Tackling emerging and re-emerging health threats through cross-border zoning and joint multi-country action

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Background. The weak disease-surveillance systems between countries require the establishment of harmonised consensus-based collaborations and the implementation of cross-border surveillance approaches.

Objective. To tackle public health emergency threats using cross-border zoning and joint multi-country collaboration.

Methods. Under the Southern Africa TB Health Systems Support project, 25 cross-border zones were identified using defined zoning criteria. Established zones were led by multisectorial zonal committees with defined roles and responsibilities.

Results. Between November 2017 and January 2020, 13 (52%) of the 25 cross-border zones were operationalised. Thirteen joint work-plans were developed, and are at different stages of implementation. Six (75%) of 8 follow-up meetings that were due were conducted. Thirteen tabletop simulation exercises and donning and doffing demonstrations were conducted. Two field simulation exercises were conducted to test preparedness in a close-to-real-life situation. Thirteen communication channels were established. Thirty zonal members were trained in threats hazards identification and risk assessment (THIRA), and 3 zones subsequently identified, and their hazards prioritised. Joint responses for cholera, anthrax, foot and mouth disease and African swine fever outbreaks were conducted.

Conclusion. The use of cross-border zoning led by multisectorial cross-border committees is an effective way of ensuring heightened preparedness and response to epidemics and events of public health concern at the local level.

Surveillance is described as an ongoing process of collecting, analysing and interpreting data in a systematic way such that it will be useful for planning purposes.[1] The aggregated information assists countries and regions to identify populations and groups at high risk, thereby directing interventions to where they are most needed, to evaluate the effectiveness of control and preventative measures implemented and to monitor trends and patterns of disease as a basis for predicting what is likely to happen.

Infectious diseases have posed a threat from time immemorial, with the influenza pandemic in 1918 infecting an estimated 500 million people.[2] The ever-present threat has led to tangible global commitments, including: the Global Health Security Agenda;[3] regional commitments in Africa, including the 48th World Health Organization Regional Committee for Africa resolution AFR/RC48/R2 that adopted the integrated disease surveillance and response strategy (IDSR); the 58th World Health Assembly, which adopted resolution WHA58.3 on International Health Regulations; the Declaration on Accelerating Implementation of International Health Regulations; and the launch of the Africa Centers for Disease Control and Prevention (Africa CDC).[4,5]

By 2013, 43 countries had implemented IDSR in the Africa region. Alongside the reported successes have also been significant challenges that present opportunities for improvement. Particularly notable are challenges associated with communities in the peripheral border areas, and globalisation, which have increased mobility of humans and animals, thereby increasing the risk of transmission of infectious diseases to neighbouring countries.[6] Locally, there have been some regional and bilateral initiatives meant to strengthen cross-border collaborations, including the East Africa Integrated Diseases Surveillance Network (EAIDSNet) and the World Health Organization (WHO) and Southern African Development Community memorandum of understanding for joint planning in identifying areas of collaboration in cross-border communicable diseases and control.[7,8]

In line with these regional commitments, the four Southern African countries of Lesotho, Malawi, Mozambique and Zambia, in partnership with the World Bank, the East, Central and Southern Africa Health Community and the New Partnership for African Development are implementing the Southern Africa Tuberculosis and Health Systems Support (SATBHSS) Project.[9] One component of the project seeks to strengthen regional capacity for disease surveillance, emergency preparedness and response, through a number of interventions including cross-border surveillance and response interventions. Key to this is the establishment of cross-border zones.

The present article describes the process of establishment of cross-border infectious disease response collaborations in southern

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Africa, and the observed progress to date.

Establishment of cross-border zones
Rationale
Given the ecological distribution of communicable diseases, globalisation of the world into a single village and the length and sometimes undemarcated and porous nature of international borders, it is imperative that countries work together to control and eliminate the threat of these diseases, and events of public health concern, from crossing political boundaries.[10] In addition to the above factors, border areas characteristically have weaker and more overwhelmed health and surveillance systems, the more one moves further away from the central administration. [10] It is therefore logical that neighbouring countries engage each other in co-ordinated and synchronised implementation of interventions for preparedness and response to threats of public health concern. [11]

Approach
The Framework for Cross-Border Integrated Disease Surveillance and Response for the SATBHSS project was developed to guide the identification and establishment of zones and zonal committees and their roles and responsibilities.[12] The cross-border zones were identified from an epidemiological and geographical perspective, where the populations of neighbouring districts across a border were considered as one epidemiological zone. Such a zone was termed a cross-border zone, made up of one or several districts (or other administrative demarcations as the case may apply) each on either side of the designated borders. Criteria were set and applied to demarcate these zones around the designated borders, including: length of the border; convenience for purposes of logistical management; burden of diseases in the area; human activities, including presence of towns; human traffic, trade and commerce; animal health activities, e.g. national parks; movement of cattle; presence of health facilities and laboratory services; and human population size. All or some of these were applicable for each zone. In total, 25 cross-border zones were identified (Table 1).

Cross-border committees and their functions
Each cross-border zone is led by a multisectorial cross-border committee tasked with the co-ordination of cross-border disease surveillance, including other health disasters, using the 'One Health' approach.[13] The defined functions of each committee include: (*i*) developing annual plans to guide rapid response team activities; (*ii*) conducting risk assessments for conditions and events of public importance for the zone, and developing multi-hazard preparedness and response plans; (*iii*) conducting situational analysis and mapping of resource availability and resource data banks to co-ordinate emergency responses; (*iv*) ensuring adequate stockpiles of laboratory supplies and medicines for outbreak investigations; (*v*) organising routine and emergency meetings of the committee; (*vi*) overseeing surveillance and response cross-border activities; (*vii*) organising training and capacity building for the district teams in the zone;

and (*viii*) sending timely reports to the respective countries' reporting structures.

Achievements
The cross-border initiative has been in implementation since the inception of the project in January 2017. The achievements reported here occurred between November 2017 and January 2020.

Cross-border zones
Between October 2017 and January 2020, 13 cross-border zones were established and operationalised through formal meetings between the districts of the respective countries. The composition of the committees varies, but there has been representation from human and animal health, immigration, security, customs, agriculture, community representatives such as chiefs and church leaders, and government partners such as the WHO, Africa CDC, International Organization for Migration and the African Society for Laboratory Medicine, among others.

Development of joint work plans
At each of the meetings when the zones were operationalised, joint work plans (13 plans; 1 per zone) were developed, to be implemented jointly and monitored by the co-chairs of the committee (one representing each country). Only those activities that are cross-border in nature and would require joint implementation are included in the plans, for example, engagement of border communities during and after outbreaks, immunisation of animals in the border districts and joint response to outbreaks. A monitoring and evaluation framework for each work plan was developed and used to track progress. Table 2 provides a summary of the most common activities planned for joint implementation across the 13 zones, and their current status.

Of the 13 cross border committees, 6 of the 8 (75%) that were due for at least one follow-up meeting held that meeting, where a review of the joint work plan, using the monitoring and evaluation framework, was conducted. The teams identified and discussed different strategies in areas were joint implementation was slow.

Capacity building
During the zonal meetings, a number of training and capacity-building initiatives were conducted to ensure that the zones are equipped with needed tools and skills to prepare and respond to events of public health concern. Thirteen tabletop simulation exercises on diseases and conditions relevant to the respective zones were conducted, including on cholera, Ebola, rabies and listeriosis. Findings from these tabletop simulations were used as input to the multi-hazard emergency preparedness and response plans that none of the countries had at the time.

Thirty zonal members from three zones were trained in Threat and Hazard Identification and Risk Assessment (THIRA).[14] THIRA will assist zonal members to systematically identify hazards and threats in their zone, conduct a risk assessment for each prioritised threat and map out the resources required to respond. In the three zones in which THIRA training was conducted, six priority hazards and threats were identified and assessed for their risk,

Table 1. Cross-border zones identified between project countries and their neighbours

Border	Zone	Districts		
Malawi, Mozambique		Mozambique districts		Malawi districts
	Zone 1	Moatize, Tsangano, Chifunde, Macanga, Angonia		Lilongwe, Dedza, Ntcheu, Mwanza, Chikwawa
	Zone 2	Milange, Morrumbala, Mutarara		Nsanje, Mulanje, Phalombe
	Zone 3	Lichinga, Mecanhelas, Mandimba, Ngauma, Lago		Zomba, Machinga, Mangochi, Likoma
Mozambique, Tanzania		Mozambique districts		Tanzania districts
	Zone 1	Sanga, Mavago, Mecula		Nanyumbu, Tunduro, Namtumbo, Sangara, Nyasa
	Zone 2	Mueda, Nangade and Palma		Mtwara rural, Tandahimba, Newala, Masasi rural
Zimbabwe, Mozambique		Zimbabwe districts		Mozambique districts
	Zone 1	Guruve, Centenary, Mt. Darwin, Rushinga, Mudzi		Mague, Cahora Bassa, Changara
	Zone 2	Nyanga, Mutasa, Mutare, Chimanimani, Chipinge		Barue, Manica, Sussundenga, Mussorize and Machaze
	Zone 3	Rupangwana, Chiredzi, Nyala, Malipati, Matibisi, Boli, Hippo Valley		Massangena, Chicualacuala
Lesotho, SA		SA – province and municipality		Lesotho district
	Zone 1	Free State – Mantsopa		Maseru
	Zone 2	Free State – Dihlabeng		Butha Buthe
	Zone 3	Natal – Okhahlamba		Mokhotlong
	Zone 4	Eastern Cape – Matatiele		Qacha's Nek
	Zone 5	Eastern Cape – Senqu		Quthing
	Zone 6	Free State – Mohokare		Mohale's Hoek, Mafeteng
Malawi, Tanzania		Tanzania districts		Malawi districts
	Zone 1	Kyela, Ileje, Makete, Ludewa		Karonga, Chitipa
	Zone 2	Nyasa		Nkhata bay
Tanzania, Zambia		Tanzania districts		Zambia districts
	Zone 1	Momba, Kalambo		Nakonde, Mbala
Malawi, Zambia		Malawi		Zambia
	Zone 1	Chitipa, Rumphi		Mafinga
	Zone 2	Mzimba		Chama
	Zone 3	Kasungu		Lundazi
	Zone 4	Mchinji		Chipata
Mozambique, Eswatini		Mozambique districts		Eswatini districts
	Zone 1	Goba, Namaacha		Lubombo
Zimbabwe, Mozambique, Zambia		Zimbabwe districts	Mozambique districts	Zambia districts
	Zone 1	Mbire	Luangwa	Zumbo

SA = South Africa.

Table 2. Common joint activities planned across 13 zones, and implementation status

Activity	Status	Comments
Conducting at least one follow-up zonal meeting	Partially done	6/8 zones (75%) due were done
Training and capacity building of zonal members in IDSR	Done	13 (100%) zones conducted at least 1 training session
Exchange visits between zones	Partially done	5 (39%) zones had interdistrict exchange visits, for various reasons
Establishing formal and informal communication channels for information sharing in line with respective countries' policies	Done	13 (100%) channels created and functional
Conducting joint outbreak investigations and response	Done	Conducted in zones where outbreaks were experienced (100%)
Testing preparedness plans using simulations	Done	Simulations conducted during zonal meetings (100%)
Conducting joint community engagements and sensitisation of matters of mutual concern	Partially done	Conducted in 6 (46%) of the 13 zones
Conducting peer assessments of port health facilities	Partially done	4 (31%) assessments conducted during zonal meetings

IDSR = integrated disease surveillance and response strategy.

the resources required to respond mapped and the capabilities required identified. The Mchinji-Chipata zone conducted a Vulnerability Assessment and Risk Mapping exercise, another method recommended by the WHO for assessing and analysing hazards, vulnerabilities and risks.[15]

In all 13 zones, members were trained in donning and doffing, in readiness for suspect cases that require the use of enhanced personal protective equipment (PPE). The exercise assisted respective countries in reviewing the types and adequacy of PPE that they have.

Communication channels

Across the 13 zones, WhatsApp and email groups have been established for formal and informal sharing of information. The information shared in the WhatsApp groups includes rumours or alerts for incidents and events, such as cholera and Ebola alerts on encountering suspect cases. Figs 1A and B show examples of common alerts, rumours and general information shared on two different WhatsApp groups.

Other information that is of public health interest was also shared, mostly published documents and guidelines such as the Africa CDC event-based surveillance framework, the WHO guidelines on Ebola rapid-test diagnostics, the WHO 2018 antimicrobial 2018 report, the WHO report on the Ebola vaccine and a warning about fake paracetamol that was circulating.

Joint response

Joint response is the cornerstone of the cross-border initiative, as it provides a formal and organised platform for effective response from neighbouring districts across the border. The established zones have been useful in a number of outbreaks and events experienced, including the joint response to anthrax in Lesotho in 2019. Alerts were shared within a day of suspected cases, and subsequent confirmation was also shared within 24 hours. The affected districts in the zone between Lesotho and South Africa (SA) held an emergency meeting at a local hospital in SA to map a joint response, which included joint community engagements through local radio stations, and the development of education, information and communication materials.

Weekly situation reports were shared.

Some notable involvements of the cross-border zones in responses include the response to a number of cholera outbreaks experienced in Zambia, Malawi, Mozambique and Zimbabwe. The respective zones in the affected districts played a role in mounting an effective response that prevented spillover of the disease to the next country. This included emergency meetings to map response, joint investigations and community engagements.

In addition to the anthrax in Lesotho, the region also experienced foot and mouth disease (Malawi, Zambia) and African swine fever (Malawi) outbreaks, during which the established zones in the affected districts provided an organised platform to aid in response efforts, including information-sharing on suspected cases and subsequent confirmed cases and serotypes, vaccination programmes and community engagement efforts.

Field simulation exercises

A simulation exercise is a quality-assurance tool used to provide an evidence-based assessment for testing and strengthening functional capacities to respond to outbreaks and public health emergencies. By creating a close-to-real life scenario, a field simulation exercise helps to test the system response if a real case was to be experienced. Since most participants are masked, this allows for them to respond in the way they would do in the event of an actual case. Blinding allows for testing the system in its natural state.

Two field simulation exercises on Ebola were conducted in Malawi and Lesotho, in the high-risk cross-border zones of Chitipa and Karonga in Malawi that border Tanzania, and Leribe in Lesotho that borders SA. The field simulation exercises tested six areas of Ebola preparedness and response that included: (i) the Ebola alert management system at points of entry; (ii) Ebola suspect case management at the respective isolation centres; (iii) Ebola suspect case management at the Ebola treatment units; (iv) co-ordination and information flow of Ebola virus disease (EVD) positive results from the laboratory to district and national level; (v) management of a confirmed case of EVD at the Ebola treatment unit; and (vi) co-ordination of structures and
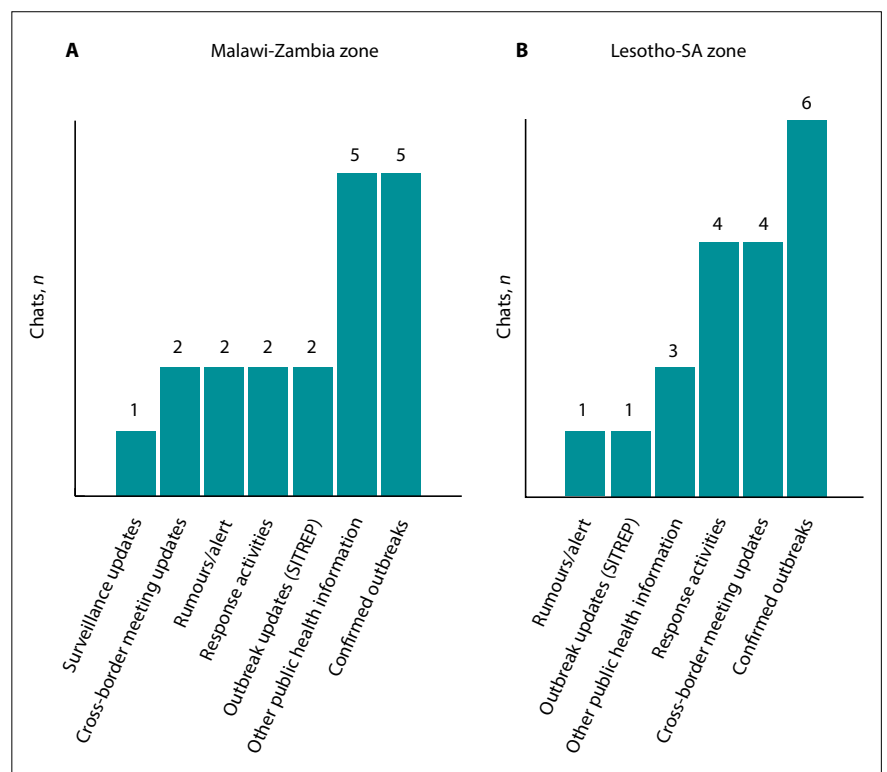
Figs 1A and B. Cross-border zone WhatsApp chat contents: (A) Malawi-Zambia and (B) Lesotho-South Africa. (SITREP = situational report; SA = South Africa).

functions between district and national level.

In both cases, the systems demonstrated strengths in preparedness and response in a number of areas, which included: screening and isolation services at port of entry; co-ordination of different agencies at the port of entry; quick response by the district rapid response team; infection control practices; availability of Ebola treatment unit (ETU) and case management team with needed supplies to manage symptoms, and capacity to collect and transport samples, in Karonga; risk communication measures; and co-ordination between port of entry, district and national teams in response to the emergency. However, there were noted areas for improvement, including: increasing human resource capacity at port of entry; practice and enforcement of infection control measures; the need for alternative means of communication to alleviate network challenges; the dissemination of standard operating procedures; the need for inclusion of standby response teams willing to manage suspected Ebola cases; the need for psychosocial support experts in the case management team; and specimen chain of custody. An action plan was developed following these recommendations.

Discussion

Halfway into the 5-year project, the implementation of cross-border zones has provided an organised and co-ordinated platform that did not previously exist, for the engagement of neighbouring districts across borders. The sharing of information, formally and informally, across the border in a trust-based system facilitated simpler and faster communication, increasing preparedness and response. Previously, such information would follow formal established channels up to the Ministry of Health and the WHO, before filtering down to districts that are just across a border. Joint response, especially community engagement, was very useful given that most of these communities, though officially separated across two or more countries, are in practice, one entity, socially, culturally and economically.

The multisectoral composition of zonal committees offered opportunities for practical implementation of the One Health Approach. In some cases, the different sectors had not met before at local level to tackle animal and human health-related epidemics and other events of public health concern.

Alongside the observed successes are challenges that offer opportunities for improvement. These include the need for ownership of the zone at the local cross-border level for sustainability, with the central level of government providing additional support when needed. In these 2-and-a-half years of implementation, it has been observed that those zones in which local leadership embraced the initiative were the most active and conducted the most frequent follow-up meetings, supported by local resources.

Implementing joint work plans requires resources beyond those currently provided through the SATBHSS project. The most challenging aspect has been engagement with countries that are not part of the project, such as the Democratic Republic of Congo, SA, Tanzania and Zimbabwe, but share borders with the four project countries. Even though plans are developed jointly, it is not always possible to synchronise these with the respective countries' planning cycles, as these are almost always different from that of the project.

Although at the regional level countries have agreed to share information for the purposes of emergency preparedness and response, this has not been operationalised at the local level. Hence, in some cases, information sharing is restricted by the need for clearance, and fears of being reprimanded for sharing sovereign data and information regarding outbreaks that have far-reaching political and economic reparations. Sharing information horizontally across the border while respecting the vertical information-sharing protocol and policies still remains a limitation for the zones. With an increase in trust, the information flow has been observed to improve.

Given their organised structure, the cross-border zones have been used for matters beyond surveillance and epidemic preparedness and response. Opportunities exist to use the zonal platform for cross-border referrals of patients, for example, TB or HIV patients who move across borders for employment or trade. In some instances, complicated maternity cases have been referred to nearer higher-level facilities across a border. The cross-border zones are taking steps to formalise arrangements for such referrals.

Conclusion

The use of cross-border zoning led by multisectorial cross-border committees is one effective way of ensuring heightened preparedness and response to epidemics and events of public health concern at the local level. For sustainability, respective governments need to recognise and support cross-border zones in the implementation of their joint work plans.

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