

A Risk Assessment Tool for the Health Sector in Africa: Filling the gaps in Public Health Emergency Preparedness and Risk Management

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Abstract

“Understanding the risk” is one of the four priorities of the Sendai Framework for Disaster Risk Management. It is also one of the critical steps for effective risk reduction and disaster preparedness programs. In the health sector, the paradigm of primary prevention of disease outbreaks is intrinsically underpinned by the rational of the identification of the threats to public health and evaluation of risk, based on the prevalent hazards, the vulnerability, and the capacity of both the community and the health system. Various organizations or sectors have proposed several tools for risk assessment. Most of these tools often only serve the particular needs of organizations or industries. As such they are usually not scalable to be applied for national and sub-national levels assessments. Besides, and more importantly, the frameworks of most risk assessment tools do not integrate the health system and the “all-hazard” approach. Moreover, various determinants of vulnerability and capacity are outside of the health sector and should be taken into account when computing risk in the health sector.

The proposed article describes the tool for vulnerability and risk assessment for the health sector in Africa. Built on the principle of “all-Hazards approach,” the tool can be used for diverse types of hazards including diseases and other natural hazards such as hydro-meteorological, geological, social, and technological. The article also presents the framework underpinning the tool, the components, the process, and the outputs of risk assessment in the health sector.

Keywords: Risk assessment; Health sector; Public health; Risk management

Background

Outbreaks, conflicts, and other natural and human-made disasters form the daily landscape of emergencies in the African region of the World Health Organization. Over 100 public health events or emergency with public health consequences are reported

every year throughout the 47 countries members of the WHO’s AFRO region [1]. For instance, the World Health Organization report on public health events indicates that in 2017 alone, the AFRO region recorded 123 emergency events, of about 92% were disease outbreaks, 5% were climate-related (floods and droughts), 1% chemical, and 2% of others [2]. Public health emergencies negatively impact the socioeconomic growth of African countries. Indeed, disasters and public health emergencies have a direct and

indirect impact on the health of a population as well as on the health systems. According to the World Bank, the Ebola outbreak that hit three West African countries in 2014/2015 caused an economic loss of US \$ 2.2 billion of their gross domestic product (GDP) [3,4]. Also, Ebola killed an equivalent of 1.45% of the country's doctors, nurses, and midwives in Guinea, 8.07% in Liberia, and 6.85% in Sierra Leone [5].

One of the crucial lessons learned from major public health emergencies such as the Ebola outbreaks is that risk management is the most appropriate approach for effective reduction of morbidity, disability and mortality related to public health emergencies and disasters. Indeed, to build resilient health systems and communities calls for actions to address factors that either increase the vulnerability of the communities or the health system, or negatively impact their capacity to resist, respond and recover from disasters. The paradigm shift from response to risk management is the core of global framework such as the Sendai framework for disaster risk management and the International Health Regulations [1]. Managing risk implies that the risk is characterized, and its various components are identified and, whenever possible, measured. Thus, understanding risk, which is also the first of the four priorities of the Sendai framework, becomes a paramount step to risk management.

Only few risk assessment tools that exist comprehensively assess the level of risks and its components, at both the strategic and operational levels, and fit for "all-hazard" approach in the health sector. A survey conducted by WHO in 2015 indicated that in the AFRO region, only two countries out of the 29 that responded to the survey, had conducted some semblance of multi-hazard risk assessment for the health sector in the last five years before the assessment [6]. The survey also showed that one of the main handicaps in conducting risk assessment for the health sector was the lack of risk assessment skills, tools, and guidelines.

In view of this gap, the WHO/AFRO developed the Vulnerability and Risk Assessment and Mapping (VRAM) tool and guidelines. The purpose of this paper is to describe the tool for Vulnerability and Risk Assessment and Mapping (VRAM) for the health sector in Africa, and to provide the perspective of its use in the African context.

It is of utmost importance, to determine what elements constitute the components of risk. The UN intergovernmental working group on indicators and terminology relating to disaster risk reduction defines risk as "the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity" [7]. The same UN group also defines risk assessment as "the qualitative or quantitative approach to determine the nature and extent of disaster risk by analysing potential hazards and

evaluating existing conditions of exposure and vulnerability that together could harm people, property, services, livelihoods and the environment on which they depend." However, Jordaan [8] distinguishes risk assessment from risk analysis. He described risk analysis as the process of identifying and measuring the various components of risk, which, in turn, provide the estimation of the level of risk. For Jordan, risk assessment includes all the elements of risk analysis plus the weighing of actions to mitigate that risk.

VRAM Overview

The concept of risk and risk assessment are often used in various contexts with different meanings. Regardless of the context, all risk assessments can globally be divided into two categories: event-based and non-event-based risk assessment. The former sometimes also called "rapid risk assessment" is usually conducted to assess, for a looming or impending outbreak, or an outbreak at its very initial stage, the potential severity as well as its likelihood of spreading to other local, regional, and global level settings. In the health sector, rapid risk assessments are mainly used in the management of outbreak prone diseases or infectious diseases in general. The outputs of the rapid risk assessment often inform the readiness operations and contingency planning. The Non-event-based is not related to any specific immediate event. It can be applied to infectious diseases as well as to any other hazard, natural or human-made. The results from Non-event risk assessments inform the risk reduction and preparedness programs. The VRAM process was explicitly designed for non-event based risk assessment. Therefore, throughout this paper, the concept "risk assessment" will exclusively refer to the non-event based category.

A meaningful risk assessment should provide answers at minimum to the following key questions: (1) what are the most likely hazards that can trigger emergencies or even disasters in a country; (2) who are the most at risk from the Hazard-related events; (3) why are they at highest risk of or what make them more at higher risk; (4) where are those at highest risk-mapping and more importantly, (5) what can be done to reduce the risk? Therefore, a rigorous and scientifically sound risk assessment methodology is essential to understanding the risk [9].

The VRAM tool is meant to be used for diverse types of hazards (all-hazards approach) including diseases, social, technological, and chemical hazards, or natural hazards such as hydro-meteorological and geological. This section will introduce the theoretical framework of the VRAM exercise, the operational process, the outputs, as well as the intended use of the VRAM outputs.

As mentioned earlier, the Vulnerability and Risk Assessment and Mapping (VRAM) exercise seeks to identify population groups, communities, or geographic areas that are at high risk

of the impact of a specific hazard or a range of hazards for well-targeted preparedness and risk reduction interventions. The four components of the VRAM process serve to identify the priority hazards in a specific geographic zone, the factors of vulnerability of the communities and the health system in that area, as well as the level of capacity for effective response and recovery. The results of the VRAM exercise can inform the development of policies, strategies, and plans for risk reduction and emergency management. The recommendations are drawn from the results to guide the development and implementation of disaster risk management program in the health sector. They can also guide other sectors in the operationalization of “health in all policies”.

VRAM Conceptual Framework

The need for a holistic approach in risk assessment is that: The framework of VRAM in the health sector is conceptually constructed with the three components of the risk: hazard, vulnerability, and capacity analyses. It stems from the United Nations’ definition of the concept of risk in disaster risk management. The UN intergovernmental working group defines risk is a - probabilistically determined - “function” of hazard, exposure, vulnerability, and capacity [7]. The UN definition of risk is in line with Heijmans and Victoria model, which expresses risk

as a function of hazard, vulnerability, and capacity [10]. There, however, exist several variant forms of conceptual frameworks of risk and risk assessment across sectors [11-16]. For instance, Bollin and Hidajat [13] risk framework has four components, the hazard, the exposure, the vulnerability, and the capacity. The pressure and release (PAR) model on the other hand mathematically translates risk as a function of hazard and vulnerability [11]. Although PAR model and its numerous variants are the most commonly used in disaster risk management, the VRAM conceptual framework is based on a definition that fits well with the health sector. Indeed, assessing and managing risk in the health sector requires taking into account the dimension of vulnerability and capacity of the population health as well as the aspects of vulnerability and capacity of the health system. In fact, during emergencies and disasters, the health system suffers double jeopardy.

On the one hand, the health system, with its infrastructure and resources, are exposed or even affected by the impact of the emergency in the same way as other sectors. On the other hand, the health system is often called upon to respond to the effects of the emergency to reduce the morbidity and mortality, with expectation of the same level of efficacy as before the crisis. The VRAM framework is schematically summarized in Figure 1.

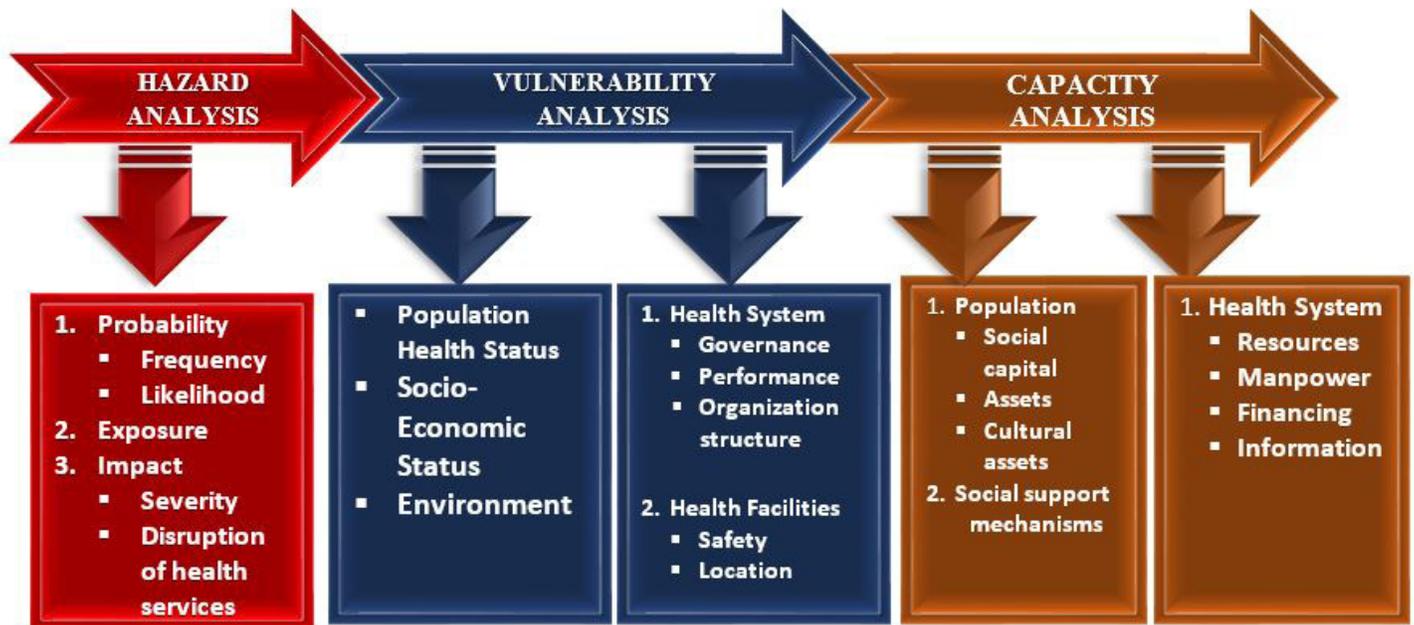


Figure 1: Framework for vulnerability and risk assessment and mapping for the health sector.

Mathematically, the Framework for vulnerability and risk assessment is translated by Heijmans and Victoria's formula:

$$\text{Risk} = \text{Hazard} \times \text{Vulnerability} / \text{Capacity}$$

VRAM Process

We conduct the VRAM exercise through a participatory, inclusive, and multi-sectoral process, which also uphold the "all-hazard approach. A typical VRAM exercise comprises four phases: (1) the preparatory phase, (2) the planning phase, (3) data collection and analysis phase and, (4) the post-analysis phase.

The preparatory phase is one of the critical steps of the VRAM process, a foundation on which all the other phases of the exercise hinge on. It consists of establishing a core team that oversees the technical and operational aspects of the VRAM. The preparatory phase also serves to raise awareness and obtain ownership from key stakeholders.

The planning phase consists of an inclusive workshop led by the health sector with the active participation of other sectors. Participants of the planning workshop determine, through a mixed method of quantitative and qualitative/consensus), the list of priority hazards. They also identify, based on the country's specific context, the parameters, and indicators of vulnerability and capacity. Finally, the participants develop a data collection tool (based on the identified indicators) and, the data collection and analysis plans.

The next phase, as indicated by its name, consists of collecting data from various sources of information. Although primary data can be collected for the VRAM exercise, the practice has consisted of collecting only secondary data instead. The use of secondary data presents several advantages. First, by using existing data from official governments documents, it improves the validity of the information. Also, collection of secondary data is less time and resources-consuming and the results are less likely to be subject to controversy or rejection from national authorities or national partners. Also, the use of secondary data in a nationally led process promotes and reinforces national ownership of the results. Finally, secondary data are objectively verifiable and less subject to controversy about the origin and the integrity of the data used in the analysis. However, in the African context, the use of secondary data is significantly affected by the chronic lack of documentation and data, especially when the data has to be disaggregated at the lowest level of subnational entities. Thus, the VRAM exercise may end up discarding many relevant and essential indicators because of lack of data disaggregated at sub-national levels. The data analysis includes the traditional data processing (data cleaning, coding, weighing, and scaling) as well as the exercise of computing the indices for each component of the risk. It also includes the comparative analysis of risk components

between different units of analysis, and finally, the formulation of the recommendations based on the results.

The post analysis phase includes the elaboration and dissemination of the VRAM report. The dissemination products may consist of the executive summary, the policy paper, and various briefing notes.

The VRAM exercise is not a one-off activity. Vulnerabilities and capacity in a country or region change from time to time. With the ongoing climate change, the continuous evolution of the natural environment and human-environment interactions, the VRAM exercise is expected to be conducted on a reasonably regular interval at least in 3 to 5 years. Besides, the priority hazards might need to be reviewed from time to time. For example, Ebola might not have been considered in West Africa as a priority ten years ago as compared to the present situation.

VRAM Outputs

The VRAM report includes the following main products:

- A list of priority hazards that may constitute imminent or significant threats and on which public health authorities at the local and national level should focus their efforts for risk reduction and emergency management
- The weighted parameters of vulnerability and capacity in the specific context of the country. The vulnerability and capacity concern both the Community and the Health system
- An estimated level of risk or risk index about each priority hazard and in each geographic entity that was determined as the unit analysis during the VRAM exercise
- A map with a visual representation of the geographic distribution of vulnerability, capacity, and risk related to specific priority hazards. The mapping facilitates comparative analysis of risk between geographic entities
- A matrix of priority actions and recommendations for effective risk reduction and emergency management program in the health sector as well as for the other sectors relevant to the reduction of risk related to the identified priority hazards
- Limitations and data gaps if any that need to be addressed in the subsequent years

Use of the VRAM Results

The products from the VRAM analysis can be used for the following purposes:

- Mark the baseline for the population and health system in each geographic entity. The baseline of the indices of the various components of the risk subsequently provides evidence against which to monitor progress
- Guide the development, Implementation, and Monitoring and Evaluation of policies and plans for Disaster Risk Management (DRM) including Emergency preparedness and risk mitigation

- Efficient resources allocation for risk reduction and emergency management at the operational level
- Development of multi-hazard preparedness and response plans that is holistically meant to address not only the lack of capacity, but also the vulnerabilities of both the communities and the health system
- Development of risk communication and other relevant training programs

Challenges

Lack of expertise in risk assessment methodology for the health sector has been the main challenge in the implementation of the VRAM exercises in the AFRO region. Additionally, because of its inclusiveness and operational characters, the VRAM exercise involves several stakeholders from various sectors. Obtaining consensus on key issues, including on relevant recommendations can be challenging when stakeholders have a different view on the problems and the proposed way forward. Also, the need for results that can be used at an operational level often requires extensive data collection and expertise from different relevant fields, which significantly increase the cost and the time. Thus, the relatively high cost and time constraint of the VRAM exercise represents another challenge. Also, even after completion of the exercise, some of the recommendations or plans developed might be shelved for various reasons, including resource constraints.

Lessons Learned and Way Forward

The pioneering development of the tool for vulnerability and risk assessment for the health sector and its implementation in the AFRO region in the last five years has been an undertaking from which few lessons learned can be drawn. First, although the understanding risk is recognized as one of the priorities for effective risk reduction programs, in the health sector, there was an urgent need for a risk assessment tool for a comprehensive risk assessment, built on a framework that takes into account the health system aspects of vulnerability and capacity. The development of the VRAM is an attempt of filling that gap. Second, risk assessment remains one of the fields that still need to be further developed, and its implementation in the health sector be rendered routine. Thus, we suggest the following to move forward the agenda of risk assessment in the health sector in the AFRO region: (1) to assess the validity and reliability of risk assessment tools that are currently used either at national or sub-national levels in the health sector; (2) to institutionalize the training of risk assessment in the health sector, in collaboration with universities and other research and teaching institutions; (3) to build and test models assessing the impact of various factors of vulnerability and capacity on morbidity and mortality, related to public health emergencies, and to measure the contributions of those elements on the reduction of risks.

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