Re-emergency of Ebola Epidemic in the Democratic Republic of Congo: Synergizing the Preparedness and Response Measures with the Sustainable Development Goals

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Abstract

Ebola outbreaks which have re-emerged in the Democratic Republic Congo (DRC) have continued to galvanize the regional and global attention. The outbreaks are likely to transcend borders and threaten the global health crisis, especially by ensuring the “healthy lives and to promote the well-being for all at all ages” which is grounded in the sustainable development goals (SDGs). In this regard, the present paper attempts to discuss the synergies between the SDGs and Ebola preparedness and response measures - with a specific outlook on the in SDG.3 and the recent Ebola outbreak in the DRC. This aims at showing how the five (5) targets in SDG.3 can be prioritized and integrated in the Ebola preparedness and response measures taken against the battle of any sporadic health disasters and emergencies similar to Ebola. The targets include: end epidemics of infectious diseases; achieve universal health coverage; support research and the development of vaccines and medicines; increase health financing and recruitment, development, training and retention of the health workforce; and strengthen the capacity for early warnings, risk reduction and management. The paper ends by calling for an approach which elucidated an interaction between the environmental factors and countermeasures of responding to re-emergency and transmission of this deadly disease in the DRC and elsewhere.

Contents

1.0. Introduction

Until recent times when Ebola Virus Disease (EVD) emerged, the chief threats to human health involved epidemics such as bubonic plague, smallpox, influenza and others which were characterized with high case-fatality rates and economic losses (Taylor, 2016). Ebola outbreaks have been happening with distinct propagation- some being mild and others lethal. Bausch and Schwarz (2014) assert that they typically constitute yet another health and economic burden to Africa's most disadvantaged populations. Although more research is being carried-out to quantify the exact impact of Ebola, studies by Georges et al (1999) Bausch and Rollin (2004); Pourrut et al (2005); Bausch and Schwarz (2014); Chippaux (2014); Yitades et al, 2014; Zulane, 2014; Aftab et al (2015); Harish et al (2015); Stein (2015) and Broadhurst et al, (2016) have shown how the epidemic has contributed to the mortality, secondary or post morbidities, and trauma and psychosocial distress. They have also indicated how EVD is associated with the displacements of populations, huge economic costs and losses, and health-related humanitarian crises.

Apart from the fatality cases as shown in the 3 figures below, the World Bank estimated the short and medium economic impact of the West Africa Ebola outbreak (WAEO) of 2014 in the three hard-hit countries (Guniea, Liberia and Sierra Leone) at USD $2.8 billion (World Bank, 2014 in Ghebreyesus, 2018). More so, Save the Children (2015) reported that £2.8 billion had been spent on aid, compared with the £1billion it would require to improve the basic healthcare in the 3 most affected countries. Also, Ebola outbreaks devastate not only the villages, towns, and cities in the afflicted countries, but they also leave a great burden on the health systems by disrupting the implementation and sustainability of the health programmes in place (Bausch and Rollin, 2004; Save the Children, 2015; Tichenor and Sridhar, 2017).

In most of the regional and international frameworks, sustainable development is underscored both as a fundamental goal and measure to improve the quality of life for people. This can, however, be impeded by the persistent political and socioeconomic challenges, especially in the countries which are embroiled in and affected by civil conflicts and instability; disasters; income inequalities; large scale environmental degradation and widespread disease. In the recent past, following the lethality of the 2014 WAEO, the World Health Organization (WHO) declared the disease as a public health emergency of international concern (PHEIC) in accordance with the 2005 International Health Regulations (IHR) (WHO, 2005; WHO, 2014). The unprecedented outbreaks of Ebola sow panic in the affected countries and to the entire globe. Apart from the United Nations Security Council declaring the disease as a "threat to international peace

and security" on September 18th, 2014 (UN, 2014), it is also important to stress that Ebola can be a serious impediment to achieving the Sustainable Development Goals (SDGs) (UN, 2015). This calls for an array of efforts to support and to promote the SDGs, primarily those divulging health as a driver to sustainable development. However, the concern which is similar to that of Aftab et al (2015) is how are the developing countries like the Democratic Republic of Congo (DRC) prepared to face-off the Ebola-like outbreaks in the era of implementing the SDGs? Also, what is the role of environmental-related factors in the re-emergency and transmission of this deadly disease in the DRC?

2.0. Ebola Virus Disease

EVD is a zoonotic and virulent pathogen caused by the Ebola virus (EBOV) and it emerged in the 21st century. According to WHO (2018), EVD is associated with mortality rates ranging from 25% up to 90%. EBOV is a member of the Filoviridae family, one of the four families of diseases that infect both humans and nonhuman primates (Bausch and Rollin 2004; Pourrut et al 2005; Bausch and Schwarz, 2014; Yitades et al, 2014; Zulane, 2014; Harish et al, 2015). The incubation period of EVD varies from between 1 and 21 days. However, patients are not considered infectious until they develop early clinical symptoms like anorexia, vomiting, prostration, chest pain, and shortness of breath (Zulane, 2014; Stein, 2015). Other signs are nonspecific, and may include: a low-grade fever, nausea, diarrhea, headache and muscle aches a cold or flu. Figure.1 shows the five genetic species which have been identified to cause EVD. They include: Zaire ebolavirus (ZEBOV), Sudan ebolavirus (SEBOV), Bundibugyo ebolavirus (BDBV), Taï Forest (Côte d'Ivoire) ebolavirus, and Reston ebolavirus (REBOV) (Bausch and Schwarz, 2014; Yitades et al, 2014; Harish et al, 2015; Stein, 2015; Broadhurst et al, 2016). The first three (3) species are pathogenic to humans, and ZEBOV has been the most prevalent and lethal one in Africa as can be observed in all figures. REBOV whose origin is Asia has never caused any Ebola infections in humans, but rather in non-human primates (Pourrut et al., 2005).

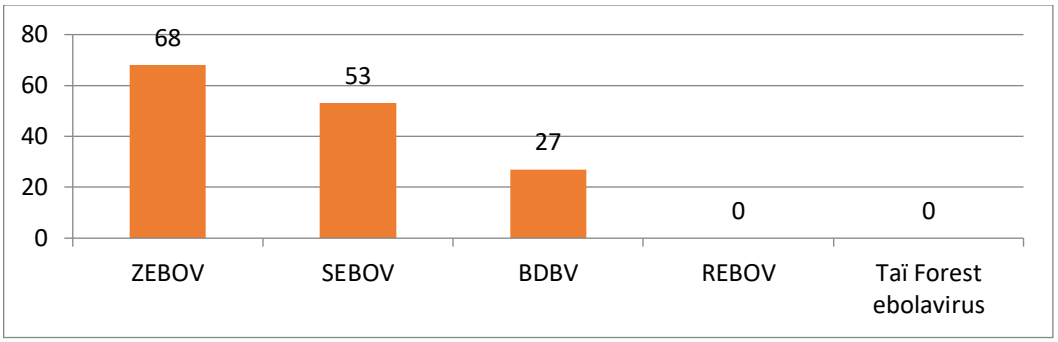


Figure 1: **Average death rates of 5 Ebola species between 1976 and 2016** (Source: WHO, 2018)

Note: The death rates were calculated by adding up the records of cases and deaths from all the known Ebola outbreaks.

Bausch and Rollin (2004); Narra et al (2017), and Yitades et al (2014) and others identified the most common chain of EBOV transmission to be human-to-human contact. EBOV is highly contagious, and it is transmitted to individuals through the direct contact with the bodily fluids from an infected person or dead animals (cadavers). In regard to this, the risk of previous EVD transmissions has been attributed to attending to infected victims, touching and kissing the dead bodies (corpses), migration and overcrowding, consumption of game meat, and through sexual intercourse (Pourrut et al, 2005; Stein, 2015; Harish et al, 2015; Broadhurst et al, 2016). Basically, these transmission ways are associated with the environment and socioeconomic determinants such as poverty; housing conditions; unemployment; inadequate hand-washing facilities and practices (sanitation and hygiene challenge); as well as the traditional and secretive cultural beliefs and practices in most of the Ebola-affected communities. Over the past decades, as it can be observed from figures 2 and 3, African countries (mainly those located in the equatorial forest regions) have sporadically witnessed the waves of EVD in distinct periods (Pourrut et al, 2005).

3.0. Ebola evolution and epidemiology

Several outbreaks of Ebola have been emerging ever since the documentation of first world case in the DRC (former Zaire) in 1976 (Bowen et al, 1997; Bausch and Rollin, 2004; Stein, 2015). Despite the unprecedented and transboundary outbreaks of EVD mainly occurred in Africa, some spilled-off from Africa to Europe and America (Coltart et al, 2017; WHO, 2018). This is presented in figures 2 and 3. Each Ebola outbreak occurred in a distinct period, and with varying epidemiological patterns which can be contextualized in the disease species (strains); transmission and

reservation agents; clinical presentation and diagnosis; geographical distribution; confirmed cases, and case fatality. Additionally, the environmental factors elucidated in this paper which are reported to be influencing the transmission of the disease are worth noting. Some of the major outbreaks, including the recent one in the DRC in 2018 are divulged below.

3.1. Ebola outbreak in the DRC and Sudan, 1976 - 1979

As indicated above, Ebola is reported to have first emerged in 1976 between June and November in the Northern DRC (formerly Zaire) near River Ebola after which the virus was named (Bowen et al, 1977). The causative agent of the disease was found to be similar to the Marburg virus (Bausch and Rollin, 2004; Pourrut et al, 2005; Chippaux, 2014; Stein, 2015; Broadhurst et al, 2016). In the same year, another severe haemorrhagic outbreak was reported at the Yambuku mission hospital. It was largely attributed to the re-use of a contaminated needle in the hospital.

Later on, a similar outbreak erupted in Nzara located in the neighboring Sudan, between July and October 1979 among the cotton factory workers. Stein (2015) asserted that the workers were infected by the insectivorous bats that were found in the factory. According to Bowen et al (1977) the simultaneous Ebola outbreaks that occurred between 1976 and 1979 were identified to be caused by two distinct virus strains - ZEBOV and SEBOV. These outbreaks were estimated to result in more than 550 cases and 430 deaths. The ZEBOV had a higher case-fatality of nearly 90% while that of SEBOV was approximately 50%. After the outbreaks were contained, no new cases were reported until 1994, when the disease re-emerged in Cote d'Ivoire. Figures 2 and 3 present the number of cases and fatalities, which were recorded during this period of the outbreaks.

3.2. Ebola outbreak in the West Africa, 1994 – 1997

Fifteen years later, a second EVD outbreak emerged in June 1994 in West Africa for the first time. This outbreak occurred in Ivory Coast and was attributed to Taï Forest ebolavirus (Pourrut et al, 2005). It started when a mild illness was reported in a female Swiss ethnologist who had dissected and performed an autopsy on a dead chimpanzee in the Tai National Park. Fortunately, she survived (Georges et al, 1999; Leroy et al, 2009). The outbreak escalated and spilled over to the DRC between January and July 1995, causing 256 deaths out of the 315 confirmed cases. Between 1994 and

1997, the disease spread further to Northeast Gabon where 32 cases were registered in a camp of the gold-miners. The miners went on to infect another 16 patients in a hospital where they sought treatment. In February 1996, another outbreak emerged in the Gabon's Mayibout village and it was attributed to hunting, the carrying of the chimpanzee carcasses, and the consumption of fruit bats (Georges et al, 1999; Bausch and Rollin, 2004). This led to 21 deaths out of 31 confirmed cases.

Between October 1996 and March 1997, the last outbreak emerged at Booué, from a hunter. In the course of seeking traditional treatment, Georges et al, (1999) noted that the hunter ended-up infecting the traditional healer and other people who also subsequently transmitted the disease to others in several towns and villages in Gabon. This resulted in 15 cases and 11 deaths. It is worth reporting that this outbreak spread as far as South Africa. According to Chippaux (2014), an index case for the South African case was of the Gabonese physician who unwarily had contracted the disease and traveled to Johannesburg for treatment but instead ended-up infecting a nurse who suddenly died. Figures 2 and 3 demonstrate the number of cases and fatalities which were recorded in this period of Ebola outbreaks.

3.3. Ebola outbreak in the DRC, Sudan and Uganda, 2000 – 2007

During this period multiple outbreaks due to ZEBOV in the DRC were witnessed, first in the DRC, and later in Sudan and Uganda. Pourrut et al (2005) and Chippaux (2014) reported Mendemba as their epicenter between October 2001 and May 2003. The outbreaks also spread widely to other areas. This was attributed to the local hunters who butchered and ate the carcasses of an antelope, gorilla and chimpanzee. Later the gold miners who were involved in handling the animal carcasses were infected. Another factor for transmission in regard to this outbreak was the evacuation of a patient from Mekambo to the Makokou hospital (Bausch and Rollin, 2004). These outbreaks were reported to have caused 128 deaths out of 143 cases, whereas the last outbreak at Mbomo occurred between October and December 2003 and caused 35 cases and 29 deaths.

In contrast to the DRC, the outbreaks in Sudan and Uganda were associated with the SEBOV and BDBV. In a study conducted by MacNeil et al (2010), it was pointed-out that BDBV was discovered in Bundibugyo district of Western Uganda in 2007. BDBV is distantly related to the Tai Forest ebolavirus (Stein, 2015). Between October 2000 and January 2001, Uganda experienced a surge of EVD mainly in Gulu district– located in the northern region of the country, and

afterwards the disease spread to the cities of Masindi and Mbarara in western Uganda (Chippaux, 2014). However, compared to two cities, Gulu was severely affected by the outbreak to an extent where the disease also claimed the lives of the medical and healthcare responders. During this period, 224 deaths occurred out of the 425 total confirmed cases in Uganda. Also, during the same period the disease re-occurred in Sudan's Yambio between May and June 2004 and it resulted in 7 deaths out of 17 cases.

3.4. Outbreak of Ebola in the West Africa, 2014 – 2016

This outbreak was due to ZEBOV was reported to be the most ferocious of all the previous outbreaks (WHO, 2014; Harish et al, 2015). It was also unique in its geographical distribution and unprecedented nature to the extent of being declared a PHEIC (WHO, 2014) as well as a "threat to international peace and security" (UN, 2014). Efforts to halt the EBOV transmission during this outbreak continued unabated for many months. This was because the WAEO spread to overcrowded urban areas with highly mobile communities and dense populations, unlike the previous ones which were easily and quickly contained since they emerged and spread in the remote and rural areas.

The outbreak ravaged mostly three (3) West African nations, including Guinea, Liberia and Sierra Leone (Bausch and Schwarz, 2014). From the genetic sequencing and epidemiology of the disease, according to Arwady et al (2015) its strain evolved separately from Guinea's South-east prefectures of Gueckedou and Macentaand, and then spiraled to Sierra Leone and Liberia. Other countries later on suffered from the small exposures to EBOV starting with Nigeria, Senegal and Mali. The epidemic went on to spread beyond Africa to Italy, Spain, and the U.S through the health care workers who mainly included the nurses and nursing aids (Matanock et al, 2014; Narra et al, 2017). Based on WHO (2016), by the time West Africa was declared Ebola free in June 2016, the total number of cases in Guinea, Liberia and Sierra Leon were reported to be 3,811, 10,678 and 14,124, while deaths stood at 2,543, 4,810 and 3,956 respectively (see figures 2 and 3).

3.5. Re-emergency of Ebola in DRC, 2018

On the 8th May 2018, an EVD outbreak was declared in the DRC. This marked the ninth resurgence of the disease in the DRC since the first ever world known outbreak in 1976 (Bowen et al, 1977). Bikoro region in the Northwest

of DRC's Equateur province was confirmed as the epicenter of the outbreak. As of 29th May 2018, Medicins Sans Frontiers (MSF) reported 54 cases that presented with the symptoms of hemorrhagic fever - with 35 confirmed Ebola cases and 25 deaths, whilst 300 suspected cases were under close surveillance (MSF, 2018). Unlike most of the previous outbreaks in the DRC and in Africa as a whole, which most affected remote areas similar to the WAEO, the outbreak of this time spread from Bikoro to Mbandaka city. The latter is located along the River Congo - a key trade and transport route that runs from the DRC up to the Central African Republic and Congo Brazzaville. Besides, it hosts a population estimated at 1.2 million people (WHO, 2018).

Although no formal declaration has been made yet as to whether the DRC is free from EVD, the latest Ebola flare-ups in the country have been comparatively contained with only 33 deaths reported between May 8th and 24th July, 2018. This might have been due to swift in local and international responses while recalling the "painful lessons" of the WAEO which occurred in an unprecedented manner. In an interview of Ryan (reported in AFP News, 2018), vaccination of more than 3,300 people using the RVSV-ZEBOV; quick isolation of cases based on the earlier investigations; and the excellent contact tracing mechanisms have so far helped with the containment of EVD in the DRC. More so, a change in the moral and social perceptions of the local communities has been helpful, whereby this time around people in the affected communities were more receptive and cooperative in a quest to control and prevent the disease unlike in the West Africa.

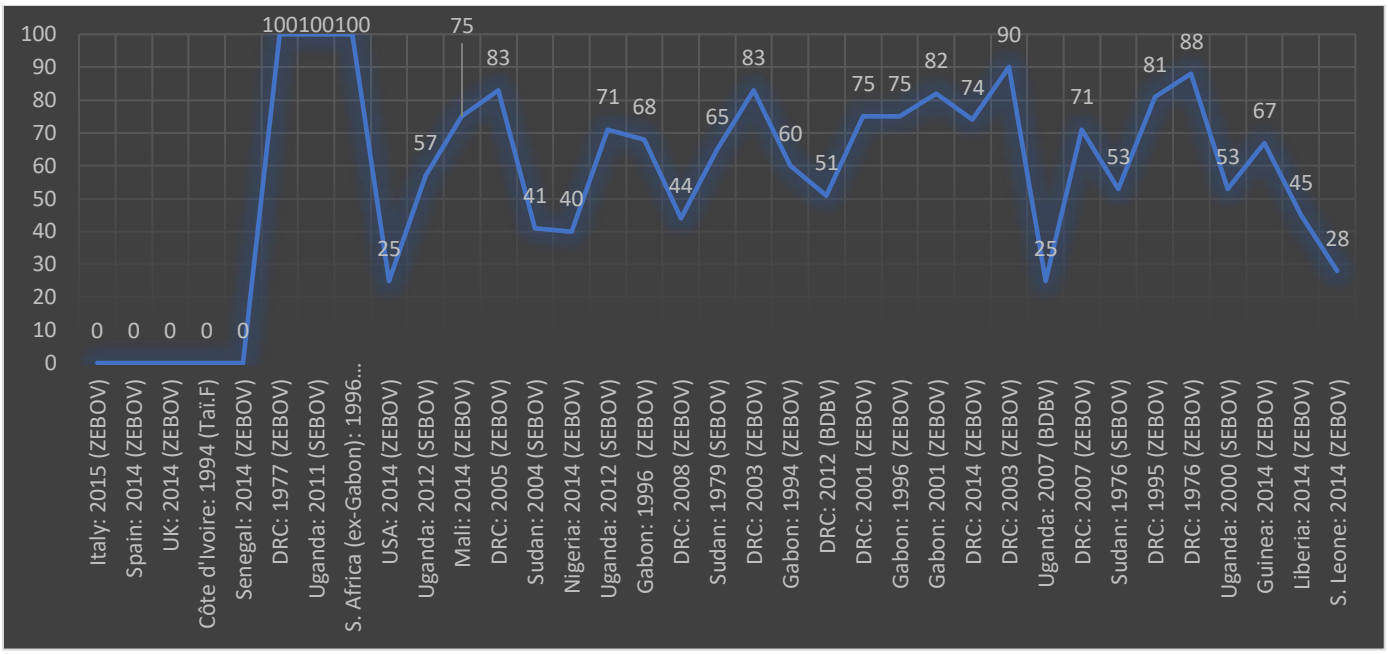
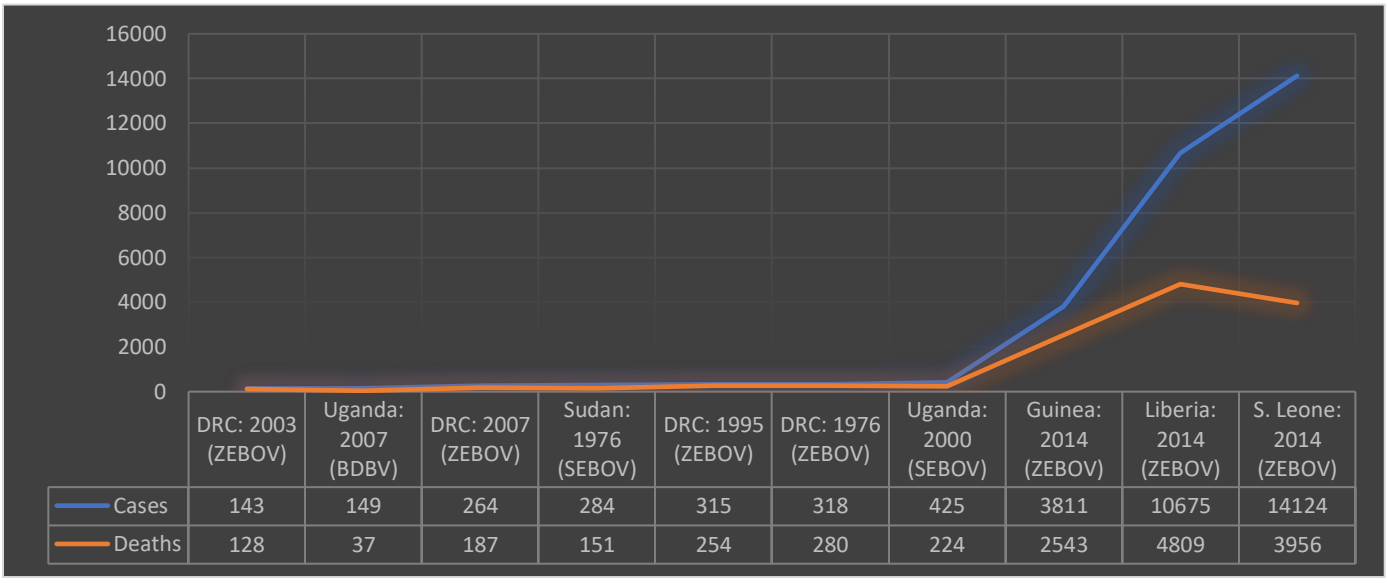


Figure 2: Percentages of case fatality in the Ebola affected countries between 1976 and 2016



	DRC: 2003 (ZEBOV)	Uganda: 2007 (BDBV)	DRC: 2007 (ZEBOV)	Sudan: 1976 (SEBOV)	DRC: 1995 (ZEBOV)	DRC: 1976 (ZEBOV)	Uganda: 2000 (SEBOV)	Guinea: 2014 (ZEBOV)	Liberia: 2014 (ZEBOV)	S. Leone: 2014 (ZEBOV)
Cases	143	149	264	284	315	318	425	3811	10675	14124
Deaths	128	37	187	151	254	280	224	2543	4809	3956

Figure 3: Cases and fatalities < 100 in selected Ebola affected countries between 1976 and 2016

Note: The number of cases and fatalities during the recent outbreak of Ebola in the DRC in 2018 are not presented in the above figures since the disease has not yet been officially declared to have ended.

4.0. The Sustainable Development Goals (2030 Agenda)

The SDGs were formally adopted by the UN member states in September 2015 under the United Nations General Assembly (UN, 2015). The ultimate goal of SDGs is to guide the national and global efforts to make international development more sustainable in the coming fifteen (15) years (2015 - 2030). The goals were a result of the 2012 Rio+20 Summits, through which the governments of different nations committed to a global pledge of responding to a wide variety of global issues (Sachs, 2012). The SDGs replaced the Millennium Development Goals (MDGs) whose period of implementation was 2000 - 2015.

Unlike the MDGs, which applied to the developing world, the SDGs have a broader framework for world development that embodies the economic, social and environmental dimensions. MDGs had 8 goals and 18 targets, and for the SDGs they are a lot more - 17 goals and 169 targets (Sachs, 2012; UN, 2015). The ultimate vision of SDGs is grounded on a tenet of "leaving no one behind". To achieve this, however, there's a need to "ensure the healthy lives and to promote the well-being for all of all ages" which is premised in SDG.3. This goal aims at achieving 9 targets which are presented in table 1. Target (3.3) agitates for effective preparedness and response to communicable diseases (e.g. AIDS, tuberculosis, malaria and hepatitis etc.) and non-communicable diseases (e.g. cardiovascular, cancer and diabetes etc.). That also applies to the newly emerging infectious diseases like Ebola.

Adshead et al (2006) contends that sustainable development and health are intricately connected. They are strongly correlated and each conditions the other. In fact, health represents not only a significant outcome, but a precondition of sustainable development (Sachs, 2012). However, emerging diseases like Ebola, whose threats transcend borders and threaten a global health crisis; achieving sustainable development might be a deferred dream. Based on the past outbreaks, EVD cannot be controlled overnight. It is also not known when it will be stopped - whether this time around the 2018 DRC outbreak will be the last battle against Ebola or before 2030, the timeline for achieving the SDGs. The optimism, however, relies on the effective and timely administration of countermeasures - biomedical (Ebola vaccine and drug development, mass vaccination, logistics and research etc.) and non-biomedical (effective health systems, cross-border surveillance and international partnerships etc.) (MSF, 2018 and WHO, 2018). Those

measures need to be sustainable by continuous and multisectoral collaboration and coordination at the local, national, regional and international levels.

The era of implementing the SDGs, which started on 1st January 2016, can also be an opportunity to try to win the battle against Ebola. SDGs can also be a safeguard against Ebola as a PHEIC and as a threat to the international peace and security (WHO, 2014; UN, 2014), particularly in the DRC and other countries exposed to at great risk of Ebola before even the 2030 timeframe of achieving the goals. In the subsequent section, the present paper, therefore, discusses the synergies between the SDG and Ebola preparedness and response measures - with a specific outlook on the SDG.3 and the recent Ebola outbreak in the DRC.

Table 1: Targets in Sustainable Development Goal 3 and their indicators

	Target		Indicator
3.1	Reduce the global maternal mortality ratio to less than 70 per 100,000 live births	3.1.1	Maternal mortality ratio
		3.1.2	Proportion of births attended by skilled health personnel
3.2	End preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births	3.2.1	Under-five mortality rate
		3.2.2	Neonatal mortality rate
3.3*	End the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases	3.3.1	Number of new HIV infections per 1,000 uninfected population, by sex, age and key populations
		3.3.2	Tuberculosis incidence per 1,000 population
		3.3.3	Malaria incidence per 1,000 population
		3.3.4	Hepatitis B incidence per 100,000 population
		3.3.5	Number of people requiring interventions against neglected tropical diseases
3.4	Reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being	3.4.1	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease
		3.4.2	Suicide mortality rate
3.5	Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol	3.5.1	Coverage of treatment interventions (pharmacological, psychosocial and rehabilitation and aftercare services) for substance use disorders

		3.5.2	Harmful use of alcohol, defined according to the national context as alcohol per capita consumption (aged 15 years and older) within a calendar year in litres of pure alcohol
3.6	Halve the number of global deaths and injuries from road traffic accidents	3.6.1	Death rate due to road traffic injuries
3.7*	Ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes	3.7.1	Proportion of women of reproductive age (aged 15-49 years) who have their need for family planning satisfied with modern methods
		3.7.2	Adolescent birth rate (aged 10-14 years; aged 15-19 years) per 1,000 women in that age group
3.8*	Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	3.8.1	Coverage of essential health services (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, newborn and child health, infectious diseases, non-communicable diseases and service capacity and access, among the general and the most disadvantaged population)
		3.8.2	Number of people covered by health insurance or a public health system per 1,000 population
3.9	Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	3.9.1	Mortality rate attributed to household and ambient air pollution
		3.9.2	Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)
		3.9.3	Mortality rate attributed to unintentional poisoning

3.a	Strengthen the implementation of the WHO Framework Convention on Tobacco Control in all countries, as appropriate	3.a.1	Age-standardized prevalence of current tobacco use among persons aged 15 years and older
3.b*	Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all	3.b.1	Proportion of the population with access to affordable medicines and vaccines on a sustainable basis
		3.b.2	Total net official development assistance to medical research and basic health sectors
3.c*	Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States	3.c.1	Health worker density and distribution
3.d*	Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks	3.d.1	International Health Regulations (IHR) capacity and health emergency preparedness

Source: (United Nations, 2015)

Note: * Selected SDG targets and indicators which are linked to the preparedness and response to Ebola

A target refers to a specific, measurable and time-bound outcome (result) that directly contributes to achievement of a goal whereas an indicator is a metric used to measure progress towards a target; generally based on available or established data

5.0. Synergizing Ebola preparedness and response measures with the Sustainable Development Goal.3

Before their promulgation, the UN General Assembly emphasized the intrinsic role of health in achieving the international SDGs (Tichenor and Sridhar, 2017). In this case, the SDG3 among other SDGs was devoted to health as a comprehensive goal to end a number of infectious epidemics (Sachs, 2012; UN, 2015). The SDG3 has nine substantive targets and four additional targets (see table 1). Although its target 3.3 does not specifically mention Ebola as one of the epidemics to be addressed, it is evident that EVD remains another ferocious infectious disease with serious potential to threaten the globe. Fighting it still needs more magnified responses, which require multi-sectoral-collaboration and partnership across borders so as to provide a real commitment to valuing all human life.

It is imperative to note that apart from the SDG3, which is very specific on health, other SDGs like SDG.1 (poverty), SDG.2 (zero hunger), SDG.4 (quality education), SDG.6 (improving water and sanitation), SDG.8 (decent work and economic growth), SDG.10 (reduced inequalities) and SDG.13 (climate change) are also linked to responding to the health needs. Therefore the implementation of SDG3 is in-line with the pathways that are needed to control and halt EVD, particularly as it has re-emerged in the DRC. This can be leveraged on the five targets in SDG.3 which include: end epidemics of infectious diseases (3.3); achieve universal health coverage (3.8); support research and the development of vaccines and medicines (3.b); increase health financing and recruitment, development, training and retention of the health workforce (3.c); and strengthen the capacity for early warnings, risk reduction and management (3.d). The present paper attempts to explain them by elucidating firstly, the existing environmental situation that is likely to be contributing to the re-emergency and transmission of EVD in the DRC.

5.1. SDG3.3: Ending epidemics of infectious diseases

Endemic infectious diseases such as malaria, HIV, TB, hepatitis and neglected tropical diseases (NTDs) like dengue and Chikungunya, human African trypanosimiasis, leprosy, schistosomiasis, trachoma, and others are still persistent and infect mostly the poorest populations in the developing world. In 2015, about 4.3 million estimated deaths (nearly 12,000 deaths every day) which represented 8% of world deaths were attributed to both infectious diseases and NTDs (WHO, 2015). With time and following the new millennium in 2000, the epidemics of Severe Acute

Respiratory Syndrome (SARS), influenza, Ebola and Zika have concentrated global attention on infectious disease outbreaks and acute response needed to bring them to an end (Raviglione and Maher, 2017). Although this is commendable, however, it should take into great consideration the socioeconomic determinants - especially poverty, which is known to contribute to them significantly.

In some countries, particularly in Africa — a region which is most affected and susceptible to infectious diseases — poverty has been implicated as one of the major causes and challenges in controlling infectious diseases. In regard to the DRC, over a long period of years, the country has been ravaged by poverty. This is evident in the 2016 Human Development Index, which reported the DRC to be among the poorest countries in the world-ranking 176 out of 188 countries and with more than 4 out of 5 persons living below the $1.25 poverty line (UNDP, 2016). Poverty in the DRC has been characterized of poor housing conditions (poor structures constructed with mud and thatched roofs); overcrowding and unemployment (leading to substantial population movements); and poor sanitation conditions (due to inadequate hand-washing facilities and practices). As a result these conditions can be blamed for the sporadic transmissions of Ebola and other infectious diseases as well as their prevention and control. Fallah et al (2015) identified similar conditions in their study that quantified poverty as a driver of Ebola transmission in Liberia.

With the reported EVD outbreaks in the DRC, which have coincided with the ongoing era of implementing the SDGs, it is important that the interventions that are in place and those prompted to respond to the disease address poverty and its drivers. This should primarily focus on the poverty stricken areas in the DRC given that the EBOV typically poses both health and economic burden to the most disadvantaged populations (Bausch and Schwarz, 2014). Although the SDGs have been met with pessimism and criticized as overly ambitious, if they are to be achieved by 2030, the SDG3.3 and the other goals should present the world with various opportunities to stimulate poverty eradication and disease control strategies. These opportunities more specifically should augment the medical and health interventions to reduce the human scourge and unnecessary deaths caused by infectious epidemics like Ebola – currently ravaging the DRC. The interventions, however, in the DRC and elsewhere need to focus on health literacy and education to orient and make the population in the poverty-stricken environments aware of its social determinants which facilitate the EVD outbreaks and transmissions. This is because in many Ebola-affected settings, including the DRC and elsewhere, a large proportion of the population

remains unaware of the basic preventive measures which are needed for self-care, disease management and response especially those emanating from the socioeconomic hindrances.

5.2. SDG3.8: Achieve universal health coverage

Despite some of the countermeasures taken to respond to Ebola, pre-existing health systems in the settings affected and most prone to diseases are too weak, inaccessible and few in numbers are too weak to effectively deliver a full spectrum of health services. This makes the battle against the disease complex. It is evident that EVD and other infectious diseases and NTDs have been indiscriminately afflicting the poorest in the remote and rural areas with less access even to the few fragile and underequipped healthcare facilities (Matanock et al, 2014; Narra et al, 2017). Also, effective response to Ebola, as noted by Scot et al (2016) has been compromised by the neglect of health systems and services without adequate health care capacity, including the logistics and communication equipment.

In respect to the DRC, Kango (2016) asserted that the country's health care system languishes behind the rest of the world and is too dysfunctional in many regions to adequately tackle any serious public health disasters and emergencies such as Ebola. This has been mainly amplified by the protracted political conflicts and violence which have riddled the country for decades. No wonder the DRC's health systems are riddled with the problems such as deficit of trained health workers, rampant absenteeism and shortages. More so, social disruption; poor remuneration; shortages of energy; and poor transport systems also impede effective health care access and service delivery especially in Congo's remote and hard-to-reach areas. All these challenges leave a large proportion of the population without access to health care.

According to Save the Children (2015), unless the world commits to building systems of Universal health coverage (UHC) in all low and middle-income countries (LMICs) such as the DRC, then up to 30 countries will remain vulnerable to the Ebola-style epidemic. Ensuring effective access to preventive, curative and rehabilitative health care interventions at an affordable cost is therefore not only a necessity, but also a fundamental right for those at the risk of contracting EVD within and outside the DRC. In this case, UHC based on strong health systems and primary health care can be useful in the prevention of health disasters such as Ebola. Although the UHC has been a key aspect in the 2005 WHO resolution (WHO, 2005), in regard to EVD, which afflicts mostly the poorest populations as noted before, inclusion and a call of the UHC as a target of SDG3 is therefore timely and fundamentally important.

SDG.3.8 offers a window of opportunity for all countries to develop robust health systems with adequately trained capacity and services, which render affordable and accessible services to all people regardless of their socioeconomic status. That should be encouraged and supported through the favorable healthcare insurance policies which are applicable in all times of health emergencies and disasters.

5.3. SDG3.b: Support research and development of vaccines and medicines

Since 2004, with Ebola outbreaks in the DRC, Gabon and Uganda, some vaccine and drug innovations for EBOV under the championship of Bausch and Rollin (2004) were embarked on. However, the need for and the pace of developing them for Ebola and its sister virus, Marburg accelerated and gained much more momentum during and after the 2014 WAEO (BBC, 2015). The vaccines aim at preventing the deadly EVD whilst the drugs are developed to help boost the recovery of victims infected. A number of scientists and researchers, institutions and companies have been compelled to engage in developing the potential vaccines and drugs that could stop outbreaks of Ebola and Marburg altogether.

Vaccines such as chAd3, rVSV, rAd5, Brincidofovir, Favipiravir and ZMapp have been developed and trialed in both animals (chimpanzees, mice, guinea pigs and hamsters etc.) and human volunteers to understand their reactogenicity and immunogenicity (Yitades et al, 2014). So far, significant strides have been registered in trialing them. GlaxoSmithKline (GSK) – a British drug Company and the National Institutes of Health are the forerunners in developing a recombinant EBOV immunization vaccine in the U.S, and the Public Health Agency in collaboration with Merck/NewLink in Canada. Another successful vaccine trial on humans (under phase 1) has been carried-out by Johnson and Johnson Company together with the Bavarian Nordic Company. Other vaccine developers are being evaluated by WHO, and they are underway in Russia and Japan. The Ebola experimental jabs already carried-out have shown some major breakthroughs in the fight against the epidemic. The Guinea Phase III trial of Henao-Restrepo et al (2017) proved rVSV to be highly efficacious when administered to individuals with substantial prophylactic protective antibodies against Ebola. Also, the ZMapp was successfully applied and it helped the two U.S aid workers and a Briton who had contracted Ebola to recover.

Despite the hope raised by some Ebola trials, there remain some practical and ethical concerns to be addressed in the course of developing more EBOV vaccines and drugs. Infrequent administration of trials only after disease outbreaks, most of which are focused on the WAEO leaving-out other countries — which are also at risk of

EVD, raise a greater concern. Additionally, there is mistrust in some communities where the trials are being tested as to whether their objectives are hidden or not. Some see the trials as implementing the "Bioterrorism agenda of the West". Other pertinent concerns and obstacles relate to access to electricity and the storage facilities of the drugs since they need to be kept at minus 80C (especially in hot countries); the adverse risks like arthritis to the patients associated with rVSV; and their transportation especially in the impoverished settings. More so, despite of some financial support given, for example by the National Institute of Allergy and Infectious Diseases, funding remains a noteworthy challenge to harness drug research for EBOV. Bausch and Schwarz (2014) attributed this to the "economics of drug development" which are dictated by the competing market forces. Notwithstanding the breakthroughs and challenges faced, with the re-emergence of Ebola in the DRC and other previous outbreaks, effective diagnostics, treatment and prevention of Ebola can only be supported by vaccines and drugs. This needs to be guaranteed by research which is also agitated for in SDG3, along with adequate funding and the use of appropriate technologies.

5.4. SDG3.c: Increase health financing and recruitment, development, training and retention of the health workforce

A robust health system, contributes not only to the prevention and the control of diseases but also it is a panacea for achieving sustainable development (Gostin and Friedman, 2015; Tichenor and Sridhar, 2017). In contrast, weak health systems represent an enduring and systemic problem not only for global health security, but also for preventing and controlling diseases across the spectrum - both infectious and non-communicable. In most of the Ebola outbreaks, the health systems were overwhelmed, and lacked the ability to cope with the deadly disease, in part, due to inadequate and ill-equipped healthcare personnel— most of whom lacked prior experience— to respond to an epidemic (Save the Children, 2015; Narra et al, 2017). However, despite of Ebola being a high risk epidemic; during some outbreaks, many healthcare workers and volunteers remained committed and were on the front line to counter the disease to save the lives of those who were affected. Regrettably, however, this was stifled by a lack of basic healthcare resources - such as protective gloves and gowns, clean needles, disinfectants, intravenous fluids, and on the other hand absence of disease control protocols and guidelines. As a result, Bausch and Schwarz (2014) asserted that this left many healthcare workers and patients alike vulnerable to EBOV nosocomial transmission. During the WAEO, increased risk of Ebola among the healthcare workers was revealed with the greatest proportions of cases in nurses and nurse aides (34/97; 35%), and among the physicians

and physician assistants (17/97; 18%) (Matanock et al, 2014; Arwady et al, 2015). Besides, at risk of their lives during the outbreaks, healthcare workers remained poorly remunerated and incentivized.

This time around, how can Ebola re-emergence in the DRC help to transform and to strengthen the health systems with the competent and well-trained healthcare workers? The prevailing political and socioeconomic conditions in the DRC have greatly affected the already poorly developed and fragile rural health systems. This is coupled with the critical dearth in the number of health facilities and personnel among other challenges. Kango (2016) reported that the DRC has only 401 hospitals (owned by both government and non-governmental entities) as well as the skilled health professionals for 10.5 per 10, 000 people in such a vast country –with a population of over 80 million people.

In light of the above challenges of health workforce, the SDG3.c should again offer a unique opportunity to ensure that health systems in the DRC are sustainably funded - with appropriate health care personnel if they are to effectively respond not only to Ebola but also to other epidemics. This should be thoughtfully crafted - to encourage the optimal resource allocation for healthcare personnel in hospitals or other public health facilities, especially in the remote and most disadvantaged areas of the DRC. Also, motivation and extramural recognition should be encouraged by awarding the "danger-pay" to the distinguished services of health care personnel who are devoted to their work amidst risking their dear lives in the fight against dangerous health disasters limited not only to Ebola. Ultimately, these measures can help to overcome the contagion fears for EBOV and also other deadly epidemics, which could inevitably lead the poorly equipped and overworked healthcare workers to absenteeism and failure to respond to the disease in a timely manner.

5.5. SDG3.d: Strengthen the capacity for early warning, risk reduction and management

Although the early symptoms of EVD simply involve not feeling well, wide research indicates that they also include developing a low-grade fever, then having nausea, vomiting and/or diarrhoea. Other signs are very nonspecific and they include: fatigue, weakness, headache and muscle aches, a cold or flu (Zulane, 2014; Stein, 2015). During the WAEO, most of these symptoms were being presented in the populations in the Ebola stricken areas. Why then did it take the WHO five months and 1,000 deaths before Ebola declared an international health emergency in August? Moreover, after severe criticisms, the WHO acknowledged that its botched attempts to contain a wide spread of the disease in the West Africa was due to its incompetent staff and lack of information.

However, this couldn't have happened if there were an effective early warning and monitoring systems (EWARS) in place to ensure vigilance, timely detection, and surveillance of the above Ebola-like symptoms in the local populations.

Ideally, effective health communication is one key component, which could have helped in containing the spread of EVD during the WAEO. It employs a combination of both traditional and modern media platforms such as Television (TV) and radio programmes, printed media, and social media (like Facebook, twitter, LinkedIn, and whatsApp) and so forth. These platforms can disseminate mass information which can help to detect and sift-out the early indicators of any impending public health and conflict crises. For instance, Odlum and Yoon (2015) singled-out the use of Twitter as having played an immense role in the surveillance of Ebola outbreaks since it allows for the real-time data capture and dissemination. Following the official announcement of the first EVD case by Center for Disease and Control (CDC) in Nigeria on July 24th, 2014, the users of Twitter tweeted by discussing and disseminating instantly the information about the EVD outbreak (Ibid). This was estimated to have reached between 1,196,793 and 120,574,549 members of the population during a period of July 24th and July 30th, 2014.

Again, this time around what is the fate of the DRC as far Ebola EWARS is concerned? The WAEO and other outbreaks have increasingly contributed to recognizing the importance of proactive responses to health and emergency disasters. Presumably, that is why the 2018 EVD outbreak in the DRC is still subsidized to the catastrophic level of the WAEO. However, a lot is still to be done to improve the ability of DRC and other nations in preventing, and adequately preparing to respond to and recover from Ebola – as one of the potentially most devastating global health disasters. Like many other LMICs, the DRC has a limited capacity for EWARS required for the timely control of Ebola before becoming a large-scale epidemic. This is worsened by the country's porous borders that it shares with other countries. In this regard, the SDG3.d is a key reference for the EWARS for ensuring effective preparedness and response to EVD - which is becoming endemic in the DRC. EWARS should be consolidated and harmonized basing on existing technical support among the stakeholders at the local, national, regional and international levels. Based on the IHR, EWARS should also be scale-up and strengthen all aspects of the outbreak surveillance including contact tracking, public information and community mobilization, case management and infection prevention and control, and effective coordination (Tambo et al, 2014). That should also encourage the dissemination of the results of early warnings in mulit-languages especially those which are understandable to local populations which are often much more exposed to the disease.

6.0. Conclusion

Sustainable development is underscored as a germane in almost all regional and international frameworks. It is also reaffirmed in the SDGs which bind all UN members. However, as traditional natural hazards persist, alongside the persistence of civil conflicts and instability, socio-economic inequalities, poverty, large scale environmental degradation and widespread disease, especially in LMICs; achieving the SDGs by 2030 might be a deferred dream. New health disasters and emergencies exacerbated by epidemics like Ebola also pose another serious hindrance to achieving the SDGs especially in the developing world.

Ebola cannot be controlled overnight. It is not known when it will also be stopped - whether this time around its re-emergency in the DRC will be the last battle against it before 2030. Also, containing the ongoing Ebola outbreak in the DRC may not safeguard against the future outbreaks of a similar or more virulent nature. The optimism, however, relies on the effectiveness and timely administration of the countermeasures - biomedical and non-biomedical. Fortunately, some are enshrined in the SDG health-related goals as is vaccine and drug development, adequate health care workforce, research, UHC, and EWARS etc. While the future fight against Ebola remains unpredictable, the disease has presented a multitude of short and long-term political and socioeconomic challenges. It is also a cogent reminder of the deadly epidemics (such as bubonic plague, flu, smallpox and influenza) which ravaged the world in the 20th century. At this point in time, an array of efforts is therefore needed to support the implementation of SDG3 - which is an overarching goal for responding to infectious epidemics.

Ebola outbreaks together with the wider impacts of the protracted civil conflicts and violence, and political and socioeconomic challenges faced by DRC and elsewhere, not only retard the progress made against infectious diseases and other NTDs but their hard-won economic growth and development. Implementation of the SDGs represents a unique opportunity to reconsider the health approaches of responding to endemic and long-standing infectious diseases, and also to the new emerging epidemics like Ebola and its indelible impacts. Therefore the health-related SDGs need to be prioritized and integrated in the Ebola preparedness and response measures taken during any sporadic health disasters and emergencies like Ebola. This can proportionately make a greater contribution in ensuring the healthy lives and well-being for all of all ages not only in the DRC but also to the globe whose international peace and security is under the threat of Ebola. It is hoped that the discussions in this paper will help to inform the decisions of bureaucrats at different levels, especially those aimed at promoting and

integrating health into sustainable development. That should, however, be based on an approach elucidating an interaction between the environmental factors and countermeasures aimed at responding to re-emergency and transmission of this deadly disease in the DRC and elsewhere.

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