

The Pivotal Roles of Performance Management Systems in Disaster Preparedness and Public Health

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ABSTRACT

Introduction: The integration of Performance Management Systems (PMS) into disaster preparedness strategies is essential for reinforcing the resilience of public health infrastructures against a wide array of disasters.

Objectives: This review article scrutinizes the role of PMS and Key Performance Indicators (KPIs) in augmenting public health systems' readiness in the face of natural, technological, and human-made disasters.

Methodology: Through a critical literature review, this study examines diverse PMS frameworks and models within public health and disaster management sectors, evaluating their effectiveness in mitigating health-related outcomes of disasters.

Results: Findings indicate that adeptly implemented PMS have the potential to predict and alleviate common health issues in disaster situations, including communicable diseases and interruptions in healthcare services.

Conclusion: The research concludes that effective disaster preparedness within the public health domain necessitates innovative, accountable, and robust PMS, specifically designed for various disaster scenarios, to significantly bolster resilience and diminish the impact on health.

Key words: Performance Management Systems, Public Health, Disaster Preparedness, Key Performance Indicators, Disaster Resilience, Health Consequences.

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INTRODUCTION

The performance management systems has become of high need especially of various sciences, which include the sciences of emergency and disaster management. In a parallel context, the interest in preparing for emergencies has increased over recent years, starting with the unification of definitions and objectives on national and local levels. For the purpose of monitoring and improving systems' capacities and capabilities, measuring preparedness complex is an essential concept to consider despite the limitations related to it [1].

The performance management system is a critical tool across various disciplines, including emergency and disaster management. In recent years, there has been an increased focus on disaster preparedness, with national and local authorities unifying definitions and objectives. Despite some limitations, measuring the preparedness complex is crucial for monitoring and improving systems' capacities and capabilities. To enhance preparedness, this study proposes using components of the performance management system, specifically focusing on related areas in the joint external evaluation tool by the international health regulations [2].

The performance management system is a comprehensive approach used to monitor and evaluate the performance of an organization, with the goal of achieving the desired outcomes and improving the organization's effectiveness. This system comprises several components, including goal setting, performance

measurement, and performance feedback, which can be adapted to different contexts, including disaster preparedness [3].

Disaster preparedness is a complex process that involves various stakeholders and requires a multidisciplinary approach. The joint external evaluation tool by the international health regulations is a comprehensive framework used to assess a country's capacities to prevent, detect, and respond to public health emergencies. This tool includes several components, such as legislation, financing, communication, and risk communication, which can be aligned with the performance management system's components to enhance preparedness [4].

To enhance disaster preparedness, organizations can use the performance management system's components to set goals, measure the progress, and provide feedback on their preparedness efforts. For instance, organizations can set goals related to the joint external evaluation tool's components and measure their progress using performance indicators. They can also provide feedback to stakeholders on their preparedness levels to enhance collaboration and coordination.

The performance management system is a critical component of the disaster management cycle, which comprises four phases: mitigation, preparedness, response, and recovery. Each of these phases serves a critical function in managing disasters and reducing their impact on affected communities [5].

Mitigation involves taking actions to reduce or eliminate the risk and impact of disasters. This phase encompasses a wide range of activities, including hazard identification, risk assessment, and preventive measures, such as land-use planning, building codes, and public education campaigns (Federal Emergency Management Agency). The performance management system can be used to measure the effectiveness of mitigation efforts, set goals for risk reduction, and monitor progress over time [6].

Preparedness involves the development of plans, procedures, and resources to respond to disasters effectively. This phase includes activities such as training and exercises, emergency communication, and resource allocation (Federal Emergency Management Agency). The performance management system

can be used to measure the preparedness of organizations and communities, identify gaps in planning and resource allocation, and provide feedback to improve preparedness efforts [7].

Response involves the immediate actions taken to save lives, protect property, and meet the basic needs of affected communities. This phase includes activities such as search and rescue, evacuation, and the provision of emergency services and supplies (Federal Emergency Management Agency). The performance management system can be used to measure the effectiveness of response efforts, track the deployment of resources, and provide feedback to improve response operations [8].

Recovery involves the restoration of normalcy and the recovery of affected communities after a disaster. This phase includes activities such as debris removal, infrastructure repair, and the provision of long-term assistance to affected individuals and families (Federal Emergency Management Agency). The performance management system can be used to measure the progress of recovery efforts, track resource allocation, and provide feedback to improve recovery operations.

This article attempts to explore practices to enhance preparedness using performance management system's components [9].

METHODOLOGY

Literature Review Approach

This study employs a comprehensive literature review methodology to examine the pivotal roles of Performance Management Systems (PMS) in enhancing disaster preparedness. The review explores existing research from a variety of academic and policy-related sources. The following steps outline the literature review process undertaken for this article

Search Strategy

The literature search was strategically initiated by pinpointing keywords and phrases that bridge Performance Management Systems (PMS) with public health disaster preparedness. The targeted search terms included "public health," "disaster resilience," "performance management in healthcare," "health consequences of disasters," "communicable diseases in disaster management," and "key performance indicators

for emergency preparedness." A thorough search was executed across multiple scholarly databases such as PubMed, Scopus, Google Scholar, and Web of Science. This comprehensive approach was employed to amass a wide spectrum of literature pertinent to the implementation and efficacy of PMS in mitigating public health issues arising from natural, technological, and human-made disasters [10].

Inclusion and Exclusion Criteria

The literature was selected based on the following criteria

Inclusion

Articles that specifically addressed the use of PMS in disaster preparedness, discussed the development and application of Key Performance Indicators (KPIs) in disaster scenarios, or evaluated the effectiveness of disaster preparedness strategies in various contexts were included.

Exclusion

Studies that did not focus on disaster preparedness or performance management systems, as well as those that did not provide empirical data or substantial theoretical contributions, were excluded from the review.

Data Extraction and Analysis

Relevant information from the selected literature was extracted, including authors, year of publication, methodology, key findings, and the context of the study.

Comparative Analysis

A comparative analysis was conducted between different frameworks and models, such as the homeland security predictive model, the Arab Strategy for Disaster Risk Reduction, and the Sendai Framework for Disaster Risk Reduction, to evaluate their effectiveness and applicability in various regions and contexts.

Synthesis of Findings

The collected data were synthesized to develop a comprehensive understanding of the current state of PMS in disaster preparedness. This included assessing the alignment between various frameworks, the adaptability of performance indicators across different disaster scenarios, and the impact of performance improvement programs on preparedness capacities [11].

Conceptual and Theoretical Framework

This literature review is grounded in a combination of theoretical and conceptual frameworks that guide the understanding and implementation of PMS and KPIs in disaster preparedness across various disciplines

Balanced Scorecard & Performance Prism

These frameworks are utilized to analyze how organizations align their disaster management activities with strategic objectives and stakeholders' expectations.

Results-Based Management (RBM)

This approach is examined to understand its application in setting and achieving disaster preparedness goals.

Contingency, Resource Dependence, and Institutional Theories

These theories provide insight into the need for tailored disaster management strategies, resource allocation, and the influence of institutional environments on disaster preparedness.

High-Reliability, Normal Accidents, and Safety Culture Theories

These theories inform the analysis of technological and human-made disaster management practices, emphasizing the need for high-reliability operations, the inevitability of accidents in complex systems, and the importance of safety culture.

The integration of these conceptual and theoretical frameworks provides a robust basis for understanding the multifaceted nature of PMS and KPIs in disaster preparedness [12].

DISCUSSION

The efforts to bridge disaster preparedness gaps using different approaches and frameworks are not unnoticeable, for instance, the homeland security addressed by introducing a predictive model that balances value-added inputs with intended results enhanced by leadership, with the organizational processes and performance outputs enhanced by management, into a system that delivers the outcomes intended with preparedness and further comparing it with current policy on national preparedness.

For instance, the disaster risk reduction strategy for Arab States has complemented the continuous

efforts by technical national and international institutions that really help in reducing the risk of disasters in Arab states. Additionally, a multisector approach was implemented by the partners of the League of Arab States to reduce the risk of disasters considerably in Arab regions by 2030, in line with the priorities set by the Sendai Framework for Disaster Risk Reduction 2015-2030, and the SDGs [13].

In order to gain harmony and coherence with the disaster risk reduction global developments, the main themes of the Arab Strategy for Disaster Risk Reduction was initially derived from the Hyogo Framework for Action (HFA)'s global priorities for disaster risk reduction. But later on were modified to adopt the Sendai Framework for Disaster Risk Reduction 2015-2030.

The general framework of the Arab Strategy for Disaster Risk Reduction was represented through these themes and all the programs, activities and action mechanisms were developed in line with the specialized regional organizations, needs and different capacities of the participating countries, support of the development partners. Thus, the expected outcome of the Arab Strategy for Disaster Risk Reduction (ASDRR) was to attain a significant decrease in the mortality and the property at all environmental, economic, and social levels in countries of the Arab region [14].

However, the Prioritized Action Plan for 2018-2020 was given by the Arab Strategy for Disaster Risk Reduction 2030 for the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030. The Arab strategy was implemented in three phases; Phase one was from 2018 to 2020 and it focuses on risk assessment; phase two is ongoing from 2021 to 2025 and it will strengthen the institutions by implementing DRR at selected local levels to build resilience; and phase 3 will be from 2026 to 2030 will be delivered for investment strengthening, recovery and response system and local levels, preparedness, and installation of DRR systems at all local levels.

The literature suggests that a one-size-fits-all assessment system has limited comparative value and has not proven to answer to the unique countries risks. By looking at the risk posture in each state and the unique capability needs, a model emerges that includes existing quantitative information and combines it with

qualitative efforts sustained in emergency management [15].

In that context, using different tools for measuring and enhancing preparedness can be justified as stated by Chiossi's study scoping review on recent tools and methods for assessing public health emergency preparedness, despite the limitations in these methodologies such as the lack of system-level performance measures. Building on that, an attempt to evaluate the effects of performance improvement programs on preparedness capacities concluded that accreditation and other performance improvement programs have a significant and positive effect on preparedness capacities [16].

Furthermore, and for the purpose of exploring the perceived drivers behind the implementation of performance measurement systems and providing an in-depth conceptual overview and understanding of factors influencing the development and use of performance measures, case study of the Indonesian government concluded that practical implications - An understanding of factors influencing the development and use of performance measures, in turn, can be used not only to improve PMSs in the future but to improve the quantity and quality of states Apparatus reporting. The development of tools to enhance disaster preparedness extends to development of a survey instrument to measure connectivity to evaluate National Public Health Preparedness and Response Performance and that found to be a reliable measure of connectivity with preliminary evidence of construct validity [17].

In the context of performance management systems, there are several efforts that have supported the concept of using these systems in the context of disaster management, specifically preparedness and different levels. At agencies level, Nakanishi et al., based on the fact that emergencies do not occur frequently, and it is unadvisable to wait until they happen to evaluate a transit agency's level of emergency preparedness, he proposed is the development of performance indicators that measure the achievement of emergency preparedness goals and policies of a transit agency where an emergency preparedness assessment flowchart incorporating performance indicators was developed [18].

At hospital levels, particularly in Saudi Arabia, a disaster Medicine Specialist and her colleagues evaluating hospitals preparedness developed a questionnaire according to five Likert scales. It was divided into eight fields of 33 indicators: structure, architectural and furnishings, lifeline facilities' safety, hospital location, utilities maintenance, surge capacity, emergency and disaster plan, and control of communication and coordination. Six hospitals participated in the study and rated to the extent of disaster preparedness for each hospital disaster preparedness indicators. Two hazard tools were used to find out the hazards for each hospital. An assessment tool was designed to monitor progress and effectiveness of the hospitals' improvement. Weakness was found in HDP level in the surveyed hospitals [19].

Disaster mitigation needs more action including: risk assessment, structural and non-structural prevention, and preparedness for contingency planning and warning and evacuation. This study demonstrated the full performance management concept with a clear positive impact on preparedness at hospital level. Likewise, the using of quality improvement as a concept is similar to performance management system in the essence of their process and outcome on disaster preparedness. The literature indicated guidance of how to develop performance indicators and their application in disaster preparedness context [20].

Performance Measurement System and Key Performance Indicators (KPIs) Concepts and Definitions

Performance measurement system provides a ways and a major opportunity to policy makers to improve and maintain the accountability and performance of the health system. This include the improvement of quality decision made by all stake holders of the health system consisting of practitioners, patients, administrative managers, insurance companies included, financial supporters, politicians and all levels of government leaders. Recent advances in the information technologies and increased demand of the accountability in the health system and also the choices of patients have rapidly driven the advancement in the performance measurement of health system [21].

Although, the health system today is in its early stages of performance measurement

and therefore, many major changes and improvements are still required in the process of data collection, policy development, analytical methodologies and implementation of all the methods that would serve to improve the performance of healthcare systems.

Performance of healthcare system has many aspects which include, treatment related health outcomes, population health, responsiveness, productivity, equity, care appropriateness, and clinical quality; and also the progressive variation and innovation in the techniques of data collection and performance measurement tools to achieve all these aspects related to increased performance of healthcare system.

Nevertheless, significant progress has been made in primary care, public health, and acute hospital care but areas like financial protection, responsiveness of health system, mental health of people; all areas require much extensive research for the development [22].

Thus, a strong conceptual framework should be formulated as a first requirement of developing any performance management system which would consist of performance measuring indicators to measure the acceptability, reproducibility, feasibility, reliability, validity, and sensitivity other than all the technical concerns. Further, risk adjustment should also be measured through advanced analytical methods where patient safety is major concern. Further, methods of surveillance and patient safety should also developed for the detection of inconsistent performance.

Thus, performance management systems could be used for the promotion of system improvement, for reporting the performance to public, to explicit the financial incentives, in improving public health, in providing the democratic accountability strongly, for the provision of feedbacks to the health care system providers, to align with accountable relationships, to align with mechanisms of healthcare system including finance, information technology and structure of market, to keep check on quality control and data audit, for governance of information, ensuring well informed debate of public, efficient and effective analysis, to ensure the consistency and comparability, risk adjustment, to negate any adverse consequences, for monitoring of performance and behavior of individuals, to

spend money cost effectively, and for managing political processes [23].

Concepts and theories of implementation of Performance Measurement System and Key Performance Indicators (KPIs) in different disaster disciplines

Performance Measurement Systems (PMS) and Key Performance Indicators (KPIs) are essential in disaster management. They assist in evaluating the effectiveness of the disaster management strategies and plans. PMS and KPIs are important in ensuring that the disaster management plans are implemented and the objectives achieved. In this article, the concepts and theories of implementing PMS and KPIs will be discussed in different disaster aspects disciplines.

There are different disaster aspects disciplines, which include natural disasters such as earthquakes, floods, hurricanes, and tornadoes, among others. There are also technological disasters such as chemical spills, nuclear accidents, and transportation accidents. Additionally, there are human-made disasters such as terrorist attacks, civil unrest, and wars. Each disaster aspect discipline has unique characteristics that require specific performance measurement systems and key performance indicators [24].

Implementation of PMS and KPIs for Natural Disasters

Effective management of natural disasters necessitates a robust Performance Management System (PMS) and well-defined Key Performance Indicators (KPIs). The unpredictable nature of these disasters calls for a strategic approach to mitigate damage to property and loss of life. Applying the Balanced Scorecard, organizations can align disaster management activities with their overarching goals, by identifying critical success factors as a measure of performance.

Furthermore, the Performance Prism is instrumental in meeting stakeholders' expectations in disaster management. By identifying stakeholders and their expectations, performance can be measured against these benchmarks to ensure accountability [25].

Results-Based Management (RBM) shifts the focus towards achieving the desired outcomes. In the context of natural disasters, RBM involves

setting clear goals, identifying pertinent indicators, and monitoring progress towards these goals.

The application of these concepts is further informed by organizational theories. Contingency Theory emphasizes the need for tailored disaster management strategies based on the specific characteristics of each disaster. Resource Dependence Theory highlights the necessity of considering the availability and utilization of resources from the government, donors, and other stakeholders in disaster management. Institutional Theory suggests that the PMS and KPIs for natural disasters should be cognizant of the legal, cultural, and social norms within the institutional environment. [Figure 1] illustrates the interplay between these established management concepts and organizational theories, depicting how they integrate to inform the implementation of PMS and KPIs for effective natural disaster response [26].

Implementation of PMS and KPIs for Technological Disasters

Technological disasters, such as incidents at chemical plants, nuclear power facilities, and transportation systems, require a specialized approach to Performance Management Systems (PMS) and Key Performance Indicators (KPIs). Performance-Based Regulation is a pivotal concept here, focusing on outcomes rather than mere rule compliance. This approach ensures that entities manage disasters effectively, aiming for results beyond minimum standards [27].

Additionally, Risk-Based Performance Management is integral, emphasizing the management of risks inherent in technological operations. This approach prioritizes the identification and mitigation of potential hazards associated with technological systems.

In aligning PMS and KPIs with these concepts, several theories provide a foundation. High-Reliability Theory posits that certain high-risk organizations can operate without significant failures, provided they adopt robust disaster management strategies. On the other hand, Normal Accidents Theory suggests that complex systems inherently pose a risk for accidents, and thus disaster management strategies must accommodate such complexity [28].

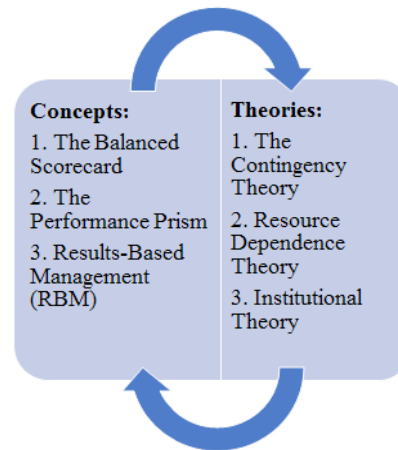


Figure 1: Integration of Management Concepts and Organizational Theories in PMS and KPI Implementation for Natural Disaster Response.

Safety Culture Theory underscores the importance of prioritizing safety as a core value within organizations to protect employees, customers, and the environment. [Figure 2] synthesizes these concepts and theories, illustrating the comprehensive framework underpinning PMS and KPI implementation in technological disaster management, integrating Performance-Based Regulation, Risk-Based Performance Management, along with High-Reliability Theory, Normal Accidents Theory, and Safety Culture Theory into a cohesive overview that informs effective PMS and KPI strategies [29].

Implementation of PMS and KPIs for Human-Made Disasters

Human-made disasters, such as terrorist attacks, civil unrest, and wars, necessitate an acute focus on the implementation of Performance Management Systems (PMS) and Key Performance Indicators (KPIs) tailored to address intentional actions that disrupt societal norms. Counter-Terrorism Performance Measurement is a critical framework in this domain, helping organizations to gauge the effectiveness of strategies to counter such adversities. This measurement approach, when applied to disaster management, ensures that organizations are actively implementing robust counter-terrorism initiatives.

Additionally, the Conflict and Fragility Performance Measurement framework is instrumental in quantifying an organization's capability in managing conflicts and fragility associated with human-made disasters. It underscores the necessity for strategies that address the complex dynamics and consequences of human-induced conflicts [30].

Within this framework, several theories provide a foundation for PMS and KPIs. Resilience Theory, for instance, posits that organizations must be adaptable and resilient in the face of human-made disasters, suggesting that resilience is a key indicator of an organization's ability to withstand and recover from such events.

Decision-Making Theory is also essential, highlighting the importance of effective decision-making processes in the management of human-made disasters. This theory suggests that the quality of decisions made during a crisis can significantly affect the outcomes.

Furthermore, Leadership Theory asserts that strong leadership is paramount in navigating through the challenges posed by human-made disasters. Effective leadership is seen as a catalyst for efficient disaster management and recovery. [Figure 3] in the manuscript offers a visual representation of these concepts and theories, providing an integrated framework for the implementation of PMS and KPIs in human-made disaster scenarios [31].

Public Health Impact of Disaster Management Performance Systems

The efficacy of Performance Management Systems (PMS) and Key Performance Indicators (KPIs) in addressing public health outcomes during disasters is a critical area of discussion. Disasters, by their very nature, disrupt normal healthcare services and can lead to immediate and long-term public health crises. In the wake of natural disasters, PMS can be instrumental in the surveillance of potential disease outbreaks. For example, KPIs might be established to monitor water quality and the incidence of water-borne

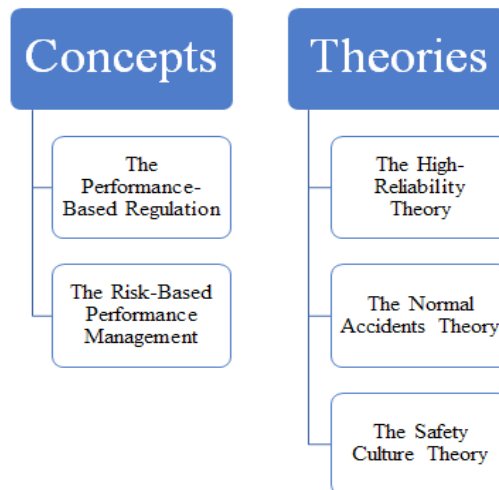


Figure 2: Conceptual and Theoretical Framework for PMS and KPIs in Technological Disaster Management.

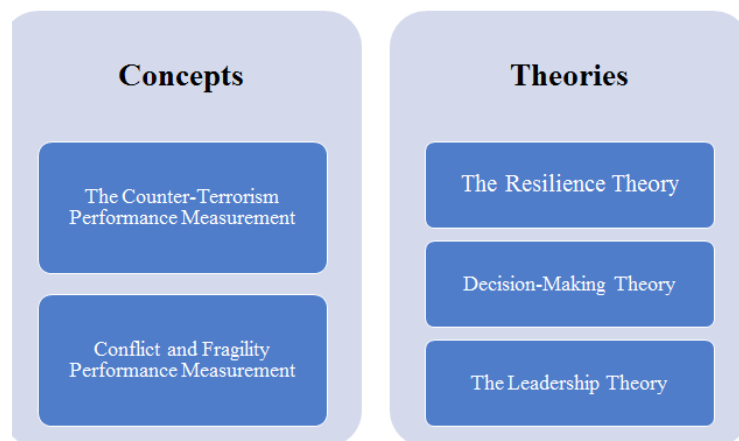


Figure 3: Frameworks for PMS and KPI Implementation in Human-Made Disaster Scenarios.

diseases, ensuring that responses are swift and targeted [32].

During technological disasters, which often involve hazardous materials or infrastructure failures, PMS play a vital role in managing healthcare services. Healthcare facilities might use KPIs to assess their readiness for handling mass casualties or chemical exposures, with performance indicators designed to measure the speed and effectiveness of the healthcare delivery.

In the context of human-made disasters, which include acts of terrorism and warfare, the coordination of emergency response teams is paramount to mitigate the spread of diseases. PMS can support this coordination by setting KPIs for the distribution of medical supplies, the establishment of quarantine zones, and the dissemination of public health information. These KPIs enable real-time assessment and

strategic adjustments, which are crucial in the dynamic environment of a human-made disaster.

The integration of PMS and KPIs in disaster management thus serves as an essential framework for maintaining and restoring public health, mitigating the immediate health impacts of disasters, and setting the stage for a more resilient healthcare system in the aftermath.

Preventive Public Health Strategies through PMS

Preventive strategies are essential in the public health domain, especially when it comes to disaster management. Performance Management Systems (PMS) can be meticulously designed or utilized to bolster these preventive measures, ensuring a robust public health emergency preparedness framework. A significant aspect of preventive strategies is vaccination distribution, which is paramount in the wake of biological disasters or when facing the risk of epidemic outbreaks post-disaster. PMS can facilitate the

strategic planning and monitoring of vaccine stockpiles, the efficiency of distribution channels, and the coverage rate within vulnerable populations.

In terms of public health education, PMS serve as a conduit for developing, tracking, and evaluating educational campaigns that aim to inform the public about disaster risks and health practices to mitigate these risks. Key Performance Indicators in this regard might include the reach and impact of health education programs, the level of community engagement, and the changes in public behavior in response to these initiatives.

Early warning systems for disease outbreaks are another crucial preventive measure where PMS prove invaluable. By setting up KPIs centered on the timeliness and accuracy of outbreak detection and the rapidity of the response, PMS can significantly augment the ability to avert full-scale public health emergencies. These systems rely on the collection and analysis of health data, environmental monitoring, and population surveillance to predict and respond to potential outbreaks, thereby minimizing the risk of spread and ensuring that the healthcare system is not overwhelmed.

Incorporating PMS into these preventive public health strategies ensures a data-driven, proactive approach to disaster management, with clear objectives, measurable goals, and an emphasis on continuous improvement. This not only helps in preparing for emergencies but also in building a resilient public health system capable of withstanding the multifaceted challenges posed by disasters [33].

Resilience and Recovery in Public Health Systems

The resilience and recovery of public health systems post-disaster are significantly bolstered by the strategic application of Performance Management Systems (PMS) and Key Performance Indicators (KPIs). PMS can guide public health officials in efficiently restoring health services and infrastructure by providing measurable targets and real-time feedback. For instance, KPIs related to the rapid reconstruction of healthcare facilities, the resumption of medical supply chains, and the re-establishment of health services are vital for recovery efforts.

Furthermore, PMS encompass the provision of mental health support, which is a critical component of the recovery phase. Performance indicators may include the number of mental health professionals deployed in affected areas, the frequency of mental health assessments conducted, and the accessibility of psychosocial services to disaster survivors. These metrics ensure that mental health recovery is quantifiable and managed with the same rigor as physical health.

Long-term healthcare provision is another area where PMS prove indispensable. Post-disaster, communities may face prolonged health impacts requiring sustained healthcare interventions. KPIs focused on long-term health outcomes, such as the incidence of chronic diseases or the quality of life indicators among the affected population, can shape policies and programs to support extended care needs.

The integration of PMS into disaster management thus not only aids in immediate response and short-term recovery but also ensures that the public health systems are equipped to support the affected communities in the long run. By setting clear, actionable KPIs, public health systems can navigate the complex pathway of recovery, making strategic decisions that prioritize the health and wellbeing of individuals and the community at large [34].

Cross-Sectoral Collaboration in Public Health and Disaster Preparedness

Effective disaster preparedness and response require seamless collaboration across various sectors, particularly between disaster management and public health. Performance Management Systems (PMS) serve as a bridge, fostering cross-sectoral collaboration by providing a common framework for setting and achieving shared objectives. The design of cross-sectoral Key Performance Indicators (KPIs) encourages different sectors to work towards unified goals, such as minimizing the health impact of disasters and ensuring quick recovery of services.

Cross-sectoral KPIs can include metrics like the time taken to mobilize joint emergency operations, the effectiveness of shared resource utilization, and the degree of inter-agency communication effectiveness. By measuring and managing these KPIs, PMS can identify areas for

improvement in collaborative efforts, thereby enhancing the overall disaster response [35].

Moreover, in complex disaster scenarios that require multidimensional responses, such as a pandemic superimposed on a natural disaster, the role of integrated PMS becomes even more critical. Establishing cross-sectoral KPIs that address both the immediate disaster response and the underlying public health crisis can lead to more strategic resource allocation and better-coordinated response actions.

Ultimately, the incorporation of PMS into the fabric of public health and disaster preparedness not only streamlines the response efforts but also builds a more resilient infrastructure capable of withstanding and recovering from the multifarious nature of modern disasters [36].

CONCLUSION

The comprehensive review of Performance Management Systems (PMS) and Key Performance Indicators (KPIs) within disaster preparedness contexts underlines the necessity for strategic, adaptable, and systematic approaches. This study has expanded the traditional focus to integrate public health outcomes, ensuring a more holistic view of disaster resilience. The exploration of various management concepts and organizational theories in the implementation of PMS for natural, technological, and human-made disasters reflects a commitment to informed, data-driven decision-making.

The phased application of these strategies, respecting the unique characteristics of different disaster types, echoes the dynamic essence of disaster preparedness. The literature advocates for a multifaceted assessment system, combining quantitative and qualitative analysis, emerging as a superior tool in emergency management. Such a nuanced approach recognizes the distinct risks and capabilities of individual entities and environments.

Performance management, as evidenced by the application of PMS in transit agencies to healthcare facilities, is an evolving field requiring continuous innovation and adaptation. It extends beyond theoretical constructs, manifesting as practical tools that significantly enhance preparedness and response across sectors.

Incorporating theoretical foundations—such as the Balanced Scorecard for natural disasters, Performance-Based Regulation for technological disasters, and Counter-Terrorism Performance Measurement for human-made disasters—provides a robust basis for practical application.

In a nut shell we can say that, the development and application of PMS and KPIs are imperative for advancing disaster preparedness. The intricate nature of disasters demands systems those are as versatile as they are steadfast, capable of meeting the specific needs of each disaster type while adhering to global standards and frameworks. The progress observed in performance measurement within healthcare systems exemplifies the ongoing pursuit of excellence in disaster preparedness—a pursuit characterized by the imperative for innovation, accountability, and a resolute commitment to enhancing community resilience worldwide.

RECOMMENDATIONS

To further elevate disaster preparedness via effective Performance Management Systems (PMS), this review posits the following recommendations

Customization of PMS

Tailor PMS to address the specific risks and requirements of various regions and disaster types, blending quantitative and qualitative insights.

Integration with Global Frameworks

Harmonize national and regional disaster preparedness strategies with international standards, such as the Sendai Framework, to foster consistency and integrate global best practices.

Continuous Improvement

Establish perpetual enhancement initiatives for preparedness, updating PMS with cutting-edge research and advancements.

Stakeholder Engagement

Involve a diverse array of stakeholders in PMS development and deployment, ensuring inclusivity and comprehensive coverage of needs.

Investment in Research

Dedicate resources to refine performance measurement methodologies in disaster

preparedness, focusing on innovative and technological advancements.

Training and Education

Equip practitioners and policymakers with the necessary knowledge and skills in PMS and KPIs to bolster decision-making capabilities in disaster preparedness.

Call for Action

A concerted effort is essential for the practical realization of these recommendations. Thus, a call for action is directed to

Policy Makers

Reassess and revise disaster preparedness policies to integrate robust PMS, guiding decisions with precise, real-time data.

International Bodies

Promote the sharing of knowledge and exemplary practices in PMS for disaster preparedness, aiding in the creation of adaptable standard guidelines.

Research Institutions

Undertake comprehensive research to address existing performance measurement gaps and devise novel tools and indicators to enrich preparedness tactics.

Funding Agencies

Channel funding towards sophisticated PMS development, facilitating insightful, actionable data for disaster preparedness.

Practitioners in Disaster Management

Implement and refine the proposed PMS and KPIs within operational frameworks, contributing to the systems' evolution through ongoing feedback and cooperation.

In rallying together to adopt these recommendations and engage in this collective endeavor, we stand at the threshold of a new era. It is one where our societies are not merely reacting to the caprices of nature and the turmoil of human-induced calamities but are proactively armored against them. This is a clarion call to action, a unifying mission that compels us to weave resilience into the very fabric of our communities. By heeding this call, we can sculpt a future where the term 'disaster' loses much of its sting, and preparedness becomes our shared bastion. Together, let us fortify our world with wisdom, foresight, and the indomitable spirit of readiness.

Competing interests

The authors declare that there is no conflict of interest

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