

# Response to Public Health Disaster - A Review of Preparedness to Disasters in Liberia

Lydia T. Cassell<sup>1</sup>, Ayun Cassell<sup>2,\*</sup>

<sup>1</sup>Department of Public Health, Cuttington University School of Graduate and Professional Studies, Monrovia Liberia

<sup>2</sup>Department of Surgery, Liberia College of Physicians and Surgeons, Monrovia Liberia

\*Corresponding author: [ayuncasselliii@gmail.com](mailto:ayuncasselliii@gmail.com)

Received June 06, 2019; Revised July 12, 2019; Accepted July 26, 2019

**Abstract** Public Health disaster is a challenge worldwide. International consensus views emergencies as barriers to progress on the health-related Millennium Development Goals (MDGs). Natural disasters, biological disasters, technological disasters and societal disasters have ravaged even the most prepared and developed nations. However, the emergency response is better when a strong public health preparedness system is established. The lack of these modalities in Africa makes disaster management impossible and devastating. Liberia as a developing nation is yet to accomplish a preplanned coordinated response due to the lack of resources, lack of expert and moreover the lack of accountability and quality control.

**Keywords:** *disaster, emergency response, preparedness, public health*

**Cite This Article:** Lydia T. Cassell, and Ayun Cassell, "Response to Public Health Disaster - A Review of Preparedness to Disasters in Liberia." *American Journal of Public Health Research*, vol. 7, no. 4 (2019): 137-142. doi: 10.12691/ajphr-7-4-2.

## 1. Introduction

International consensus views emergencies as barriers to progress on the health-related Millennium Development Goals (MDGs), as they often set back hard-earned development gains in health and other sectors [1]. In the past decade, a succession of public health emergencies has challenged preparedness capacities of government agencies and response, hospitals and clinics, public health agencies, and academic researchers, in the United States and abroad [2].

Resilience to disasters—the ability to mitigate and rebound quickly—has received increased attention in the relatively new field of public health emergency preparedness and is now a central focus and a required activity for all public health departments that are recipients of Centers for Disease Control and Prevention (CDC) Public Health Emergency Preparedness (PHEP) grants [3]. Strengthened preparedness and response capacities from community to national levels are the foundation of a timely and effective response [4].

In the last three decades, Africa has borne a significant disaster burden, largely due to the effects of climate change, environmental degradation, rapid urbanization, increasing poverty, and increased disputes over land, resources, ethnic identity, and political and religious ideology [A]. Of the newly displaced 11 million people globally in 2014, an estimated 60 % were from five countries, three of which were African countries (South Sudan, Democratic Republic of Congo, and Nigeria) [5].

Liberia is a signatory to the International Health Regulations (2005) and is obligated to build capacities to detect, prevent and respond to national, regional and international public health risks, including infectious disease threats, and chemical and radiological events. Until 2015, Liberia has been assessing the progress of development of its IHR (2005) core capacities self-reporting to the World Health Assembly (WHA) annually [6].

The basic findings of the assessment are that mechanisms for management, planning and coordination of disaster management and disaster risk reduction activities are generally nonexistent at County level [7]. Only Nimba County has a Disaster Preparedness and Awareness Committee, a coordinating mechanism, largely for responding to disasters in communities [7]. In Lofa, efforts have been made to establish a disaster relief committee, but with limited membership [7]. The underlying reason is the absence of a national framework that defines structures and processes for disaster risk reduction at local government level. National Disaster Relief Commission mechanism exists only at central level in Monrovia and has no corresponding structures at County, District and Community levels [7]. This is the key institutional gap [7].

Strengthening the IHR core capacities and having strong health system will protect lives and increase resilience of the Liberian people to threats of epidemics and disasters [6].

This National Action Plan for Health Security (NAPHS) developed through a consultative and multi-sectoral engagement is a tool for the government to comprehensively address the threats to public health security in Liberia [6].

Following the Joint External Evaluation (JEE) report, the Ministry of Health (MOH) and the National Public Health Institute of Liberia (NPHIL) with the support of partners undertook several initiatives to address some of the identified gaps and weaknesses [6]. Natural, biological, technological and societal hazards put the health of vulnerable populations at risk and bear the potential to cause significant harm to public health [1]. Examples of these public health hazards are as follows: Natural (earthquake, landslide, tsunami, cyclones, flood or drought) [1]. Biological (epidemic disease, infestations of pests) [1]. Technological (chemical substance, radiation agents, transport crashes). Societal (conflict, stampedes, acts of terrorism) [1].

This review tends to ascertain the level of preparedness and response to public health disaster in Liberia as compared to the global trend.

## 2. Methodology

A literature review was conducted containing published articles and surveys from 2006 to 2019 using various search engines as Google, Google Scholar and PubMed electronic database. The search term included the following terminologies (preparedness and response to public health disaster) with annexes Europe/Africa/West Africa and Liberia. A total of 50 studies were found and only English language studies were considered for the review. The study included 16 articles consisting of surveys, retrospective and prospective data. The following parameter assessed were Natural (earthquake, landslide, tsunami, cyclones, flood or drought), Biological (epidemic disease, infestations of pests) Technological: (chemical substance, radiation agents, transport crashes) and Societal (conflict, stampedes, acts of terrorism).

## 3. Discussion

The concept of a “public health emergency of international concern” is not limited to epidemic prone diseases, but extends to biological, chemical and nuclear hazards, including the chemical or nuclear contamination of the environment, and contaminated food and pharmaceuticals [8]. An all-hazards approach is vital to effectively manage the risks to health from hydro meteorological, geological, biological (such as epidemics and pandemics), technological and societal hazards [4].

The epidemic of the severe acute respiratory syndrome (SARS), the 9/11 terrorist attacks, and the anthrax mailings, stand out as signal examples in the early years of the decade [2]. Community resilience has been defined as the sustained ability of a community to withstand and recover from adversity (e.g., economic stress, pandemic influenza, manmade or natural disasters) [3]. It represents a paradigm shift in public health emergency preparedness in emphasizing an assessment of community strengths not simply describing vulnerabilities [3].

Collaboration between human and animal health and the Environment Protection Agency (EPA) is important because most epidemics arise from the interface between human and animal health and the environment [6]. Events threatening health security in Liberia range from zoonotic

diseases to food insecurity and risks of diseases importation [6]. In recent years, such events have contributed to significant morbidity and mortality among humans and animals [6]. However, key weaknesses continue to exist including reported challenges with the community level surveillance structure; weak national laboratory network, quality standards and management system [6]. Discussion with some stakeholders demonstrated limited understanding and efforts to address disaster risk reduction issues [7]. This limited understanding was also made evident by the responses gathered from the mini-survey that shows 74% of randomly selected interviewees having limited or no understanding of disaster risk reduction [7].

Natural disasters as well as emergencies resulting from human actions, may create dangerous or contaminated areas that present a risk to public health and must be immediately closed off to the public [8]. The 2005 floods in Europe and hurricanes in the USA also reminded us that natural disasters do not only affect developing countries: they are global problems, and no country is safe from them [9].

## 4. Natural Disaster

The ongoing 2018 Atlantic hurricane season and the number of wildfires in California and other Western states have demonstrated that natural disasters can have a tremendous public health impact [10]. From injuries in the immediate aftermath of the storm to long-term mental health effects, recovering communities face a range of challenges [10]. And, public health works tirelessly alongside and on the frontlines of the preparation, response and long-term recovery [10]. In the last year an excess of 700 emergencies arising from natural hazards affected more than 200 million people [1]. A comparative analysis of emergency statistics in Latin America found that for each disaster listed in global disaster databases, there are some 20 other disasters with destructive impact on local communities that are not recorded [1].

In Canada, wildfires have resulted in large population evacuations, air pollution and deaths; floods are an annual risk causing displacement of Indigenous communities, urban infrastructure damage and adverse health impacts [11]. The 2013 Lac-Mégantic train derailment and explosion resulted in 47 deaths, environmental contamination, and adverse mental health impacts [11]. Reducing risks and the short and long-term impacts of all-hazards emergencies on population health is a key responsibility for the public health sector [11].

In addition to natural disasters such as the 2010 earthquake in Haiti and the 2012 Superstorm Sandy, [2].

Natural disasters as well as emergencies resulting from human actions, may create dangerous or contaminated areas that present a risk to public health and must be immediately closed off to the public [8]. Critical lessons from Hurricane Katrina in 2005, the H1N1 pandemic of 2009, and, most recently, Hurricane Sandy continue to demonstrate that underlying issues of lack of trust and the absence of sustainable engagement with community-based organizations, faith-based organizations, and other neighborhood-level organizations create significant disparities in population health outcomes following emergencies and disasters [3].



**Figure 1.** Source: <https://themonroviatimes.com/2018/06/29/flooded-monrovia/> severe flooding in Monrovia City affecting schools, homes and businesses

The most common hazards causing disasters in the Liberian communities are floods (Figure 1), windstorms, fire, and sea erosion [7]. Incidents of drought have also been reported but these climate related hazards are expected to worsen with climate change [7]. The result of a mini survey in Liberia showed that windstorm constitutes 47% followed by floods, 23% which during the previous assessment was high in occurrence. Lightning is another potential hazard that is emerging [7]. Disposal of toxic waste in rivers (water pollution) has been of some concern with no visible concrete risk reduction programs in place. Implementation of zoning laws, city ordinances and building standards remain a huge challenge for local authorities [7].

Efforts to relocate communities at risk especially in areas affected by sea erosion and floods are resisted largely due to fear of loss of livelihoods and lack of perceived viable options [7]. The 3rd highest priority of National Adaptation Plan of Action (NAPA) which calls for reduction in the vulnerability of coastal urban areas from erosion, floods, siltation and degraded landscapes will address the effect of sea erosion which is Liberia's major hazard [7]. Sea erosion is viewed as the number one threat in all coastal cities, such as Buchanan, Greenville and Robertsport. For example, it is observed that sea erosion has removed at least 250 meters of beach in Balehweh Town, since 1969, an encroachment of 6.6 meters per year [7]. The same report indicates that in Buchanan City, in May 2008, Sea erosion destroyed

houses and properties, leaving 1000 people homeless. While the lack of technical data on the sea erosion processes is considered scarce, the impact of sea erosion is visible everywhere [7]. Floods: According to LNRC in Margibi in 2007 floods displaced more than 2500 people while Communities such as New Kru Town, Robertsport and Fanti town in Buchanan are constantly under water [7]. There was a reported case of flooding that took the lives of a child and her mother in Porulu in Kolahun district, Lofa County [7]. Floods in mid-June every year in Monrovia displaced about 600 people mostly women and children (see Figure 1. above).

Windstorms: in February 2009 strong winds ravaged Karnpaly in Gbehlay Geh District, in Nimba County, Karmoh Town and the neighboring town of Bilibukree in Sinoe County, Robertsport and Tewor Fahnbulleh in Grand Cape Mount County as well as Kolahun and Voinjama in Lofa County destroying houses, trees, livestock, banana plants (Table 1). In the Karnpaly and Kolahun disasters, public buildings (i.e. school buildings and hospitals) were damaged as well [7]. Other Hazards and Potential Disasters include unregulated mining activity that resulted in a landslide in No Way Camp (1982) Grand Cape Mount Killing over 40 people [7]. In Bangoma, the site of open diamond and gold mining, presents a potential danger of a landslide and the existence of crater in Robertsport indicates evidence of volcanic action perhaps in some distant past [7].

**Table 1. Shows the Various types of Public Health Disaster in Liberia**

Disaster	Type of Disaster	County	Year	Response	Mortality/ Hazard
Floods	Natural	Margibi	2007	Inadequate support	2,500 people affected
Windstorms	Natural	Nimba, Sinoe, Grand cape mount and Lofa	2009	Inadequate support	Houses, trees, livestock, banana plants destroyed
Sea erosion	Natural	Balehweh	1969 – present	Inadequate support	250 meters of beach land
Floods	Natural	Monrovia	Mid- June yearly	Inadequate support	600 people displaced
Landslide	Natural	Grand cape mount	1982	Not available	40 killed
Ebola virus diseases	Biological	All counties inclusive	2014 - 2016	Government, NGO, UN and communities	4,810 deaths
Chemical spill	Technological	Bong	2017	Not available	36 people fell ill
Conflicts	Societal	All counties inclusive	1986 - 2003		250,000 people killed



**Figure 2.** Source: <https://www.globalhealthnow.org/2018-06/lessons-learned-and-forgotten-ebola-response> showing Ebola treatment center in Liberia with an Ebola health worker and a child in the suspect zone

## 5. Biological

A recent assessment of Zika response agencies in high-risk U.S [10]. areas found that 68 percent of those surveyed lacked competency in mosquito control and surveillance, including many in Texas and Florida (areas where Zika is present).<sup>4</sup> For example, a survey of health departments found that the redirection of just \$44 million in public health preparedness grants during the Zika response would lead to impacts in community preparedness, volunteer management, medical countermeasure dispensing and other key activities [10].

In March 2014, Guinea identified 49 cases of Ebola virus disease (EVD) and reported them to international health agencies [12]. Nearly twelve months later, the epidemic, having exploded into neighboring Sierra Leone and Liberia, has reached over 22,000 cases and nearly 9,000 deaths (Table 1. Above) [12]. The toll on human life, impact on health infrastructure, diversion of funding from routine—but critical—priorities, and concentrated mortality among health care workers places the epidemic among the worst disease outbreaks in recent history (Figure 2 above) [12]. The outbreak began in Guinea in December 2013 but soon spread into neighboring Liberia and Sierra Leone [13]. In early August 2014, Ebola was declared an international public health emergency [13].

The Ebola virus disease outbreak in 2014–2015, which resulted in the establishment and deployment of the United Nations Mission for Ebola Emergency Response (UNMEER), has been a catalyst for several developments in the global management of public health emergencies [8]. These include the establishment of a global health emergency workforce, and a contingency fund to support WHO’s emergency response capacity [8]. The current Ebola virus disease outbreak in western Africa highlights how an epidemic can proliferate rapidly and pose huge problems in the absence of a strong health system capable of a rapid and integrated response [13].

In the aftermath of the 2014–16 West Africa Ebola Virus Disease outbreak, the WHO called on all countries “to create resilient integrated systems that can be responsive and proactive to any future threat” [11]. The revised International Health Regulations (2005) (IHR), adopted by the World Health Assembly in 2005, are binding on all WHO Member States and provide a

regulatory framework for international management of public health emergencies [8]. The purpose of the IHR is to prevent and manage the public health risks arising from the international spread of disease, while avoiding “unnecessary interference with international traffic and trade” [8]. Prior to the EVD crisis, Liberia’s health outcomes had been improving steadily since the end of the second civil war in 2003 [6].

With the adoption of IHR (2005) Liberia has been reporting Public Health Events of International Concern (PHEIC) to the World Health Organization (WHO). One such event was the unprecedented outbreak of Ebola Virus Disease (EVD) in 2014 [6]. However, the EVD crisis led to a devastation of the already fragile healthcare system in Liberia and severely constrained the ability of the Government of Liberia (GOL) to deliver key social services, including basic and secondary health services, thereby leading to many preventable deaths [6].

Liberia is also known to be endemic for Cholera. Some communities especially in Montserrado including Monrovia, Maryland, Sinoe, Nimba, Gbarpolu and Grand Bassa Counties record outbreaks annually [7]. The country has become more vulnerable due to the serious political economic disruptions and intermittent civil wars which destroyed most infrastructures for response [7]. In Sinoe County the establishment of a Committee on Asian influenza indicates awareness of the threat of the epidemic and efforts to address it [7].

Following the EVD outbreak, the WHA recommended countries to shift from exclusive self-assessment to a strategy of all-inclusive internal assessment and Joint External Evaluation (JEE) followed by the development and implementation of a National Action Plan for Public Health Security (NAPHS) [6]. NPHIL collaborates with the MOH and strengthens the existing infection prevention and control efforts, laboratories, surveillance, infectious disease control, public health capacity building, response to outbreaks, and monitoring of diseases with epidemic potential [6].

## 6. Technological

The international disaster database (EM-DAT) recorded more than 1,500 people from technological disasters killed

which also affected more than 17,000 individuals [1]. Countries are required to notify WHO within 24 hours (or immediately in the case of nuclear-related events), through their National IHR Focal Point [8]. Prior to this point, countries are encouraged to consult with WHO about emerging health threats and the appropriate health response [8]. The Deepwater Horizon oil spill, and the Fukushima Daiichi nuclear reactor emergency in Japan — illustrate the diverse and complex forms that threats to public health can assume [2].

In October 2017, a chemical spill from a mining company contaminated a creek used for cooking, drinking and bathing by 1 000 inhabitants of Bong County (Sayweh town, Kokoya District) where thirty-six people fell ill [6]. Outbreaks of Peste des petit ruminants repeatedly affect sheep and goat populations and thus challenge food security, with a 2015 outbreak resulting in 2,000 livestock deaths across Nimba and Lofa Counties [6].

Similarly, capacity building in other areas (e.g. chemical, radiological, and nuclear) should be among the priorities while ensuring long term provision of adequate stockpiles [14]. The main challenges affecting the implementation of planned activities include inadequate financing; limited human resources; limited technical expertise in areas such as chemical, radiological, nuclear [14].

No legislative or institutional framework to manage the public health risk of exposure to toxic chemical and radiation [14]. This has limited the capacity of national authorities in enforcement and control jurisdiction [14].

## 7. Societal

Complex emergencies, including conflict, continue to affect tens of millions of people, causing displacement of people both inside and across borders [1]. In 2012 there were an estimated total of 20 million persons who remained internally displaced by armed conflict across the world [1]. Disasters may threaten public order and public health due to violence and crime [8]. Reproductive health needs are often especially great in the aftermath of a disaster [8]. Displaced women are often victims of rape and sexual violence and may have an urgent need for emergency contraception and treatment for sexually transmissible infections [8]. WHO's Interagency Emergency Health Kit, which includes emergency contraception and midwifery supplies, and WHO's Model List of Essential Medicines, can serve as a benchmark in operational planning for a public health emergency [8].

Over a 14-year period (1989 to 2003), Liberia went through a civil war that left the health system dysfunctional with the destruction of the infrastructure and severe health workforce shortages [15]. Around 250,000 people were killed in Liberia's civil war, and many thousands more fled the fighting [17]. Since 2005, the country has made great effort to rebuild the health system through reform and introduction of the Basic Package of Health Services (BPHS) under the National Health Policy and Plan 2007 – 2011 and later the Essential Package of Health Services (EPHS) under the National Health Policy and Plan 2011 - 2021, all of which defined the type of services to be delivered at every level of care, inclusive of the

minimum levels of resources required to provide the package, namely infrastructure, equipment, essential medicines and human resources [7].

Land Disputes: Land disputes also have potentials for conflict. As part of mitigation process there should be regular meetings amongst Land Commissioners to discuss common problems and identify strategies [7]. Meetings between Land Commissioners, City Mayors and training Chiefs on regulations for land allocation and administration is regarded critical [7].

Epidemics and invasion by animals from Game parks are serious threats to some communities, especially in Lofa County, with some concern raised also in Sinoe County [7].

## 8. Center of Disease Control (CDC) Recommendations for Preparedness

Preplanned and coordinated rapid-response capability [16]:

1. Health risk assessment. Identify the hazards and vulnerabilities (e.g., community health assessment, populations at risk, high-hazard industries, and physical structures of importance) that will form the basis of planning.

2. Legal climate. Identify and address issues concerning legal authority and liability barriers to effectively monitor, prevent, or respond to a public health emergency.

3. Roles and responsibilities. Clearly define, assign, and test responsibilities in all sectors, at all levels of government, and with all individuals and ensure each group's integration.

4. Incident Command System. Develop, test, and improve decision making and response capability using an integrated Incident Command System (ICS) at all response levels.

5. Public engagement. Educate, engage, and mobilize the public to be full and active participants in public health emergency preparedness.

### Expert and fully staffed workforce [16]:

1. Operations-ready workers and volunteers. Develop and maintain a public health and health care workforce that has the skills and capabilities to perform optimally in a public health emergency.

2. Leadership. Train, recruit, and develop public health leaders (e.g., to mobilize resources, engage the community, develop interagency relationships, and communicate with the public).

### Accountability and quality improvement [16]:

1. Testing operational capabilities. Practice, review, report on, and improve public health emergency preparedness by regularly using real public health events, supplemented with drills and exercises when appropriate.

2. Performance management. Implement a performance management and accountability system.

3. Financial tracking. Develop, test, and improve accounting, and other financial systems to track resources and ensure adequate and timely reimbursement.

**Community preparedness [16]:** The ability of communities to prepare for, withstand, and recover—in both the short and long term—from public health incidents.

Function 1. Determine risks to the health of the jurisdiction.

Function 2. Build community partnerships to support health preparedness.

Function 3. Engage with community organizations to foster public health, medical, and mental and behavioral health social networks.

Function 4. Coordinate training or guidance to ensure community engagement in preparedness efforts.

**Community recovery [16]:** The ability to collaborate with community partners (e.g., health care organizations, business, education, and emergency management) to plan and advocate for the rebuilding of public health, medical, and mental and behavioral health systems to at least a level of functioning comparable to pre incident levels, and for improved levels where possible.

Function 1. Identify and monitor public health, medical, and mental and behavioral health system recovery needs.

Function 2. Coordinate community public health, medical, and mental and behavioral health system recovery operations.

Function 3. Implement corrective actions to mitigate damages from future incidents.

## 9. Conclusion

Public Health disaster is a challenge worldwide. Natural disasters, biological disasters, technological disasters and societal disasters have ravaged even the most prepared and developed nations. However, the emergency response is better when a strong public health preparedness system is established. The lack of these modalities in Africa makes disaster management impossible and devastating. Liberia as a developing nation is yet to accomplish a preplanned coordinated response due to the lack of resources, lack of expert and moreover the lack of accountability and quality control.

## Conflict of Interest

The authors declare no conflict of interest towards this publication.

## Funding

No external funding available.

## References

- [1] Abrahams J, Barbeschi M, Akoth S et al. Emergency Risk Management for Health Overview. Global Platform (2013). [https://www.who.int/hac/techguidance/preparedness/risk\\_management\\_overview\\_17may2013.pdf](https://www.who.int/hac/techguidance/preparedness/risk_management_overview_17may2013.pdf).

- [2] Lurie N, Manolio T, Patterson AP, Research as a Part of Public Health Emergency Response. *N Engl J Med* (2013) 368(13): 1251-1255.
- [3] Plough A, Fielding JE, Chandra A. Building Community Disaster Resilience: Perspectives From a Large Urban County Department of Public Health *American Journal of Public Health* (2013) 103(7): 1190-1197.
- [4] Protecting People's Health From The Risks Of Disasters [http://www.unicefinemergencies.com/downloads/eresource/docs/Health/protecting\\_peoples\\_health\\_march2015.pdf](http://www.unicefinemergencies.com/downloads/eresource/docs/Health/protecting_peoples_health_march2015.pdf).
- [5] Olu O, Usman A, Manga L. Strengthening health disaster risk management in Africa: multi-sectoral and people-centered approaches are required in the post-Hyogo Framework of Action era *BMC Public Health* (2016) 16: 691.
- [6] Joint National Action Plan for Health Security (NAPHS) 2018-2022 <https://extranet.who.int/sph/sites/default/files/document-library/document/20062018%20Liberia%20NAPHS%20Final%20version.pdf>.
- [7] Capacity Needs Assessment In Disaster Risk Reduction County, District and Community Assessment National Disaster Management Commission Ministry of Internal Affairs United Nations development Program Monrovia, Liberia (2009) [https://www.preventionweb.net/files/17504\\_cnareportfinaldraft.pdf](https://www.preventionweb.net/files/17504_cnareportfinaldraft.pdf).
- [8] Public health emergencies- Advancing the right to health: the vital role of law <https://www.who.int/healthsystems/topics/health-law/chapter11.pdf?ua=1>.
- [9] Yeşils ST. Public health and natural disasters: disaster preparedness and response in health systems *J Public Health* (2006) 14: 317-324.
- [10] The Critical Role of Public Health Programs in Responding to Natural Disasters [https://www.tfah.org/wp-content/uploads/2018/09/Public\\_Health\\_In\\_Disasters\\_Fact\\_Sheet\\_091318.pdf](https://www.tfah.org/wp-content/uploads/2018/09/Public_Health_In_Disasters_Fact_Sheet_091318.pdf).
- [11] Khan Y, O'Sullivan T, Brown A. Public health emergency preparedness: a framework to promote resilience *BMC Public Health* (2018) 18(1344):1-16.
- [12] Siedner MJ, Gostin LO, Cranmer HH, Kraemer JD (2015) Strengthening the Detection of and Early Response to Public Health Emergencies: Lessons from the West African Ebola Epidemic. *PLoS Med* 12(3): e1001804.
- [13] Kieny MP, Evans DB, Schmetsa G. Health-system resilience: reflections on the Ebola crisis in western Africa *Bull World Health Organ* 2014; 92: 850.
- [14] Joint External Evaluation of the Republic of Liberia Mission Report September 2016 <https://www.ghsagenda.org/docs/default-source/jee-reports/liberia-jee-report.pdf>.
- [15] Investment Plan for Building a Resilient Health System in Liberia 2015 to 2021 [https://au.int/web/sites/default/files/newsevents/workingdocuments/27027-wd-liberia-investment\\_plan\\_for\\_building\\_a\\_resilient\\_health\\_system.pdf](https://au.int/web/sites/default/files/newsevents/workingdocuments/27027-wd-liberia-investment_plan_for_building_a_resilient_health_system.pdf).
- [16] Nelson C, Lurie N, Wasserman J, Zakowski S. Conceptualizing and Defining Public Health Emergency Preparedness. *American Journal of Public Health Supplement* (2007) 97(1): 9-11.
- [17] Liberia country profile. BBC News 2018. <https://www.bbc.com/news/world-africa-13729504>.

