DOES CONTAINMENT MEASURES FOR EMERGING AND RE-EMERGING VECTOR-BORNE DISEASES AND OTHER INFECTIOUS DISEASES WORK?

AN EVIDENCE BRIEF FOR POLICY MAKERS AT INTERNATIONAL/NATIONAL LEVEL

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HIGHLIGHTS

- → **In presence of seasonal or cyclic diseases, containment strategies for outbreaks should be planned and designed ahead of time, when possible.**
- → **Systematic documentation of the design and implementation of containment measures is necessary to improve the creation of standardized guidelines of general use.**
- → **Improving the structure of health system, including health care practitioners' training, improvement of surveillance, improved management and allocation of resources (beds, medication, etc.) were reported as effective measures to contain outbreaks.**
- → **Inclusion of environmental and sanitary measures such decontamination, quarantine and fogging were described as commonly used containment measures.**
- → **The design of containment measures should be informed by evidence-based lessons and recommendations generated from objectively conducted research.**
- → **More comprehensive and systematic descriptions of implementation measures used to control outbreaks are needed.**

ABSTRACT

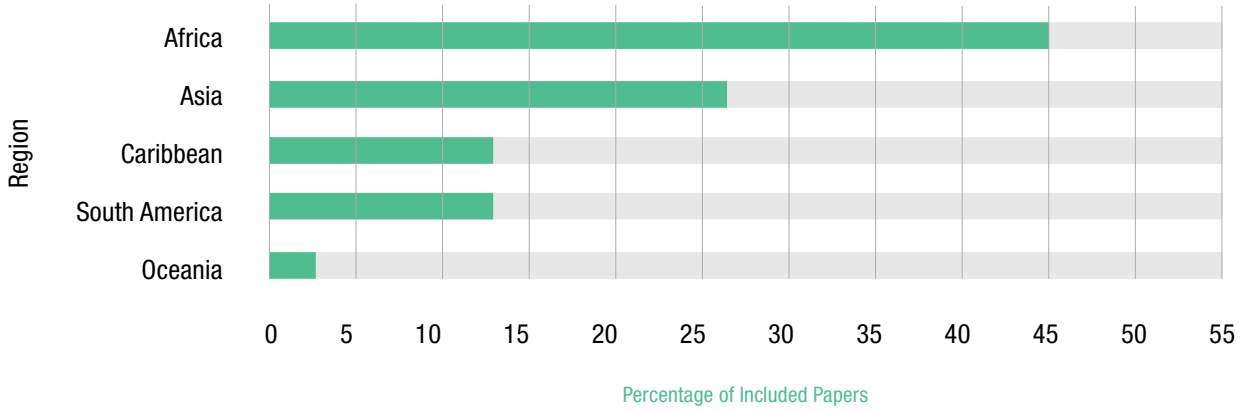
Several measures to contain infectious diseases' outbreaks are in place worldwide. However, documentation on implementation or effectiveness of such measures is limited. We conducted a systematic scoping review about the effectiveness of containment measures of emerging and re-emerging Vector-Borne Diseases (VBDs) and other infectious diseases. The reviewed articles (n=31) showed that containment strategies were mostly designed and launched only after the outbreaks were already declared and stablished. The majority of studies presented experiences on health care provision and environmental or sanitary interventions, with few community-based interventions. There was no information about standardized practices, implementation processes or modifications made to the initially designed intervention. The evaluation of the effectiveness was generally observational and rarely experimental. The recommendations presented in the literature were used to create a list of recommendations for stakeholders that could be used to design and implement outbreak management guidelines in the future.

INTRODUCTION

The increasing urban growth facilitates the rise emergence and re-emergence of vector borne diseases and other infectious diseases. Containment measures (CM) are strategies put in place for the effective prevention and control of epidemics. To improve containment measures in the future, we need to identify the measures that have been implemented in the past, assess their effectiveness and address knowledge gaps exposed previously. Although some outbreaks could be predicted/expected, usually health systems are 'caught off guard' by new or re-emerging pathogens, making difficult the management of epidemics. Therefore, to ascertain what is known about the effectiveness of containment measures of emerging and re-emerging vector-borne and other infectious diseases in urban settings, we conducted a scoping review of the literature. Here we present a summary of the results and provide a list of recommendations for policy making.

APPROACH

We searched major health databases for articles published between 2000 and 2016 with a final 31 articles included in our scoping review. Studies were carried out in Africa (n=14; 45%), South America (n=4; 13%), Asia (n=8; 26%), the Caribbean (n=4; 13%), and Oceania (n=1; 3%).

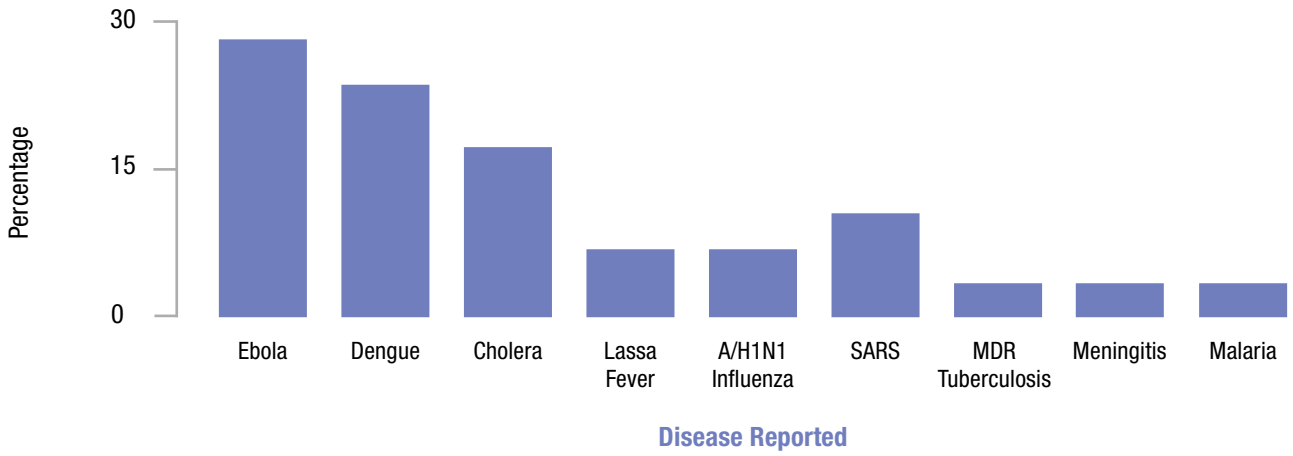


RESULTS

The review indicates a wide range of effectiveness of containment measures, given differential design, implementation and contextual factors. The majority of the information came from diseases of cyclic/seasonal pattern. Several measures of containment were used simultaneously, although the assessment of its effectiveness was mainly observational without standardized indicator or pre-established guidelines.

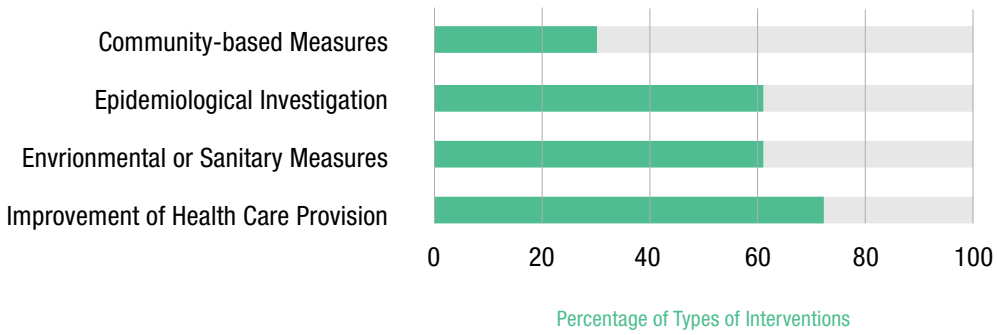
1. DISTRIBUTION OF DISEASES

Diseases included Ebola (n=9; 29%), dengue fever (n=7; 23%), cholera (n=5; 16%), Lassa fever (n=2; 6%), A/H1N1 influenza (n=2; 6%), severe acute respiratory disease (n=3; 10%), multi-drug resistant tuberculosis (n=1; 3%), meningitis (n=1; 3%), and malaria (n=1; 3%).



2. TYPES OF INTERVENTION USED

Measures were grouped into four categories: healthcare provision (n=22, 71%), epidemiological investigation and/or surveillance (n=19, 61%), environmental or sanitary measures (n=19, 61%), and community-based measures (n=9, 29%).



3. EFFECTIVENESS REPORTED (AVERAGE) / OPPORTUNITY

The majority of articles (24 out of 31) reported overall positive results, including reduction in disease burden or spread. Outcomes used to evaluate the effectiveness of interventions varied largely among articles and included:

- Number of cases
- Case fatality rates
- Entomological indices
- Delay in disease detection or time between illness onset and hospitalization
- Proportion of contacts among new cases
- Number of cases averted, among others

4. IMPLEMENTATION PROCESS AND TRANSFERABILITY

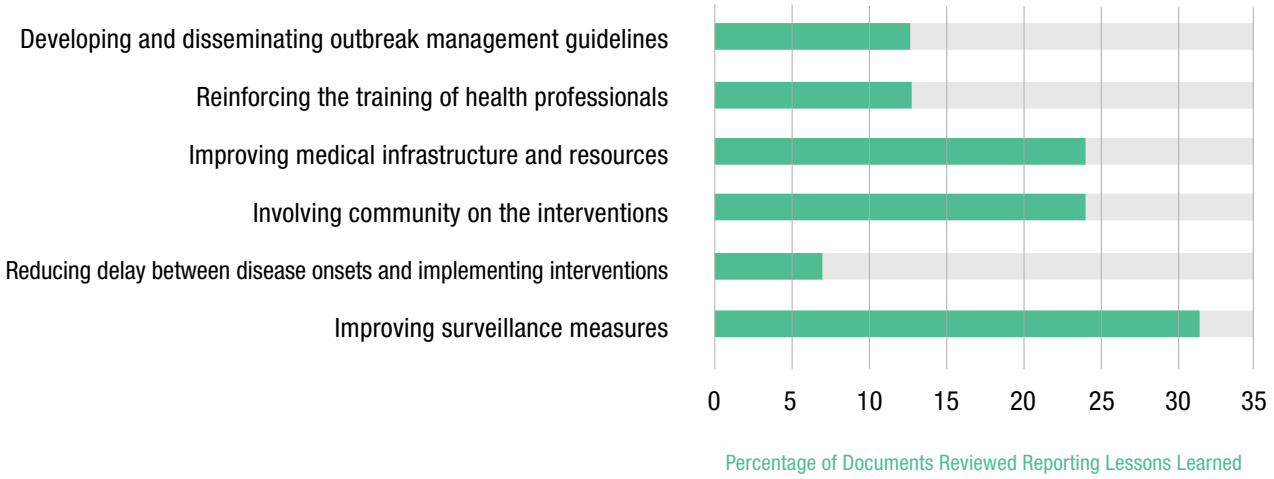
The recipient population should be better described while reporting implemented measures. Only eight articles provided information about epidemiologic and/or sociodemographic characteristics. Institutional factors influencing the interventions, such as committed political will or decision-makers' positive perceptions of the intervention, were rarely described. The types of partners involved with the intervention included international organizations (e.g. WHO, Médecins Sans Frontières, United Nation agencies), local and international non-governmental organizations, governmental institutions, and other stakeholders, such as local authorities or opinion leaders. The different aspects related to the implementation process were minimally described in the majority of studies.

5. CHALLENGES

- Lack of experience in the diagnosis, management, and treatment of the diseases in question among local doctors, mainly due to the non-endemicity of those diseases was described as the main challenge.
- Identification of outbreaks and therefore a delay in the implementation of containment measures was associated to misdiagnosis or underreporting of early cases.
- Absence of sufficient resources (medical material, medications, hospital beds, etc.) and infrastructure were identified as barriers to efficient containment of outbreaks.

6. REPORTED LESSONS LEARNED AND RECOMMENDATIONS FROM THE REVIEWED STUDIES

Most articles provided recommendations for the effective containment of future diseases. Recommendations provided in the revised documents: improving surveillance measures (n=10, 32%), reducing the delay between disease onset and implementation of interventions (n=9, 9%), involving the community in the intervention (n=7, 23%), improving medical infrastructure and resources (n=7, 23%), reinforcing the training of health professionals (n=4, 13%), and developing and disseminating outbreak management guidelines (n=4, 13%).



CONCLUSIONS

Although some outbreaks are expected and therefore containment measures could be in place ahead of time, our research shows that the systems assessed in our review are more reactive than proactive. More importantly, it is difficult to establish a causal link between the implementation of containment measures and success of outbreaks control given the differential context and variability of implementation processes. Nonetheless, despite the limited evidence on the effectiveness of containment measures, it is possible to indicate that some of the successful measures include: timely planned activities, improvement of the health system (surveillance system, training of health care providers), and adequate allocation of resources (economic, personnel and material). Finally, effective containment of outbreaks is possible in presence of adequate planning, multidisciplinary collaboration and systematic report and assessment of their activities.

FOR MORE INFORMATION

Complete study report available at:
https://idpjournal.biomedcentral.com/articles/10.1186/s40249-018-0478-4

RECOMMENDATIONS

1st **Focus on proactive approaches when time and resources allow. For instance:**

- → **Acknowledge and identify the presence of an outbreak timely.**
- → **Generate and a prepare a generic baseline plan for generic outbreak including the possibility of redistribution of economic and human resource allocation when needed.**
- → **Identify cyclical or seasonal conditions (e.g: dengue or malaria after rainy seasons) and generate a guideline procedure assessing surveillance role and hospital-beds availability.**

2nd **Favor the training of health professionals and the improvement of medical infrastructure during interepidemic periods of know threats. For example, creating plans for continuous education of medical, surveillance, and sanitation staff about known and re-emergent conditions, contributes to the improvement of health system structure as observed in successful intervention.**

3rd **Rely on frameworks that actually worked in previous and similar contexts (i.e: when planning interventions work with evidence-based recommendations about situations that are similar to the ones presented in your local setting).**

4th **Promote comprehensive intervention description, especially regarding context, using validated checklists.**

- → **Allocate time and resources for the operative-public health sector to report comprehensive and systematically the design and implementation of the containment measures.**
- → **Include an adequate evaluation period in the planning of interventions.**

5th **Promote sustained community participation, this would favor their involvement before and during outbreaks.**

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