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Research Article

Strengthening One Health in BARMM: Integrative Approaches to Human, Animal, and Environmental Health for Sustainable Community Resilience

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ABSTRACT

Where formal medical–veterinary linkages are weak or nonexistent, as in BASULTA, zoonotic risks are commonly governed through informal institutional mechanisms that may be described as pragmatic “political settlements” operating at the local level. Health workers often use tacit and networked knowledge and culture-specific coordination—such as consultation with local animal handlers, traditional healers, barangay leaders (village heads), and environmental officers—to recognize disease patterns before they are reportable ZDs. Although undocumented, these informal mechanisms enable communities to adjust quickly in geographically isolated and resource-poor territories and are an indication of what De Vera (2022) refers to as negotiated governance in conflict-affected areas. Instead of these configurations being seen as deficits, One Health “policies on paper” should identify and incorporate them as realistic nodes for institutionalization. This may require mediation of community-based animal health workers, institutionalization of local reporting pathways into surveillance and multi-actor protocols that value experiential knowledge as much as technical expertise. Although mired at local scale by piecemeal efforts, embedding such locally adapted coping mechanisms into formal policy can shift One Health implementation in BARMM away from externally-driven models and towards context responsive modes of governance sensitive to everyday practices; while supporting a resilient system overtime.

Keywords: *One Health, Community Resilience, BARMM*

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Introduction

Barriers to health and well-being in the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) are complex, interwoven, and extend beyond human populations. A region characterized by ecological diversity, reliance on agriculture and fisheries, and repeated exposure to conflict and climate-induced challenges makes Archipelago a prime setting in which to develop the One Health framework - one that recognizes the interconnectedness of human, animal and environmental health. In Basilan, Sulu and Tawi-Tawi—the island provinces collectively known as BASULTA—challenges are amplified by geographic remoteness, inadequate health service delivery infrastructure, and socioeconomic vulnerabilities that require integrated response approaches addressed to local contexts.

Responding to the pressing need for resilience building, this paper examines integrative One Health approaches in BARMM and how communities understand and experience the

relation between human health, animal health and environment sustainability. Using a qualitative design, focus group discussions (FGDs) were held with purposively selected members of key sectors in the community i.e., health workers, local government staff, community leaders and individuals who come in direct contact with natural environment and domestic/farm animals.

We aimed to explore opportunities and challenges in the operationalization of One Health at community level by documenting the experiences, reflections, and insights from stakeholders across Basilan, Sulu, and Tawi-Tawi. The results present an insightful understanding of the local context as well as practical guidance to further strengthen policies, programs and mechanisms for collaboration that influence sustainable community-level resilience in the Bangsamoro. In the end, this study is a step toward connecting all facets of the BARMM to address, together, pertinent health issues facing the region.

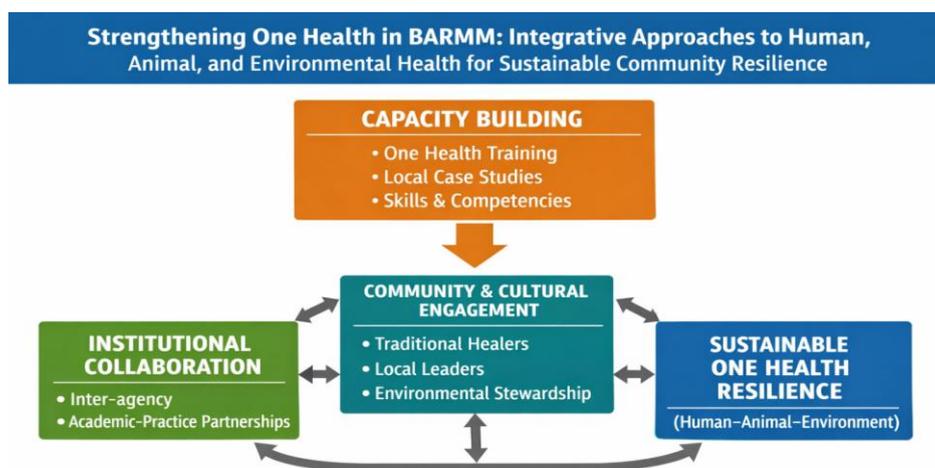


Figure 1. Three-Pronged Strategy for Strengthening One Health in BARMM

Figure 1 The figure presents the study’s proposed three-point strategic approach to enhance the implementation of One Health and construct sustainable community resilience in BARMM. Capacity building is the keystone, with an emphasis on structured training of breeders through locally-based case studies, to turn instinct into technology. Institutional collaboration is the “shell” to identify at the structural level, i.e., coordinated effort between health

systems, veterinary and environmental authorities, and academic centers in order to provide a response towards fragmented governance and weak inter-sectoral linkages. Culture and community involvement is social, and acknowledges the importance of traditional healers, local leaders and indigenous environmental knowledge in shaping health practices and early response protocols. These three features are interdependent and lead to sustainable One Health resilience, where human, animal

and environmental health interventions are in an integrated context specific culturally legitimate way. In picturing these connected elements, the diagram offers easy references to policymakers and implementer alike, with regard to putting One Health into practice in the context of conflict-affected and resource restricted environments like BASULTA.

Methodology

Methods This qualitative study sought to determine how the principles governing One Health were integrated in BARMM. Qualitative research was considered most suitable, since it allows for a detailed examination of the views and experiences and (practice) of health workers regarding the interrelationship between human, animal and environmental health. The study employed purposive sampling to select health professionals with direct experience in community-level health systems and exposure to human, animal, and environmental health concerns relevant to the One Health framework. Participants included doctors, nurses, midwives, veterinarians, and public health workers actively engaged in local service delivery across the island provinces of Basilan, Sulu, and Tawi-Tawi. To ensure balanced geographic representation, the sample was stratified by province, with ten (10) respondents selected from each area. This stratification was not intended to introduce randomness but rather to guarantee equitable provincial representation within the purposively selected sample, which is consistent with qualitative research designs that prioritize depth, relevance, and contextual insight over statistical generalizability.

Stratified random sampling was employed to ensure that participants across each of the provinces were representative of different groups of health professionals. This mechanic permitted a variety off different professions whilst keeping the selection fair. The information was collected through Focus Group Discussions (FGDs) as they help in

creating a more interactive environment for the participants to express their opinions, experiences and suggestions. Three FGDs, one in each province, were held with 10 persons in each. The interviews were based on a semi-structured interview guide that addressed the following areas:

- a. Recognition of the One Health approach and its applicability to local health issues.
- b. Lessons learned from human, animal, and environmental health collaboration.
- c. Barriers and facilitators of One Health implementation in BASULTA.
- d. Recommendations for Building Community Resilience to Health Challenges Using Integrative Approaches.
- e. Every FGD session lasted for about 60–90 minutes and was held in a place of convenience and comfort for the participants. With permission the consultations were audio-recorded and written notes made to ensure full representation of a topic.

Thematic analysis was used to analyse the qualitative data obtained. Transcripts were analyzed by repeated reading and were coded, categorized into themes and sub-themes with reference to parts of the data that provided perspectives in common or in contrast among participants [28]. The analysis followed Braun and Clarke’s (2022) six-phase process of thematic analysis (familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and writing up).

Ethical Considerations

The study was approved by the appropriate local review board. Participation in the FGDs was voluntary and all respondents had provided written informed consent. Anonymity was ensured by deidentifying responses, and participants were told that the data would only be used for research.

Results

Table 1. Emergent Themes from FGDs on One Health in Basilan, Sulu, and Tawi-Tawi

Theme	Sub-Themes	Illustrative Participant Insights
1. Awareness and Understanding of One Health	– Recognition of human-animal-environment linkages	“We see that animal diseases also affect people, but most of us are

Theme	Sub-Themes	Illustrative Participant Insights
	<ul style="list-style-type: none"> - Limited technical knowledge of the One Health framework 	not familiar with the formal 'One Health' concept." (FGD, Sulu)
2. Health System Challenges	<ul style="list-style-type: none"> - Limited resources and infrastructure - Geographic isolation and referral difficulties - Weak inter-agency collaboration 	"On our island, if there's a zoonotic outbreak, it's very difficult to get a quick response because of transport and coordination," he said. (FGD, Tawi-Tawi)
3. Community Practices and Perceptions	<ul style="list-style-type: none"> - Reliance on traditional healing - Knowledge gaps on zoonotic risks - Environmental degradation affecting livelihoods 	"Fisherfolk rely on the sea, yet pollution and climate change are already impacting their health and livelihoods." (FGD, Basilan)
4. Barriers to One Health Integration	<ul style="list-style-type: none"> - Lack of cross-sectoral policies - Minimal veterinary-public health linkages - Absence of systematic training on One Health 	"Human doctors and veterinarians don't often collaborate, even if our problems overlap." (FGD, Sulu)
5. Opportunities for Strengthening One Health	<ul style="list-style-type: none"> - Community willingness to participate - Role of local governments and academe - Potential for policy support and capacity-building 	"If it's training and communication, we are open to working together for better health results. (FGD, Basilan)

Findings

Many health workers in Basilan, Sulu and Tawi-Tawi recognize the connectivity between human-animal and environmental health through informal networks however there is little technical familiarity of the official One Health model. It is in this context of the general weakness of governance structures and institutional febleness in conflict-prone areas of Mindanao where it becomes more understandable that despite little technical knowledge regarding the formal One Health, health workers within Basilan, Sulu and Tawi-Tawi recognize the interconnectedness among human, animal and environmental health. De Veras (2022) review of enterprise development in the Philippines argues that, in a weak institutional environment enforced by armed groups, it is informal contracts and deals as well as political settlements which are necessary conditions to survive and thrive. In such fragile environments, formal systems, whether of business regulation or health services - are usually only weakly mandated (if at all), and the practical

force of written rules is overrun by political ecologists and resource shortfalls.

When the lens is brought to bear on the BASULTA experience, one notes that health care practitioners already intuitively appreciate how determinants of health are related and do so without adopting more formalistic One Health framing where governance is weak. As with firms in zones of violence working through non-conventional intermediaries, health workers practising using material techniques cannot be characterized by descriptions fabricated out of abstract universals. The conflict dynamics, geographic remoteness and weak institutional capacity in the provinces we have chosen may thus create challenges for systematic One Health promotion and operationalization.

Thus, the lack of technical report this study findings in the communities did not only represent a gap on information transmission but also reflects political and structural interface at conflict areas in BARMM. Improving One Health implies not just education but a consciousness

of the political settlements and governance aspects that condition how these frameworks are embedded and implemented at the local level (De Vera, M., 2022). The health system is constrained in terms of resources, infrastructure and geography that limit the response to zoonotic and environmental health issues according to participants.

Participants also exchanged views concerning community practices and perceptions that shape the outcomes of One Health. Indeed, some signatories to Avaaz's petition have drawn these crucial connections, referring to the impact of traditional healing practices on health and livelihoods; inconsistent understanding of zoonotic disease threats or environmental pressures (overfishing or pollution) for health. The observation in this study that community practices and perception play a role in One Health situation as dependence on traditional medicine, poor awareness of zoonotic risks and environmental stressors (overfishing/pollutants) is consistent with what has been reported by Majiwa et al. (2024) in East Africa. In a qualitative research conducted by Majiwa et al., employers of livestock traders could recognize diseases in animals, but had limited information on the difference between zoonotic diseases. Hazardous practices, such as skinning/butchering dead animals and Active disease control measures were identified as being associated with a greater risk of zoonotic spread.

Proximately, the reliance of communities on indigenous health and lack of formal knowledge about zoonotic risks in Basilan, Sulu and Tawi-Tawi reveal common vulnerability as well. Both studies highlight that cultural practices and health-related practices, whether livestock keeping in fragile or resource-poor East Africa or fishing and traditional medicine use in BARMM, are tightly woven into the fabric of everyday community life but can represent sources of emergent, unfolding risk to human well-being.

This duality emphasizes the significance of community involvement and education in promoting One Health. As Marija et al. (2024)), advocate that the training of local actors, as an extension of animal health workers for example; this community-based model can also be

applied in BARMM where raising awareness and building capacities at the community level could address poor outcomes linked to low knowledge on zoonotic diseases and hence fragile environmental behavior. In either case, it is imperative to forge partnerships between conventional healthcare workers and local knowledge holders in order to maintain sustainable health outcomes that are managed within a One Health framework.

In agreement with those of Majiwa et al. (2024), traditional healing practices in BASULTA do not necessarily stand as a block for One Health implementation but a pool of culture-embedded resources that could be proactively injected into the community health systems. Faith healers and individuals with local knowledge tend to be the first line of contact in remote areas, and have subtle observations related to environmental cues, animal behaviour, and culturally accepted paths of care. Thus within the proposed three-tier strategy, organised integration between biomedical health workers, traditional healers and environmental stewards becomes necessary. For example, this may include participatory dialogues around alignment of disease recognition and referral pathways, co-developed health education activities drawing on local belief systems and the integration of traditional healers into early warning and risk communication for zoonotic and eco-health diseases. Through formalizing such collaborations, One Health interventions can build trust among communities, improve early detection of health risks and foster sustainable outcomes that are scientifically evidence-based and culturally acceptable in Bangsamoro.

Constraints to OHR at the provincial level were generally comparable and coherent, such as insufficient formal embeddedness of medical-vet collaboration and limited inter-agencies coordination. However, respondents indicated that they would be willing to engage in trans-sectorial TB research if it was strengthened by local government actions, academia and policy reform. Absence of structured collaborations between medical and veterinary services was identified as the major barrier to One Health intervention, followed by poor inter-agency cooperation. This is closely parallel to its above

mentioned findings by Khumphiranont (2022) in its study of the southern border provinces in Thailand where cooperation between government, private and civil society was weakly fragmented and plagued with resource allocation, mechanisms unclarity as well as coordination problems. These two instances show that collaboration is believed to be important, but is hampered by structural and organizational weaknesses - not the lack of will among participants.

The implications of the results are important especially in terms that academic institutions can play a key role as central conveners and knowledge brokers in nestodding One Health implementation of BASULTA. Leveraging on respondents' willingness to cooperate across sectors, local universities including Mindanao State University-Sulu and Western Mindanao State University are poised to champion formal academic-practice partnerships Fill to ensure that the gap in systematic training and feedback loops is plugged. This could include factors such as, for universities to organize ongoing capacity strengthening in One Health for health, veterinary and environmental practitioners using models of best practice; produce locally relevant training modules that are based on field realities; set up feedback loops via joint monitoring-feedback-learning-reflection workshops-applied research dissemination. Further, akin to the Thai example where collaboration was facilitated by common goals and trusted coordinating bodies, academic institutions in BARMM can serve as neutral grounds that bridge government agencies, community actors and practitioners toward achieving unified One Health objectives. One Health work can progress from ad hoc coordination to enduring, evidence-informed engagement with local trust and context by formalizing these partnerships. Both outcomes emphasize the need for formalized collaboration and policy support to achieve sustainable One Health outcomes. Otherwise, events are ad hoc and doomed to failure. "The eagerness of researchable communities and stakeholders to engage, provides a solid foundation for any well-structured model for collaboration to effectively the output (whether in health,

education and justice and zoonotic disease prevention)".

Overall results underscore the importance and opportunity for OH mainstreaming at BARMM through advocacy, capacity building and multisectoral actions. Law (2017) highlight healthcare disaster recovery does not belong solely to the health sector but requires broad multi-sector partnership. His work illustrated that involving non- health actors is crucial to more effectively tackle the "triple burden" while simultaneously developing the capability to respond and recover from Health Emergencies and Disasters (HED). What the findings from BARMM demonstrate is that it cannot succeed, unless part of a wider programme to develop an approach based on One Health dealing with human, animal and environmental health. The findings highlight the necessity for timely and targeted mainstreaming of One Health in BARMM through advocacy, capacity building and interagency collaboration. This accords with Law's suggestion of health resilience being generated coconstitutionally by coregulation among diverse responsibility-holders.

By engaging various fields in science, governance (government, local communities, academe and civil society) through synergy, the One Health approach presents the strategic architecture to tackle not just emerging infectious disease threat but also deep seated morbidities that date centuries back in Bangsamoro. Thus, as Law did regarding cross-sectoral governance in DRRM but this study by focusing on multi-sector partnerships as important to operationalize One Health as a framework for developing stronger local community resilience in BARMM. These statistics provide robust indication for the pursuit of community resilience from different fronts towards a more healthy Bangsamoro.

Discussion

This study analyzed the perceptions of health workers on One Health in Basilan, Sulu and Tawi-Tawi provinces (BST) of Bangsamoro Autonomous Region in Muslim Mindanao (BARMM). The results highlight shared risks faced by the island provinces and unique

opportunities for strengthening resilience through combined health programs.

First, the results reveal baseline awareness amongst practitioners of the interconnectedness between human, animal and environmental health. This is in-line with evidence from LMICs globally that, without formal OH training, many local actors perceived environmental pressures and zoonotic risks (Traore, T., Shanks, S., Haider, N., Ahmed, K., Jain, V., Rüegg, S. R., Razavi A, Kock R, Erondun N Rahman-Shepherd A Yavlinsky A Mboera L Asogun D McHugh T D Elton L Oyebanji O Okunromade O Ansumana R Djingarey M H ... Dar O 2023)

However, there exists a significant lack of understanding in the structured appreciability of the architecture of One Health and such intuitive awareness can be advanced by training courses.

Second, it drew attention to systemic health issues of geographic isolation and lack or resource poor infrastructure. These constraints are indicative of more common issues encountered by archipelagic or conflict-affected settings where human-generated and logistical barriers preclude effective action against outbreaks, and routine health care (CF Bogale, B., Scambler, S., Mohd Khairudin A. N. & Gallagher J.E.) 2024). Weak collaboration between government departments was cited as a challenge repeatedly, with the reminder that connectivity between human health, animal health and environment sectors must be enhanced in institutional terms.

Third, Drawing from these results can be seen the wide divergence between respondents' highly intuitive recognition of relationships among human, animal and environmental health and their limited technical exposure to a formal One Health construct – making more clear the importance of capacity building. Health workers do however understand that community behaviors, cultural practices, environmental degradation and traditional healer dependency are determinants of health but this knowledge is at times experiential at best described as tacit but not systematically theorized. Closing this gap demands a contextualized competency-based program that transforms intuitive understanding to professional

competence through rooting One Health principles in local illustrations. For example, training modules could use zoonotic risks found in the BASULTA area (e.g., livestock-associated infections; inappropriate waste management; contamination of water and deforestation-linked emergence of disease) as entry points to explain the human–animal–environment interface. A curriculum as described here could combine experiential learning, community health risk mapping and case-based discussion based on what practitioners are facing in their daily practice to make abstract One Health subject categories alive for application into adaptable decision-making tools. This distinction is consistent with Degeling et al. (2015) stressed that culturally and contextually anchored approaches are central for successful One Health practice, especially in regions where local culture and environments have a strong influence on health-related behaviors.

Despite the obstacles however, the study did find some low-hanging clusters of fruits for One Health in BARMM. Health workers were willing to be engaged in multisectoral work, so long as they were trained, coached and supported with logistics. Local governments and universities had the potential to drive such efforts, consistent with international One Health recommendations that acknowledge multilevel governance and involvement of local communities.

In summary, it is emphasized that to further One Health in BARMM, a tri-partite approach should be pursued as follows: (1) enhancement of knowledge and capacity of practitioners; (2) institutional collaboration among human, animal and environmental sectors; and (3) cultivation of community participation, taking into consideration the cultural-ecological milieu. By addressing these dimensions, BARMM can strive for sustainable resilience of communities, cutting across academic disciplines for a healthier and safer Bangsamoro.

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