Improving epidemiological response: lessons learnt from successive outbreaks in Nigeria

Assad Hassan,1,2* Muhammad Balogun,1 Mahmood Dalhat1 and Chikwe Ihekweazu2

1Nigeria Field Epidemiology and Laboratory Training Programme, Abuja, Nigeria and 2Nigeria Centre for Disease Control, Abuja, Nigeria

*Corresponding author. Nigeria Field Epidemiology and Laboratory Training Programme, Abuja, Nigeria. E-mail: hssnassad@yahoo.com

A series of disease outbreaks in Nigeria demonstrated the need for countries to invest more in improving their health security capabilities.1 Nigeria experienced five major disease outbreaks in 2017 which stretched the response capacity of its epidemiologists and its public health system.2 There are three levels of public health delivery in Nigeria: national, state and local government levels. At the national level, the Nigeria Centre for Disease Control (NCDC) coordinates the response to disease outbreaks of public health importance. At the state and local levels, epidemiology teams and disease surveillance officers are responsible for disease prevention and control.

The outbreaks

Between December 2016 and June 2017, Nigeria experienced the largest ever reported outbreak of meningococcal meningitis serogroup C.3 By the end of the outbreak, 14,518 suspected cases were reported (of which 433 (32%) were confirmed), leading to 1166 deaths. The case fatality ratio (CFR) was 8.0%.3

Starting from May 2017, there were cholera outbreaks across the country with the worst one recorded in the security-compromised north-eastern part of the country, where the Boko Haram insurgency has destabilized normal societal structures. Most cases occurred in camps for internally displaced persons (IDPs). By the time the cholera outbreak was brought under control in December 2017, over 5000 cholera cases had been reported with a CFR of 1.1%.4

In September 2017, Nigeria was hit with outbreaks of two re-emerging zoonotic diseases—yellow fever and monkey pox. An epidemiological investigation of a cluster of unexplained deaths in two states led to the confirmation of the first yellow fever outbreak in Nigeria since 1986.2 Almost simultaneously, there were reported cases of a strange illness in a state in southern Nigeria, which was confirmed to be monkey pox, a disease that was last seen in Nigeria in the 1970s.5 It eventually became the largest reported outbreak of monkey pox in West Africa.6 As the country grappled with the outbreaks of meningococcal meningitis, cholera, yellow fever and monkey pox, there was a persistent rise in the number of detected Lassa fever cases.2

The response to the outbreaks

The NCDC coordinated the response to all the outbreaks from the national level. The response to the meningococcal meningitis outbreak had many challenges. The surveillance officers at the local level failed to detect and report the early cases of the outbreak. At the state level, there were delays in notification of the outbreaks and at the national level, there were delays in initiating reactive vaccination campaigns.7 There were an uneven distribution of skilled epidemiological resources and inadequate laboratory capacity in the country. As the meningitis outbreak progressed, NCDC established a national incident management system (IMS) and emergency operation centre (EOC). The IMS helped to ensure enhanced epidemiological surveillance, standard case
management and reactive vaccination campaigns to control the outbreak.

There was some variability in the response to the cholera outbreaks. Cholera outbreaks are caused by systemic failures often outside the control of the health sector, such as good water supply and effective refuse collection and disposal. Various agencies of government responsible for water supply and the environment were not sufficiently aware of their roles in the prevention of cholera outbreaks. In contrast to the response in other states, in Borno State there was a rapid response to the outbreak in the IDP camps, probably because of the heightened risk awareness by those managing the camps. The oral cholera vaccine (OCV) was used for the first time in Nigeria to control this outbreak.

The early phases of the response to the two highly unusual outbreaks of yellow fever and monkey pox were held back by delays in laboratory confirmation. There was great public anxiety regarding the cases of monkey pox, as features of the disease were visually challenging and were similar to the dreaded smallpox disease.

There was immense support from both national and international organizations who worked in partnership with NCDC in response to the outbreaks. The multi-agency meningitis IMS helped to bring the meningitis outbreak to an end. Partnership support also facilitated the quick and vital decision to use OCV in curtailing the cholera outbreak, and the laboratory confirmation of the monkey pox and yellow fever outbreaks.

**Lessons learnt from response to the outbreaks**

Strengthening of public health systems must be a national policy priority, especially in low- and middle-income countries (LMICs). Targeted legislative advocacy is required to ensure enactment of public health laws that will provide adequate resources for epidemiological interventions, as well as infrastructure that is required to improve disease surveillance and outbreak preparedness. If policy makers are not made aware of the impact and the urgency of prioritizing epidemiological resources, planning for epidemic preparedness and response will continue to be reactive rather than strategic, with an associated risk of huge human and economic consequences.8

African nations have been implementing the Integrated Disease Surveillance and Response (IDSR) strategy. IDSR aims to ensure timely availability of epidemiological surveillance data for disease prevention and control.9 Objective assessments of the IDSR implementation, using its core indicators of surveillance and response activities within the IDSR framework, must be conducted routinely to help identify weaknesses that need to be addressed urgently for desired outcomes. The IDSR framework has the advantage of clearly defined roles for all levels of public health surveillance regarding outbreak preparedness and response. The strategy rightly focuses on the local level, which maintains the surveillance systems that detect outbreaks and is usually the first level of response to outbreaks. The IDSR strategy should be exploited to educate health care workers in health facilities on how to identify suspected cases of epidemic-prone diseases, when and how to report such cases and when not to collect and forward specimens for laboratory analysis. Full implementation of IDSR strategy will ensure the local level has basic epidemiological skills and communication systems for rapid information sharing. To ensure optimal state-level epidemic preparedness and response, EOCs with full complement of the IMS structure should be developed in all the states, to enable them to improve rapid coordination of outbreak responses at their own level.

Epidemiologists at the national level must have coordination mechanisms for outbreak preparedness and response, in order to confront the modern-day challenges of multistate outbreaks. Case definitions must be standardized, questionnaires must be rapidly developed and data must be rapidly pooled and shared.8

Non-health sector agencies have a profound impact on the prevention and response to disease outbreaks.10 Agencies responsible for agriculture, water resources and environment must be involved in epidemic preparedness and response activities. With the threat of new, emerging and re-emerging zoonotic diseases, surveillance for diseases among humans should be complemented with a commensurate surveillance among animals. The concept of one health must be fully embraced.

The global community has a critical role to play in supporting epidemic preparedness and response activities in LMICs. Long-term financial investments in both innovative and routine methods are required to develop a robust human and animal surveillance system in LMICs. Investments should focus on human and laboratory capacity building as well as on strengthening existing systems. Public-private partnerships could also be used as advocacy tools to bring the attention of policy makers to the challenges of epidemic preparedness and response.11 The availability of a well-trained and equipped public health workforce is essential to overcome the challenges of poor surveillance and delayed response to outbreaks. In the context of a highly mobile global population, appropriate epidemiological capacity to sufficiently prepare and rapidly respond to sequential outbreaks must be put in place to ensure global health security.

Mathematical modelling of epidemics could be a valuable tool towards understanding disease transmission patterns and determination of outbreak control measures.
This form of epidemiological analysis can project likely scenarios in the early stages of an outbreak, which can be used to guide policy makers on the optimal response strategy. Modelling was particularly used in the response to Ebola. The idea of making projections is to ‘get ahead of the curve’, to respond to or prevent epidemics. Spatiotemporal analysis of disease outbreaks should be used to further understand the epidemiology of epidemics. Spatiotemporal analysis can provide information on evolution of disease pathogens as well as on climatic and environmental risk factors for disease (re-)emergence. An understanding of the local drivers of outbreaks and local health system capacity could facilitate a more focused and effective response.

In conclusion, many lessons were learnt from several large, sometimes simultaneous outbreaks in Nigeria in 2017. The NCDC began to rapidly build up its capacity through the period. The unexpected situation with multiple outbreaks provided opportunities to identify areas where LMICs such as Nigeria need to strengthen their health security capacity. Governments in LMICs must take the lead in seizing these opportunities to build sustainable national and sub-national quality systems for both reactive and proactive epidemiological response capabilities. By improving epidemiological response in LMICs, the world would potentially be better placed to deal with the next big public health global scare following the Ebola outbreak of 2014.

Acknowledgements
Thank you to Stephen Leeder for offering the opportunity to contribute this editorial.

References