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Report from the Field

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Ebola Outbreak Control in the Democratic Republic of the Congo

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Health Security is a major concern for the Democratic Republic of the Congo (DRC). It is the second largest country in Africa, borders nine other countries, has more than 80 million inhabitants, and has suffered from decades of neglect and conflicts together with multiple recurrent disease outbreaks, including Ebola.

The first recognized Ebola outbreak occurred in 1976 in a village near the Ebola River, from which the disease takes its name[1]. See Figure 1. This disease is rare but severe, with a high mortality if untreated. There have been 15 Zaire ebolavirus (Ebola) outbreaks in the DRC; eight of them occurred in the last seven years. The second worst outbreak anywhere killed thousands of people in the DRC during 2018-2020 as transmission occurred during 18 months[2]. The latest outbreak was recorded late in 2022. There is much to learn from it, as this time, the outcome was different.

In prior Ebola outbreaks, international teams streamed into DRC to carry out case investigation, contact tracing, staff the surveillance system, isolate and care for suspected cases, run lab tests, provide protective equipment in health facilities, and engage in mass education of the public. However, for the last five outbreaks, there has been a shift with the national Ministry of Health taking increasing lead to coordinate response. As the most recent outbreak occurred in an insecure area (Nord-Kivu province), Congolese personnel not only led but provided the entire on-the-ground response.

There has been an improvement in the detection of Ebola outbreaks in DRC over time. In the 2018-2020 outbreak, the time from first transmission to its identification took four months; 2287 deaths were recorded. In the 2020 outbreak, this took 2 weeks; 55 deaths were reported. The 2022 outbreak was recognized within 48 hours when the index case made contact with the health care system; a total of 6 deaths occurred. This outcome was years in the making through investments in training, labs, emergency management, and surveillance. Improved detection was aided by surveillance among those formerly infected with Ebola; the first cases in the recent outbreaks occurred among a relapsing patient.

Starting in 2013, a field epidemiology training program (FETP) began in DRC as a partnership between the U.S. Centers for Disease Control and Prevention (CDC); the United States Agency for International Development (USAID); the DRC Ministry of Health (MOH); the DRC Ministry of Fisheries, and Livestock; the African Field Epidemiology Network (AFENET); and the University of Kinshasa, School of Public Health (KSPH). To date, this program has trained more than 200 master's level epidemiologists with 2 year's "FETP – Advanced" training and 300 "front line" staff with 3 months of training in the DRC ("FETP – Frontline" (3, 4). Since 2014, they have been engaged in each country's responses to Ebola outbreaks.

DRC has more than 500 health zones and 8 000 primary health facilities. FETP graduates and the infrastructure to support them cannot yet cover all of them, but it is the first program to train individuals to respond to outbreaks and other public health events. Due to strong Ministry of Health leadership, more than 90% of master's trainees graduated from the program and close to half of all Frontline graduates work in rural or remote provinces; most spend the majority of their time doing surveillance and other disease control activities. This stands in stark contrast to many other low resource countries, where graduates migrate to administrative posts in the capital or emigrate in large numbers.

With support from the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), the U.S. President's Malaria Initiative (PMI), and the Global Health Security Agenda (GHSA), decades of effort has gone into strengthening laboratory systems; preparedness, disease outbreak response, health communications, and trust building within communities; disease surveillance; and workforce capacity in the DRC.

A National Public Health Institute was established in 2022 to further strengthen and coordinate these public health functions. Six DRC health officials have been trained through the CDC's 3-month residential Public Health Emergency Management (PHEM) Training

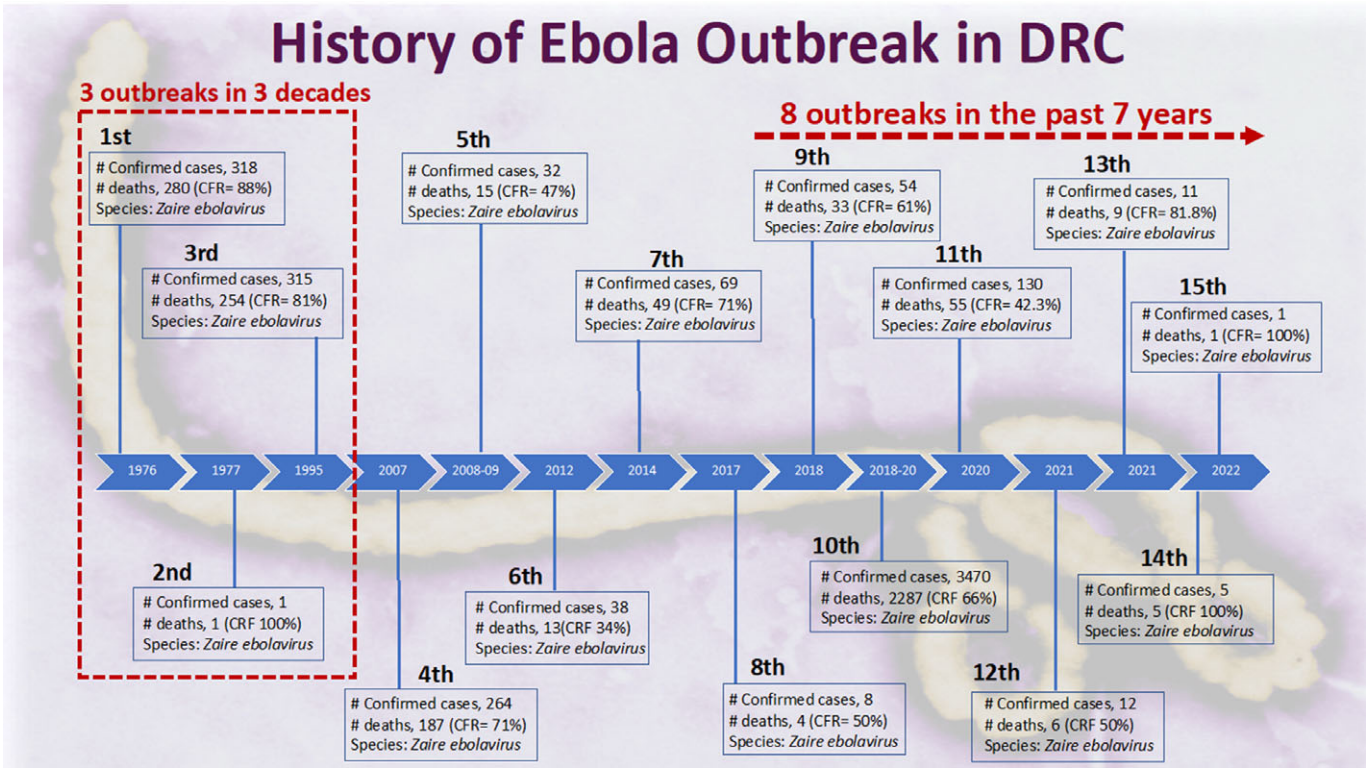

Figure 1. History of Ebola Outbreaks in DRC

program since 2017. They, in turn, helped train 60 in-country MOH staff in emergency management. The DRC now has 30 Rapid Response Team (RRT) managers and team members leading response activities using the Incident Management System.

The national laboratory, the Institut National de la Recherche Biomédicale (INRB), engaged with international experts to develop vaccines, therapeutics, and validate rapid diagnostic tests for Ebola now used around the world. The national lab can carry out whole-genome sequencing, serology, and multi-pathogen detection. To support epidemiological investigations and real-time decisions making, INRB's mobile sequencing laboratory was used in recent Ebola outbreaks. With support from the U.S. State Department, INRB trained staff to do lab testing and to maintain a biorepository with adequate biosafety and biosecurity for viral hemorrhagic testing; additionally, INRB supports 10 regional reference laboratories, a lab information system, and has 14 national laboratory staff trained with international support. CDC and INRB evaluated a rapid test developed by Orasure and funded by BARDA to detect Ebola in post-mortem surveillance; this helps prevent one of the major avenues of disease spread.

The MOH's maturing system of surveillance and lab support has made it possible to staff where most needed for outbreak response. The availability of trained staff was key, as international experts could not travel to affected areas during recent outbreaks.

Key elements of success in DRC are needed by many countries improving their health security. These include:

1. Training and accompaniment to strengthen skill in disease surveillance among public health leaders over an extended period, at least a decade
2. International training of those in leadership, who then expand in-country training for many more national staff in emergency management
3. Review of recent outbreak experiences to improve management of emergency responses over time
4. Technical and material support to develop the national and regional laboratory system
5. Effective leadership by national institutions – the Ministry of Health, the National Lab System, and the National Public Health Institute[5]
6. The harmonization of external technical and financial support from universities, governmental, and non-governmental organizations from a variety of countries
7. Gradual increase in responsibility for response and collaboration among national and provincial authorities over a series of outbreaks

Over time, we have observed improved coordination and effectiveness and timeliness of response activities in managing Ebola outbreaks in the DRC. This has occurred despite shortfalls in staffing and lab support in a very resource-limited country i. It is the product of sustained investment both by the international community, national leaders, and strong community involvement. These developments are not easy or automatic once training has occurred, nor are they successful everywhere. DRC shows, however, that in even a difficult and resource-limited environment, sustained investments in health security can yield profound results. Reaching these goals is important for not only DRC's citizens, but also for global health security, as Ebola and other emerging and re-emerging conditions are a threat to all nations in today's interconnected world.

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Simon Agolory conceived of and initiated the organization and analysis of data and systems and contributed to its writing.

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