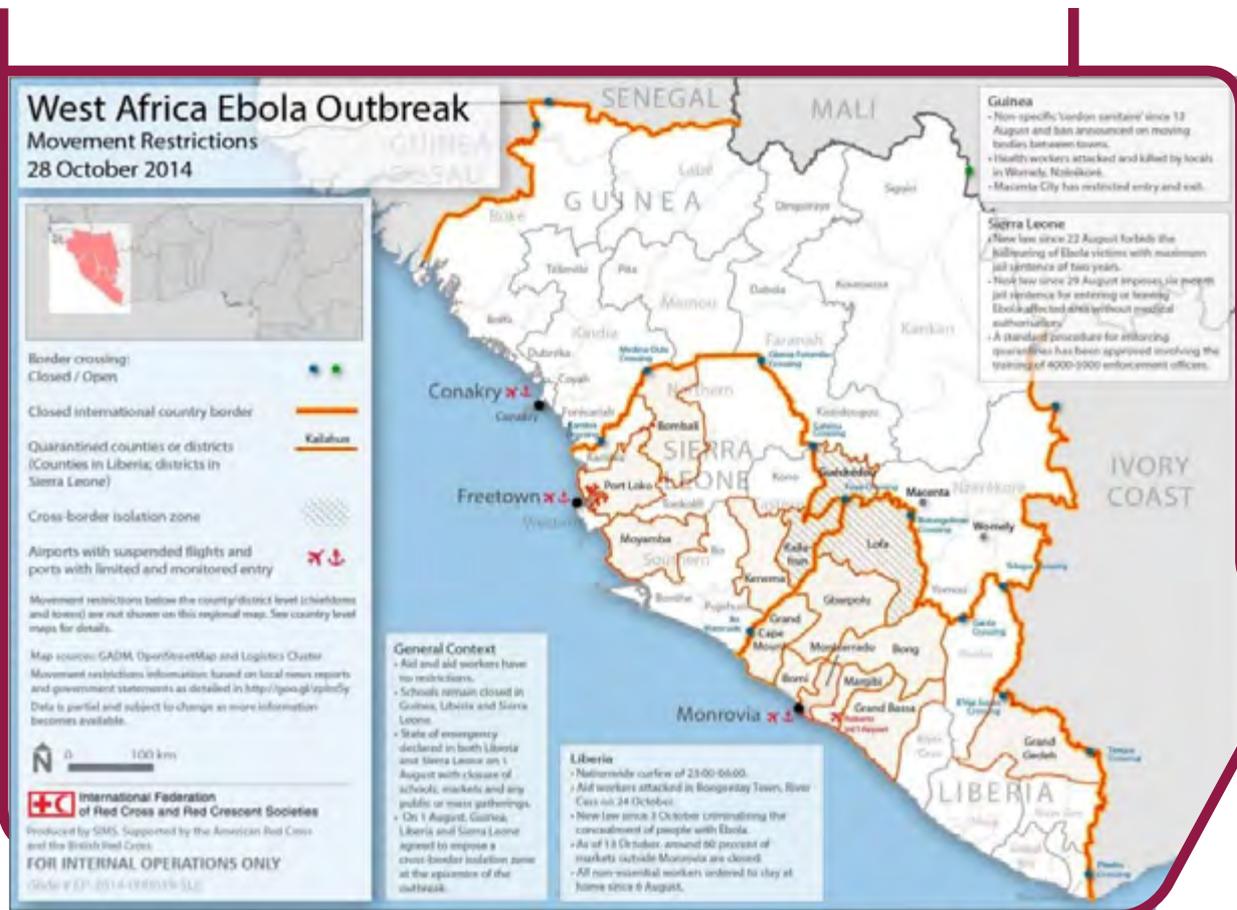


Source: USAID and CDC (2014).

As one humanitarian working in Liberia explained, ‘The majority of people treated in Liberia were treated... in ETUs within Monrovia. They’d come from other counties to receive medical treatment... That population movement posed significant risks. Loved ones would come to the city to bring their loved one that presented symptoms, would often [then] go back to their outlying county in a rural area. Because of an encouragement of “social distancing”, this led to people dropping off loved ones and leaving them there, often anonymously... so that really creates an environment where people are exposing themselves to very high-risk behaviour and then trying to return to their daily lives when they may in fact be carriers.’

While social distancing had a useful aim, without sufficient health care options and clear messaging (more on this in the communication/engagement paper) on what to do if relatives fell ill, it did not have the desired effect.

Figure 5. Movement restrictions across the region at the height of the outbreak



Source: ICRC (2014).

Restrictions on population movement did not stop movement from happening

Laverack and Manoncourt (2015) note that, 'In West Africa, international borders are porous and artificially separate closely interwoven communities linked by common languages, ethnicity, cultural traditions and access to markets. The cross-border movement of people is inevitable.'

In the EVD response, focus was placed on top-down orders and monitoring through official border crossing checkpoints. While these crossings did monitor and restrict traffic along highways and roads, 'Foot and bicycle traffic has never stopped, and may even have increased in the remote areas, acting as a potential source of transmission' (Laverack and Manoncourt, 2015). Others note that surveillance and restrictions at official border crossings 'only promoted clandestine movement in an area where borders are very porous, which made it harder to monitor movement' (Onoma, 2016).

One interviewee explained, 'You are capturing the people who choose to go through the checkpoints. You are not actually understanding the population movement, and the fact that the border means nothing to people.'

Interviewees noted that, though it did have its limits, sharing information across different levels of surveillance was useful. For contacts who had been lost from sight, information about where they may have moved to was often a successful way to identify at-risk individuals. However, these approaches still do not address movement through unofficial, unmonitored routes.

Self-monitoring at a small scale may hold more potential than top-down movement restrictions for stopping movement

A commonly heard critique of the EVD response is that it did not sufficiently engage communities. Given the challenges of monitoring population movement at a mass scale, an alternative method would be for movement in and out of different neighbourhoods or villages to be self-monitored by the communities that live there. One interviewee explained that top-down approaches to population movement were ineffectual: 'We felt that the whole issue of trying to police, as an outside agency, these porous borders was never going to work... Communities... should be allowed to police their own borders and report on the movement of people.'

Laverack and Manoncourt (2015) agree that 'a systematic community management approach to record travel histories, contacts and symptoms of illness in the cross-border areas would improve the situation'.

A community approach may be even more appropriate given the number of 'little footpaths and tracks that went through the bush', as described by one interviewee. These porous boundaries 'could be easily controlled by communities themselves if communities have been properly engaged'. In his argument about the need to understand the drivers of population mobility, Onoma (2016) explains that effective engagement with communities could have been a more successful strategy because those moving between places often notify their relatives in advance of their trip; because messages (such as, 'Please

don't travel here if you're sick, it could harm us') are more effective when personalised from family and friends; and because friends and relatives caring for one another have information about when the ill have arrived, developed symptoms, etc., all of which could contribute to epidemic control and prevention.

There are some reports of communities being able to do this during the EVD response. However, as these instances were not well documented and were few and far between, further study is required (Sustersic, 2015; Mukpo, 2015). One interviewee felt that, 'The local community itself really struggled with the severity of population movement and the implications of that.' As such, more research is required to see how self-monitoring approaches can be effective, and what support communities may need to manage this. Nevertheless, self-monitoring appears to hold great potential.

5. Conclusion

Population mobility is a consistent dynamic of cities and nations around the world. People are constantly on the move within and between urban and rural areas. In many places, the formal boundaries we understand as demarcating a city or country are much newer, and often weaker, than social and economic linkages. The motivation to be on the move can stem from a variety of reasons, and it is imperative that humanitarians are aware of and account for mobility patterns in their programming, in any context. In urban contexts, daily population movement is often anonymous and untraceable. In spaces where people have the capacity to disappear, it can be very difficult to monitor or regulate movement in emergent crisis situations.

In the West Africa EVD outbreak, attempts to understand population movement were limited, and efforts to regulate movement were often ineffective. Underlying this context was a lack of knowledge about mobility patterns and motivations, which proved to obstruct effective state and humanitarian intervention. Centrally controlled efforts to block all movement and punishment for those who used official border checkpoints did not work.

Moving forward, there are promising avenues for further research and improved techniques that will improve future response to urban crises. Inter-agency and intergovernmental coordination and information-sharing is an important area and can enable responders to target their interventions more smoothly and utilise existing resources. Understanding the forces driving population movement may enable humanitarians to better predict migration flows, and target more specific interventions by anticipating the socioeconomic consequences of movement restrictions and surveillance. And, as noted frequently by interviewees and in the literature, community-level monitoring, tracking and engagement is extremely important to avoid local rejection and defiance of responders and their activity. By empowering communities to take ownership of their own problems and supporting their innovative solutions, humanitarians may increase their efficiency and improve their sensitivity.

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