

## SPECIAL ARTICLE

## A SYSTEMS VIEW AND LESSONS FROM THE ONGOING EBOLA VIRUS DISEASE (EVD) OUTBREAK IN WEST AFRICA

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## SUMMARY

This article analyses the on-going (2014) Ebola Virus Disease (EVD) outbreak in West Africa from a systems perspective; and draws out lessons for West Africa in general and Ghana in particular.

**Keywords:** Ebola Virus Disease, West Africa, Ghana, Systems, Prevention and Control

## INTRODUCTION

Ebola Virus Disease (EVD) outbreaks are not new in Sub-Saharan Africa.<sup>1,2</sup> The disease was recognized and named almost 40 years ago following an outbreak in the Democratic Republic of Congo (DRC) near the river after which it is named. Since then, despite the absence of vaccines or cures, knowledge has accumulated on the causation, diagnosis, risk factors<sup>3</sup>, prevention, management and containment of outbreaks. So why is the biggest outbreak ever recorded occurring in West Africa like an out of control bush fire? What are lessons for containment, current and future prevention and management in the countries of the sub-region in general and Ghana in particular?

In this paper I draw upon the concepts of complex adaptive systems and complexity thinking to think about and try to answer these questions. Systems are made of separate but interdependent parts that interact with each other. Complex adaptive systems are systems made of components or agents that adapt, self organize and change based on experience and are governed by feedback. Intervening in one part of the system will almost always have ripple effects on other parts of the system. Most biological systems and almost any system with people in it will have some characteristics of a complex adaptive system. To understand occurrences and outcomes within complex adap-

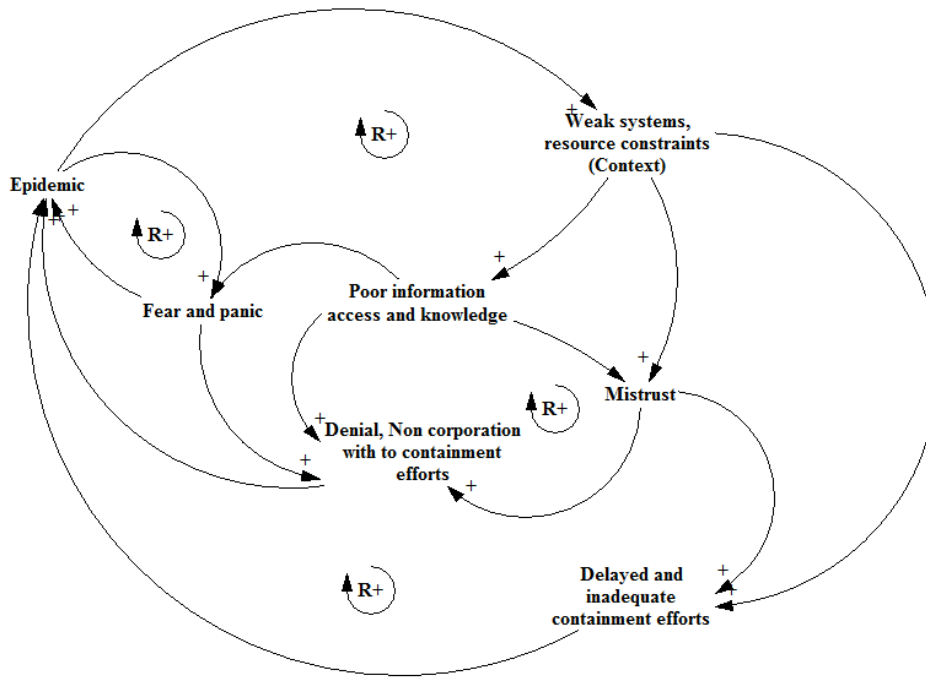
tive systems requires an appreciation of the relationship and interconnectedness between the parts rather than an exclusive focus on any one part of the system.<sup>4,5,6</sup>

**A systems view model of the EVD outbreak**

Disease outbreaks are social as well as biological phenomenon. Prevention and control requires understanding and management of causative agents and pathology; but also of contexts, systems and people; and the mechanisms generated by their interactions. Figure 1 analyses mechanisms driving the current EVD outbreak from a systems perspective in a causal loop diagram. In causal loop diagrams, arrowheads show the direction of influence between 'influencing variables' and 'influenced variables'. The positive (+) sign at the arrowhead means that increases in the influencing variable lead to increases in the influenced variables. The symbols of a clockwise curved arrow with an R+ show that a causal loop is reinforcing. In reinforcing loops the cycle of events ends with the reinforcement of the chain of events. In this case it initially generates and then turns back on itself to keep the epidemic alive and magnify it. Breaking these reinforcing loops is key to stopping the epidemic and preventing future ones.

**The Context: Weak systems and resource constraints**

Across much of West Africa, health systems are weak and severely under resourced. Disease surveillance, infection prevention and control, and clinical care are all casualties of this weakness. This context, favorable to outbreaks, is the one in which EVD emerged in West Africa in December 2013 and has continued into 2014. Moreover, EVD emerged in some of the weakest contexts and health systems in the sub-region; fragile and post conflict states with a long history of economic and human under development.<sup>7</sup>

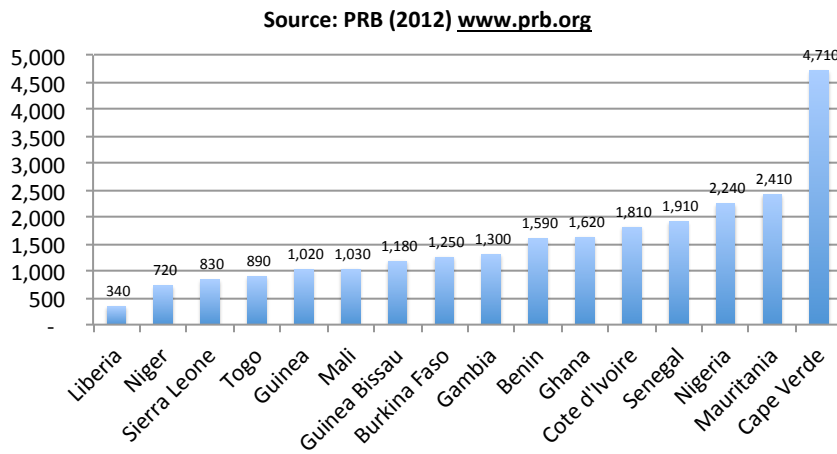


**Figure 1** A systems view of the Ebola Virus Disease (EVD) Outbreak in West Africa

Protracted civil conflict and the associated militarism sustains under development in poorer nations.<sup>8</sup> Both Sierra Leone (1991 – 2002) and Liberia (1989 – 2003) have only recently emerged from protracted

civil conflict. Along with Guinea they have some of the lowest Gross National Incomes (GNI) per capita in a sub-region of low GNI per capita (Figure 2).

**Figure 2:** Gross National Income (GNI) Purchasing Power Parity (PPP) per capita (US\$) in the countries of West Africa (2010)



### The Mechanisms

The EVD virus in the context of West Africa triggered the mechanisms in the causal loop diagram that have led to an epidemic that keeps escalating. Specifically, the contextual weaknesses fueled delayed recognition and inadequate responses, allowing the initial spark to become a bush fire. EVD unlike airborne illness such as influenza requires direct contact with sick people, objects contaminated with fluids from sick people; or the bodies of those who have died from the disease. Major airborne spread has still not been proven over the 40 years since the disease was first recognized, though investigations continue. Without the contextual factors and mechanisms that are currently supporting its spread EVD should not have become an outbreak of the current magnitude.

As the outbreak grew, it placed major pressure on already weak systems and resources, further weakening them (a reinforcing loop). The contextual challenges also reinforced poor information access and knowledge in the population and even among health workers. It also ensured that health workers were poorly equipped to deal with the problem or to protect themselves despite being a high-risk group. Such a combination can easily generate mistrust as well as fear and panic in the face of an outbreak. The contrast between poorly equipped and protected, scared and worried health workers in the under resourced settings of this outbreak, many of whose colleagues had already died; and the confident coming forward by specially trained and well equipped staff in specialist centers in the strong, well resourced and informed systems of the US and the UK to receive and manage their citizens flown in from the affected areas speaks for itself.

### Lessons from Cholera in Ghana

There are several countries in the West African sub-region including Ghana that have not recorded EVD cases yet. Despite their resource constraints, these countries, including Ghana have quite a bit of potential to adequately prevent, respond to and contain disease outbreaks including EVD. They will need some external support, but there to my observation there is still quite a bit of latent internal potential to address challenges within the countries of the sub-region. Potential energy however has to be activated to have any effect.

Observation of the way we in Ghana have handled Cholera over the years illustrates the effects of a failure to convert potential energy into successful implementation to eliminate future outbreaks. It suggests we have no cause for complacency in the face of EVD; but also provides some learning as to what to do to make the story different.

Cholera is endemic in Ghana especially in the poorer parts of densely populated urban areas with poor water supplies, liquid and solid waste disposal and environmental sanitation. Routine time series data from the Greater Accra region, which is 90% urban and often the center of outbreaks, shows several outbreaks with a two to three year cycle. Improvement in access to clean water, proper liquid and solid waste disposal, and enforcement of local government byelaws related to sanitation has remained sub-optimal despite the experience of several epidemics. After a sustained decline in the peaks, the magnitude of the outbreaks shot up in 2011/12 (figure 3). In 2014 a new outbreak is raging which promises to reach if not exceed the 2011/12 peaks if we are not lucky. Several thousand cases and tens of deaths have already been recorded as at the end of August 2014. The escalated outbreaks after what looked like a sustained decline in the outbreak peaks are not surprising in the face of the failure to put in place adequate long term preventive measures.

Cholera, like EVD is a disease that requires multi-agency, multi-sector, community and local government action before and well beyond any outbreak for prevention and control. We have been aware that Cholera is endemic in Ghana for years. Nevertheless, outbreaks continue to manage to catch us with our pants down. Why? Partly because after the crisis of each outbreak cycle is over, instead of addressing the multi-agency and multi sector system weaknesses driving the problem, complacency sets in and everyone goes to sleep until the next outbreak is in full force.

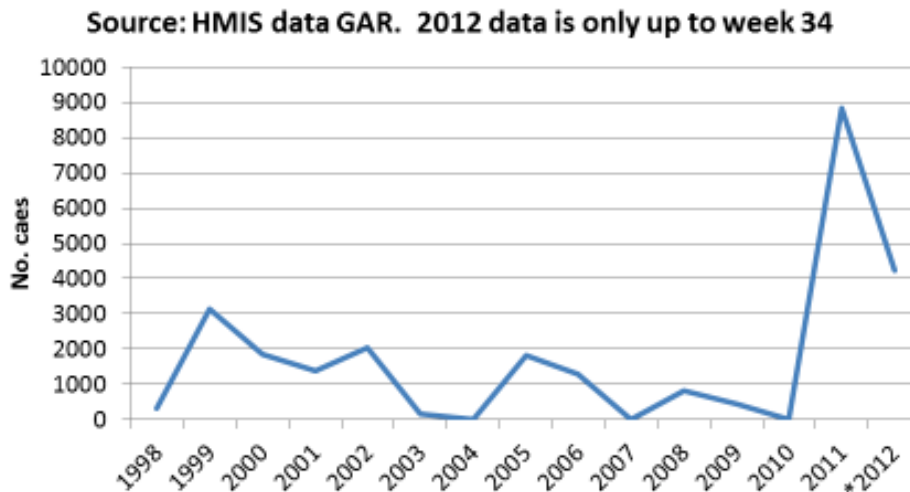
### A wake up call

The current EVD outbreak in West Africa is a wake up call for immediate as well medium and long term investments in health and health related systems including surveillance and outbreak preparedness; as well as water and sanitation in the sub-region. *'We do not have money'* should not be allowed to be an excuse for doing nothing. Low national incomes are not an absolute obstacle to achieving desired outcomes.<sup>9</sup> Where and how nations choose to invest such income as they have affects outcomes at any given income level. An economic and social costing of the effects of the current EVD outbreak on the affected countries may help us realize that it is probably penny wise and pound foolish not to make better investments in our health systems and their surveillance, outbreak prevention and control mechanisms. Specifically for the countries that have not yet recorded cases, we have the advantage that there is no element of surprise. There is an already established outbreak in the sub-region of which we are a part, and all countries in the sub-region are at high risk.

Moreover, we are at risk not only because of our proximity to the epicenters of the outbreak, or the highly contagious nature of the virus; but also because the

contextual conditions and mechanisms that have favored the escalation of the outbreak and the difficulties in its control are not far from us.

Figure 3: Cholera cases in GAR over time



Mistrust has played a role in the difficulties in controlling the current EVD outbreak.<sup>10</sup> Mistrust is a lack of conviction that the other party has your interest at heart and will do you no harm. Long standing and deep seated inequities, inadequate and inaccurate information are a good way to generate mistrust, fear and panic in a crisis situation. Statements about readiness combined with a lack of attention to genuine readiness to handle outbreaks, inadequate information provision and protection of the population and high risk groups such as health workers also generates mistrust. It is only a matter of time before people find out they have been deceived, or even harmed.<sup>11</sup> The mistrust created is not easily reversed.

It is not impossible to prevent or break the reinforcing cycles show in Figure 1. Uganda's handling of EVD during and after it's first disastrous epidemic shows that a sub-Saharan African country can contain EVD in spite of resource constraints.<sup>12</sup> The Ugandan success story is the result of aggressive and sustained efforts. It did not come by hopeful pronouncements and reassurances backed by weak implementation and failure to put in place long term prevention interventions. Let us

hope that Ghana and beyond Ghana, West Africa, will also make our story different.

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