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COMMENTARY

Emergent threats: lessons learnt from Ebola

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Recent disease outbreaks have demonstrated the severe health, economic and political crises that epidemics can trigger. The rate of emergence of infectious diseases is accelerating and, with deepening globalisation, pathogens are increasingly mobile. Yet the 2014–2015 West African Ebola epidemic exposed major gaps in the world's capacity to prevent and respond to epidemics. In the midst of the world's second largest ever recorded Ebola outbreak in the Democratic Republic of the Congo, we reflect on six of the many lessons learnt from the epidemic in West Africa, focusing on progress made and the challenges ahead in preparing for future threats. While Ebola and other emerging epidemics will remain a challenge in the years to come, by working in partnership with affected communities and across sectors, and by investing in robust health systems, it is within our power to be better prepared when they strike.

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Recent disease outbreaks have disrupted global health on an unprecedented scale, demonstrating the severe costs epidemics pose to human health and the economic and security crises they can trigger.[1] Today, a confluence of socioeconomic, political and environmental factors is accelerating the rate of the emergence of infectious diseases. With deepening globalisation, these pathogens are increasingly mobile and the threats they pose are global in nature. Indeed, we have recently faced numerous era-defining epidemics such as the 2002–2003 outbreak of severe acute respiratory syndrome, the global spread of the Zika virus and the 2014–2015 outbreak of Ebola Virus Disease (EVD) in West Africa.

The 2014–15 Ebola epidemic in particular exposed how a 'perfect storm' of weak health systems, poverty, and political and economic fragilities can fuel outbreaks.[2] In the aftermath, numerous analyses[3] have shown that some of the 28 000 cases and 11 000 deaths could have been prevented with stronger preparedness at the national and international levels and a faster, more effective response.[4] At the time of writing, the second largest ever recorded Ebola outbreak is unfolding in the provinces of North Kivu and Ituri, Democratic Republic of the Congo (DRC), with more than 2 500 cases and 1 700 deaths as of 17 July 2019.[5] Amidst a prolonged humanitarian crisis, violence and attacks on health workers, political instability, and community mistrust, there is currently no evidence that the end of the epidemic is in sight. Rather, there is a significant risk that the outbreak could further expand in DRC and regionally, as illustrated by the recent confirmed case of Ebola in the major border city of 2 million Goma, while the risk of another outbreak emerging in DRC or elsewhere remains. Indeed, on 15 July 2019, the World Health Organization (WHO) recognised these risks and declared the outbreak a Public Health Emergency of International Concern (PHEIC). It is within this context that we briefly reflect on six of the many critical lessons learned from the West African Ebola outbreak, focusing on progress made and challenges ahead in preventing and preparing for future epidemics.

First, countries must strengthen their core capacities to prevent, detect and respond to outbreaks, with commensurate domestic and, where needed, international investments.[4] Strengthened health systems must be responsive to peoples' rights and needs, addressing the everyday health problems they experience as well as emerging threats. A strong and supported health workforce is central to a robust health system. At the onset of the Ebola outbreak in West Africa, many frontline staff lacked appropriate training in emergency preparedness and response. Several health workers operated in unsafe environments with inappropriate equipment and without adequate pay, which affected their readiness, safety, motivation and the quality of care they could provide. Within this context, more than 800 health worker infections were reported.[6]

Encouragingly, many initiatives have since been mobilized to improve national preparedness.[7] For instance, WHO launched the Joint External Evaluation tool to independently assess national capacities to address public health threats in line with their commitments under the International Health

Regulations (2005). As of 28 March 2019, 96 countries have already volunteered and completed the assessment.[8] Another important step was the establishment of the Africa Centres for Disease Control and Prevention, which supports countries throughout the African region to strengthen surveillance, prevention and response to infectious diseases and wider health issues.[9]

However, efforts to strengthen national preparedness and core capacities are also challenged by inadequate funding.[7] Limited investment in health workforce strengthening, for example, has meant that 4 y after the West African epidemic, health workers in the affected countries are still underprepared to address existing and emerging health threats. In Liberia, for instance, limited funding and fiscal space challenge the Ministry of Health's capacity to absorb, distribute and retain newly trained health workers to address identified gaps, which minimizes the impact of well-designed evidence-based interventions.

Second, outbreaks are not only a major cause of societal disruption in the nation in which they occur, but they can also spread across borders and can surpass national capacities; coordinated global action across sectors is therefore critical. After the collective failure to respond early and effectively in West Africa, consensus emerged that both WHO and the broader humanitarian system required strengthening.[4] WHO was heavily criticized for its performance, and substantial reforms were recommended to address longstanding operational and institutional shortcomings.[4] In particular, concern was raised that the then WHO Director-General was too late to convene the Emergency Committee and to declare a PHEIC,[10] which highlighted the need for a more nuanced, tiered, and accountable global procedure to declare an outbreak instead of an all-or-nothing system. Facing a slow response, humanitarian and other nongovernmental organisations beginning with Médecins Sans Frontières worked to fill the gaps.[10]

The good news is that we have since seen some improvements. WHO has created a new Health Emergencies Programme, which is working to strengthen its operational capabilities and to support countries' preparedness for health emergencies.[11] Health emergencies have also featured prominently on WHO's agenda under the new leadership of Director-General Dr Tedros, with a central position in WHO's 13th general programme of work 2019–2023[12] and Dr Tedros' personal commitment and engagement on the ground during health emergencies, such as the Ebola outbreak in DRC. Another important step was the establishment of the World Bank's Pandemic Emergency Financing Facility (PEF), which provides surge funding to prevent rare, high-severity disease outbreaks from becoming largescale pandemics.[13] Despite a swift and better coordinated response in many ways to the current outbreak in North Kivu and Ituri from DRC and internationally, the outbreak is not under control and it is clear that that high-level political action, improved coordination, greater funding, and a consideration of new strategies are needed to end this devastating epidemic.

Third, we must remain vigilant and forward-looking, implementing well-accepted control measures when an outbreak hits but also expanding these strategies to areas at high risk of infection. Since the first known outbreak of Ebola in 1976, the basic control strategy, and its refinement over subsequent outbreaks, has focused on rapid case identification for isolation, treatment and care, contact tracing, community engagement and mobilization, safe and dignified burials, effective infection control; and laboratory testing[14]. From a purely reactive response to primary prevention through vaccination, expanding efforts to find and reach high-risk areas and groups is critical for stopping small, localised epidemics from spiralling into global emergencies. As the current Ebola epidemic in DRC highlights, we must use every possible approach and tool available- from community engagement, to strengthened diagnosis and real time sequencing, to ring vaccination and primary prevention through broader vaccination in the community.

Fourth, early investment is critical to incentivize research and development (R&D) on pathogens that are likely to cause epidemics. Despite early studies into EVD in the 1970s, there were no approved drugs, vaccines or rapid diagnostic tests when the outbreak began in West Africa.[15] The scarcity of available health technologies signalled a wider failure in the R&D system to respond to diseases that predominantly affect relatively small populations in poorer countries.[16] Equitable access to these technologies lies at the heart of the right to health, and research agendas must be set with scientists and communities from affected countries.

Promising efforts to rethink how health technologies for emerging infections are developed are now underway. WHO convened a broad coalition of experts to contribute to a new R&D blueprint, which identifies a list of priority diseases and acts as a source of global guidance on R&D during outbreaks.[17] Complementing the normative functions of WHO, a global multisector partnership called the Coalition for Epidemic Preparedness Innovations was launched in 2017 to fast-track the development of vaccines against emerging pathogens and to ensure that affected populations have equitable access to them during outbreaks.[18]

During the 2014–2015 crisis, a cause for optimism was that social science and biomedical research efforts were mobilised during the epidemic. This research has translated into application on the ground with the deployment of health technologies in DRC to help manage the current outbreak. In particular, Merck's investigational rVSV-ZEBOV-GP vaccine has been deployed in DRC through a ring vaccination strategy after a trial carried out in Guinea found that the vaccine offered maximal impact against the spread of the virus among contacts of patients.[19] As of 13 July 2019, over 160 000 contacts and contacts of contacts have been vaccinated with the investigational rVSV-ZEBOV-GP vaccine.[20] While the addition of the investigational rVSV-ZEBOV-GP vaccine has been a critical new tool in the current response, it is clear that, up to now, the current strategy has not been able to bring the epidemic under control.

In line with the recommendations of the WHO Strategic Advisory Group of Experts (SAGE) on Immunization, the deployment of a second experimental vaccine under study conditions would have the dual benefit of supporting the ongoing response and improving preparedness for future outbreaks. Primary prevention through broader vaccination in the community with the Johnson & Johnson investigational Ebola vaccine regimen (Ad26.ZEBOV, MVA-BN-Filo) should be considered as another critical approach to prevent further transmission of EVD to high risk areas and to help stop the outbreak.

The Ministry of Health of DRC also announced in November 2018 the launch of a multidrug randomized control trial to evaluate the effectiveness and safety of investigational Ebola therapeutics, which is enrolling and treating patients at Ebola treatment centres in Beni, Butembo, Katwa, and Mangina.[20] The DRC has been a leader in scientific advancement during Ebola outbreaks, and should remain at the forefront of research and innovation in this area during the current epidemic.

Fifth, communities must be engaged and empowered as primary partners in preparedness and response activities. Innovative medical technologies alone are not enough to prevent and contain epidemics without serious efforts to gain the trust of communities and to understand their perceptions of control measures in order to better meet their needs.[21] And for this, community engagement and social science activities must be included as central components of decision-making, research agendas, and resource prioritisation during the conceptualisation, planning, and implementation phases of public health initiatives.[22] The deployment of new health technologies in DRC is certainly a marked improvement from West Africa; however, amidst political instability and in a time of controversial national elections, stronger efforts to engage communities and build trust will be critical for encouraging people to seek care, accept health interventions, and adopt preventative behaviours.[23] While the declaration of a PHEIC will hopefully mobilise the world in response to this very complex outbreak in DRC, this support must directly reach the people of North Kivu and Ituri and contribute to vital work at the community level.

Sixth and finally, the health care needs surrounding Ebola do not end when the outbreak does- we must look beyond Ebola, placing communities and their needs at the centre of our efforts. Increasing clinical and research observations have shown that the medical complications experienced by Ebola survivors linger for many years after an outbreak.[24–29] Yet this accumulating evidence has had little impact on health services for survivors. Local health institutions were not prepared to care for survivors, and international humanitarian organizations funded or implemented short-term interventions in few affected areas. Ministries of health battled with whether and how to integrate survivor care needs within existing public health services due to the lack of resource capacity and expertise to provide clinical care for the specialized medical and psychological sequelae of Ebola.

Moreover, the very slow clearance of Ebola virus fragments from immunologically protected body tissues and fluids prolongs the potential risk of infection of close contacts and relapse of acute EVD.[30–34] Thus, even where capacity exists for treatment, health workers are reluctant to provide critically needed care considering their risk of infection. The 2017 death of Salome Karwah, a Liberian Ebola survivor, caused by eclampsia, highlighted this fear.[35] International recommendation to delay surgical procedures amidst an uncertain level of risk of transmission caused delay in provision of ophthalmological surgery and progression to irreversible blindness resulting from ongoing postinfectious inflammatory uveitis.

As countries with weak health systems continue to experience Ebola outbreaks, the population of survivors is growing and the need for and right to access care must not be ignored. Countries need to enhance baseline capabilities for integrated research and long-term specialized care for Ebola survivors. Improving Ebola survivors' interaction with quality health services is associated with regression or arrest of progress of the physical and psychological post-Ebola sequelae and can have a lasting positive impact on the quality of life of survivors.

To conclude, the West African Ebola epidemic was a profound tragedy for all of the affected communities and countries. It was also a wakeup call that hoisted global health security onto the world's agenda. While important lessons have been learnt in the aftermath of the crisis and efforts are already underway to strengthen epidemic preparedness at all levels, concerning gaps remain. The world remains vulnerable to the threat of emerging infections. Looking ahead, further investment is needed to strengthen core capacities in countries, including to create enabling work environments with training and fair pay for health workers. Progress delivering medical innovations must be matched by scaled-up efforts to meaningfully engage and empower affected communities, including supporting the needs and promoting the rights of Ebola survivors. As we approach the one-year mark of the world's second largest Ebola outbreak in DRC, the world must step up to support DRC in their incredible efforts stop this epidemic, using all of the tools at our disposal. While Ebola and other emerging infections will remain a challenge for the years to come, by working in partnership across sectors and with communities, and investing in robust health systems, it is within our power to be better prepared when they strike. Important lessons have been learnt since the West African Ebola epidemic, now it is up to the world to employ those lessons and act in solidarity with the people of DRC.

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