

Excerpt from

Landscape of Anticipatory Action for Health in a Changing Climate

A FEINSTEIN INTERNATIONAL CENTER PUBLICATION 

Erin Coughlan de Perez, Leah Poole-Selters, Maya E. M. Sandhofer, Evan Easton-Calabria, Carolyn Van Sant, Mashfiqus Salehin, Sonia B. Murshed, Shampa, Shammi Haque, Ahmed I. A. Chowdhury, Mauricio Santos-Vega, Natalia Niño-Machado, Christopher Garimoi Orach, Christine Aanyu, Glecy C. Atienza, Jamie T. Gundaya, Carlos P. Gundran, Leonard D. Javier, Mark Andy Pedere, Christian Jesus G. Sanchez

Waterborne disease

Waterborne disease Anticipatory Action (AA) plans focus entirely on reducing health impacts and rely heavily on surveillance systems. The following information provides evidence on health outcomes of AA for waterborne diseases, along with examples of active AA frameworks in Bangladesh and Democratic Republic of the Congo using the 4Ms (Model, Mandate, Method, Means) framework.

Evidence review

Approaches for tracking and reducing waterborne diseases vary according to the context and the disease itself. One expert explained, “There are 32 organisms in water alone that cause diarrhea, let alone [those in] food.” Rotavirus, for example, is vaccine preventable. Cholera is virulent and more dramatic than diarrheal disease, affecting people of all ages, while diarrheal disease is common in children. Given the high frequency of diarrhea episodes in children, parents might not recognize this as a health concern, despite the fact that it contributes to malnutrition and long-term negative impacts in children. Surveillance and tracking of diarrheal disease in children are therefore difficult; many parents might not bring their children to the health clinic with these symptoms. As a result, documenting progress is a challenge; for example,

a 50% reduction in diarrhea (e.g., three episodes rather than six episodes in a year) might not be immediately noticed or recorded. Because diarrhea is a symptom rather than a disease, it can also be associated with a variety of comorbidities.

When it comes to water, sanitation, and hygiene (WASH) interventions, household water treatment has been shown in high-quality studies to effectively reduce diarrhea in emergency contexts, with exact levels of efficacy depending on the method (Ramesh et al. 2015). While water purification supplies can be rapidly deployed and effectively improve water quality, one literature review showed that adoption is low in acute emergency contexts, never reaching above 20% (Lantagne & Clasen 2011). However, when combined with education, levels of adoption increase. Additionally, programs introduced before emergencies saw better adoption and outcomes, suggesting prior exposure significantly enhances effectiveness (Lantagne & Clasen 2011).

For cholera, practitioners recommend that best practice is to target response in hotspots, following a case-area target interventions (CATIs) approach (Ratnayake et al. 2021). These are triggered by the identification of a cholera case, and CATI teams respond to the case by providing interventions to the household itself and neighbors within a certain

radius. This is similar to the ring vaccination method that was used to eradicate smallpox. Multisectoral interventions including both WASH and health are recommended, including antibiotics, for example. A randomized control trial of CATI in a stable hospital setting in Bangladesh found a 47% reduction in cholera (George et al. 2016). A Haitian study found that CATI's quick case responses could reduce final caseloads by 76%, and the duration of the outbreak by 61%, signaling the immense value of timely and early action (Michel et al. 2019). Measures included:

- Oral cholera vaccination
- Identification of additional cases
- Decontamination of patient premises
- Education on risk factors and methods of prevention and management
- Distribution of soap and oral rehydration salts
- Chlorination of water at the household level or directly at collection points
- Proposal of prophylactic antibiotics to close contacts of cholera cases

Given that cholera and childhood diarrhea do have spatial-temporal spikes, the potential for AA to anticipate and reduce those spikes is large. Targeted spatiotemporal interventions are recommended over blanket campaigns to direct scarce resources most efficiently (Ratnayake et al. 2021). However, most models that have attempted to predict cholera outbreaks have had limited success, and much of their predictive ability is derived from the simple method of following the first cases. Simple seasonality of disease can be used for scaling up regular seasonal preparedness in places where daily models are not effective at forecasting caseloads.

Globally, government agencies have developed elaborate surveillance and control measures to combat the spread of waterborne disease, and disease-driven approaches make use of these surveillance systems. However, these systems are generally scaled up after cases are detected, and the AA community is hoping to improve the development and use of waterborne disease predictive models:

If structure is still based on occurrences to take action, if the trigger to take action is an event, which is the case in health, most cases. You see, to declare Ebola outbreak, you need to first get an Ebola case. To declare cholera, you need to first get 10 cases. To declare all these different things in health, you need to first look at cases, confirmed cases. In the capacity of Anticipatory Action, that's response now. It's happened already, so you just start responding to the cases, and maybe preventing future cases, but it's in the response kind of sphere. (KII in Uganda)

Focusing on predicting cases in "cholera hotspots" is a major component of the Ending Cholera: A global roadmap to 2030 report (WHO 2017). Such hotspots are regions in endemic countries that have "recurrent and predictable cholera outbreaks, often coinciding with the rainy season" (WHO 2017, 8). AA systems can be designed to support these wider goals of eliminating such hotspots (WHO 2017).

Example of high-potential design

Model: Epidemiological model integrating surveillance and weather information to predict outbreaks of waterborne disease. Models can be designed based on historical data on spatiotemporal patterns of cholera outbreaks or outbreaks of diarrheal disease. Verify model forecasts to ensure that the model is providing useful information.

Mandate: Government health authorities generally hold the mandate for disease monitoring, including cholera. Cases detected by health facilities or community health workers, for example, are to be reported to district or national authorities. For acute emergency response, governments collaborate with NGOs and the humanitarian response system to provide immediate disinfection and water treatment. This requires a collaboration between organizations working in WASH and health. Ultimately, such responses should also inform development interventions to invest in infrastructure for frequent cholera hotspots. Currently, most cholera forecasting models have been developed by researchers or institutions outside of the health ministry of governments, and the mandate for operationalizing such forecasts has not been clearly defined.

Method: Provide WASH and health interventions through case-area targeted interventions to people near the forecasted hotspots (either confirmed or suspected case) and nearby communities. Identify the cause of the waterborne disease and

the appropriate WASH/health measures. Direct resources to the level of community, household, health center, or school, including household disinfection, community water treatment, vaccination, active case-finding nearby, or prophylaxis.

Means: Government health sector budgets can be structured to provide scaled-up support in the times and locations of greatest risk in AA, as in the CATI approach. This can be complemented by humanitarian support scaling in similar ways.

Case study: Government of Bangladesh

The National Cholera Control Plan (NCCP) (DGHS 2019) integrates surveillance and early warning systems to forecast cholera trends and guide response efforts. Bangladesh has a passive diarrheal disease reporting system, with active surveillance conducted only during outbreaks, and there is also a cholera surveillance system that has been operational since 1979. Bangladesh aims to eliminate cholera transmission as a public health threat through improved forecasting, surveillance, and preventive interventions.

However, despite comprehensive policies for disease surveillance and management, agencies face challenges in case detection and reporting due to a lack of diagnostic facilities at district and upazila levels and no routine cholera case reporting from peripheral health facilities. Despite progress, cholera mortality remains a challenge, exacerbated by frequent environmental disasters such as floods, cyclones, and landslides that damage WASH infrastructure and increase contamination risks.

Bangladesh [National Cholera Control Plan \(NCCP\)](#) was formulated in 2019 by the Directorate General of Health Services (DGHS). It is important to note here the difference between “control” and “elimination” in the context of cholera. The term “control” in this plan is defined as “A reduction in the incidence, prevalence, morbidity or mortality of cholera cases to a locally acceptable level (according to NCCP) and no longer considered as a public health problem and continued intervention is required to maintain controlled situation” (DGHS 2019, 7). In contrast, “elimination” is defined as “Any country that reports no confirmed cases with evidence of local transmission for at least three consecutive years and has a well-functioning epidemiological and laboratory surveillance system able to detect and confirm cases” (DGHS 2019, 7). The cholera

outbreak, as defined in NCCP is the “occurrence of at least one confirmed case of cholera by culture or PCR [polymerase chain reaction] and evidence of local transmission” or “an unexpected increase in the magnitude or timing of suspected cases over two consecutive weeks, with some cases being confirmed by the laboratory” (DGHS 2019, 7).

Model: The core of the NCCP model lies in strengthening cholera surveillance through 22 sentinel sites and developing an Early Warning, Alert and Response System (EWARS), which currently doesn’t exist. Surveillance responses include a) proactive and b) reactive responses. Proactive responses are envisioned to run throughout the year irrespective of any triggering cholera event and includes multiphased oral cholera vaccination (OCV), enhanced WASH services, effective coordination and monitoring, and communication and social mobilization. The reactive responses, on the other hand, will trigger when the surveillance mechanism identifies a suspected case; every 10th case will be tested with a rapid diagnosis test (RDT), and positive samples will be sent to the nearest public medical college hospital for confirmation by culture and sensitivity testing. An outbreak will be declared according to the NCCP definition (described above). Rapid response teams at national, district, upazila, district municipality, and city corporation levels will be trained and emergency preparedness plans put place, so that within three hours of notification of an outbreak, teams will activate. The Institute of Epidemiology Disease Control and Research (IEDCR) will be notified of all outbreaks to ensure the national team is always in communication with the local investigating team and, when required, can be deployed in the field.

Mandate: NCCP will be initiated by the Communicable Disease Control (CDC) unit of DGHS and led by the Ministry of Health and Family Welfare (MOHFW). Ministry of Local Government, Rural Development and Co-operatives (MOLGRDC), Ministry of Education (MOE), Water Supply and Sewerage Authority (WASA), Department of Public Health Engineering (DPHE), Dhaka North City Corporation (DNCC), and Dhaka South City Corporation (DSCC) are essential stakeholders for the implementation of this plan. The technical support of relevant partners/donors, such as World Health Organization (WHO), United Nations Children’s Fund (UNICEF), International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b),

WaterAid, and other nongovernmental organizations is also part of the implementation of this plan.

Method: NCCP is envisioned to be implemented through six strategic approaches. These are 1) developing a sustainable cholera surveillance system, 2) strengthening cholera case management, 3) implementing oral cholera vaccination, 4) increasing the access to safe water, sanitation, and hygiene intervention, 5) enhancing coordination and monitoring through multisectoral approach, and 6) advocating communication and social mobilization (ACSM).

NCCP will be executed through the following activities.

1. **Short-term activities (2019–2021)** to reduce 25% of cholera burden. This involves capacity development for cholera detection at all levels of health facilities, identification of hotspots/high-risk areas/populations, strengthening of case management for cholera as per WHO guideline, preferably through the mHealth platform in all health facilities, establish Early Warning and Response System (EWARS), development of standard operating procedures (SOPs) for emergency outbreak response, develop SOPs to provide/strengthen WASH services, establishment of supervision and monitoring system, and ensuring vaccine and logistics supply, etc.
2. **Mid-term activities (2022–2025)**, targeting 50% reduction of cholera burden. Key activities are mainly strengthening short-term activities. Examples include: a multisectoral coordination mechanism among stakeholders, revision of the strategy as per evaluation report after short-term activities, an OCV campaign along with WASH intervention in all identified cholera-prone areas, identification of hotspots/high-risk areas/populations, strengthening of supervision and monitoring system, etc.
3. **Long-term activities (2025–2030)**, aiming at 90% reduction of cholera burden. Activities are mainly those that further strengthen the mid-term activities and include multisectoral coordination mechanism among stakeholders, revision of the strategy as per evaluation report after mid-term activities, a sustainable surveillance system, and an OCV campaign along

with WASH intervention in the newly identified hotspots and outbreak areas.

Means: The NCCP outlines development activities from 2019–2030, with a total estimated budget of USD 3.58 billion. Out of this, OCV budget will be USD 0.43 billion; the WASH budget will be USD 3.13 billion (improved water USD 0.68 billion, sanitation USD 1.35 billion, and hygiene promotion around USD 1.1 billion). The surveillance budget is estimated to be USD 0.02 billion.

Box 9 introduces a short example of a cholera-focused AA framework from the Democratic Republic of the Congo.

BOX 9. Snapshot: UN-facilitated Anticipatory Action (AA) in Democratic Republic of the Congo.

The OCHA-facilitated AA framework for cholera in the Democratic Republic of the Congo is enabled through a government partnership, in which government-collected surveillance data is shared with OCHA to capture disease dynamics and trends that could inform the likelihood of a country-wide outbreak.

Model: Three different scenarios can independently trigger an activation. Two scenarios are triggered based on observational epidemiological data provided by the National Program for the Elimination of Cholera and the Control of Other Diarrheal Diseases (PNECHOL-MD) for an endemic and nonendemic outbreak, respectively; and the third scenario allows CERF to trigger funding based on an external shock like rapid displacement or flooding in an endemic province.

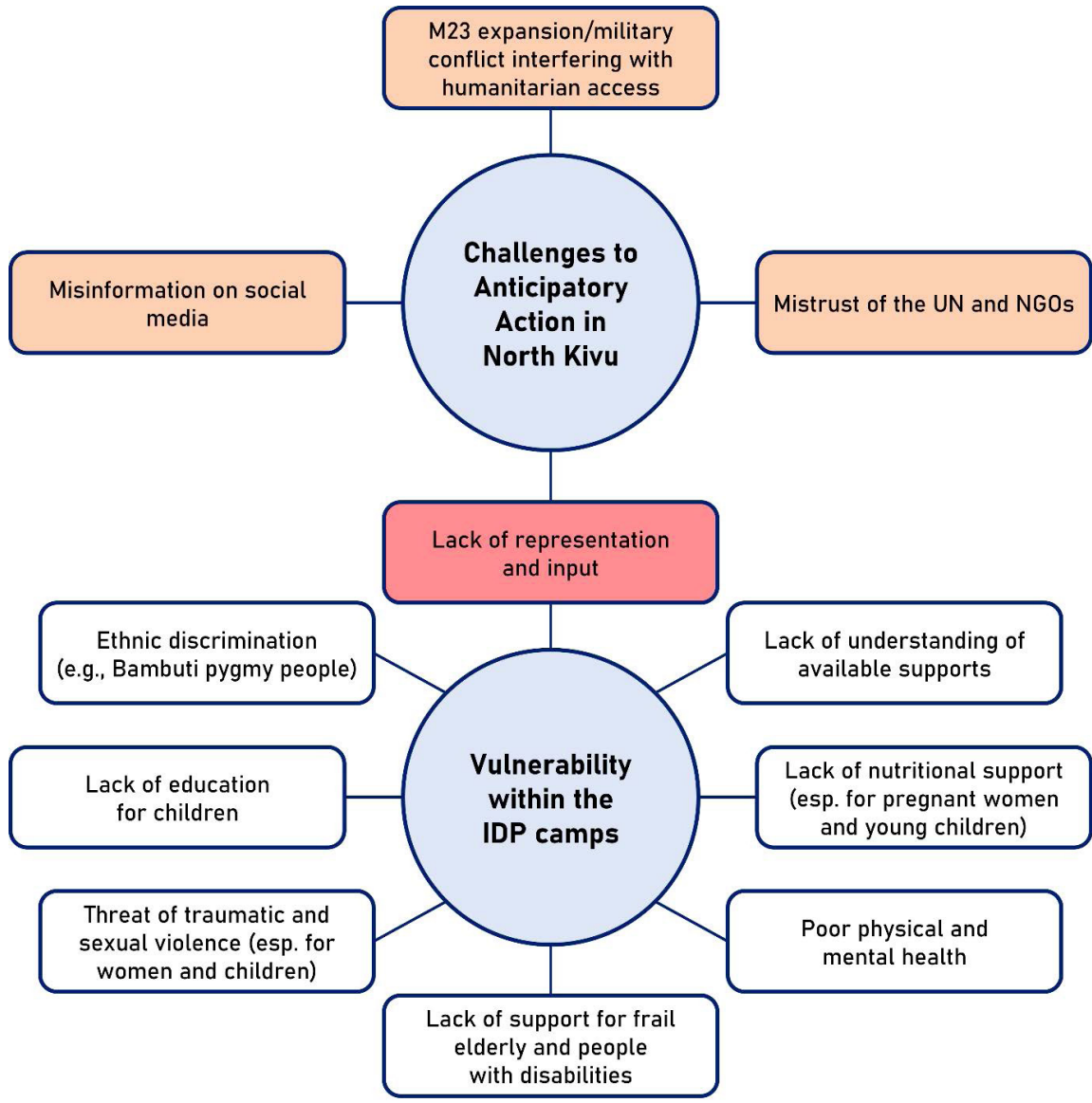
Mandate: This is the first AA framework for infectious diseases facilitated by OCHA, and includes UNICEF and WHO as key collaborators along with government and local implementing partners (UN OCHA 2023). While most humanitarian-led AA frameworks have not engaged with government surveillance systems, this is one of a few examples of efforts to bridge this divide. Data collected ranges from the national level to particular health zones, and even down to particular health facilities. While this partnership is working well, there have been struggles to expand this model to other countries, in part due to many governments' sensitivity in sharing cholera data due to a reputational risk.

Method: Anticipatory activities are grouped into “case-area targeted interventions” led by UNICEF (e.g., deployment of rapid response teams (RRT)), “quadrillage” led by WHO (e.g., establishment of chlorination points and sensitization), “surveillance and early detection” and “medical care for infected patients.”

Means: OCHA's actions are funded through the CERF.

Evaluation: The pilot was first triggered in December 2022 and benefitted from an independent study shortly after funding was disbursed. This study, based on interviews in the Goma Region at the time of activation, documented the range of challenges that the pilot faced in the complex crisis of Eastern DRC, as well as the significant vulnerabilities faced by the recipients of the AA (see Figure 10).

FIGURE 10. Overview of challenges to Anticipatory Action (AA) in North Kivu, DRC, and vulnerability within IDP camps (Source: Bowman and Manialawy 2024)



BOX 9. Continued

The study also identified a range of recommendations for AA targeting infectious diseases by humanitarian partners:

1. Disease surveillance is mandatory. It needs to be long-term, sustainable, and include all major infectious diseases. There is broad consensus that this is not happening currently.
2. Systems must be designed for and capable of timely, flexible, and expandable resources for intervention.
3. There must be a permanent, longstanding infrastructure for treatment, including health centers, laboratories, and hospitals to coordinate interventions and assess their efficacy for future planning and development.
4. Information must be managed, coordinated, and disseminated in a timely manner.
5. Balanced and fair communication, recognition, and job sharing between partners.
6. Responsible and ethical governance that operates independently of personal or agency interests alone. This area was stated to be of grave concern to those interviewed but lies beyond the scope of this inquiry (Bowman and Manialawy 2024).