

Revisiting Ebola outbreaks public health emergencies in fragile conflicts zones and displaced populations in Africa

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19 Abstract

20 Little is documented on conflict and displacement impact on West Africa Ebola Virus disease (EVD) outbreaks. The paper revisits Ebola
21 outbreaks public health emergencies in fragile conflict zones and displaced populations across Africa. Findings showed that the duration of
22 conflict/war events varied one to forty three years. Notably the Darfur war in Sudan for 18-23 years, RD Congo and Guinea incessant political
23 and ethnical or mining conflict instability repeatedly ranging between 2-6 years, Liberia and Sierra Leone 5 and 12 years conflict/war events
24 associated Ebola outbreaks were documented. In West Africa, in Liberia the seven and four years of conflicts from 1989-1996 and 1999-2003
25 prior to a democracy nation led by S Johnson (president). Worldwide, there have been 28,639 cases of Ebola virus disease and 11,316 deaths at
26 December 2016. Ebola outbreak public health emergencies advocacy, community social mobilization and engagement, Ebola awareness and
27 effective and culturally dignified communications, social media and mass media risk communication, community literacy and preparedness and
28 emergency response engagement and participation, access and deployment of digital technology applications (Health map) in surveillance,
29 tracking and monitoring and key traditional burial practice behaviours changes were being translated into positive successes and benefits those
30 play key roles to mount rapid and effective prevention of further spread and containment activities of West Africa Ebola outbreak. Inter-
31 humanitarian organizations, institutions and other stakeholders including government's cooperation and coordinated leadership commitment and
32 investment were laudable in supporting accountability and transparency in the overall objectives of public health emergency preparedness
33 planning, care management systems in Ebola outbreak centres, public awareness epidemic early detection and rapid response as well as effective
34 immunization programs implementation to outwit Ebola virus. Sierra Leone conflict lasted from 1991-2002, Guinea recorded frequent relentless
35 instability than Liberia with two major conflict periods from 1989-1996 and 1999-2003. For the first time, we established a statistical significant
36 correlation between duration of war/conflict events and Ebola outbreaks onsets in Africa ($P < 0.05$). Unexpectedly; the total fatality rate in Liberia
37 or Sierra Leone only was greater than the previously reported cumulative EVD cases across Africa since 1976. It is crucial to intensify advocacy
38 on conflicts/wars resolutions to disaster risk reduction framework evidence practice implementation in fostering health and socioeconomic
39 development and growth. Authors call for the urgent need for concerned commitment and engagement of all stakeholders to develop, implement

40 and strengthening local, regional and global public health emergencies evidence practice approaches and strategies including national public
41 health disaster emergency situations insurance schemes in paramount in disaster high risk prone settings and particular in Africa.

42 **Key Words:** Public health emergencies, evidence, practice, preparedness, response, conflict, war, displacement, resolution, consequence, Ebola,
43 outbreak, Africa

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48 **Introduction**

49 Given the unprecedented scale and emerging outbreaks public health emergencies with limited absorptive capacity and functional surveillance and
50 early warning systems in most African countries, the West Africa Ebola outbreak in the most affected three countries was declared as public
51 health emergency international concern (PHEIC) in early 2014. The deadliest diseases in history and highly unparalleled dimensions of human
52 contagious through diverse transmission routes dynamics and severe to contain, leading to over almost 28,638 cases affected and more than
53 11,316 deaths worldwide (1). The West Africa Ebola outbreaks requires further in-depth in untangling the potential drivers and issues that
54 trigger the unhealthy events and reducing life expectancy with diverse health and socioeconomic consequences in different geospatial affected
55 and non-affected communities in Africa (2). The WHO declared Ebola outbreak as a public emergency of international concern in West Africa
56 early March 2014 as the number of cases and fatality rate has increasing significantly with more than 6,700 children orphans. The Ebola
57 epidemic has taken a heavy toll on the already scarce health workforce including some humanitarian workers having about 21 to 32 times high

58 risk probability to be infected with Ebola (815 confirmed and probable cases reported) than people in the general population in the three most
59 affected countries (1). Several reasons of the scale West Africa Ebola outbreak public health emergency were attributable to deficiencies national
60 and regional infectious diseases surveillance-response and early warning systems, governments and stakeholders including humanitarian
61 organisations coordinated logistics and management inappropriateness, weak to lack of capability of health systems to respond to health
62 emergencies and meeting routine community healthcare needs. In addition, to local staff shortages, long working hours, unpredictable and
63 delayed health workers remuneration, community resistance and stigmatization, poor social protection, lack of preparedness capabilities
64 (workforce and infrastructure) to personal protective equipment (PPE), defective infection prevention and control (IPC) and cultural- behaviour
65 practice, and poor mastering of frontline conditions and social-anthropological determinants(1,2,3).

66 The resulting unsettled conflict resolution and peace agreements consequences such as, human and animal displacement, food insecurity, forest
67 and wildlife incursions, illicit hunting and poaching and complex vicious cycle of poverty could be responsible for the West Africa Ebola
68 eruption and public health consequences and losses (2,4). Africa has been home to a range of conflicts and wars event-linked public health
69 emergencies since the era of colonisation up to date. Public health emergencies are sporadically and randomly distributed across the region and
70 perpetuated by a variety of actions ranging from conflict, wars and political leadership motivated civil unrest, ethnical genocide and mining
71 groups incursions. But also, accentuated by local insecurity and volatility linked population displacements and resettlements to regional neo-
72 colonial excitements splintering across African conflict-fragile countries with few effective and stable peace and reconciliation leadership and
73 functional competency processes and strategies (1, 4). In addition, African governments exhibit significant distinctive intra and inter country
74 conflicts types and events as well as diverse conflict trends and patterns. Conflict and civil wars have left several marks (1, 5), such as
75 dysfunctional, inadequacy and severely disabled in health systems, high level of illiteracy amidst populations of years without education, lack of
76 qualified health personnel and brain drain syndrome, chronic unemployment, fluid population movement and migration; fear, anxiety and
77 hostility, rumours and Ebolaphobia, discrimination and stigmatization, lack of water and sanitation, lack of integration of African traditional
78 medicine in the health systems and other sociocultural factors such as traditional burials and funerals practices involving close contact with the

79 corpses threatening the national security and international responses (3, 6). How do conflicts/wars and displaced populations events bring about
80 Ebola outbreak public health emergencies in Africa? Can peacebuilding and conflict resolutions reduce or enhance public health humanitarian
81 outbreak or disaster crisis / catastrophe prevention and resilience in Africa?

82 Few previous studies have documented the infectious diseases mainly Ebola virus (EVD) outbreaks public health emergency linked to
83 conflicts/wars or disaster crises events extend and severity across Africa. The relationship between conflicts/wars events, wars, populations
84 displacements and resettlements implications on Ebola outbreak emergence and spread in most Ebola affected communities is still poorly
85 understood (1, 4, 7, 8).

86 The article examines conflict/wars related displacement events impacts on alarming West Africa EVD outbreak public health emergencies
87 consequences, and provides practical and effective evidence-based in nurturing peace-building, evidence based conflict linked emerging
88 infectious diseases outbreak public health emergencies prevention and management approaches and strategies within Africa towards promoting
89 resilient health system strengthening and health equity, social justice and global economic prosperity.

90

91 **Methods**

92 **Search strategy and scrutiny**

93 The systematic review dataset was collected from PubMed and acknowledged website searched based in West Africa region conflict events to
94 emergence and spread of Ebola outbreak emergencies in the affected countries without restriction on language for studies published from
95 January 1, 1960, to July 31, 2017. We used the Uppsala/PRIO Armed Conflict Dataset (ACD) and “conflict, location and resettlement/
96 displacement public health emergencies events dataset [4] which contains information on the geo-location of conflict events impacts in West
97 African countries over the period 1997-2010 and other reference United Nations (UN) reports on conflicts, peace and conflict resolutions

98 meetings in West Africa Ebola affected countries. A unique feature of ACLED dataset is that it contains information on the type of events, as
99 well as the characteristics of the actors on both sides of the conflicts, events trend and patterns from 1997- July 31, 2017.

100 **Selection criteria and assessment**

101 To assess both the direct and indirect impacts of conflict/wars and Ebola outbreaks, we used the following keywords: “Ebola epidemics or
102 outbreaks linked conflict/war, civil unrest,” “political unrest, political instability,” and “displacement, resettlement, refugees’ camps public
103 health emergencies”. To assess articles that focused on Ebola outbreaks and conflicts zones we used free text and MESH terms (where
104 available). These conflict events are obtained from various, including national annual reports, regional and local conflicts proceeding and
105 humanitarian agencies or research publications. Exclusion criteria were determined a priori such as Ebola outbreaks editorials, view point
106 or guidelines and letters in isolated case report in military or tourists.

107

108 **Statistical analysis**

109 Data were analysed using Statistica version 12.0 software frequency of exposure, resurgence of diseases throughout the duration of conflict and
110 post-conflict EVD outbreak public health emergencies prevention and management or humanitarian assistance or relief. Analyses were two-
111 tailored with a significant P value threshold set at less than 0.05. Correlation analyses were performed between war duration, years for epidemic
112 minus war start, years for epidemic minus war end, cumulative cases (n) and cumulative fatality rate (%).

113

114 **Results**

Of the 304 publications produced by the search strategy, 56 reported conflicts and infectious diseases and 19 reports describing conflicts-related separate outbreaks were evaluated, found eligible and analysed.

3.1 Trend and pattern of political conflict/wars duration and Ebola Outbreaks in African countries from 1960 -2015

The trend and patterns of conflicts events related public health emergencies in Africa countries were diverse and complex ranging from civil unrest and wars associated displacement, diseases outbreaks (Ebola, Cholera, Polio, meningitis, rift valley fever, dengue), natural disaster events (climate change and global warming impact, Droughts related hunger and famine, deforestation and intense mining, flooding and mud-/landsliding, volcanic eruptions and coast sea rise or *el-nino*). The pattern of these situations were multifaceted and complicated by where rebels and militias or terrors capitalized on wild and forest jungles to hide, plan and stage their plots against the opponents to mining conflicts linked population displacement and forest incursions and wildlife those varied from one fragile country to another. The duration of conflict/war events varied one to forty three years. Notably the Darfur war in Sudan for 18-23 years, RD Congo and Guinea incessant political and ethnical or mining conflict instability repeatedly ranging between 2-6 years, Liberia and Sierra Leone 5 and 12 years conflict/war events were documented. In West Africa, in Liberia the seven and four years of conflicts from 1989-1996 and 1999-2003 prior to a democracy nation led by S Johnson (president). Worldwide, there have been 28,639 cases of Ebola virus disease and 11,316 deaths at December 2016. The most affected countries are Liberia and Sierra Leone and Guinea with a total of 10,675 and 11,123 cases, and 4,809 and 3,956 deaths respectively (Table 1).

Interestingly, the total Ebola outbreaks fatality rate in Liberia and Sierra Leone alone was greater than the documented cumulative fatality rate in Sudan, DR Congo, Congo, Gabon, Uganda, South Africa, Nigeria and Mali. The geopolitical ethnic rebels and militias or terrors conflicts, repression and fragility showed to influence greatly Ebola geographical distribution in the region in addition to ethnic, religious and economic divisions to gain control of political power, and natural resources. Conflict and war events appear to be directly linked to persisting emergence of Ebola outbreaks (e.g., DR Congo) in most affected communities in Africa (Table 1).

135

136 **3.2 Correlation between conflict/war event duration displacement impact on geographical distribution of EVD across affected countries**

137 The duration of conflict/war events in fragile conflict zones and displaced populations varied weeks to years across community and country. The
138 longest duration was recorded in Sudan 2with 17 years (1955-1972) prior the first Ebola outbreak in Sudan in 1976 Uganda (1979-1986 prior to
139 their first Ebola episode in 2000, and 1993-2003 with the 2007 and 2012 Ebola outbreaks respectively. Guinea in West Africa also recorded the
140 constant instability with Liberia 7 and 4 years conflicts and wars from 1989-1996 and 1999-2003 respectively. As well as conflict in Sierra
141 Leone broke out from 1991-2002 (10 years) with the cumulative resulting effect and emergence of West Africa Ebola outbreak. Conflicts/wars
142 fragile African zones have also lasted longer, on average they lasted from averagely weeks to eight years. There was a strong and statistically
143 significant correlation between conflict/war event duration, years of Ebola epidemic minus war onset and cumulative cases and cumulative
144 fatality rate to Ebola outbreak in Africa ($R=0.57$, $P=0.0016$; $R=0.74$, $P=0.000$). Also, there was a weak negative correlation between the
145 conflict/war event duration and years of Ebola epidemic minus conflict/war end. Our findings showed the duration of conflict/war could be
146 responsible for the human displacement, forest and wildlife incursions and hunting as the source of food (Table 1).Community or national/sub-
147 regional instability was documented at different time points across Africa and probably the epicentres were areas of former resettlement,
148 neighbouring districts or communities were wildlife have been chase or hunter away then rendering the next communities more susceptible to
149 EVD outbreak due to exposure to wildlife animals reservoirs and cultural practices.

150

151 **3.3 Building and strengthening early public health preparedness and response resilience capacity to future public health emergencies**

152 Promoting and strengthening Public Health Emergency Response (PHER) Framework implementation as recommended by,
153 the WHO and adopted the Africa Union is needed to accelerate local and regional public health emergency preparedness and
154 response benefits and gains compared to the existing reluctance and inaction.

155 West Africa EVD outbreaks has taught us that WHO Grade 3 PHEIC declaration delaying an announcement imperils lives and
156 health systems and more economic losses, and undermine domestic political legitimacy those motivate responses to international
157 emergencies and establishment of a US\$100 million contingency fund for rapid response WHO, UN and other humanitarian
158 organizations including NGOs commitment remains and rely on mobilizing funding from member states and other partners. yet,
159 2014-2016 West Africa Ebola outbreaks pledges remain unfulfilled and need can be fulfilled for sustained investment by global
160 partners in strengthening establishment and functioning of a global emergency fund in public health emergencies capacity
161 development and training of local health workers in knowledge, skills and abilities that can be deployed rapidly in preparedness,
162 planning, prevention and control of potential emergencies situations including diseases outbreak. Moreover boosting the local,
163 national and regional capacity with public health emergencies know-how and expertise ranging from integrated early detection and
164 surveillance, timely risk communication, community awareness and engagement, insourcing and outsourcing supply chain
165 procurement processes and quality management in accordance with International Health regulations, Human Rights and upholding
166 global health security Alma Mata and principles in future public health emergency situations.

167 Increasing public health emergency partnership and collaboration with local institutions, researchers and private sectors to rapidly
168 identify, investigate, track or map and define contextual acceptable response approaches and strategies development and
169 implementation is crucial. Efforts in more granularity, development of public health emergencies quality monitoring indicators and
170 metrics, guidelines and best practices is important in risk stratify geographic settings susceptible to disease outbreaks and earlier
171 responses to localized epidemics before they reach epidemic proportions and great potential of fund for the global public health
172 community. Improving our global health solidarity and collective capabilities to plan, detect, investigate and respond early
173 documented prolonged periods of civic unrest and suffering from decimated health systems with limited human resource capacity
174 compared to Nigeria successful EVD outbreak containment response in Guinea, Sierra Leone, and Liberia are all recovering from,
175 Albeit limited, public health infrastructure resulted in timely and effective efforts in public education, isolation, quarantine, contact

176 tracing, and case identification to control an epidemic after only 20 cases and 8 deaths in a little over a month in 2014 West Africa
177 EVD outbreak compared to recent DR Congo Ebola outbreak in forest with challenging access and humanitarian assistance and
178 response delivery using UN humanitarian helicopters.

179 Investing in Public health emergencies preparedness and response capabilities in conflict prone settings in Africa is core in and
180 require the establishment of robust and resilience local and regional public health emergency health policies, and integration into
181 national health agenda. While exploring local public health disaster insurance schemes and life emergency fund from all
182 stakeholders. where routine weak health systems, limited diagnostic tools and resources for structured surveillance and data
183 transmission are lacking to stem the Ebola virus disease epidemic is laudable but should not encourage complacency in our efforts
184 to improve the global public health infrastructure concerted international response is required to prevent urgent natural,
185 technological and others hazards and disasters occurrence and emergence before they become catastrophic.

186

187 **Discussions**

188 The devastating effects and the aftermath of political violence, civil war and ethnic conflicts have generated millions of displacement and
189 resettlement with unbelievable pictures of suffering and unnecessary associated persistence of Ebola outbreaks and emerging infectious diseases
190 mortality and disability across the African continent (4, 9, 12, 13). During times of armed conflict, civil disturbance, and state repression and the
191 basic critical right deteriorated. Attacks on and interference with health care providers, facilities, and services pose enormous challenges to
192 effective health care delivery where it is most needed (4). Yet, Africa still remains the land of complex conflicts environment and instability
193 where the vast majority of conflicts experienced on a daily or yearly basis is as a result of civil wars, ethnic divisions, civil conflict, battle for
194 local natural resources due to international commodity pricing and demand, fragile institutions and systems (4, 14, 15). African populations
195 continue to suffer from many different consequences of violent conflict, wars and forced mass migration since the early day of colonization up to

196 the contemporary neo-imperialism facets. They are challenged by highly significant risk and impact of poverty related disease outbreaks
197 including Ebola, cholera and HIV/AIDS pandemics, unemployment, low and loss of income owing to mortality and disability, and disruption in
198 economic activity and uncertainties that increased cost of doing business, and capital flight leading to socio-economic consequences and
199 humanitarian crises (6).

200 Since 2003 the Integrated Disease Surveillance and Response (IDSR) existed in Sierra Leone, but just like in most African countries remain
201 dormant until when Ebola hit. The extent, to which Ebola spreads, therefore, depends on the actions of politicians, doctors, and patients and on
202 how much those who are not infected trust their governments. At the very basic level, the local governments of Guinea, Sierra Leone, and
203 Liberia need to focus on building a proper healthcare infrastructure, training medical professionals, and sending a unified clear message about
204 Ebola to the masses (14). In addition to the basic steps that West Africa needs to take to contain Ebola, is the need to encourage regional
205 cooperation and cross-border collaboration in effective control as the strength of health systems varies across countries and an increase in health
206 standards within each country is necessary for successful assistance and mutual trust in effective and timely cross-country information
207 communication (1, 6).

208 Public health epidemic preparedness measures to be taken should involve training staff to use surveillance tools and manage cases of epidemic-
209 prone diseases and equipping them with reliable means of communication. Isolation facilities and high containment biosafety laboratories for
210 pathogen confirmation must be identified in advance, and support must be provided to local institutions regarding training and supplying
211 equipment and reagents. Data should be analyzed locally and regular feedback provided (e.g., a weekly bulletin) to health partners. A rapid
212 response mechanism for investigation alerts and implementation of control measures as outlined in outbreak preparedness plans (e.g., by an
213 interagency outbreak control committee) are also crucial. Diseases threat and outbreak surveillance systems rely on close partnerships with
214 NGOs, international organizations, and community groups and are built on resources and capacities of all organizations present. Effective
215 surveillance systems in emergencies have involved selecting a small number of syndrome-based priority events, using standard surveillance
216 forms, simplifying case definitions, health facilities weekly reporting of data, immediate reporting if set alert thresholds are passed. Establishing

217 community-based programs and mechanisms for identifying disease clusters. Improving detection and control of infectious diseases pre, during
218 and post-conflict situations in any disaster risk and emerging infectious diseases primarily require a functional healthcare system, preparedness
219 and response systems. It is imperative that the technical capacity of all humanitarian health partners and ministries of health regarding disease
220 surveillance, prevention, and control in conflict-affected countries be enhanced to ensure effective implementation of infectious disease
221 interventions. Such implementation can be achieved through availability of internationally accepted standards, guidelines, and tools adapted to
222 conflict situations, which can be supported by specific training of health planners and health facility staff, and rapid mobilization of international
223 experts to provide technical field support as required. In poor resource settings such as Africa and elsewhere, building local, national and
224 regional capacity peace and conflict resolutions, and disease prevention and control should be an integral part of programs implementation.

225 It is worth noting that major humanitarian international and local non-governmental organizations (NGOs) have been created, with the purpose
226 to improve the effectiveness of relief operations and to alleviate the suffering of these vulnerable populations. However, humanitarian aid
227 logistics and coordination during previous decade had remained mainly justified on the basis of humanitarian geopolitical strategies and its
228 charitable nature of emergency response, rather than its effectiveness (15). More detailed investigations are required to establish the links
229 between Ebola outbreak emergence and transmission dynamics pre, in or post conflict events. Such will include assessing the role of population
230 displacement, forest and wildlife encroachment, ecological and environmental consequences. Conflict may lead to the displacement of large
231 populations into temporary settlements or camps with overcrowding and rudimentary shelters, inadequate safe water and sanitation, and
232 increased exposure to disease vectors during the acute phase of the emergency. In protracted and post-conflict situations, populations may have
233 high rates of illness and mortality due to breakdown of health systems, flight of trained staff, failure of existing disease control programs, and
234 destroyed infrastructure. With the purpose of providing an evidence base for actions aimed at reducing the number of conflict consequences,
235 spatio-temporal trends conflict epidemiology and knowledge of the impact of conflicts on public health, and its ensuing impact on outbreaks
236 deaths or lifelong health disabilities. Thus, informed policy-making through the provision of reliable evidence based knowledge and information

237 for emergency decision making and response including rapid diagnosis, case isolation and management, contact tracing, safe burials, and the
238 identification of transmission chain implementation and performance (6, 16, 17).

239

240 Our findings showed that conflict/war events affect the spatial and temporal patterns of Ebola outbreaks both in a quantitative and qualitative
241 ways across affected African countries (Table1). The history of conflict in the region and noted that after decades of civil wars in West Africa
242 outsiders and authorities are widely distrusted as result in Guinea, Sierra Leone, and Liberia, the response to the Ebola outbreak has been highly
243 politicized, with political factions pointing fingers at each other, further contributing to the social instability. Similar trends are beginning to be
244 seen in the case of Ebola in West Africa. Violence against civilians in Guinea where a crowd attacked an Ebola isolation centers and threw rocks
245 at aid workers, likely stemming from fear and misinformation about the disease, was seen as early as April 5, 2014 with the first official
246 diagnosis of the disease probably as result of three instances of violence against civilians occurring in Guinea in 2014 thus far (1, 4, 14, 15).
247 Conflict prevention, peace and security training and awareness could provide several opportunities to civil society, and citizens highly vulnerable
248 to the influence, governments and conflict early warning in Africa and elsewhere as capacity to respond to these complex challenges remains
249 weak with structural weaknesses, requisite institutional capacity and frameworks and significant economic growth albeit obvious democratic
250 government and development gains. Some explanations have been given by Jonathan and colleagues (2008), however it can be directly
251 established that the emergence of Ebola outbreak can be linked with years of conflicts, displacements, forest and wildlife insurgences as well as
252 human hunt for food for survival in the wild Africa forest. It has also been shown that mining activities have direct and indirect implications on
253 the wildlife and ecosystems leading to emergence and resurgence of known and emerging infectious diseases outbreaks (19, 20).

254 In contrast to central Africa, DR Congo persistent conflict/war events instability in the Mobutu Sese Seko military ruling era, the 1990s and
255 2000s periodic conflicts witnessed the highest second after Congo with more than 7 times episodes of Ebola outbreak in 1977, 1995, 2005, 2007,
256 2008, 2012 and 2014 compared to the first West Africa cases in 2014 (Table 1). In West Africa, Liberia had a long civil conflict / wars from
257 1989-1996 and 1999-2000 respectively. Only this total fatality in Liberia is greater than the cumulative fatality rate in Sudan, Congo, Gabon,
258 Uganda, South Africa, and Nigeria (Table 1). It could be demonstrated that DRC, Liberia and Sierra Leone's violence supports the notion that

259 more events drive increase in locations and actors vulnerability to Ebola outbreaks and psychosocial challenges. The WHO is working with the
260 governments of EVD affected countries to strengthen the health system, including bolstering the capacity of public laboratories to detect most
261 existing infectious likely to cause epidemics (20,21). Since the middle 1990s, wars and political instabilities in West Africa (Liberia, Sierra
262 Leone, Côte d'Ivoire), Great Lakes and East regions (DR Congo, Uganda, Burundi, Rwanda, Ethiopia, Eritrea, Somalia) have forced millions of
263 people to flee their homes or communities within and across their own borders stretching from northern Mali through Southern Algeria to Libya
264 into Egypt. Nowadays, recent outbreaks on Cholera and Polio, Meningitis and Influenza to famine and malnutrition/food insecurity have been
265 reported sporadically in conflict zones in South Sudan, Central Africa Republic (CAR) and Nigeria insurgency-related activity of Boko
266 Haram and associated actors, DR Congo recent Ebola outbreak and Somalia continue to be worrisome due to high rate of displacement of
267 indigenous populations and casualty attacks relatively bleak. Interestingly, in Uganda, more than half of the 1.8 million of internal displaced
268 populations in 2005 returned homes by December 2009, similar to Burundi from 800,000 displaced in 1999 to 100,000 at the end 2009. With
269 considerable decreased in recent years, strengthening African leaders political commitment is the most important factor in increasing financial
270 resource capacity and peace building instilling national patriotism and resilience, disarmament and reintegration post conflicts programs.

271 Conflict-affected countries represent one of the weakest links in global health security and should be prioritized by the international community
272 in provision of technical and operational support to implement core capacities for detection and response to epidemics. The trend and patterns of
273 conflicts war events in Africa countries is diverse and complex ranging from ethnic, civil to mining conflicts and varied from one country to
274 another and resulting to incursion in wildlife and forest where rebels and militias or terrorists capitalized on wild and forest jungles to hide, plan
275 and stage their plots against the opponents. Consequentially, insidious and spread of rape and sexual violence against girls and women, lack of
276 food, shelter and medical access to forced recruitment of children into armed groups (e.g. Boko Haram in Northern Nigeria) have been
277 documented. Boko Haram in Nigeria eight years conflict left more than 20,000 deaths and 2.6 million displaced in Nigeria, with spilled out
278 violence in Cameroon, Chad and Niger, and creating major humanitarian catastrophes in refugees' camps in recent times. Military humanitarian
279 forces (local, US, UK) were been deployed in most affected Ebola outbreak West Africa countries emergency humanitarian responses in 2014-

2015 and slow down during recovery and rebuilding programs amongst survivors and affected populations (22,23). These programs have a crucial role and are valuable resource in health systems development and socioeconomic growth. However, military humanitarian assistance in outbreak has not been fully elucidated and requires further attention in terms of neutrality, community liaisons, and cooperation, consistent and transparent policy and humanitarian interventions especially in previous war zones. Also, it might be of importance in avoiding resurgence of geopolitical conflicts, repression and fragility showed to influence greatly Ebola geographical distribution in the region. In addition to ethnic, religious and economic divisions, conflicts to gain control of political power, and natural resources appears to be directly linked to Ebola outbreak in most affected communities in Africa (4, 20). Although the difficulty to access communities, security problems and poor communications and transport infrastructure, weak health systems and human health resources, poor leadership and the delay in international emergency response contributed to the worsening situation in the ongoing Ebola crisis in West Africa.

Based on the historical trends and dynamics patterns of instability and emerging outbreak in these countries, others countries worldwide suffering from similar challenges and issues in Africa such as central Africa Republic, Sudan, Libya, Burundi, Nigeria, Mali, Kenya, Rwanda, Niger, Somalia, Egypt, Tunisia, Algeria, Mozambique, Senegal, Madagascar, and Malawi can simply take the right steps in the right direction to avoid the horrors of Ebola and other emerging infectious diseases (18,19, 20). Again, lessons learnt from EDV outbreaks and conflict related public health emergencies consequences can serve in early warning alert and mitigation on incessant Middle East and Asia-Pacific countries whirling in the same dilemma and perpetual state of fragility including Syria, Iraq, Lebanon, Pakistan-Kashmir, Palestine, Myanmar, Sri Lanka, Thailand, as well as Latin America countries including Colombia, Guatemala, in Europe Northern Ireland and Western Balkans. Our findings provide evidence and information insights to leaders, organizations such as mining, policy makers and other stakeholders especially communities on their importance and role in seeking and undertakings rebuilding strategies pre-/post conflict events, and advocating on protection of environment and wildlife in Africa and elsewhere on sustainable national and global health, socioeconomic and environment development and growth (3,22, 23, 24,25). In 2016, the growth in displacement figures was largely driven by the conflicts, gender violence, hunger and human rights violations in Middle Eastern countries such as Syria, Yemen, Iraq and India-Pakistan border. But conflicts in sub-Saharan Africa also forced millions of people to flee their homes in countries such as South Sudan, the Central African Republic, Burundi, the

302 Democratic Republic of Congo, and Sudan. The region also hosted a large and growing number of refugees, which continued to exert enormous
303 pressure on public services and local infrastructure in neighboring countries far-reaching political implications. African governments and local
304 and multinational actors including humanitarian organizations should agree to shoulder primary responsibility for preventing forced
305 displacement, access to the displaced and delivery of relief supplies. Recent Cholera outbreak in Yemen requires detailed outbreak investigation
306 and rapid assessment is currently ongoing due to limited local capacity. The source of this cholera infection needs to be quickly established to
307 facilitate appropriate strategies and interventions for rapid containment. There is an urgent need to strengthen the cholera case management
308 system as the current treatment centre falls short of the minimum standard. There is also a need to secure personal protective equipment, stock of
309 medical supplies and dedicated personnel, in case of an influx of patients; likewise mudsliding and flooding related public health emergency
310 disaster with potential cholera outbreaks threat in Sierra Leone that led to over 1,000 deaths in August 2017. Therefore, both public health
311 emergencies events require urgent local and international requisite resources (mobilization and technical support in recovery and rebuilding
312 (mental, food and social, human capacity, funds and logistics) efforts as well as urban planning laws and reforms are critical to strengthening
313 Sierra Leone and other prone disasters countries public health emergencies preparedness and response capabilities. The insufficiencies in national
314 and regional surveillance and early warning and emergency response systems showed to favor Ebola outbreaks in both urban and rural areas
315 under natural and human made conditions. The central Africa of DR Congo neighbourhood area had been affected by civil war since 1997 and
316 was controlled by Congolese rebels. Moreover, an estimated 850,000 children of 1.4 million indigenous populations have been forcefully
317 displaced and horrific atrocities of committed with over 3,383 deaths in over 20 ethnic (Luba and Lulua) groups villages completely destroyed
318 in Kasai provinces, DR Congo in due to constitutional crisis by violation of presidential term limits set out in the constitution, succession deal
319 brokered and Bana Mura government-backed militia versus Kamuina Nsapu militia factions uprising since March 2016 to date. Likewise
320 Boko Haram terrorism and insurgency has been linked to political instability and insecurity in Nigeria threatening Cameroon, Chad and Niger.
321 CAR and Burundi on neighbouring Uganda, South Sudan, Angola and other civil unrest in African countries remain of regional and global public
322 health concerns. African leaders have limited peace-building technical capacity and leadership competencies, peace-conflict resolution to public
323 health laboratory know-how capacities, facilities and lack of technical expertise require an urgent attention. For example, in South Sudan, the

324 situation has led to continued food insecurity as no tangible agricultural activities have taken place. The armed conflict has resulted in massive
325 population displacement, disrupted people's livelihoods, trade and access to humanitarian assistance, which remains the main source of food and
326 livelihood in the conflict areas. The situation is being compounded by the high food prices and economic meltdown, which has eroded household
327 purchasing power. High levels of severe acute malnutrition remain a serious public health concern across South Sudan, being driven by
328 widespread fighting, displacement and poor access to services, disease outbreaks, extremely poor diet and extremely critical levels of acute
329 malnutrition, putting 45,000 people at risk of famine (in terms of both quality and quantity), low coverage of sanitation facilities, provision of
330 healthcare services have been severely compromised, and poor hygiene practices. WHO and other aid agencies will continue providing
331 humanitarian assistance to the populations humanitarian crisis needs. The recent upsurge of cholera in the populous cosmopolitan Nairobi city
332 and refugee setting in the north-eastern part of Kenya remains a challenge. The resurgence is being driven by factors such as high population
333 density in peri-urban and camp settings, mass gatherings, low access to safe water and proper sanitation, and mass population movements within
334 the country and with neighbouring countries. High level I multisectoral engagements and advocacy to tackle humanitarian public emergencies
335 crises across Africa including nutrition screening and treatment, vaccination (polio, measles and tetanus), vegetable seeds, fishing tools, NFIs,
336 WASH and borehole repair kits to 1,600 vulnerable households for cumulative socio-economic and public health impact. Strengthening local
337 and regional outbreaks and conflicts early detection, surveillance and monitoring implementation is crucial evidence-based outbreak associated
338 conflicts prevention and control countermeasures may be hampered by fighting, impeded access to populations, destroyed infrastructure, limited
339 coverage of healthcare services, poorly trained health staff, and difficult logistics that prevent delivery of drugs. Hence, strengthening public
340 health emergencies events surveillance, knowledge and abilities is crucial in investigating and monitoring invasive pest, vector and associated
341 diseases threats or outbreaks for effective prevention and control programs, improving access, to safe water and proper sanitation in the camps.
342 Recognizing the need to investing in proactive and resilient behaviour social mobilisation and resilience activities in sensitizing the local
343 population mainly the youths is imperative against disasters or catastrophic crises in the region.

344 However, it should be noted that the geo-coding of the events in the ACLED dataset is not immune from potential biases and measurement. We
345 cannot rule out the possibility that the reporting of conflicts is biased towards certain types of countries, regions or events, as some regions might
346 in particular have better media coverage. An event dataset such as ACLED cannot, by definition, be exhaustive.

348 **Conclusion and recommendations**

349 This paper provides the first comprehensive evidence-based conflict and wars public health emergencies associated Ebola outbreaks events
350 implications in Africa and provide practical and effective approaches, programs and activities in full rebuilding processes (peacekeeping, peace-
351 building, conflict resolution, healthy outbreak recovery) for wellbeing and productivity. Authors call for the urgent need for concerned
352 commitment and engagement of all stakeholders to develop, implement and strengthening local, regional and global public health emergencies
353 evidence practice approaches and strategies including national public health disaster emergency situations insurance schemes in paramount in
354 disaster high risk prone settings and particular in Africa is imperative to fostering health and socioeconomic development and growth. The
355 importance of implementation of effective and timely outbreak early warning alert, surveillance and emergency response systems is recognised,
356 but there is a scarcity of evidence on optimal ways to detect these outbreaks in most conflict eventful countries in Africa. Building positive
357 legacy through investing in evidence-based and effective public health emergencies partnerships strengthening by financing community-based
358 programmes in championed by the Africa CDC centres core public health laboratory infrastructure and Human resources capacity development
359 and targeted training, and epidemiologic surveillance expertise are all urgently needed in West Africa and beyond. Global funding and local
360 public-private commitment and investment including disaster insurance schemes capabilities could be assets to deploy resources successfully
361 and in a timely fashion to prevent and respond to disaster emergencies. The collective public health emergencies benefits is vital in health
362 systems strengthening including substantial resource expenditures and routine full functioning health services successful implementation in line
363 with IHR, 2005 and global community agenda against international infectious disease threats. While advocating for an effective implementation

364 of outbreaks and emerging tropical diseases surveillance response systems in Africa, Surveillance systems are often weak in conflict situations,
365 which results in delays in detection and reporting of epidemics.

366

367 **Competing interests**

368 The authors declare that they have no conflict interests

369

370 **Author's contributions**

371 ET conceived the study and designed methodological search strategy and assessment. ET performed the review search and wrote the primary
372 draft of the paper. OAO, ECU, MF and JYN provided additional country information. ET provided extensive revision and update. All authors
373 read and approved the final manuscript

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441 **Table 1: Trend and pattern of political conflict/wars events and Ebola Outbreaks in African countries from 1976 -2016**

Country	Conflict/War start year	Conflict/War end year	Conflict/War duration	Ebola species	Ebola epidemic year	Years for Epidemic minus war start	Years for Epidemic minus war end	Cumulative cases(n)	Cumula deaths
Guinea	2009	2010	2	Zaire ebolavirus	2014	5	4	3,804	2,53
Liberia	1999	2003	5	Zaire ebolavirus	2014	15	11	10,675	4,80
Sierra Leone	1991	2002	12	Zaire ebolavirus	2014	23	12	11,123	3,95
Nigeria	1967	1970	4	Zaire ebolavirus	2014	47	44	20	8
Mali	1960	2012	2	Zaire ebolavirus	2014	2	2	8	6
Senegal	2010	2012	3	Zaire ebolavirus	2014	4	2	1	0
South Sudan	1955	1972	18	Sudan ebolavirus	1976	21	4	284	151
South Sudan	1955	1972	18	Sudan ebolavirus	1979	24	7	34	22
South Sudan	1983	2005	23	Sudan ebolavirus	2004	21	-1	17	7
Gabon	1960	1963	3	Zaire ebolavirus	1994	34	31	52	31
Gabon	2000	2000	1	Zaire ebolavirus	2002	2	2	65	53
Congo	1996	1997	2	Zaire ebolavirus	2002	6	5	59	44

Congo	1996	1997	2	Zaire ebolavirus	2003	7	6	143	128
Congo	1998	2003	6	Zaire ebolavirus	2003	5	0	35	29
Congo	1998	2003	6	Zaire ebolavirus	2005	7	2	12	10
Uganda	1998	2003	6	Zaire ebolavirus	2000	2	-3	425	224
Uganda	1998	2003	6	B. ebolavirus	2007	9	4	149	37
Uganda	1998	2003	6	Zaire ebolavirus	2011	13	8	149	37
Uganda	1998	2003	6	Sudan ebolavirus	2012	14	9	7	4
DR Congo	1960	1965	6	Zaire ebolavirus	1976	16	11	318	280
DR Congo	1960	1965	6	Zaire ebolavirus	1977	17	12	1	1
DR Congo	1960	2017		Zaire ebolavirus	2017	8	4	4	813
DR Congo	1960	1965	6	Zaire ebolavirus	1995	35	30	315	254
DR Congo	2005	2006	2	Zaire ebolavirus	2007	2	1	264	187
DR Congo	2005	2006	2	Zaire ebolavirus	2008	3	2	32	14
DR Congo	2008	2008	1	Zaire ebolavirus	2012	4	4	57	29
DR Congo	2008	2008	1	Zaire ebolavirus	2014	6	6	82	50
				Tai Forest					
Ivory Coast	2008	2011	4	ebolavirus	1994	-14	-17	1	0
South Africa	1948	1994	47	Zaire ebolavirus	1996	48	2	1	1

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