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INTERNATIONAL INSTITUTIONS AND EBOLA RESPONSE: LEARNING FROM THE 2017 OUTBREAK IN THE DEMOCRATIC REPUBLIC OF CONGO†

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INTRODUCTION

On July 17, 2019, the World Health Organization (WHO) declared that the Ebola outbreak in east Democratic Republic of Congo (DRC) was a public health emergency of international concern (PHEIC) under the International Health Regulations (2005) (IHR), the fifth declaration since the agreement entered into force in 2007.[1] Despite availability of a vaccine and the introduction of a second vaccine candidate, the current Ebola outbreak has not been brought under control. As of this writing, many public health officials are worried over border closures, even though WHO did not recommend travel or trade

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1. Int'l Health Regulations (2005) Emergency Comm. for Ebola Virus Disease in the Democratic Republic of the Congo, Statement on the meeting of the International Health Regulations (2005) Emergency Committee for Ebola virus disease in the Democratic Republic of the Congo on 17 July 2019 (2019), https://www.who.int/ihr/procedures/statement-emergency-committee-ebola-drc-july-2019.pdf [https://perma.cc/MGM4-FYJ7]; Helen Branswell, *WHO Declares Ebola Outbreak an International Emergency*, July 17, 2019 avaialable at https://www.statnews.com/2019/07/17/who-declares-ebola-outbreak-an-international-health-emergency/ [https://perma.cc/QYP3-FBHD] ("This marks only the fifth time the WHO has declared a public health emergency of international concern.").

restrictions. Armed conflict and local resistance in the region has stymied the global response.

These events are reminiscent of the 2014-16 Ebola outbreak in West Africa, when the aftermath of civil conflict, the closure of borders, and a fragmented initial response contributed to the most deadly Ebola outbreak on record.[2] The resulting retrospective criticism, comprised of no fewer than seven major and approximately forty international collaborative reviews, called into question the effective implementation of the IHR.[3] Trade and travel restrictions imposed by the neighbors of Guinea, Liberia, and Sierra Leone as well as other European and African countries strongly suggested that in the face of a real pandemic emergency, the countries of the world could be relied upon to abandon internationalism and international institutions and adopt country-first policies, no matter how counterproductive.

While calls for reform were justified and many of the recommendations following the 2014 West Africa Ebola outbreak are under way, the purpose of this article is to shed light on a subsequent episode of Ebola outbreak and response in the DRC that emphasizes the *effective* implementation of not only the IHR, but the successful incorporation of international collaborative relationships that quickly addressed an outbreak in the northern DRC, and paved the way for the rapid deployment of biomedical interventions. The DRC's surveillance system identified Ebola quickly, bolstered by a national planning system revised in light of the West Africa Ebola outbreak, WHO and international partners including the U.S. Centers for Disease Control and Prevention (CDC), the International Federation of the Red Cross and Red Crescent, and Doctors Without Borders responded quickly and adroitly, and the outbreak ended with only eight cases.[4] Identifying effective implementation of international law when outbreak responses succeed—in some cases despite numerous barriers and limited resources—can assist in articulating fully-developed strategies for improving future outbreak responses and global health security. It argues that the IHR may be, and often are, an iterative or *learning* agreement, and that much learning informed the DRC response in 2017 and two outbreak responses in 2018. Given that the current outbreak in the DRC has not, as of this writing, been brought under control, it is important to understand the limits of this thesis even within the conditions we analyze. Yet, we believe that understanding how *learning* works within the IHR implementation process may

2. G.A. Res. 69/1, 1 (Sep. 23 2014); S.C. Res. 2177, 1–3, ¶ 3–4 (Sep. 18, 2014).

3. Surie Moon et al., *Will Ebola change the game? Ten essential reforms before the next pandemic. The report of the Harvard-LSHTM Independent Panel on the Global Response to Ebola*, 386 LANCET 2204, 2207 (2015).

4. *2017 Democratic Republic of the Congo - Bas Uélé District Outbreak Report,* CENTER FOR DISEASE CONTROL, CDC.GOV, https://www.cdc.gov/vhf/ebola/outbreaks/drc/2017-may.html [https://perma.cc/D8QQ-AYGB] (last visited August 23, 2019).

lead to better compliance and better outcomes including the cohesive cooperation between national and international actors.

Methodologically, the Article applies the obligations imposed under Articles 4-6 and 13 of the IHR to the two Ebola outbreaks and demonstrates how the DRC system internalized the lessons of the 2014-16 Ebola outbreak. Articles 4-15 of the IHR are the primary information sharing and public health readiness provisions.[5] Articles 7-12 and Article 14 are not separately analyzed either because their obligations are relevant within a previous discussion (e.g. Article 9 deals with "other reports" WHO may receive to determine whether there is a public health emergency of international concern,[6] but that analysis is undertaken with respect to Article 5) or because they are simply not relevant to the analysis (e.g. those provisions dealing exclusively with WHO decision-making). The Article then compares the national-international nexus for each outbreak and response.

The Article proceeds as follows. Part I provides the legal background to the two Ebola outbreaks—the IHR—and the etiological and epidemiological background to Ebola Virus Disease (EVD) more generally. Part II identifies the failures of international public health law between April 2014 and May 2015 and compares those failures with the success of the IHR between May and July 2017 in the DRC. Part III provides a conclusion.

I. THE INTERNATIONAL HEALTH REGULATIONS AND THE EBOLA THREAT

When international law-makers established WHO they intended to give it strong law-making and regulatory authority.[7] Article 19 of the WHO Constitution authorized it to conclude treaties within its broadly worded mandate while Article 21 gave the World Health Assembly the authority to adopt legally binding recommendations in five discrete areas: sanitary and quarantine regulations; nomenclatures on diseases, causes of death, and public health practices; standards for diagnostic procedures for international use; standards for safety, purity, and potency of biological, pharmaceutical, and similar products moving in international commerce; and advertising and labeling of biological, pharmaceutical, and similar products moving in international commerce.[8] Article 22 established the binding legal effect of these regulations unless states opted out of them within the notification period, an innovation which collapsed

5. WORLD HEALTH ORG., *International Health Regulations*, arts. 4–15 (2005), https://www.who.int/ihr/publications/9789241580496/en/ [https://perma.cc/D4YE-LJ36].

6. WORLD HEALTH ORG., *International Health Regulations*, arts. 7–12, 14 (2005), https://www.who.int/ihr/publications/9789241580496/en/ [https://perma.cc/MN6S-R66P].

7. George Codding, Jr., *Contributions of the World Health Organization and the International Civil Aviation Organization to the Development of International Law*, 59 PROCEEDINGS OF ASIL 147, 147-48 (1965).

8. WORLD HEALTH ORG., Const. arts. 19, 21.

the usual drawn-out ratification process historically experienced in the international law-making process.[9]

One of the first exercises of this authority was to adopt the International Sanitary Regulations, an international agreement that resurrected and rationalized moribund international treaties that addressed international traffic and quarantine policies oriented at plague, cholera, yellow fever, smallpox, louse-borne typhus, and relapsing fever.[10] WHO updated the regulations and renamed them in 1969 (hence the official name of the agreement, the International Health Regulations (1969)), eventually narrowing their reach to yellow fever, cholera, and plague by 1981 and expanding the monitoring and control mechanisms applicable to those diseases.[11] The resurgence of cholera in South America, plague in India, and Ebola in Africa, as well as the emergence of HIV as a global pandemic, encouraged the world's countries to consider further, more extensive revision.[12]

The 1980s and 1990s witnessed the emergence of new infectious diseases like HIV and viral hemorrhagic fevers.[13] Between 1994 and 2000, for example, there were as many outbreaks of EVD in Africa as there had been in the twenty years before.[14] In 1995, the World Health Assembly, the governing body of WHO, instructed WHO's Director General to revisit the IHR precisely because they neglected "the emergence of new infectious agents" and failed to provide for an adequate response of those that were covered.[15] The World Health Assembly attributed these failures to the erosion of barriers between goods and people.[16] In 2003, the outbreak of SARS facilitated the 2005 revisions of the

9. WORLD HEALTH ORG., Const. arts. 19, 21–22.

10. Editorial, *International Sanitary Regulations*, 147 [J]AMA 62, 63–64 (1951).

11. Richard A. Cash & Vasant Narasimhan, *Impediments to global surveillance of infectious diseases: consequences of open reporting in a global economy*, 78 BULLETIN OF THE WORLD HEALTH ORGANIZATION [WHO] 1358, 1359 (2000), https://www.who.int/bulletin/archives/78(11)1358.pdf [https://perma.cc/52A2-N546].

12. *Frequently asked questions about the International Health Regulations (2005)*, WHO.GOV, https://www.who.int/ihr/about/faq/en/ [https://perma.cc/9WND-8NYA].

13. David P. Fidler & Lawrence O. Gostin, *The New International Health Regulations: An Historic Development for International law and Public Health*, 34 J.L. MED. ETHICS 85, 85 (2006).

14. Ramon Martinez, *Chronology of Ebola Virus Disease outbreaks, 1976-2014*, HEALTH INTELLIGENCE (June 10, 2014, 4:01 AM), http://publichealthintelligence.org/content/chronology-ebola-virus-disease-outbreaks-1976-2014 [https://perma.cc/529K-26KE].

15. *WHO - Revision process of the International Health Regulations (IHR)*, WHO.GOV, http://www.who.int/ihr/revisionprocess/revision/en/index.html [https://perma.cc/KC82-NALZ] (last visited August 30, 2019).

16. Rebeca Katz & Julie Fischer, *The Revised International Health Regulations: A Framework for Global Pandemic Response*, 3 GLOBAL HEALTH GOVERNANCE 1, 2 (2010). The threat of the Ebola virus and the emerging HIV/AIDS crisis (among other viruses) were major factors the global community considered when advocating revisions to the existing IHR. *Id.*

IHR, by highlighting the speed by which an emerging infectious disease can travel around the world and the dearth of tools to govern the global spread.[17]

A. The Scope of the IHR (2005)

The IHR (2005) was revised to encompass the detection and prevention of all infectious diseases.[18] Their scope was expanded "to include any event that would constitute a public health emergency of international concern."[19] "'The Regulations now encompass public health risks whatever their origin or source (Article 1.1), including: (1) naturally occurring infectious diseases, whether of known or unknown etiological origin . . .'"[20]

Acknowledging the importance of communication and cooperation to successful detection and prevention of communicable diseases, States Parties are obligated to "develop the means to detect, report, and respond to public health emergencies . . . [and] establish a National IHR Focal Point (NFP)[21] for communication to and from WHO . . . ."[22] States Parties must inform WHO within twenty-four hours of an assessment of any event that could be considered a "public health risk to other States requiring a coordinated international response."[23] Ebola was a specified disease in the revised IHR, Annex 2, that is, its detection was likely to have significant public health impact and to potentially spread internationally.[24]

17. David P. Fidler, *Revision of the World Health Organization's International Health Regulations*, ASIL INSIGHTS (April 16, 2004), https://www.asil.org/insights/volume/8/issue/8/revision-world-health-organizations-international-health-regulations [https://perma.cc/G4Y5-BH8B].

18. The stated purpose is to "prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade." WORLD HEALTH ORG., *International Health Regulations*, art. 2 (2005), https://www.who.int/ihr/publications/9789241580496/en/ [https://perma.cc/ZGX4-3EAX].

19. Katz & Fischer, *supra* note 16, at 2.

20. Martin Cetron, *Isolation, Quarantine, and Infectious Disease Threats Arising From Global Migration*, GLOBAL MANAGEMENT OF INFECTIOUS DISEASE AFTER EBOLA, 245, 251 (Sam F. Halabi, Lawrence O. Gostin, and Jeffrey S. Crowley eds. 2017) (quoting Fidler & Gostin, *supra* note 13, at 86).

21. The NFP is a "national centre, established or designated by each State Party [and] must be accessible at all times for IHR (2005)-related communications with WHO." International Health Regulations Coordination, INTERNATIONAL HEALTH REGULATIONS (2005): TOOLKIT FOR IMPLEMENTATION IN NATIONAL LEGISLATION 7 (2009). As of July 2009, ninety-nine percent of all State have established an NFP. *Id*.

22. Katz & Fischer, *supra* note 16, at 2-3.

23. *Id*. at 3. Once an incident has been reported, WHO will then "coordinate communications across nations, provide technical assistance to responding nations, and work with international scientific experts to develop recommendations for mitigating the consequences of the event." *Id*.

24. WORLD HEALTH ORG., *International Health Regulations*, annex 2 (2005), https://www.who.int/ihr/publications/9789241580496/en/ [https://perma.cc/Z68Y-FNK8].

Epidemiological investigations have revealed that human infections with the Ebola virus are associated with the handling of infected chimpanzees, gorillas, fruit bats, monkeys, forest antelope, and porcupines.[25] Human-to-human transmission of Ebola occurs through close and direct physical contact with infected bodily fluids; the most infectious being blood, feces, and vomit.[26] The 2013-15 outbreak was the twenty-fourth known outbreak of Ebola and by far the most severe.[27] A new outbreak occurred in the DRC in August of 2014, May of 2017, and then the following year on April 4, 2018.[28] For the latter outbreak, "a total of 38 laboratory confirmed and 15 probable cases (deaths for which it was not possible to collect laboratory specimens for testing) have been reported.[29] Of these 53 cases, 29 died, giving a case fatality ratio of 54.7%."[30] On August 1, 2018, a new outbreak was officially declared in North Kivu province of the DRC, on the other side of the country from the April outbreak, an outbreak that continues, fueled by armed conflict and interference with the international response effort.[31] With a case fatality rate of 55%, Ebola remains a biomedical research priority.[32]

II. IHR PERFORMANCE FROM 2014-16 WEST AFRICA TO 2017 DRC

A. Background to the 2014 West Africa Outbreak

Although the outbreak of EVD in West Africa originated in Guinea between December of 2013 and March of 2014, it spread more rapidly in the eastern regions of Sierra Leone and then in North Central Liberia, followed by Nzérékoré in Guinea.[33] "Between December 2013 and April 10, 2016, a total of

25. *Ebola Virus Disease*, WORLD HEALTH ORG. (May 30, 2019), http://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease [https://perma.cc/G5F6-UFGD].

26. Seth Judson, et al., *Understanding Ebola Virus Transmission*, VIRUSES (Feb. 3, 2015), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4353901/ [https://perma.cc/2Q9M-29KR].

27. Johnathan Corum, *A History of Ebola in 24 Outbreaks*, N.Y. TIMES (Dec. 29, 2014), https://www.nytimes.com/interactive/2014/12/30/science/history-of-ebola-in-24-outbreaks.html [https://perma.cc/38VW-4A8K].

28. Health Emergency Information and Risk Management, WORLD HEALTH ORG., *Ebola Virus Disease: Democratic Republic of Congo External Situation Report 15* (Jul. 12, 2018), http://apps.who.int/iris/bitstream/handle/10665/273088/SITREP_EVD_DRC_20180712-eng.pdf [https://perma.cc/U3YB-ADE2].

29. *Id.*

30. *Id.*

31. Megan Specia, *Years After Latest Ebola Outbreak New Cases Emerge in Congo*, N.Y. TIMES (Aug. 1, 2019), https://www.nytimes.com/2019/08/01/world/africa/ebola-congo-rwanda.html [https://perma.cc.4GUC-QZJV].

32. Ebola Vaccines – Background Paper for SAGE Deliberations, WORLD HEALTH ORG. (Oct. 2, 2018), https://www.who.int/immunization/sage/meetings/2018/october/2_Ebola_SAGE 2018Oct_BgDoc_20180919.pdf [https://perma.cc/V4Q3-JGG9].

33. WHO Ebola Response Team, *After Ebola in West Africa - Unpredictable Risks, Preventable Epidemics*, 375 NEW ENG. J. MED. 587, 588 (2016).

28,616 suspected, probable, and confirmed cases of EVD were reported."[34] A total of 11,310 deaths were attributed to the outbreak.[35] The largest numbers of cases and deaths occurred in Guinea, Liberia, and Sierra Leone, but thirty-six cases were reported from Italy, Mali, Nigeria, Senegal, Spain, the United Kingdom, and the United States.[36] After peaking at approximately 950 confirmed cases per week in September of 2014, the incidence dropped precipitously toward the end of that year.[37]

The IHR in 2005 required Guinea, Liberia, and Sierra Leone to have surveillance and detection infrastructure in place to detect Ebola and to promptly notify WHO should they receive a reportable event.[38] Civil wars in or affecting all three countries had devastated what weak health infrastructure existed, and external assistance would have been critical to bridge the gap between their capacity and what the IHR envisioned. This is true in many countries, and initial information led many in the international community to believe Ebola would be contained in West Africa as it had in equatorial Africa. Because WHO maintained significant activities in Guinea, Liberia, and Sierra Leone and cases reported in Guinea and Liberia between April and May technically declined, WHO, for example, believed that that the virus dynamics were not unlike those of past outbreaks.[39]

B. Background to the 2017 Ebola outbreak in DRC

The DRC has a long history with detecting and responding to EVD. The virus was first identified near the eponymous Ebola River in then-Zaire, in 1976.[40] Since 1976, there have been ten Ebola outbreaks in the DRC.[41] This experience played a role in the commitment of the central government in Kinshasa to specialized laboratory, health worker, and health facility infrastructure for Ebola response.

"On April 22, 2017, the Nambwa health center received a 45-year-old (early reports stated 39-year-old) male subject with presenting symptoms including

34. *Id.* at 587.

35. *Id.*

36. *Id.; see also 2014-2016 Ebola Outbreak in West Africa*, CTR. FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/index.html [https://perma.cc/A3T8-EFGD] (last reviewed Mar. 8, 2019).

37. WHO Ebola Response Team, *supra* note 33, at 587.

38. WORLD HEALTH ORG., *International Health Regulations* (3rd ed. 2005).

39. Wolfgang Hein, *Response to the West African Ebola Outbreak (2014-16): A Failure of Global Health Governance?, in* Leonie Vierck, THE GOVERNANCE OF DISEASE OUTBREAKS, INTERNATIONAL HEALTH LAW: LESSONS FROM THE EBOLA CRISIS AND BEYOND 68 (2017).

40. *History of Ebola Virus Disease,* CTR. FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/vhf/ebola/history/summaries.html [https://perma.cc/8LSY-67HX] (last reviewed Sept. 18, 2018).

41. History of Ebola in the Democratic Republic of Congo, WORLD HEALTH ORG., https://www.who.int/ebola/historical-outbreaks-drc/en/ [https://perma.cc/8QBK-HDEA].

fever, asthenia, vomiting of blood, bloody diarrhea, hematuria, epistaxis and extreme fatigue."[42] "He was referred to the Reference General Hospital (RGH) of Likati." He died twelve kilometers before reaching the facility.[43] He traveled by motorbike and taxi across the large province.[44] His blood was drawn on May 1, 2017.[45] "A few days later, the driver and the person behind the motorcycle carrying the index case developed the same signs and symptoms."[46] "An investigation was initiated and five (5) samples were collected."[47] "It took 10 days for the samples to reach Kinshasa, which is about 1400 kilometers from Likati."[48] The DRC has no roads that span the country and long-distance travel largely is restricted to river boats and private airplanes.

On May 9, 2017, the DRC's Ministry of Health informed WHO about the undiagnosed illness and deaths including hemorrhagic symptoms in Likati Health Zone, Bas Uele Province which is in the northern region of the DRC that borders the Central African Republic.[49] The DRC Ministry of Health was able within two days to confirm Ebola virus subtype *Zaire* at the Institut National de Recherche Biomédicale (INRB) in Kinshasa.[50] Even before laboratory confirmation, on May 10, 2017, a multidisciplinary team led by the Ministry of Health and supported by WHO and partners was deployed to the field; the team reached the affected area on May 13, 2017 to conduct a field investigation.[51] All contacts (538) were identified immediately and monitored. The possibility of introducing an Ebola ring vaccination with experimental vaccine rVSV-ZEBOV was immediately discussed. The DRC approved the experimental vaccine rVSV-ZEBOV for use in 2017, although the outbreak ended before the vaccine

42. INTERNATIONAL FEDERATION OF RED CROSS AND RED CRESCENT SOCIETIES, *Emergency Plan of Action Democratic Republic of Congo: Ebola Outbreak* (May 15, 2017), https://reliefweb.int/report/democratic-republic-congo/democratic-republic-congo-drc-ebola-outbreak-emergency-plan-action [https://perma.cc/PG7D-PEGQ].

43. *Id*.

44. *Id*.

45. Jon Cohen, *Will Vaccine Help Curb Ebola Outbreak in DRC?*, AM. ASSOC. FOR THE ADVANCEMENT OF SCI. (May 15, 2017), http://www.sciencemag.org/news/2017/05/updated-will-vaccine-help-curb-new-ebola-outbreak-drc [https://perma.cc/783A-WLYE].

46. INTERNATIONAL FEDERATION OF RED CROSS AND RED CRESCENT SOCIETIES, *supra* note 42.

47. *Id.*

48. Cohen, *supra* note 45.

49. *Ebola Virus Disease*, WORLD HEALTH ORG., http://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease [https://perma.cc/DWC6-CG67] (last visited Aug. 23, 2019).

50. *New technology allows for rapid diagnosis of Ebola in Democratic Republic of the Congo*, WORLD HEALTH ORG. AFRICA, https://www.afro.who.int/news/new-technology-allows-rapid-diagnosis-ebola-democratic-republic-congo [https://perma.cc/QRU6-PCX3] (last visited Aug. 23, 2019).

51. WORLD HEALTH ORG., *supra* note 49.

shipped.[52] By May 15, there were nineteen suspected cases, one confirmed case, and three deaths.[53] While suspected cases were spread across three health zones, the deaths occurred only in Nambwa.[54] The 2017 Ebola outbreak in the DRC affected eight people, four of whom died.[55] One-hundred and five cases, for whom laboratory tests revealed negative results, were recorded.[56] The outbreak was declared over on July 2, 2017, when the last patient had tested negative for Ebola a second time.[57]

a. Responsible Authorities (IHR Article 4)

Article 4 of the IHR requires, in pertinent part, that countries "disseminat[e] information to, and consolidat[e] input from, relevant sectors of the administration of the State Party concerned, including those responsible for surveillance and reporting, points of entry, public health services, clinics and hospitals, and other government departments."[58]

i. West Africa

In 2014 in Guinea (and the border with Sierra Leone and Liberia), the "sectors . . . including those responsible for surveillance and reporting" were largely controlled by non-governmental organizations (NGOs) and foreign aid workers.[59] Many of these NGOs providing health services in Guinea and Sierra Leone worked under agreements that authorized the sharing of relevant data only with official health authorities and, in some cases, only with specific administrators.[60] Requests by other NGOs for information, especially for contact lists, were frequently rejected.[61] For instance, one district-level Ebola response center in Sierra Leone found it problematic that NGOs engaged in contact

52. Erika C. Hayden, *Experimental Drugs Poised for Use in Ebola Outbreak*, NATURE (May 18, 2018), https://www.nature.com/articles/d41586-018-05205-x [https://perma.cc/T5Z9-Z9GA].

53. Emergency Plan of Action (EPoA) Democratic Republic of Congo (DRC): Ebola Outbreak, INT'L FED'N OF RED CROSS AND RED CRESCENT SOC'Y (May 15, 2017), http://adore.ifrc.org/Download.aspx?FileId=162853.

54. *Id.*

55. *2017 Democratic Republic of the Congo, Bas Uélé District,* CTR. FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/vhf/ebola/outbreaks/drc/2017-may.html [https://perma.cc/W7DZ-H4ZV] (last visited Aug. 23, 2019).

56. *The Ebola Epidemic Defeated in the DRC*, ALIMA, https://www.alima-ngo.org/en/the-ebola-epidemic-defeated-in-the-drc [https://perma.cc/TC8N-9MJ9] (last visited Sept. 9, 2019).

57. CTR. FOR DISEASE CONTROL AND PREVENTION, *supra* note 55.

58. WORLD HEALTH ORG., NAT'L IHR FOCAL POINT GUIDE, *Designation/establishment of National IHR Focal Points*, at 1 (2005).

59. *Id.*

60. Leon Schreiber, *Chasing an Epidemic: Coordinating Liberia's Response to Ebola*, INNOVATION FOR SUCCESSFUL SOCIETIES, 2017, at 3.

61. *Pushed to the Limit and Beyond: A year into the largest ever Ebola outbreak*, MEDECINS SANS FRONTIERES, 2015, at 8.

tracing spontaneously but in coordination with their role of providing supplies to families in quarantine.[62] The NGOs "took it upon themselves to start taking temperatures, recording travel and contact histories."[63] "There was already a contact-tracing team from Sierra Leone's official District Ebola Response Centre visiting them over several days to monitor symptoms and gather information on exposure to risk."[64] There were several other organizations visiting or doing similar activities, undermining the role of the centralized, official authority.[65]

Even within the formal arms of the state, there were important barriers to consolidating and disseminating relevant information.[66] A retrospective study by Chatham House noted that the governments, particularly in Guinea and Sierra Leone, were conflicted about the relevance of information for compliance with the IHR versus its potential for economic damage.[67] In some cases, the flow of information to leaders was itself not clear: "[there was a perception that] no one in authority wanted to admit to [Sierra Leone] President Koroma how bad the situation was."[68] In the Sierra Leone response, British participants stated that "by late July 2014 they had decided that information coming out of the [Sierra Leone Ministry of Health and Sanitation] had to be ignored."[69]

In a report by the WHO Ebola Interim Assessment Panel in January 2015, it acknowledged that "problems with information flow and decision-making within WHO[,] and difficult negotiations with countries" explained much of the failure to respond as robustly as it should have, and those problems and negotiations involved desires primarily by Guinea and Sierra Leone to control or delay the messaging about a health emergency.[70] "Ministries overseeing both the economy and finance [in Sierra Leone] were concerned about what closing the borders would mean to the post-conflict improvements in Sierra Leone's economic outlook, which in early 2014 were significant and promising."[71]

Liberia better integrated international stakeholders. It relatively rapidly reached out to the U.S. National Institutes of Health to work on the deployment of promising therapeutic and vaccine candidates, ensuring that protocols to

62. EMMA ROSS, GITA HONWANA WELCH & PHILIP ANGELIDES, SIERRA LEONE'S RESPONSE TO THE EBOLA OUTBREAK: MANAGEMENT STRATEGIES AND KEY RESPONDER EXPERIENCES 34 (2017).

63. *Id.*

64. *Id.*

65. *Id.*

66. *Id.* at 7.

67. ROSS, *supra* note 62, at 7.

68. *Id*. at 7-8.

69. *Id.* at 8.

70. WORLD HEALTH ORG., EBOLA INTERIM ASSESSMENT PANEL REPORT BY THE SECRETARIAT, U.N. DOC. A68/25 4 (May 8, 2015).

71. Susan Erikson, *Cell Phones Self and Other Problems with Big Data Detection and Containment during Epidemics*. MED. ANTHROPOLOGY Q., 2018, at 322.

administer those candidates could be done ethically and efficaciously.[72] The Liberia Ministry of Health and Social Welfare was organized so that a National Technical Management Coordinator aggregated epidemiological, surveillance, mental health, contact tracing, case management, and laboratory data.[73] If the national coordinator was not available, then data bottlenecked, a problem that was resolved by the appointment of an incident manager and a deputy incident manager that coordinated with large external entities like the CDC.[74]

ii. The DRC

Before the 2017 outbreak of Ebola, the universe of stakeholders, including points of entry, public health services, clinics and hospitals, and other government departments for Ebola response was, and is, relatively defined in DRC. First, the provision of healthcare and the surveillance and reporting roles is undertaken by public authorities under central ministry supervision or coordinated with NGOs. Second, when Ebola cases emerge in remote areas of the DRC, data about illnesses and deaths is clearly associated with known pathogens that prevail in the country so that Ebola may be quickly distinguished and diagnosed.

In August 2014, the Ministry of Public Health updated its National Plan for the Preparation and Response to the Ebola Virus Disease Outbreak, not only because of the outbreak in West Africa, but because a new case had developed in Boende district, Equateur province, unrelated to the outbreak in West Africa.[75] The revised plan included coordination with WHO, UNICEF, MSF, and CDC.[76] On May 13, 2017, pursuant to this plan, the government deployed a multidisciplinary team to assess the situation at Likati and prepare for the arrival of the main response team.[77] Ministries, local governments, clinicians, NGOs, suppliers, and donors all had clear chains of reporting to the DRC Ministry of Health. In light of the 2014–16 emergency, "WHO had set up a $41 million contingency fund to ensure that money would be readily available for future

72. Press Release, Office of the Press Secretary, FACT SHEET: U.S. Response to the Ebola Epidemic in West Africa (Sept. 16, 2014) (available at https://obamawhitehouse.archives.gov/the-press-office/2014/09/16/fact-sheet-us-response-ebola-epidemic-west-africa [https://perma.cc/8KRU-5HX6]); Telephone Interview with U.S. National Institutes of Health Staff (Sept. 20, 2018).

73. Health Communication Capacity Collaborative, *Social Mobilization Lessons Learned: The Ebola Response in Liberia*, JOHN'S HOPKINS CTR. FOR COMM. PROGRAMS, Feb. 2017, at 13.

74. *Id.*

75. Terrence McCoy, *A second and different Ebola outbreak hits Congo, the fifth infected African country*, WASHINGTON POST (Aug. 25, 2014), https://www.washingtonpost.com/news/morning-mix/wp/2014/08/25/a-second-and-different-ebola-outbreak-hits-congo-the-fifth-infected-african-country/ [https://perma.cc/GXF9-YK6X].

76. *Democratic Republic of the Congo (DRC): Ebola Virus Disease Outbreak - Emergency Plan of Action (EPoA)*, INT'L FED'N OF RED CROSS AND RED CRESCENT SOCIETIES (May 14, 2018), http://adore.ifrc.org/Download.aspx?FileId=162853.

77. *Id.*

[Ebola] emergencies."[78] This fund allowed organizations authorized by the Ministry of Health "to quickly rent helicopters for flying personnel, generators, and supplies into Likati."[79]

Between April 22 and May 10, the government set up coordination committees at national, provincial, and local levels; expanded training of healthcare personnel; contacted publicly recognized figures to raise awareness; and drafted lists of contacts and family members.[80] The aforementioned committees covered surveillance, medical care, laboratory and research, communication and social mobilization, water, hygiene and sanitation, psychosocial care, and logistics.[81]

b. Surveillance (IHR Article 5)

Article 5 of the IHR provides in relevant part that "[e]ach State Party shall develop, strengthen and maintain, as soon as possible but no later than five years from the entry into force of these Regulations for that State Party, the capacity to detect, assess, notify and report events in accordance with these Regulations . . . ."[82]

i. West Africa

Before the Ebola outbreak, Guinea, Liberia, and Sierra Leone had suffered from devastating civil wars or internal conflict, which leveled a corresponding effect on the countries' health system infrastructure. Under WHO assessments, their health infrastructures were among the weakest in the world. These weak infrastructures led to two related problems in the context of surveillance.[83]
"First, the provision of healthcare and the surveillance and reporting roles often undertaken by public authorities were fractured among dozens of non-governmental organizations, many of which paid higher salaries or offered employment on more favorable terms than state-administered entities of the healthcare system."[84] "These organizations maintained non-uniform systems for collecting, centralizing, analyzing and transferring data" about possible EVD

78. Ed Yong, *How the Democratic Republic of the Congo Beat Ebola in 42 Days*, THE ATLANTIC (July 3, 2007), https://www.theatlantic.com/science/archive/2017/07/how-the-democratic-republic-of-congo-beat-ebola-in-42-days/532590/ [https://perma.cc/N86K-CQW5].

79. *Id.*

80. *Id.*

81. INT'L FED'N OF RED CROSS AND RED CRESCENT SOCIETIES, *supra* note 75.

82. WORLD HEALTH ORG., INT'L HEALTH REGULATIONS, PART II, ARTICLE 5 (2d ed. 2005).

83. GEORGETOWN UNIV. MED. CTR., *Data Sharing during the West Africa Ebola Public Health Emergency: Case Study Report*, GLOPID-R (Nov. 2018), http://www.glopid-r.org/wp-content/uploads/2019/07/data-sharing-during-west-africa-ebola-public-health-emergency-case-study-report-georgetown.pdf [https://perma.cc/4PDH-QBH9].

84. *Id.*

cases.[85] "Second, when EVD cases emerged in remote areas of the most affected countries, data about illnesses and deaths was confused with other common causes of morbidity and mortality that occurred at high rates in all three countries."[86]

"Inconsistent and haphazardly collected and transmitted data bottlenecked at the hospital, ministry, and international levels."[87] "Data quoted by Sierra Leone's Ministry of Health and Sanitation, for example, were inconsistent with WHO's which was in turn inconsistent with determinations made by responders reporting from the field."[88] "MSF, interpreting data based on the geographic dispersion of cases confirmed through methods other than laboratory confirmation and identification of family networks crossing Guinea, Liberia, and Sierra Leone, determined that cases were spreading in the latter well before May 26, when the first case was officially confirmed."[89] "The result was data that justified both action and inaction by relevant stakeholders, with other political and economic pressures favoring the latter from March until July 2014."[90]

"In Sierra Leone, the Ministry of Health and Sanitation shared data infrequently and haphazardly with its own National Ebola Response Centre (NERC) (which integrated UK DFID, UN, and other international stakeholders)," but it was more readily shared with the WHO.[91] "NERC received summary data, but not detailed data relevant to its activities."[92] "WHO would publish its data according to its own criteria which affected the credibility of data issued by the NERC, which in turn had to request data from UK DFID and other aid or public health agencies."[93] "The delay had material, significant effect."[94] "According to one study, if resources committed in September and delivered in October had done so one month earlier, 12,500 cases could have been prevented."[95]

"Health workers immediately started tracking [individuals] who had contact with infected individuals, eventually tracing 583 such contacts."[96] Because there are few or no accurate maps of the area, volunteers used their cellphones to start

85. *Id.*
86. *Id.*
87. GEORGETOWN UNIV. MED. CTR., *supra* note 83.
88. *Id.*
89. *Id.*
90. *Id.*
91. *Id.*
92. *Id.*
93. GEORGETOWN UNIV. MED. CTR., *supra* note 83.
94. *Id.*
95. *Id.*
96. Ed Yong, *How the Democratic Republic of the Congo Beat Ebola in 42 Days*, THE ATLANTIC (July 3, 2007), https://www.theatlantic.com/science/archive/2017/07/how-the-democratic-republic-of-congo-beat-ebola-in-42-days/532590/ [https://perma.cc/N86K-CQW5].

charting the region.[97] Villages in the Bas Uele province are generally only accessible on foot or by bicycle or motorbike, and transferring suspect cases safely to Ebola Treatment Centers was not possible. Outreach teams from the Ministry of Health visited those who were ill, took blood samples, and provided advice and medical supplies to treat the sick at home.[98]

Related to the training and education of DRC's workforce, its laboratory capacity for Ebola detection was relatively well developed while it also made use of rapid diagnostics and mobile laboratory technologies developed in West Africa as part of its response.[99] Before more rapid Ebola diagnostics were developed, several methods for detecting infection and/or disease with Ebola virus had been developed that were amenable for use in clinical laboratory settings.[100] Those methods fell into three basic categories: "(i) serologic tests that detect host antibodies generated against the virus, (ii) antigen tests that detect viral proteins, and (iii) molecular tests that detect viral RNA sequences."[101] Tests (i) and (ii) were available at the national laboratory in Kinshasa.[102]

The DRC made use of rapid-diagnostics that could be confirmed on the ground within an hour and at the national laboratory in Kinshasa within a day. The results from the first samples, subsequently confirmed by the Centre International de Recherche Médicale de Franceville, a WHO collaborating center in Gabon, showed the index case to have died from EVD.[103] "As soon as the outbreak was detected, the Ministry of Health, together with WHO and other partners, mobilized laboratory resources to ensure investigations could be conducted as quickly as possible to guide the response."[104] "In addition to the testing facilities available at the INRB in Kinshasa, an INRB mobile field lab was quickly dispatched to the affected health zone of Likati."[105]

97. *Id.*

98. *In Equatorial Congo, WHO and its Partners Respond to an Ebola Outbreak*, WORLD HEALTH ORG., http://www.who.int/emergencies/ebola-DRC-2017/articles/working-with-partners/en/ [https://perma.cc/5CZY-3LXY] (last visited Aug. 16, 2019).

99. *Id.*

100. *Joint External Evaluation of the Main IHR Capacities of the Democratic Republic of Congo,* WORLD HEALTH ORG. (Mar. 12-16, 2018), https://extranet.who.int/sph/sites/default/files/jeeta/WHO-WHE-CPI-2018.28-fre.pdf [https://perma.cc/4WJ2-7ZW9].

101. M. Jana Broadhurst et al., *Diagnosis of Ebola Virus Disease: Past, Present, and Future*, 29 CLINICAL MICROBIOLOGY REVIEWS 773, 774 (2016).

102. *New Technology Allows for Rapid Diagnosis of Ebola in Democratic Republic of the* Congo, WORLD HEALTH ORG., https://afro.who.int/news/new-technology-allows-rapid-diagnosis-ebola-democratic-republic-congo [https://perma.cc/B5WX-RCNA] (last visited Aug. 22, 2019).

103. *Id.*

104. *Id.*

105. *Id.*

c. Notification (IHR Article 6)

IHR Article 6 governing notification of relevant public health events requires that:

> a State Party shall continue to communicate to WHO timely, accurate and sufficiently detailed public health information available to it on the notified event, where possible including case definitions, laboratory results, source and type of the risk, number of cases and deaths, conditions affecting the spread of the disease and the health measures employed; and report, when necessary, the difficulties faced and support needed in responding to the potential public health emergency of international concern.[106]

i. West Africa

Although WHO released official case definitions of confirmed, probable, and suspected Ebola cases, different countries adopted different testing strategies, thereby limiting the opportunity for inter-country comparison. Limited experience caused many cases to be over looked.

> By 23 March 2014, a few scattered cases had already been imported from Guinea into Liberia and Sierra Leone, but these cases were not detected, investigated, or formally reported to WHO. The outbreaks in these two countries likewise smouldered for weeks, eventually becoming visible as chains of transmission multiplied, spilled into capital cities, and became so numerous they could no longer be traced.[107]

In Liberia, ministries (including port, airport, finance, health, and environment), local governments, clinicians, NGOs, suppliers, and donors all collected data related to identifying cases and taking immediate action, but there was "no information sharing" because there was no centralized authority or resource to do so.[108] Even within data collected, inconsistences limited usefulness. "Dates recorded on a case document might have referred ambiguously to when data was collected, submitted, or edited."[109]

106. WORLD HEALTH ORG., *International Health Regulations*, art. 6 (2005), https://www.who.int/ihr/publications/9789241580496/en/ [https://perma.cc/EA6T-8GL7].

107. *Factors that Contributed to Undetected Spread of the Ebola Virus and Impeded Rapid Containment,* WORLD HEALTH ORG. (Jan. 2015), https://www.who.int/csr/disease/ebola/one-year-report/factors/en/ [https://perma.cc/9LTX-BL3Y].

108. Leon Schreiber, *Chasing an Epidemic: Coordinating Liberia's Response to Ebola, 2014-15*, PRINCETON UNIV., https://successfulsocieties.princeton.edu/publications/ebola-chasing-epidemic-coordinating-liberia-response [https://perma.cc/3JNH-5MYX] (last visited Aug. 23, 2019).

109. *Data Sharing During the West Africa Ebola Pub. Health Emergency: Case Study Report,* GEORGETOWN UNIV. MED. CTR., http://www.glopid-r.org/wp-content/uploads/2019/07/data-sharing-during-west-africa-ebola-public-health-emergency-case-study-report-georgetown.pdf [https://perma.cc/6EMQ-43YE] (last visited Aug 23, 2019).

ii. DRC

The Provincial Health Division issued an alert on May 8, 2017, seventeen days after the death of the index case, and on May 9, the DRC's Ministry of Health informed WHO about undiagnosed illness and deaths including hemorrhagic symptoms in the Likati Health Zone.[110] On May 11, the INRB in Kinshasa confirmed that one of five samples sent from Likati had tested positive for Ebola, and the Ministry of Heath established seven national committees and dispatched investigative teams[111]

In April 2017, the WHO's Strategic Advisory Group of Experts recommended use of an experimental Ebola vaccine should an outbreak occur, delivered in a ring vaccination strategy and under an Expanded Access Framework.[112] Pursuant to the recommendation, the DRC Ministry of Health established ethics review and regulatory channels for approval of the experimental vaccine under an Expanded (or Compassionate Use) Access Framework.[113] On May 11, the DRC Ministry of Health initiated discussions on the use of experimental vaccine with WHO and MSF.[114] "A WHO/Global Outbreak Alert and Response Network team and an MSF Ebola vaccine team were deployed to support implementation."[115]

Communication between the Ministry of Health, Merck (the manufacturer of the vaccine), MSF, and WHO was fluid and frequent during the outbreak, and the DRC maintained both ethics review and regulatory channels for approval of the experimental vaccine rVSV-ZEBOV, which was approved for priority groups on May 29.[116] The Ministry of Health in partnership with WHO developed a plan for establishing and maintaining a cold chain for the vaccine, including borrowing a -60°C -90°C freezer from the Ministry of Health in

110. *Ebola Virus Disease – Democratic Republic of the Congo: External Situation Report 15*, WORLD HEALTH ORG. (July 12, 2018), http://apps.who.int/iris/bitstream/handle/10665/273088/SITREP_EVD_DRC_20180712-eng.pdf?ua=1 [https://perma.cc/E6HV-Q7SV].

111. *New Technology Allows for Rapid Diagnosis of Ebola in the Democratic Republic of the Congo,* WORLD HEALTH ORG., https://www.who.int/emergencies/ebola-DRC-2017/articles/rapid-diagnosis/en/ [https://perma.cc/U56K-QUJ7] (last visited Aug. 19, 2019); *External Situation Report 9*, *Ebola Virus Disease Democratic Republic of the Congo,* (May 22, 2017) WORLD HEALTH ORG., apps.who.int/iris/bitstream/handle/10665/255564/EbolaDRC-22052017.pdf?sequence=1 [https://perma.cc/ZS2Y-N42B].

112. *Workshop on Expanded Access to Experimental Ebola Vaccines During Outbreaks*, WORLD HEALTH ORG., https://www.who.int/blueprint/expanded-access-ebola-vaccines.pdf?ua=1 [https://perma.cc/A3WR-M9H9] (last visited Aug. 30, 2019).

113. Amy Maxmen, *Ebola Vaccine Approved for Use in Ongoing Outbreak*, NATURE (May 30, 2017), https://www.nature.com/news/ebola-vaccine-approved-for-use-in-ongoing-outbreak-1.22024 [https://perma.cc/UNF3-MMT5].

114. WORLD HEALTH ORG., *supra* note 112.

115. *Id.*

116. Maxmen, *supra* note 113.

Guinea, which was packed and ready to be shipped in forty-eight hours.[117] Total time for all logistics, including transportation of doses from a stockpile in Geneva, was one week post approval.[118] The ethics review committee discussed with MSF forms for informed consent and a ring vaccination strategy to immunize contacts of suspected and confirmed patients, the contacts of those contacts, and health workers.[119] The outbreak was contained before these plans became necessary to operationalize.

d. Public Health Response (IHR Article 13)

Article 13 of the IHR requires "Each State Party shall develop, strengthen and maintain, as soon as possible but no later than five years from the entry into force of these Regulations . . . the capacity to respond promptly and effectively to public health risks and public health emergencies of international concern as set out in Annex 1."[120] Article 13 further includes the ability of countries to request assistance from WHO, including the coordination of international partners for public health emergencies of international concern.[121]

i. West Africa

As for surveillance and detection, capacity to respond was significantly limited in the most affected West African countries, and that capacity was largely spread over the informal sector.[122] The public health response, between March and July 2014 was not generally mediated through national governments, but rather through entities employed by major funders: the Bill & Melinda Gates Foundation, CDC, the CDC Foundation, DFID, the Paul Allen Foundation, the UK government, and USAID among the most significant.[123] These entities experienced barriers coordinating responses between themselves. "Without agreement about the mutually beneficial roles, responsibilities, and legitimate contributions of clinicians, scientists, and public health authorities, parties end

117. WORLD HEALTH ORG., *supra* note 112.

118. Stephanie Soucheray, *WHO: Ebola Vaccine Could Be Deployed Within a Week*, CIDRAP (May 18, 2017), http://www.cidrap.umn.edu/news-perspective/2017/05/who-ebola-vaccine-could-be-deployed-within-week [https://perma.cc/FY24-LN9D].

119. *Id.*; *External Situation Report 22, Ebola Virus Disease Democratic Republic of the Congo,* (June 8, 2017), https://apps.who.int/iris/bitstream/handle/10665/255630/EbolaDRC-06062017.pdf?sequence=1 [https://perma.cc/ZS2Y-N42B].

120. WORLD HEALTH ORG., *supra* note 107.

121. *Id.*

122. *Ebola: Pushed to the limit and beyond*, MEDECINS SANS FRONTIERES (Mar. 23, 2015), https://www.msf.org/ebola-pushed-limit-and-beyond [https://perma.cc/KW82-C23A].

123. *Data Sharing during the West Africa Ebola Public Health Emergency: Case Study Report*, GEORGETOWN UNIV. MED. CTR. (Nov. 2018), http://www.glopid-r.org/wp-content/uploads/2019/07/data-sharing-during-west-africa-ebola-public-health-emergency-case-study-report-georgetown.pdf [https://perma.cc/XTR4-WUN6].

up either encroaching on one another or not communicating."[124] These practices are reflected in the retrospective reports entities drafted for donors and others, emphasizing number of geographic locations in which there was a presence, number of volunteers trained, and number of staff hired.[125]

ii. DRC

The 2017 outbreak was guided by the International Health Regulations, the response component of which had been informed by the experience in Guinea, Liberia, and Sierra Leone. The DRC's 2018 Joint External Evaluation (JEE) demonstrated "a considerable commitment of the authorities of the Democratic Republic of Congo in the process of improving the implementation capacity of the IHR (2005) through the creation of a Congolese agency for the prevention and control of diseases and the establishment of short-term plan for an integrated and multisectoral national plan for strengthening health security."[126] Its highest scores (three or four indicating, respectively, developed capacity and demonstrated capacity) under the JEE framework were for its system of epidemiological training, its strategy for its healthcare workforce, and its emergency response program.[127]

In addition, the National Plan Health Development Plan 2016-2020 and the Guide to Integrated Disease Surveillance and Response revised in 2011 include provisions for the adequate implementation of the IHR (2005).[128] In most sectors, there is legislation, regulations, administrative requirements, and other relevant government instruments for the implementation of the IHR (2005). At the institutional level, the NFP RSI is appointed within the National Border Hygiene attached to the Ministry of Health. The country also has a National Coordinating Committee (NCC) within the Ministry of Health in the event of an outbreak.[129]

While the DRC still faces significant barriers with respect to the adoption and dissemination of laws relevant to the IHR, communication and coordination between ministries, surveillance capacity, its NFP, national coordinating

124. *Id.*; *see also* Ben Goldacre, Sian Harrison, Kamal R. Mahtani, et al., *WHO Consultation on Data and Results Sharing During Public Health Emergencies*, CTR. FOR EVIDENCE-BASED MED. (Sep. 2015), http://www.who.int/medicines/ebola-treatment/background_briefing_on_data_results_sharing_during_phes.pdf [https://perma.cc/7L5C-J2LX].

125. *Social Mobilization Lessons Learned: The Ebola Response in Liberia,* JOHNS HOPKINS UNIV. (Feb. 2017), www.healthcommcapacity.org/wp-content/uploads/2017/02/Ebola-Lessons-Learned-ksm.pdf [https://perma.cc/A36E-U25Q].

126. *Joint External Evaluation of the Democratic Republic of Congo*, WORLD HEALTH ORG. (Mar. 12-16, 2018), https://extranet.who.int/sph/sites/default/files/jeeta/WHO-WHE-CPI-2018.28-fre.pdf [https://perma.cc/D4P7-CD5M].

127. *Id.* at 3.

128. *Id.* at 4.

129. *Id.* at 6.

committee, and emergency response plans functioned well in support of the response to the 2017 outbreak. This coordination was attributed to agreements that clearly defined roles, transparent and agreed-upon categories of data needed for the trials to show evidence of safety and efficacy, and adequate resources to enroll volunteers, conduct trials, and gather information. Response was run from the central government generally and Kinshasa specifically, where dedicated committees executed clear, well-defined roles. The national government established committees overseeing surveillance, medical care, laboratory and research, communication and social mobilization, water, hygiene and sanitation, psychosocial care, and logistics. While major non-governmental organizations and international organizations including ALIMA, IFRC, MSF, UNICEF, and WHO were invited to participate in the response, they did so according to a national emergency action plan overseen by DRC authorities. Before the 2017 outbreak, the previous eight largest outbreaks of Ebola took on average two months to be recognized and confirmed; the 2017 outbreak took only nineteen days.[130]

After alerting international partners on May 9, consistent with its national plan of action, the Ministry of Health dispatched a team including doctors, nurses, logisticians, water and sanitation experts, health promoters, and an epidemiologist.[131] On the same day, MSF sent a team of fourteen support staff including physicians.[132] On May 12, a cargo plane with fifteen tons of medical and logistical supplies flew from Kinshasa to Kisangani, which is connected to Buta, the capital of Bas Uele Province, by a newly repaired road stretching 324 km.[133] Likati is 150 km from Buta over rugged terrain, but all people and supplies nevertheless arrived in Buta on May 16.[134] By May 17, aid groups were setting up centers for treatment and isolation, and mobile labs.[135] Health centers

130. *Years of Ebola Disease Outbreaks*, CTR. FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/vhf/ebola/history/chronology.html [https://perma.cc/LL4Y-EMC2] (last visited Sept. 11, 2019); *External Situation Report 1, Ebola Virus Disease Democratic Republic of Congo,* (May 15, 2017) apps.who.int/iris/bitstream/handle/10665/255419/EbolaDRC-1552017-eng.pdf?sequence=1 [https://perma.cc/ZS2Y-N42B].

131. *World Health Organization, DRC: Response to The Ebola Virus Disease Outbreak in Bas-Uele Likati*: First joint visit of the Minister of Health and the WHO Representative to the epicenter of the Ebola virus disease outbreak (May 7, 2017), https://reliefweb.int/report/democratic-republic-congo/drc-response-ebola-virus-disease-outbreak-bas-uele-likati-first [https://perma.cc/MAY2-FJCJ].

132. *Id.*

133. *Id.*

134. *Id.*

135. Denise Grady, *Suspected Cases of Ebola Rise to 29 in Democratic Republic of Congo*, N.Y. TIMES (May 19, 2017), https://www.nytimes.com/2017/05/18/world/africa/ebola-outbreak-congo-virus.html [https://perma.cc/76KH-DFGV].

throughout the province regularly sent out alerts through the national surveillance system.[136]

A number of community engagement mechanisms enabled more rapid public health response. Most villages in the Bas Uele province are only accessible on foot or by bicycle or motorbike.[137] "Outreach teams from the Ministry of Health and with partner support, visit those who are ill, take blood samples and provide advice and medical supplies to treat the sick at home."[138] Communicators about Ebola, especially how to prevent its spread, were selected according to their credibility in the community, literacy, and willingness to participate.[139] The Ministry of Health worked with UNICEF and WHO to develop a two-day training for these volunteers, who spread out to the surrounding health zones to inform the public about how to protect themselves from Ebola and avoid spread of the disease.[140] Jean-Jacques Muyembe-Tamfum, director-general of the National Institute for Biomedical Research in Kinshasa, engaged affected communities immediately, building their trust in medical teams and helping them understand the importance of not touching others in checking the spread of the virus.[141]

Surveillance, health facility, and clinical data was shared rapidly through the channels described above. The Ebola containment effort added several places not reflected on existing maps (towns and villages), often on the basis of descriptions from local sources. Some places already present in the RGC were re-localized when GPS recordings or recent digitizations were available from other sources. Because contact tracing was so swift and shared so readily between responding partners (ALIMA, CDC, MSF, and WHO), Ministry of Health personnel were able to confirm two cases of Ebola quickly and identify and follow the next and final six that followed. By May 28, there were seventeen suspected cases in the DRC awaiting a diagnosis, and all contacts remained under surveillance.[142] Sixty-seven percent of the computer simulations run by

136. WORLD HEALTH ORG., *supra* note 131.

137. *In equatorial Congo, WHO and its partners respond to an Ebola outbreak*, WORLD HEALTH ORG., http://www.who.int/emergencies/ebola-DRC-2017/articles/working-with-partners/en/ [https://perma.cc/9RYR-ABW6] (last visited Sept. 11, 2019).

138. *Id.*

139. *Id.*

140. *Id.*

141. Amy Maxmen, *Ebola Vaccine Could Get its First Real-World Test in Emerging Outbreak,* NATURE (May 12, 2017), https://www.nature.com/news/ebola-vaccine-could-get-first-real-world-test-in-emerging-outbreak-1.21989 [https://perma.cc/BL8T-Q7GS]; *Jean-Jacques Muyembe Tamfum: a life's work on Ebola*, WORLD HEALTH ORG., https://www.who.int/bulletin/volumes/96/12/18-031218/en/ [https://perma.cc/8MQL-HZ44] (last visited Sept. 11, 2019).

142. *Ebola Virus Disease – Democratic Republic of the Congo, Disease Outbreak News*, WORLD HEALTH ORG. (May 13, 2017), https://www.who.int/csr/don/13-may-2017-ebola-drc/en/ [https://perma.cc/H2DA-5P9P]; Stephanie Soucheray, *Who confirms 2nd Ebola case in DRC; 17 suspected,* CTR. FOR INFECTIONS DISEASE RESEARCH AND POLICY (May 15, 2017), www.cidrap.

DRC Ministry of Health predicted that there would be no further cases in the next month, and the outbreak was declared over on July 2, forty-two days after the last confirmed case tested negative for Ebola the second time (two twenty-one day incubation cycles of the virus).[143]

CONCLUSION

There are models for effective Ebola response that demonstrate the soundness of the IHR (2005) and provide good models for the integration of international partners. These models often grow from previous experiences with emergencies governed by the IHR, including those where a PHEIC is not declared. Indeed, in the current outbreak in the DRC participation of international partners has been crucial, even if data and response coordination remains imperfect and also faces a stronger, militarized resistance. In the context of the Ebola outbreak in the DRC, rapid containment was achieved in the face of significant resource scarcity, poor physical infrastructure, and limited healthcare infrastructure. Because the DRC acted quickly, through a framework consistent with the International Health Regulations, especially as they functioned in 2014-16 West Africa; invested in the training of its best doctors and nurses to the Ebola threat; communicated clearly and through credible outlets; devoted resources to contact tracing and surveillance; and established regulatory channels for diagnostics and vaccines, it was able to identify and respond to Ebola in record time.

umn.edu/news-perspective/2017/05/who-confirms-2nd-ebola-case-drc-17-suspected [https://perma.cc/B4AF-GDYF].

143. Maxmen, *supra* note 113; *End of the most recent Ebola outbreak in the Democratic Republic of the Congo, Ebola outbreak Democratic Republic of the Congo 2017*, WORLD HEALTH ORG. (Jul. 2, 2017), https://www.who.int/emergencies/ebola-DRC-2017/en/ [https://perma.cc/VJ6E-5ED5].