

The Philippine Disaster Risk Reduction and Management in Health: A Sequential Explanatory Approach

Mary Joy E. Hermosura^{*1}, Aaron Carlo C. Decendario², Leo A. Chiong³

^{1,2}Notre Dame of Dadiangas University, General Santos City, Philippines

³Department of Health, SOCCSKSARGEN, Philippines

*Corresponding Author Email: mjhermosura23@gmail.com

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Abstract. Despite being mandated and operational in the Philippines, there is a critical gap in a standardized, context-specific, and evidence-based framework to guide the nationwide consistent, coordinated, and effective implementation of disaster risk reduction and management in health (DRRM-H) practices. Existing initiatives are often fragmented, vary widely across regions, and lack an integrated structure that aligns mitigation and prevention, preparedness, response, rehabilitation, and recovery activities in the health sector. To address this gap, the study aimed to develop a framework by identifying and analyzing current practices and best practices in DRRM-H. A mixed-methods explanatory sequential design was employed, combining quantitative and qualitative approaches. In the quantitative phase, 30 DRRM-H managers were surveyed using a validated questionnaire, revealing that all DRRM-H practices were implemented to a high extent. In the qualitative phase, focus group discussion with 7 DRRM-H managers generated four major themes of best practices: (a) strengthening disaster mitigation through inclusive, data-driven strategies, partnerships, and culturally adaptive management; (b) institutionalizing disaster programs through governance, capacity building, and multi-sectoral collaboration; (c) ensuring coordinated and adaptive disaster response for efficient health and social service delivery; and (d) promoting resilient and collaborative post-disaster recovery efforts for sustainable community rebuilding. These findings informed the development of the Hermosura DRRM-H Framework, which provides a systematic and integrated approach to strengthening all phases of disaster management within the health sector. The study concludes that addressing the fragmentation through a unified framework is essential for enhancing DRRM-H program outcomes and recommends that the Health Emergency Management Bureau (HEM-B) collaborate with Regional DRRM-H Offices to implement regular program evaluations and research to sustain national alignment and responsiveness.

Keywords: Disaster management cycle; Disaster risk reduction and management in health; Health emergencies; Philippine disasters; Theory of Planned Behavior.

1.0 Introduction

Disasters, whether natural or human-induced, pose an urgent threat to global health and stability. The frequency and severity of these events are increasing, driven by climate change, rapid urbanization, and environmental degradation. Typhoons, earthquakes, floods, and wildfires continue to claim lives, disrupt economies, and strain healthcare systems. According to the World Meteorological Organization, weather, climate, and water-related events have surged 9% over the past decade, disproportionately affecting the least developed and small island

states (World Meteorological Organization, 2020). The Philippines accounted for 75% of all disaster-related deaths in the South-West Pacific from 1970 to 2019. These disaster-related deaths are expected to rise as the frequency is projected to increase by 40% between 2015 and 2030, rising from 400 to 560 annual events (UNISDR, 2015). The Centre for Research on the Epidemiology of Disasters (CRED) reported 396 disasters in 2019 alone, affecting 95 million people and causing 11,755 deaths (Centre for Research on the Epidemiology of Disasters, 2019).

According to the World Risk Report (2024), the Philippines, Indonesia, and India have the highest overall disaster risk globally. The 2024 report highlights how crises, such as pandemics, extreme weather events, and conflict, interact with and amplify one another, creating a complex web of risks that can overwhelm existing disaster risk management. The health impacts of disasters extend far beyond immediate casualties. Pandemics such as COVID-19 have overwhelmed healthcare systems, exacerbated social inequalities, and exposed deficiencies in disaster preparedness. Limited access to healthcare, pre-existing medical conditions, and poverty heighten vulnerability, with marginalized populations such as the elderly, disabled, and immunocompromised bearing the most significant burden (Maltz, 2019). Post-disaster conditions further threaten public health through injuries, disease outbreaks, mental health crises, food insecurity, and infrastructure collapse (UNISDR, 2015). Global frameworks, such as the Sendai Framework for Disaster Risk Reduction, the Sustainable Development Goals (SDGs), and the Paris Agreement, guide on addressing these risks. However, it is the crucial responsibility of health policymakers, researchers, and disaster management professionals to ensure these frameworks are effectively implemented and contribute to strengthening disaster resilience (WHO, 2019).

While policies such as RA 10121 and the Department of Health's Disaster Risk Reduction and Management in Health (DRRM-H) framework have been enacted, gaps persist in leadership, resource mobilization, health system resilience, and interregional coordination. Despite the various initiatives and implementation of best practices, significant gaps persist in implementing the Disaster Risk Reduction and Management for Health (DRRM-H) program. Challenges such as weak leadership and governance, limitations in health human resources, inefficiencies in health information systems, difficulties in ensuring healthcare accessibility during disasters, constraints in health financing, and lack of coordination among regions continue to hinder the program's effectiveness. Addressing these issues is crucial to strengthening disaster resilience, particularly in the health sector. However, most research on disaster management in the Philippines focuses on overall DRRM preparedness and response, with limited studies and a focus dedicated to health despite its critical role in reducing mortality and morbidity during crises. Failure to understand the Department of Health DRRM-H Program practices results in gaps in health response strategies, leading to preventable casualties and long-term public health consequences.

This study is focused on identifying and implementing best practices in disaster risk reduction and management in health (DRRM-H) to bridge critical gaps in disaster preparedness and response. The findings of this study not only establish evidence on DRRM-H initiatives across various provinces and regions but also lay the groundwork for advocating the full implementation of the Universal Health Care Law and RA 10121. By identifying and explaining inconsistencies between existing DRRM-H programs and best practices, this study paves the way for necessary improvements. Furthermore, the study assesses the prevalence of disasters across Philippine regions to determine community vulnerabilities and identify high-risk areas, thereby supporting targeted interventions aimed at enhancing disaster resilience. This study ultimately strengthened the conceptual foundation of Disaster Risk Reduction and Management in Health (DRRM-H). It paves the way for a broader disaster management framework beyond standard DRRM responses. The DRRM framework developed in this study was specifically designed for local government units (LGUs) and takes into account geographical and cultural factors. As a result, it is expected to enhance the DRRM-H program, promoting a safer, more adaptive, and disaster-resilient health system in the Philippines.

2.0 Methodology

2.1 Research Design

This study employed an explanatory sequential mixed-methods research design to develop a framework for disaster risk reduction and management in health (DRRM-H) in the Philippines. The design involved two phases: a quantitative phase followed by a qualitative phase, with integration occurring during interpretation to provide a comprehensive understanding of the phenomenon. Quantitative data were first collected through a validated questionnaire administered to 30 DRRM-H managers to assess the extent of program implementation. Descriptive and inferential statistics were used to summarize the results. Based on the quantitative findings, seven managers

were purposively selected for a Focus Group Discussion to explore their experiences and best practices, with thematic analysis identifying the main themes. Integration of both phases provided a comprehensive understanding of DRRM-H practices, forming the basis for the proposed framework. This design was chosen to capture and explain measurable trends through rich qualitative insights.

2.2 Research Locale

The study was conducted in selected regions and provinces of the Philippines where designated DRRM-H managers actively implement DRRM-H programs under the Department of Health (DOH) through the Centers for Health Development (CHDs). Given the country's location along the Pacific Ring of Fire and the typhoon belt, the Philippines faces frequent natural hazards, making a strong and responsive health system essential. Research locales were purposively selected from Luzon, Visayas, and Mindanao, representing diverse geographical areas, levels of hazard exposure, and socio-political contexts.

2.3 Research Participants and Sampling

The study participants were DRRM-H managers of the Philippines Department of Health Center for Health Development. This study employed purposive sampling to select participants based on specific characteristics relevant to the DRRM-H program. For the quantitative phase, 30 DRRM-H managers were selected based on the inclusion criteria: (1) they must be DRRM-H managers at the regional or provincial level, (2) they must have hands-on experience in disaster preparedness and response operations, and (3) they must have at least three years of experience in managing DRRM-H programs. In the qualitative phase, 7 participants were selected from the quantitative sample. These individuals were chosen based on the same criteria, but with additional considerations to ensure a diverse representation in terms of demographic factors and variability in quantitative scores. This selection enabled a deeper exploration of different perspectives and experiences regarding the program practices, including both typical and atypical cases. The participants included medical professionals (e.g., nurses, doctors, medical technologists, and midwives) and non-medical professionals responsible for managing and implementing DRRM-H practices in their communities, totaling 30 DRRM-H Managers. Their selection was based on their direct involvement in disaster mitigation and prevention, preparedness, response, rehabilitation, and recovery efforts in the health sector.

2.4 Research Instrument

The study used a three-part questionnaire to assess best practices in DRRM-H in the Philippines. The instrument was reviewed for content validity by four experts with doctorate degrees. A self-made survey questionnaire was utilized to assess the demographic profile of the participants. A five-point Likert scale was also employed to measure the extent of DRRM-H practices across four disaster phases: mitigation and prevention, preparedness, response, rehabilitation, and recovery. To ensure reliability, the questionnaire was pilot-tested with ten (10) DRRM-H managers. The data were analyzed using Cronbach's Alpha and SPSS to assess internal consistency. For the qualitative phase, a semi-structured interview guide was used for Focus Group Discussions (FGD) to explore and interpret the quantitative findings. The guide was developed after analyzing the quantitative results to ensure alignment with the study's objectives. A document review was also conducted to examine major disasters in the Philippines from 2013 to 2023, utilizing credible Disaster Risk Reduction and Management (DRRM) plans and regional disaster health boards. Before finalizing, the instruments underwent expert validation, pilot testing, and revisions to ensure clarity, reliability, and appropriateness for DRRM-H managers.

2.5 Data Gathering Procedure and Analysis

Permission was obtained from the Health Emergency Management Bureau (HEM-B) before the collection of data. The study began with distributing the quantitative questionnaire to 30 DRRM-H managers from selected regions and provinces in the Philippines. Participants were provided with informed consent forms before completing the questionnaire. After collection, the data were analyzed using SPSS, and Cronbach's Alpha was calculated to assess reliability. Following the quantitative phase, Focus Group Discussions (FGDs) were conducted with seven DRRM-H managers. These participants were selected from the quantitative sample to gain deeper insights into the practices and challenges of DRRM-H management. Informed consent was obtained, and the FGDs were conducted face-to-face, with conversations recorded and transcribed for thematic analysis. A document review was also undertaken to examine disaster health plans and data on major disasters in the Philippines from 2013 to 2023. This review provided additional context for the primary data. The data from both the questionnaires, FGDs, and document review were compiled and analyzed together to provide a comprehensive understanding of DRRM-H practices.

2.6 Ethical Considerations

This study adhered to ethical guidelines to ensure the rights and confidentiality of participants. Before participation, all DRRM-H managers were provided with informed consent forms that explained the study's purpose, the voluntary nature of participation, and the confidentiality of responses. Participants were informed of their right to withdraw at any time without consequence. To maintain privacy, all data were anonymized, and only aggregated findings were reported. Data security measures included encrypted electronic files and securely stored physical records, accessible only to the research team. The study was reviewed and approved by the relevant ethics committee, ensuring compliance with the standards for human subject research. Throughout the process, participants' cultural and professional backgrounds were respected, and they were encouraged to share their insights openly in a supportive environment.

3.0 Results and Discussion

3.1 Characteristics Profile of the DRRM-H Managers

Table 1 presents the frequency and percentage distribution of DRRM-H managers by age, sex, employment status, position, and years in current position. Table 2 presents their training status.

Table 1. Characteristics Profile of DRRM-H Managers (n=30)		
Variables	Frequency	Percentage
Age		
21-30	1	3.30
31-40	13	43.30
41-50	8	26.70
51-60	5	16.70
61 or older	3	10.00
Sex		
Male	18	60.00
Female	12	40.00
Employment Status		
Regular	29	96.70
Non-Regular	1	3.30
Employment Position		
Nurse	15	50.00
Medical Officers	9	30.00
Medical Technologist	2	6.70
Midwife	3	10.00
Non-Medical Professionals	1	3.30
Years in Employment Position		
Less than 1 year	0	0.00
1-5 years	6	20.00
6-10 years	7	23.30
Above 10 years	17	56.60

The age profile suggests that DRRM-H leadership is primarily composed of experienced individuals, with limited recruitment opportunities for younger professionals. This aligns with research emphasizing the importance of experience in disaster management (Grossman, 2020). Mid-career professionals bring critical skills in leadership, decision-making, and crisis management (Kapucu, 2023). However, the scarcity of younger professionals raises concerns about the sustainability of the workforce. Studies emphasize the need for integrating younger professionals for innovation and long-term continuity (Pickering et al., 2021). Without succession planning, the retirement of experienced managers could lead to leadership gaps and reduced operational efficiency.

Sex profile reflects the historically male-dominated nature of disaster response and emergency management, often attributed to perceptions that these roles require physical strength and technical expertise (Sumarmi & Sumarni, 2022). However, recent studies highlight the importance of gender diversity, noting that women bring unique perspectives and leadership skills that enhance the effectiveness of disaster management (Erman et al., 2021). The underrepresentation of women in DRRM-H leadership may be attributed to gender norms, societal expectations, and barriers to career advancement within disaster management institutions (Chineka et al., 2019). Despite growing recognition of women's essential role in disaster preparedness and response, challenges such as limited

leadership training, unequal career opportunities, and gender biases persist (Career Barriers and Motivations for Women and Men in Disaster Risk Reduction in Asia-Pacific, 2023).

Employment status reflects a stable workforce essential for the continuity of disaster risk reduction and health emergency management efforts. Regular employment ensures that DRRM-H Managers have the necessary tenure, benefits, and job security to plan, implement, and sustain effective disaster preparedness and response initiatives. A stable workforce allows managers to develop expertise, undergo continuous training, and build institutional knowledge, which is crucial for effective disaster management (Ardiansyah et al., 2024). Regular employment fosters consistent leadership and experience, supports long-term strategies and coordination with various agencies, and strengthens the disaster risk reduction system (Grossman, 2020; Madrigano et al., 2017). Furthermore, regular employees tend to show higher motivation, engagement, and performance in disaster-related roles, benefiting from professional development opportunities and leadership positions (Hung et al., 2022).

Furthermore, the majority of DRRM-H Managers are nurses, comprising 50% of the sample. As frontline responders, nurses are essential in triage, patient care, health education, and the coordination of emergency health services, making them ideal leaders in disaster risk reduction and health emergency management (World Health Organization, 2019). Their clinical training and disaster response expertise position them as key players in health-related disaster management (Rivera-Rodriguez, 2017). This is followed by medical officers (30%). According to Kocak et al. (2021). Medical officers play a crucial role in overseeing medical decisions, policies, and complex health emergencies during disaster response, ensuring that evidence-based medical practices guide recovery efforts. Furthermore, midwives comprised 10% of the population. Midwives are crucial for maternal and newborn health during disasters, ensuring continuity in reproductive health services for vulnerable populations, such as pregnant women and newborns (Mielke & Prepas, 2019). On the other hand, medical technologists comprised 6.7% of the workforce. According to Ladner et al. (2019), medical technologists play a vital role in disease surveillance, laboratory diagnostics, and epidemiological investigations, supporting swift decision-making in disaster-stricken areas. Moreover, non-medical professionals were also involved in disaster management, accounting for 3.3% of the total. While non-medical professionals represent a smaller portion, their involvement is also critical, as they provide expertise in logistics, planning, coordination, and resource management, which are essential for effective disaster response (Thrwi et al., 2021). This distribution reflects the multidisciplinary nature of disaster management, with healthcare professionals playing a central role.

Finally, most DRRM-H managers have over 10 years of service (53.3%), indicating substantial experience and expertise in disaster risk reduction and health emergency management. This long tenure is crucial for effective leadership, decision-making, and crisis management (Bly et al., 2021). A significant portion (23.3%) have 6-10 years of experience, while 20% have 1-5 years, reflecting a balance of senior and mid-career professionals that supports knowledge transfer and mentoring. A mix of experienced and newer professionals increases adaptability and resilience in disaster management (Steen et al., 2022). However, only one respondent (3.3%) has less than a year of experience, raising concerns about leadership succession in DRRM-H. The limited entry of new professionals may challenge continuity and expertise (Kwon & Park, 2020). This highlights the importance of succession planning, mentorship, and professional development in ensuring the sustainability and effectiveness of disaster management efforts (Goniewicz et al., 2020).

Table 2 shows the training attended by DRRM-H Managers. Most respondents attended Basic Life Support (BLS) training (96.7%), followed by Standard First Aid (SFA) at 56.7%. A significant gap exists in Mass Casualty Incident (MCI) training, with only 23.3% participation. Psychological First Aid (PFA) and Health Emergency Response Operations (HERO) had a 53.3% attendance rate. Half (50%) attended the Public Health and Emergency Management training in Asia and the Pacific (PHEMAP). Other trainings, such as SPEED, Mental Health and Psychosocial Support (MHPSS), and Nutrition in Emergencies (NEM), had lower participation rates, at 63.3%, 60%, and 46.7%, respectively. The high participation in BLS training is a positive development, ensuring that responders are equipped with essential life-saving skills. However, the lower SFA and MCI training rates point to gaps in first aid and large-scale disaster response capabilities. This could affect the efficiency of disaster management, especially during high-casualty events (WHO, 2019). Participation in PFA and HERO training is commendable but should be expanded, as mental health support and emergency coordination are crucial for disaster response (Wang et al., 2021). The equal split in PHEMAP participation suggests inconsistent leadership development in DRRM-H. These training gaps highlight the need for continued professional development to ensure a well-prepared workforce capable of effectively managing all aspects of disaster response.

Table 2. Trainings Attended (n=30)

DRRM Trainings	Attendance	Frequency	Percentage
Basic Life Support	Trained	29	96.70
	Not Trained	1	3.30
Standard First Aid	Trained	17	56.70
	Not Trained	13	43.30
Mass Casualty Incident	Trained	7	23.30
	Not Trained	23	76.70
Psychological First Aid	Trained	16	53.30
	Not Trained	14	46.70
Health Emergency Response Operation	Trained	16	53.30
	Not Trained	16	46.70
Public Health and Emergency Management in Asia-Pacific	Trained	15	50.00
	Not Trained	15	50.00
Surveillance in Post-Extreme Emergencies and Disasters	Trained	11	36.70
	Not Trained	19	63.30
Mental Health and Psychosocial Support	Trained	18	60.00
	Not Trained	12	40.00
Nutrition in Emergency	Trained	15	50.00
	Not Trained	15	50.00
Water, Sanitation, and Hygiene	Trained	12	40.00
	Not Trained	18	60.00
Other Trainings	Trained	16	53.30
	Not Trained	14	46.70

Table 3 presents the results of a review of relevant documents from 2013 to 2023. It reveals that the Philippines experienced a series of significant disasters encompassing various types, including natural disasters. From a national perspective, disasters encompass a combination of different types, including natural, man-made, and biological disasters.

Table 3. Summary of Disasters in the Philippines that Occurred from 2013 to 2023

Name of Disaster	Location	Year
Natural Disasters		
<i>Volcanic Eruption</i>		
Taal Volcano Eruption	Region IV	2020
Vulcanic Eruption Mt Mayon, Albay	Region V	2018
<i>Typhoon</i>		
Super Typhoon Rai (Odette)	Region VII & VIII	2021
Philippine Southwest Monsoon Floods	Region III & IV	2016
Flood/Landslide/Heavy Rain	Region V	2021
Typhoon Haiyan (Yolanda)	Region VII & VIII	2013
<i>Earthquake</i>		
Tectonic Bohol & Cebu 2013	Region VII	2013
<i>BioLogical Emergencies and Disasters</i>		
COVID-19	Nationwide	2019
Polio Outbreak Philippines	Nationwide	2019
Man-made Disasters		
<i>Armed Conflict</i>		
Marawi Siege	BARRM	2017
Zamboanga Siege	Region IX	2013
<i>Fire</i>		
NCCC Mall, Davao City	Region XI	2017
Kentex Manufacturing, Valenzuela City	NCR	2015

The recurrence of these disasters highlights the need for an integrated, multi-sectoral approach to disaster risk management. According to Ayuningtyas et al. (2021), resilience-building should encompass structural mitigation, early warning systems, and emergency response capabilities tailored to each type of disaster. The Sendai Framework for Disaster Risk Reduction advocates a multi-hazard approach, ensuring that communities are prepared for frequent, high-impact disasters (UNISDR, 2015). Studies indicate that volcanic eruptions require continuous monitoring and improved evacuation strategies (Bly et al., 2021). Meanwhile, climate-related disasters, such as typhoons and floods, necessitate long-term adaptation strategies, including improved land-use planning and resilient infrastructure (Lee et al., 2018). The World Health Organization (2018) emphasizes that biological disasters, such as pandemics, require robust public health systems, rapid response mechanisms, and practical

cross-border cooperation. Additionally, conflict-related disasters highlight the importance of psychosocial support and post-crisis recovery programs (Morganstein & Ursano, 2020).

3.2 Implementation of DRRM-H Practices in Terms of Mitigation and Prevention

Table 4 shows the quantitative and qualitative findings on the extent of implementing the DRRM-H program practice in mitigation and prevention. The findings reveal that implementing mitigation and prevention practices in the Philippines is highly extensive, with an overall mean score of 3.95. This suggests that prevention practices are highly practiced and well-integrated into the DRRM-H program's efforts. This data also signifies a strong focus on prevention and proactive measures to mitigate disaster impacts by planning, organizing, and equipping individuals, communities, and organizations to effectively anticipate, respond to, and recover from potential disasters. It involves developing strategies, conducting training, securing resources, and building systems that enhance the capacity to mitigate risks and minimize the impact of disasters.

Table 4. *Implementation of DRRM-H Practices in Terms of Mitigation and Prevention*

Quantitative data			Qualitative Data	
Indicators	Mean	Interpretation	Subthemes	Theme
1. Utilizes epidemiological data to assess the risks and impacts of specific disasters.	3.83	Highly Extensive	1. Health information system utilization for proactive surveillance and evaluation	Resilient Health Systems through Inclusive, Data-Driven, and Culturally Responsive Disaster Management
2. Identifies challenges to the healthcare system and works with the multidisciplinary team to mitigate them.	3..93	Highly Extensive	2. Establishing public-private partnerships for integrated planning and coordination	
3. Coordinate activities with vulnerable populations to reduce risk, exposure, and hazard	3.93	Highly Extensive	3. Assessment of functionality and readiness of infrastructure, health resources, and community	
4. Collaborates with organizations and governments to build the community's capacity to prepare for and respond to disasters.	4.10	Highly Extensive	4. Fostering cultural sensitivity and tailored-fit health education practices	
5. Participates in community education activities to promote awareness and participation.	3.90	Highly Extensive	5. Strengthening the efficiency to prevent outbreaks	
6. Assesses the community health status to determine pre-existing health issues	3.93	Highly Extensive	6. Continuous planning, policy development	
7. Participates in planning to meet the community's health care needs, such as mass immunization and medication administration programs.	4.13	Highly Extensive	7. Integrating post-response evaluations to refine health mitigation plans	
8. Participates in disaster planning and policy development.	4.10	Highly Extensive		
9. Contributes to the development, evaluation, and modification of the community disaster plan.	4.00	Highly Extensive		
10. Participates in the development of policies related to disaster preparedness and response through political and legislative channels.	3.67	Highly Extensive		
Grand Mean	3.95	Highly Extensive		

The findings align with previous studies and the literature. According to WHO (2021), epidemiological surveillance is critical in identifying vulnerabilities and guiding interventions to minimize health impacts during disasters. Studies by Paton and Johnston (2017) confirm that community engagement and government collaboration are key factors in reducing disaster-related mortality and morbidity. FEMA (2021) states that disaster literacy and early identification of health risks enhance community preparedness and adaptive capacity.

DRRM-H managers should strengthen epidemiological risk assessments and healthcare preparedness programs to enhance disaster mitigation efforts. Collaboration with policymakers should be prioritized to institutionalize Disaster Risk Reduction and Management in Health policies and ensure sustained government support. Expanding community education initiatives will further empower populations to participate in disaster preparedness. Enhancing coordination with vulnerable populations and increasing legislative engagement can create more inclusive and sustainable disaster risk management strategies.

The qualitative responses emphasized that a resilient health system ensures continuous and effective healthcare delivery during disasters by integrating inclusivity, data-driven decision-making, and cultural responsiveness. Inclusivity ensures equitable access to healthcare for all, particularly vulnerable populations. Meanwhile, a data-driven approach enhances disaster preparedness and response through real-time surveillance, predictive analytics, and efficient resource allocation. Furthermore, cultural responsiveness acknowledges local beliefs and practices, fostering trust and community cooperation. These strategies strengthen disaster management, improve health outcomes, and build community resilience against future crises.

Integrating quantitative data on disaster risk reduction and management into health program practices, along with qualitative sub-themes, reveals best practices for mitigating disasters in the Philippines. A mean score of 3.95, which is interpreted as highly extensive. This aligns with the various best practices in mitigating disasters. The quantitative indicators utilize epidemiological data to evaluate the risks and effects of specific disasters, with a mean score of 3.83, and assess community health status to identify pre-existing health issues, with a mean score of 3.93. This reflects the qualitative sub-theme of health information system utilization for proactive surveillance, effective health education, and evaluation. The indicators include identifying challenges to the health care system and working with the multidisciplinary team to mitigate the challenges with a mean score of 3.93 and collaborating with organizations and governments to build the capacity of the community to prepare for and respond to a disaster with a mean score of 4.10 are align with qualitative sub-theme, establishing public-private partnerships for integrated planning and coordination.

The indicators, such as coordinating activities with vulnerable populations to reduce risk, exposure, and hazard (with a mean score of 3.93) and participating in community education activities to promote awareness and participation (with a mean score of 3.90), are aligned with the qualitative sub-theme of fostering cultural sensitivity and tailored-fit health education. The indicator, such as participation in planning to meet the community's healthcare needs, including mass immunization and medication administration programs, with a mean score of 4.13, aligns with the qualitative sub-theme of strengthening program efficiency to prevent outbreaks. The indicators, such as participating in disaster planning and policy development (with a mean score of 4.10) and participating politically and legislatively in the development of disaster preparedness and response policies (with a mean score of 3.67), align with the qualitative sub-theme of continuous planning and policy development. The indicator contributes to the development, evaluation, and modification of the community disaster plan, with a mean score of 4.00, reflecting the qualitative sub-theme of integrating post-response evaluations to refine health mitigation plans.

3.3 Implementation of DRRM-H Practices in Terms of Preparedness

Table 5 shows the quantitative and qualitative findings on the extent of implementing the DRRM-H program practice in preparedness. The findings reveal that implementing preparedness practices in the Philippines is highly extensive, with an overall mean score of 3.97. This suggests that readiness practices are highly practiced in the Philippines and are likely well-integrated into the overall efforts of the DRRM-H program. This data also indicates a strong focus on readiness and proactive measures to mitigate the impacts of disasters.

The result highlights the importance of continuous training in enhancing the competency of disaster response personnel. According to WHO (2021), strengthening the capacity of emergency responders is crucial in minimizing disaster-related morbidity and mortality. Training ensures that responders can effectively manage health emergencies, reducing delays in life-saving interventions. Results also align with the Hyogo Framework for Action (OCD-NDRRMC, 2015), which emphasizes the role of institutionalized policies and well-maintained response centers in ensuring disaster resilience. On the other hand, Grayshaw (2020) stresses that public engagement and stakeholder partnerships improve preparedness outcomes. Research by Kruk et al. (2018) affirms that adequate funding and pre-positioned resources are critical in maintaining an effective health emergency response system.

Responses highlight an integrated approach to institutionalizing disaster resilience, emphasizing the synergy between policy, training, and partnerships to create a sustainable and adaptive disaster management system in the Philippines. Policy development establishes a robust governance framework, ensuring that disaster risk reduction measures are integrated into institutional structures. Training initiatives enhance the capacity of responders and communities, equipping them with essential skills for effective preparedness, response, and

recovery. Meanwhile, strategic partnerships foster collaboration among government agencies, the private sector, and local communities, maximizing resources and expertise. By aligning these key components, institutions can build long-term resilience, improve disaster response efficiency, and safeguard public health and safety.

Table 5. *Implementation of DRRM-H Practices in Terms of Preparedness*

Quantitative data			Qualitative Data	
Indicators	Mean	Interpretation	Subthemes	Theme
1. Policies. Adopts/Updates DRRM-H Policies from national to regional or provincial level through the local health board	4.13	Highly Extensive	1. Institutionalization and local adaptation of disaster management policies through strategic advocacy and collaborative governance	Integrated approach to institutionalize disaster resilience through policy, training, and partnerships
2. Plan. Updates of DRRM-H Plan to document enhanced strategies on disaster management	4.17	Highly Extensive	2. Building Capacity and Enhancing Preparedness through Comprehensive Training	
3. People. Conduct Capability-Building activities for the Emergency Response Team to promote staff competency in disaster preparedness and response.	4.27	Very Highly Extensive	3. Integrating practical experience into training, education, and strategies	
4. Physical Infrastructure. Maintains functionality of the Health Operation Center 24/7 to provide immediate and responsive services	3.87	Highly Extensive	4. Strategic resource management and initiatives	
5. Partnership Building. Maintains a clear networking agenda with health clusters and other partners.	3.93	Highly Extensive	5. Integrated health information campaigns for dengue prevention and other health programs	
6. Promotion and Advocacy. Conducts information drives such as observance of National Disaster Consciousness Month and other health emergencies, and dissemination of DRRM-H Information	3.77	Highly Extensive	6. Diverse partnerships and networks are a fundamental strategy	
7. Program Development. Develops and applies the standard operating procedures in managing health emergencies in disasters.	3.83	Highly Extensive	7. Support and services provided by a 24/7 operation center	
8. Practice Documentation. Generates reports regarding the institution's DRRM-H conduct of activities	3.90	Highly Extensive		
9. Peso and Logistic. Ensures the availability of budget and essential health emergency commodities to maintain operational expenses.	3.90	Highly Extensive		
Grand Mean	3.97	Highly Extensive		

Integrating quantitative data on practices in terms of preparedness areas and qualitative sub-themes reveals the best practices of DRRM-H managers in disaster management. The table demonstrated the mean value for best practice in preparedness as 3.97, interpreted as highly extensive, which aligns with the number of best practices in the qualitative approach. The quantitative indicators, such as DRRM-H policies from national to regional or provincial levels through local health boards, with a mean score of 4.13, align with the qualitative subtheme of institutionalization and local adaptation of disaster management policies through strategic advocacy and collaborative governance. For individuals conducting capability-building activities for emergency response teams to promote staff competency in disaster preparedness and response, the mean score is 4.27, corresponding to the qualitative sub-theme of building capacity and enhancing preparedness through comprehensive training. For qualitative indicators, plan or updates of DRRM-H Plan to document enhanced strategies on disaster management which has a mean score of 4.17, the program development or develops and applies the standard operation procedures in managing health emergencies in disasters with the mean score of 3.83, and practices documentation or generates reports regarding the institution's DRRM-H conduct of activities with a mean score of 8.83, they are aligned with qualitative sub-theme which is integrating practical experience into training, education and strategies.

Furthermore, for the promotion and advocacy of conducting information drives, such as the observance of National Disaster Consciousness Month and other health emergencies, the dissemination of DRRM-H

Information, with a mean core of 3.77, aligns with the qualitative sub-theme of integrated health information campaigns for dengue prevention and preparedness. The indicators, such as peso and logistics, ensure the availability of budget and essential health emergency commodities to maintain operational expenses with a mean score of 3.90, which resonates with the qualitative subtheme of strategic resource management and initiatives. The partnership, building or maintaining a clear networking agenda with health clusters and other partners, has a mean score of 3.93, which aligns with the qualitative subtheme of diverse partnerships and networks as a fundamental strategy. The indicators, physical infrastructure or maintains the functionality of the Health Operation Center 24/7 to provide immediate and responsive services with a mean score of 3.87 and performance packages or ensure availability of health emergency services including medical, psychological, nutrition and water and sanitation with a mean score of 3.97 corresponds with the qualitative subtheme support and services provided by operation center.

3.4 Implementation of DRRM-H Practices in Terms of Response

Table 6 presents the quantitative findings of the extent of implementation of the DRRM-H program practice in terms of response. Response refers to the immediate actions taken during and after a disaster to protect lives, reduce health impacts, ensure public safety, and meet the basic needs of affected populations. The findings reveal that implementing preparedness practices in the Philippines is highly extensive, with an overall mean score of 4.10. This means that the actions or practices taken directly after a destructive event occur are widely implemented within the DRRM-H program across the Philippines. This signifies a strong focus on timely and effective response measures during emergencies and crises.

Table 6. *Implementation of DRRM-H Practices in Terms of Response*

Quantitative data			Qualitative Data	
Indicators	Mean	Interpretation	Subthemes	Theme
1. Activates Incident Command System to work with other agencies during disasters.	4.23	Very Highly Extensive	1. Structured and safe activation of disaster response operations	Comprehensive Framework for Enhancing Operational Competency
2. Activates Emergency Response Plan to prevent or minimize fatalities and injuries	4.23	Very Highly Extensive	2. Effective utilization of information and a data management system	
3. Activates Incident Action Plan to reflect the tactics necessary to manage an incident during an operational period.	4.13	Highly Extensive	3. Collaborative logistics and resource mobilization	
4. Activates the Information Management System to facilitate the collection, storage, organization, and distribution of information.	4.03	Highly Extensive	4. Systematic deployment and coordination of health human resources	
5. Activates health emergency clusters to reduce morbidity and mortality in the affected population while protecting the rights of people in affected areas.	4.03	Highly Extensive	5. Effective health service delivery through referral systems and the Service Delivery Network	
6. Coordinates the deployment of teams for public health assessment and service delivery.	4.20	Highly Extensive	6. Integrated Health and Social Services through the emergency cluster and agencies	
7. Coordinates with hospitals on service delivery to follow a systematic referral system	4.10	Highly Extensive	7. Systematic evaluation and reflective learning for enhanced disaster response	
8. Facilitates the mobilization of resources such as workforce and logistics	4.17	Highly Extensive		
9. Conducts debriefing sessions for teams deployed in disaster incidents	3.83	Highly Extensive		
10. Conducts Post-Incident Evaluation (PIE) to assess the outcome of disaster response.	4.03	Highly Extensive		
Grand Mean	4.10	Highly Extensive		

According to Thrwi et al. (2021), an efficient ICS and ERP contribute significantly to the effectiveness of disaster management, ensuring that responders follow a structured approach to resource mobilization, team coordination, and real-time decision-making. The WHO (2019) also emphasizes that health emergency clusters and referral systems improve response efficiency by providing targeted health interventions to affected populations, reducing morbidity and mortality.

Qualitative data points to a coordinated and data-driven approach to disaster response and health service delivery, ensuring efficient resource allocation, timely interventions, and evidence-based decision-making. By integrating real-time data collection, analysis, and information sharing, stakeholders can enhance situational awareness and optimize response efforts. Meanwhile, collaboration among government agencies, healthcare providers, and community organizations strengthens coordination, reducing service gaps and improving health outcomes. This approach fosters resilient health systems that are adaptive, proactive, and responsive to the evolving needs of affected populations during disasters.

Integrating quantitative data on Disaster Risk Reduction and Management in Health (DRRM-H) Program practices and qualitative sub-theme reveals the best practices in disaster response in the Philippines. The indicators such as activating the incident command system to work together with other agencies during disasters with a mean score of 4.23, activating the emergency response plan to prevent or minimize fatalities and injuries with a mean score of 23, and activating the incident action plan to reflect the tactics necessary to manage an incident during an operational period with a mean score of 4.13 aligns with the qualitative sub-theme which is structured and safe activation of disaster response operations. The indicator, which activates an information management system to facilitate information collection, storage, organization, and distribution, with a mean score of 4.03, resonates with the qualitative sub-theme of effective utilization of information and data management systems. The indicators include activating health emergency clusters to increase and reduce morbidity and mortality in the affected population while protecting the rights of people in affected areas, with a mean score of 4.03, and conducting debriefing sessions for teams deployed in the disaster incidents, with a mean score of 3.83 is consistent with the qualitative sub-theme which is integrated Health and Social Services through emergency clusters and agencies.

Furthermore, the indicators, such as coordinating deployment of teams for public health assessment and service delivery, with a mean score of 4.20, align with the qualitative sub-theme of systematic deployment and coordination of health human resources. The indicator, such as the coordinates with hospitals on service delivery, follows a systematic referral system, with a mean score of 4.10, reflecting the qualitative sub-theme of effective health service delivery through referral systems and service delivery networks. The indicator facilitates the mobilization of resources such as workforce and logistics, with a mean score of 4.17, reflecting the qualitative sub-theme of collaborative logistics and resource mobilization. The indicator conducts a Post-Incident Evaluation (PIE) to assess the outcome of disaster response, with a mean score of 4.03, which aligns with the qualitative sub-theme of systematic evaluation and reflective learning for enhanced disaster response.

3.5 Implementation of DRRM-H Practices in Terms of Rehabilitation and Recovery

Table 7 presents the quantitative findings of the extent of implementation of the DRRM-H program practice in terms of rehabilitation and recovery. Rehabilitation and recovery are critical phases in the Disaster Management Cycle, focusing on restoring and improving the health, infrastructure, and overall well-being of affected communities after a disaster. The findings reveal that implementing preparedness practices in the Philippines is highly extensive, with an overall mean score of 3.68. This means that restoring someone to health or their everyday life through training and therapy following the impact of a disaster is a highly practiced and well-integrated aspect of the DRRM-H program's overall efforts. This integration enhances the program's ability to facilitate recovery and improve resilience post-disaster.

The findings indicate that several indicators in disaster response practices fall within the pervasive level, underscoring the effectiveness of health emergency management in recovery and rehabilitation efforts. Literature supports this, emphasizing that coordinated health responses significantly improve patient outcomes and resource distribution during emergencies (Raker et al., 2020). Additionally, studies have highlighted that the early implementation of rehabilitation measures ensures a smoother transition to normalcy and mitigates long-term health consequences (Amatya & Khan, 2023). Similarly, activating the standard operating procedure for post-disaster needs assessment supports evidence-based decision-making in resource allocation (Cuthbertson & Penney, 2023).

Table 7. Implementation of DRRM-H Practices in Terms of Rehabilitation and Recovery

Quantitative data			Qualitative Data	
Indicators	Mean	Interpretation	Subthemes	Theme
1. Coordinate recovery Efforts with health clusters and other agencies after a disaster for collaborative health emergency management	3.83	Highly Extensive	1. Develop and implement plans and policies for adequate recovery and rehabilitation.	Strategic framework for effective disaster recovery and resilient health systems
2. Activates Emergency Recovery Plan to apply appropriate rehabilitation strategies in the area affected by the disaster.	3.73	Highly Extensive	2. Clear roles and responsibilities of health teams in the Management of the Dead and Missing	
3. Activates the rehabilitation plan for the disaster to enable affected localities and communities to return to normalcy and build resiliency from the impact of future disasters.	3.70	Highly Extensive	3. Centralized financial management and fund accessibility in disaster recovery	
4. Activates Standard Operating Procedure on Post-Disaster Needs Assessment to provide adequate resources in the affected area.	3.63	Highly Extensive	4. Post-disaster support and well-being of the response teams and people in the community	
5. Activates management of the Dead and the Missing services during emergencies to assist in the proper identification and disposition of human remains in a sanitary manner.	3.53	Highly Extensive	5. Multi-agency collaboration and partnership for comprehensive disaster response	
6. Develops plans to meet short- and long-term physical and psychological nursing needs of survivors.	3.70	Highly Extensive	6. Continuous monitoring and evaluation for strengthening disaster management	
7. Evaluates nursing response and practices during the disaster and collaborates with nursing organizations to resolve issues and improve response.	3.51	Highly Extensive	7. Restoration of essential documents and livelihoods for disaster-affected families	
8. Assists the community in transitioning from the response phase of the disaster or emergency through recovery and rehabilitation to normal functioning.	3.70	Highly Extensive		
9. Assists in developing recovery strategies that improve the quality of life for the community.	3.73	Highly Extensive		
10. Collaborates with appropriate groups and agencies to re-establish health care services within the community	3.80	Highly Extensive		
Grand Mean	3.68	Highly Extensive		

Managing the dead and missing remains an essential yet often overlooked aspect of disaster response. Literature underscores that proper handling of human remains preserves dignity, reduces health risks, and aids in the grieving process of affected families (International Federation of Red Cross and Red Crescent Societies, 2019). Developing plans to meet survivors' short- and long-term physical and psychological nursing needs is essential, as psychological first aid and ongoing mental health services are critical for disaster-affected populations (Guilaran & An, 2020). Evaluating nursing response and collaboration with nursing organizations highlights the importance of continuous improvement and feedback mechanisms in disaster response. Studies show that post-incident evaluations facilitate learning, enhance preparedness, and optimize future responses (Lorenzoni et al., 2020). Assisting in community transition and developing recovery strategies contributes to building resilient communities, a concept strongly advocated by the Sendai Framework for Disaster Risk Reduction.

Qualitative findings highlight a strategic framework for effective disaster recovery and resilient health systems, ensuring a structured, adaptive, and sustainable approach to post-disaster rehabilitation. By integrating policy development, capacity building, and resource optimization, this framework enhances the resilience of health systems and accelerates recovery efforts. Collaboration among stakeholders, data-driven decision-making, and culturally responsive strategies improve service delivery and long-term health security. This approach fosters preparedness, rapid response, and sustainable health interventions to mitigate future risks and improve community well-being. Effective disaster recovery and rehabilitation require well-structured plans and policies guiding post-disaster actions. The Sendai Framework for Disaster Risk Reduction (SFDRR) emphasizes the integration of disaster risk reduction into development.

Integrating quantitative data on the DRRM-H managers' program practices and qualitative sub-themes reveals the best practices in the disaster rehabilitation phase in the Philippines. The table demonstrates that the grand mean value of rehabilitation practices is 3.68, which is interpreted as “highly extensive” and aligns with the various best practices identified quantitatively and qualitatively. The quantitative indicators such as coordinating recovery efforts to health clusters and other agencies after an incident of disaster for collaborative health emergency management with a mean score of 3.83 and collaborating with appropriate groups and agencies to re-establish health care services within the community with a mean score of 3.80 reflects on the qualitative sub-theme of multi-agency collaboration and partnership for comprehensive disaster response. The indicators include activating an emergency recovery plan to apply appropriate rehabilitation strategies in the area affected by disaster with a mean score of 3.73, developing plans to meet short- and long-term physical and psychological nursing needs of survivors with a mean score of 3.70, and assisting in developing recovery strategies that improve the quality of life for the community with a mean score of 3.73 are aligned with the qualitative sub-theme develop and implement plans and policies for an effective recovery and rehabilitation.

Furthermore, the indicator activates management of the Dead and the Missing services during emergencies to assist in the proper identification and disposition of human remains in a sanitary manner, with a mean score of 3.53. It is aligned with the qualitative sub-theme of clear roles and responsibilities of health teams in the Management of the Dead and the Missing. The indicators, such as evaluating nursing responses and practices during disasters and collaborating with nursing organizations to resolve issues and improve responses, with a mean score of 3.51, are aligned with the qualitative sub-theme of continuous monitoring and evaluation for strengthening disaster management. The indicator, which assists the community in transitioning from the response phase of the disaster or emergency through recovery and rehabilitation to standard functions, with a mean score of 3.70, resonates with the qualitative sub-theme of post-disaster support and the well-being of response teams and community members. The indicator, such as activating the rehabilitation plan for the disaster to enable affected localities and communities to return to normalcy and build resilience from the impact of future disasters, with a mean score of 3.70, is aligned with the qualitative sub-theme, which focuses on the restoration of essential documents and livelihoods for disaster-affected families.

3.6 Summary of the Results

Table 8 presents the overall mean for the extent of implementing the DRRM-H Program Practice in disaster phases. The response obtained the highest overall mean value, with a mean score of 4.10, followed by preparedness, which had a mean score of 3.97. While mitigation and prevention scored 3.95, rehabilitation and recovery obtained the lowest mean score of 3.68. The Disaster Risk Reduction and Management for Health (DRRM-H) is a critical framework for ensuring the resilience of health systems in disaster-prone areas. The study evaluated the four key indicators of DRRM-H, Mitigation Preparedness, Response, and Rehabilitation, with results reflecting varying levels of implementation effectiveness.

Table 8. Summary of the Results

Indicators	Mean
Mitigation and Prevention	3.95
Preparedness	3.97
Response	4.10
Rehabilitation and Recovery	3.68

The response obtained the highest overall mean value (4.10) among the indicators, suggesting that DRRM-H managers are well-prepared to handle emergencies. This aligns with the findings of Pettet et al. (2022), who emphasized that an effective response mechanism is vital in minimizing casualties and addressing urgent health concerns during disasters. A well-established emergency response system, featuring trained personnel, rapid deployment strategies, and efficient resource allocation, significantly contributes to effective disaster management (Klein & Irizarry, 2021).

Preparedness was closely followed by a mean score of 3.97, indicating a high level of readiness among DRRM-H personnel. This aligns with the Sendai Framework for Disaster Risk Reduction (2015-2030), which underscores the importance of preparedness in reducing disaster risks and ensuring the continuity of essential health services. Adequate preparedness, including capability-building activities, emergency drills, and the formulation of disaster contingency plans, enhances a community's ability to withstand disasters and recover effectively (WHO, 2019).

Mitigation and Prevention scored 3.95, highlighting significant efforts in implementing disaster risk reduction strategies. Mitigation and Prevention measures, such as epidemiological surveillance, hazard mapping, and infrastructure resilience, are essential in reducing the impact of disasters on public health (UNISDR, 2015). While the mean score is relatively high, further improvements are necessary to strengthen preventive actions and community-based disaster risk reduction initiatives (Fatoni et al., 2022).

Rehabilitation and Recovery received the lowest mean score of 3.68, indicating that post-disaster recovery and long-term health system restoration require further enhancement. The rehabilitation and recovery phase is crucial for rebuilding damaged infrastructure, restoring healthcare services, and providing psychological support to affected populations (Boroujeni, 2019). The lower score suggests gaps in recovery planning and resource allocation, which could hinder long-term resilience and sustainable development in disaster-affected areas. Although the mean score for rehabilitation is slightly lower at 3.68, it still falls under the pervasive category, indicating that the DRRM-H program effectively supports recovery efforts post-disaster. Rehabilitation involves rebuilding, restoring infrastructure, and helping affected communities regain normalcy. The slightly lower score may suggest challenges in long-term recovery efforts, such as resource constraints, coordination complexities, or difficulties restoring affected areas to their pre-disaster state. It also indicates that while immediate response activities are highly efficient, there might be gaps in sustaining support during the longer-term recovery period. Strengthening the rehabilitation phase could enhance community resilience and ensure comprehensive recovery, addressing both physical rebuilding and the psychological and social needs of affected populations.

4.0 Conclusion

The increasing frequency and severity of disasters pose significant challenges to public health systems, necessitating a more systematic, evidence-based, and locally adaptable approach to Disaster Risk Reduction and Management for Health. The Hermosura DRRM-H Framework for Disaster Risk Reduction and Management in Health Program (see Figure 1) is drawn from integrating the Disaster Management Cycle Model and the Theory of Planned Behavior (TPB). This comprehensive Framework enhances the capacity of health systems for disaster mitigation and prevention, preparedness, response, rehabilitation, and recovery. Grounded in practical experiences and established theoretical foundations, it integrates governance, resource management, community engagement, and inter-agency collaboration to ensure effective disaster health management.

In the context of DRRM-H program practices in the Philippines, this Framework presents that each phase offers opportunities to identify best practices to improve disaster response effectiveness, resource management, and resilience-building efforts. On the other hand, the theory of Planned Behavior reflects that a DRRM-H manager with access to proper training, adequate resources, and institutional support is more likely to feel confident in managing disaster situations, thereby increasing the likelihood of engaging in these behaviors. This holistic approach is evident in the Hermosura DRRM-H Framework, which considers multiple demographic factors, including age, sex, employment status, length of service, position title, disaster training, and attendance at response events.

Based on the result of the study, the Hermosura DRRM-H Framework was built reflecting the main themes that emerged by integrating the four phases of disaster management and the Theory of Planned Behavior (TPB) elements such as (1) attitude, which pertains to the DRRM-H managers commitment in the implementation of program best practices disaster risk reduction and management in health program in four disaster phases namely: mitigation and prevention, preparedness, response and rehabilitation and recovery, the (2) subjective norms which pertains to the expectations and support from stakeholders and expectations on disaster-related behavior, and (3) perceived behavior controlled which deals with DRRM-H managers' confidence in their ability to perform disaster risk reduction and management in health practices in their respective regions and provinces. The main themes that emerged include a) the strengthening of disaster mitigation through inclusive, data-driven strategies, partnerships, and culturally responsive and adaptive management; b) an integrated approach to institutionalizing disaster programs through governance, capacity-building, and multi-sectoral collaboration; c) a coordinated and adaptive disaster response for efficient health and social service delivery, and d) resilient and collaborated post-disaster recovery efforts for sustainable community rebuilding.

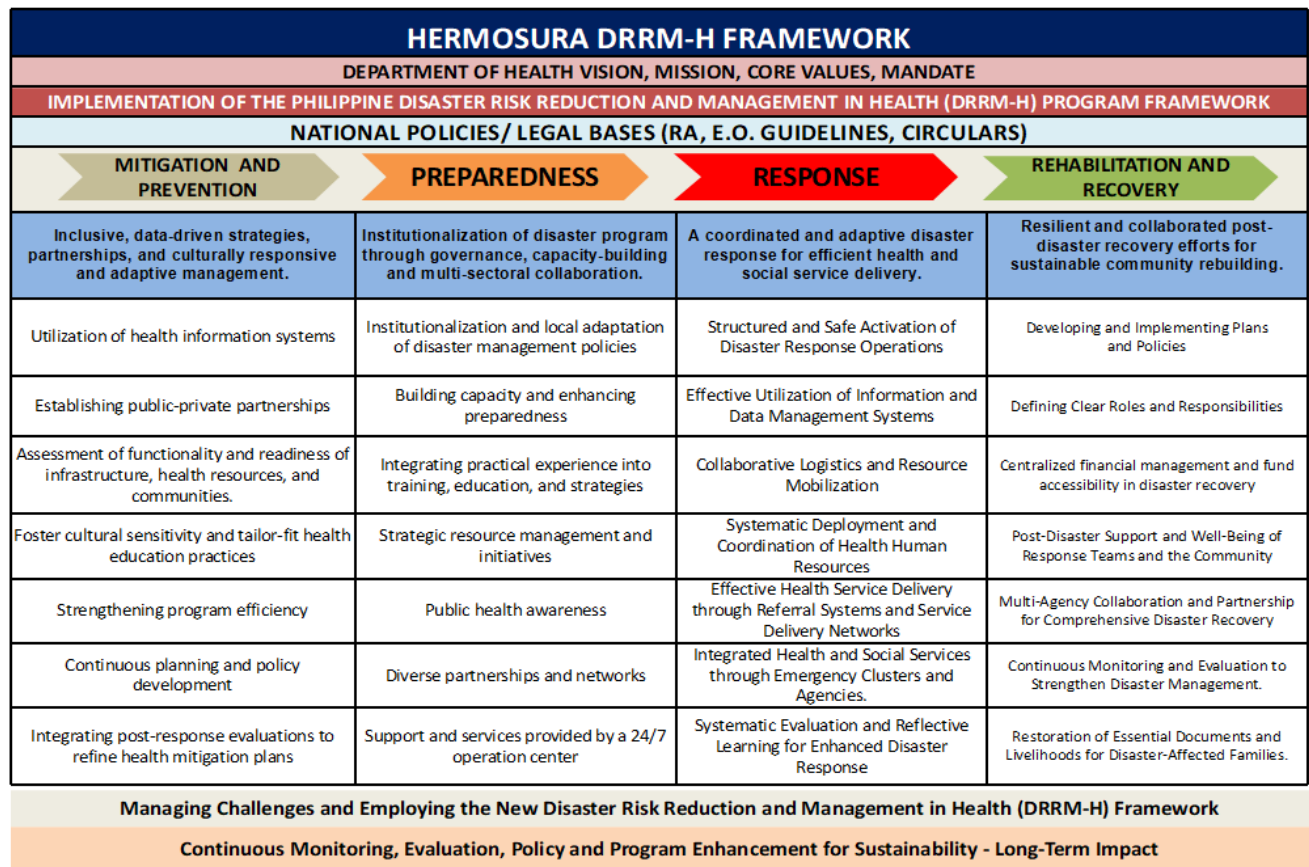


Figure 1. Hermosura DRRM-H Framework for Disaster Risk Reduction and Management in Health Program

5.0 Contributions of Authors

The authors indicate equal contribution to each section. The authors reviewed and approved the final work.

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7.0 Conflict of Interests

There is no conflict of interest in the conduct of this study. The research was undertaken independently, and no external party influenced the design, data collection, analysis, interpretation, or reporting of the findings. All results were presented objectively and without bias.

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