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Narrative Review of Resilience Strategies in War-Torn Health Systems

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ABSTRACT

Health systems in war-torn settings face unprecedented challenges, including destruction of infrastructure, workforce attrition, disrupted supply chains, and governance breakdowns. Despite these threats, resilience strategies can enable systems to maintain essential services and recover functionality during and after conflict. This narrative review synthesizes evidence from diverse protracted conflict contexts, including Syria, Yemen, South Sudan, and Afghanistan, to identify key resilience mechanisms. These mechanisms encompass adaptive governance and leadership, health workforce management, service delivery modifications, health information continuity, infrastructure protection, community engagement, financing strategies, and coordination with external actors. Comparative analysis highlights recurring patterns and context-specific adaptations, emphasizing the importance of decentralized service delivery, contingency planning, and community participation. The review also identifies gaps in equity, ethical considerations, and integrated recovery-resilience frameworks. Findings underscore the critical need for policymakers and practitioners to adopt multifaceted resilience strategies tailored to local conditions to safeguard health service continuity in conflict-affected settings.

Keywords: Health systems resilience, armed conflict, service continuity, governance, protracted crises.

INTRODUCTION

Health systems in low and middle-income countries often endure considerable damage from armed conflict. Protection and reconstruction initiatives focus primarily on hospitals and physical infrastructure, with little attention dedicated to continuity of health services [2]. A resilience approach allows health providers to adapt and maintain essential services in the face of severe disruptions. Resilience has been increasingly embraced as a paradigm for health systems in countries affected by natural disasters or disease outbreaks, but the analysis of armed conflict remains limited[1]. The present work aims to inform the strengthening of these capabilities amid the escalation and prolongation of armed conflicts worldwide, including the resurgence of violence in Afghanistan, the war in Ukraine, and deteriorating conditions in several African countries [1]. Critical health system threats during armed conflict include extensive patient influxes, destruction of facilities and supplies, disruptions to and unsafe movement along transport routes, loss of personnel, and failures in governance. Such threats can be anticipated and must be complemented by a comprehensive understanding of resilience strategies that have proven valuable in other war-torn contexts [2]. Particular attention is warranted to the access dimension of resilience, complemented by continuity of care through the careful management of interruptions, monitoring and supervision of frontline operations, optimal staffing strategies for static posts, and the protection of information streams [1].

Conceptualizing Health System Resilience in Conflict Settings

Health systems operate amidst a dynamic interplay of evolving challenges [2]. To capture the heightened risks, disturbances, and pressures on health systems in wartime, the literature presents two conceptual frameworks [5]. The first distinguishes resilience from robustness, adaptation, and recovery as the ability to deal with unforeseen shocks. The second expands the definition of health-systems resilience as the ability of a system under stress to maintain functionality with a minimum loss of performance under the crisis condition [4]. Health systems in war contexts thus confront threats that escalate and extend existing stressors beyond critical thresholds. The resultant rapid-onset, protracted oscillations in supply, demand, and security create an amplified set of endemic safety

hazards. Resilience frameworks attending to such contexts help articulate both the additional burdens and the specific strategies needed to restore and sustain health-service delivery [1]. Resilience, health system development, the human dimension of the health system, and the ability of health systems to maintain their essential functions in the face of crisis [2]. It is now widely accepted internationally that health systems must be able to keep delivering essential services to populations under all circumstances (e.g., WHO, 2008). This implies developing strategies and approaches that are adapted to each specific context after a careful surveillance-context analysis [1].

Threats to Health Systems in War-torn Environments

Health systems face diverse yet acute threats during wartime. These threats accelerate damage and disruption, hindering the capacity of health systems to deliver effective care and contributing to detrimental population health outcomes [6]. Five central threats have been observed amid conflict: influxes of injured or traumatized patients, disruption of supply lines for essential medical inputs, increased risk to health system personnel and facilities, displacement of skilled professionals, and deterioration of governance structures [7]. Health emergencies arising from wartime violence can create overwhelming demand for health services as large numbers of patients seek care for injuries or mental health trauma. For example, the Syrian crisis resulted in a fivefold increase in the demand for trauma surgery [3]. Health systems with pre-existing capacity constraints are particularly vulnerable to such surges. Wartime attacks on health staff and facilities can exacerbate these pressures by increasing the demand for care while simultaneously reducing supply [8]. In the protracted conflict in Syria, 677 attacks against healthcare personnel were recorded; 84 healthcare workers were reportedly killed, 187 were injured, and 420 were abducted. Hundreds of health facilities suffered varying degrees of damage, and approximately half of Syria's medical personnel fled the country. The provision of primary healthcare and mental health services both suffered severe disruptions as the conflict progressed and the protracted humanitarian crisis evolved [10]. Disruption of supply chains can impede the availability of essential inputs such as medical supplies, equipment, and pharmaceuticals. The absence of these items diminishes both the quality and extent of care [7]. Logistics breakdowns caused by violence, damage to infrastructure, or blockades can precipitate severe shortages. Worldwide shortages of vaccines and medicines are also aggravated by the war in Ukraine. Cold-chain continuity is critical for vaccines stored at low temperatures, and damaged or destroyed roads and bridges can create logistical chokepoints that hamper distribution [4].

Governance and Leadership as Resilience Mechanisms

Good governance and leadership at the national and subnational levels play important roles in building and sustaining resilience through protecting key functions, ensuring stakeholder engagement, and enabling adaptive responses [12]. Although health systems in conflict settings may exhibit irregularities such as interruptions and dysfunctionality, adaptation still occurs through diverse mechanisms [4]. Influential stakeholders, including the state, non-state actors, international organizations, and local authorities, may role-play in collective health governance and response [7]. Among the many functions and dimensions involved in governance, priority-setting, and decision-making capabilities under duress for the remaining services and networks occupy an important position. For instance, South Sudan's national and state health authorities and non-state actors took collective action to provide health services in government-controlled areas without external funding, despite staff retention difficulties and interruptions to supplies [10]. The absence of effective governance prevents the emergence of resilient strategies and the maturing of health systems, derailing sustainable development aimed at fundamental human rights [11]. Leadership roles and oversight and coordination of cross-sectoral inputs also prove vital for timely responses in situations characterized by spatial, functional, or service de-concentration, as in Punjab and Yemen. In Yemen, operations shifted from primary health to maternal healthcare and a focus on service needs in both government-held and non-government-controlled areas as health governance evolved post-conflict [12]. During prolonged conflict, as witnessed in Afghanistan, Liberia, and Sudan, different governance arrangements arose at the national, sector, and sub-sector levels, progressively contributing to gradual investment recovery [7]. Higher reliance on civil society governance, sometimes translated into health facility and service decentralization, characterized certain districts with a longer conflict history. Such decentralized approaches, along with dedicated governance arrangements and other engagement mechanisms, appeared significant for response during and after humanitarian programming [8].

Health Workforce Adaptations and Capacity Building

Amid conflict and turmoil, health service organizations must seek and exploit innovative approaches to capacitate the workforce and sustain service delivery [1]. Recruitment of additional personnel through multiple options, including briefer or less formal education, is one strategy, albeit one that can severely threaten acceptability and quality of care [3]. Re-invigorating retired or inactive health workers, meanwhile, depends on guaranteeing personal safety and the availability of essential supplies. Leadership support emerges as critical to the

sustainability of pre-emptive and responsive strategies wherever both personnel and facilities are subject to extreme risk [5].

Service Delivery Modifications and Continuity of Care

Interruptions in the provision of services do not merely prolong existing impediments; they lead to service decay, the establishment of multiple parallel systems, and the creation of a crisis environment. Helping prevent backsliding when services are interrupted is therefore crucial and can take various forms [6]. Sometimes, unanticipated cessation of services occurs due to factors such as conflict, natural disasters, or the COVID-19 pandemic [6]. Delivery into the community via mobile clinics or outreach teams constitutes an effective way to modify service delivery. General hospitals or secondary facilities can maintain services by prioritizing the management of a limited set of essential surgical conditions with simple planning and no new investments. Community facilities can shift to a few essential family planning methods using existing personnel with no additional inputs [7]. A limited primary health care (PHC) package, such as antenatal care, childhood immunization, and integrated community case management of childhood illnesses, can often be decentralized and maintained by community health workers, facility-based staff, and outreach teams from comparatively secure health facilities [8]. One of the major prerequisites for maintaining essential health services in conflict-affected areas is the decentralization of the delivery system to an extent that allows undamaged facilities to take over service delivery responsibilities. Maintaining services constitutes a possible mechanism for improving resilience and for restoring access after service interruption [3].

Health Information Systems and Surveillance under Duress

Health information systems serve as an anchor for decision-making in health systems striving to achieve their core objectives. Data collection and reporting become more challenging [12]. The protracted nature of conflict leads to interruptions being regarded as the norm, placing a premium on ensuring continuity of care [3]. As health systems become increasingly digitalised, the prospect of operating "off-grid" becomes more challenging. Throughout the crisis, the Health Information Management System (HIMS) continued to be operational, with data flowing on a routine basis from health facilities [6]. At one stage, data from over sixty facilities spread across all woredas under the control of the federal government continued to come in. Despite other infrastructure systems getting increasingly brittle, the health information system was able to deliver under conditions of extreme pressure [8].

Infrastructure Protection and Logistics Resilience

War and civil strife destroy many health facilities and threaten those that remain. Protection comes through armed forces, police, and militia securing buildings [10]. Secure sites can serve as government health service points or remain a viable alternative if services collapse. Diversifying delivery locations mitigates the risk of access being denied if any one site is attacked. Logistical resilience facilitates materials receipt, hence supply chain simplification enables expedited delivery while cold-chain vaccines and other medicines remain effective if stored insufficiently for limited periods [11]. Contingency plans enable the transport of materials via routes other than the usual ones if access becomes impossible.

Community Engagement and Social Capital in Resilience

Although war is inherently chaotic, communities have a remarkable capacity to mobilize and organize resources to pursue common purposes [8]. Community networks, local leaders, and social ties can foster trust within and across diverse groups, improve two-way risk communication, and channel social capital into priority initiatives that facilitate response at the front line [3]. Outside the health sector, for example, social networks and organizations have contributed to communities contributing to education, food, and shelter in the context of military conflict, population displacement, and natural hazards [7]. Community resilience in health systems encompasses three interrelated aspects: absorbing, adapting, and restoring. Absorbing defines the extent to which a community can withstand shocks and continue to function without major adjustment; adapting denotes the initiatives and adjustments implemented by communities to continue functioning in the face of change; and restoring denotes recovery [8]. During national conflicts, booming international non-governmental organization (NGO) assistance and expanding internal resources have been used to replace and supplement external resources lost by formal health systems [9]. Efforts to rebuild organizational capacity, improve the distribution of material and technical facilities, sustain job opportunities, and expand food security following severe droughts feature similar absorb, adapt, and restore facets and characteristics [8].

Financing and Resource Allocation during Protracted Conflict

In war-affected contexts, health financing, defined as the generation, allocation, and use of resources for healthcare, becomes an intricate challenge [4]. Despite numerous humanitarian actors and financing initiatives, both general funding for health systems and specific financial support for many health interventions are severely lacking. Understanding how budgetary, allocative, and operational decisions are made and how these influence health financing amidst conflict has been extensively documented [10]. Wartime fiscal policies favour

paramilitary groups over public goods and infrastructure, subverting normative accountability and undermining donor incentives for health sector support. If funding does arrive, strict alignment with pre-existing governmental policies may delay their implementation [9].

External Actors, Aid Coordination, and Policy Coherence

War-torn health systems routinely depend on external actors for service provision, capacity building, funding, and strategy formulation [9]. This may involve international organizations, bilateral agencies, and non-governmental organizations operating under a wide array of governance structures [9]. Health-system resilience can be compromised by the fragmentation of governance, the lack of alignment among interventions, and the inability of outside actors to adapt strategies to a context they often fail to recognize [10]. External actors address war-related health system disruptions and advocate for strategies aligned with national systems. Yet, responses to funding requests and decision-making procedures depend heavily on individual organizations [9]. Furthermore, policy formation and implementation may prioritize areas other than health. Parallel agendas have been evident in Afghanistan, where health-system reconstruction and broader development were addressed by separate Ministries, leading to a disjunction of strategies [11].

Methodological Approaches To Studying Resilience in Conflict Health Systems

In recent years, the concept of resilience has gained increased attention within the health systems research domain, encompassing determinants, characteristics, relevant frameworks, analytical tools, and health systems resilience levels in different contexts, including war-torn settings [6]. The general principles of health systems resilience remain applicable in these extreme environments, but the primary objective, the health sector system enabler, and the underlying determinants could be distinctive. Additional preparations may also be needed to enhance the feasibility of health systems resilience analyses [5]. Resilience in war-torn health systems remains of vital importance; thus, an assessment of the existing methodologies for studying resilience in protracted-conflict settings is justified. Much valuable evidence on health systems resilience has been generated since the systematic review conducted in early 2021[3]. However, material retrieved during the subsequent scoping review is potentially less comprehensive and relevant, and the selection of additional studies continues, now focusing on the protracted-conflict dimension. An overview of the different methodological approaches employed to study resilience in war-torn health systems is therefore presented [7]. The overview encompasses various study designs, data sources, ethical considerations, external transferability of findings, and specific synthesis methodologies suitable for fragile settings [1].

Evidence Synthesis: Lessons Learned From Past Conflicts

The review synthesizes empirical analyses of health systems in protracted war contexts. Despite variation in triggers, trajectories, modalities, and organisational frameworks, conflict-stricken health systems share distinctive adaptive responses [9]. A comparative analysis of mediation approaches in Syria, supplementary strategies in Yemen, and experiential practices in Southern Sudan yields transferable principles and context-dependent insights on resilience enhancement[8]. Thematic patterns and recurring features emerge from diverse situations. Effective health system performance during ongoing, large-scale armed violence hinges on adaptive governance and authoritative leadership across institutional strata. Triage of system and service delivery objectives according to changing needs underpins continual functionality [6]. Systematic recruitment, training, retention, security, safeguarding, telehealth, and mental health provision for personnel remain vital. External financing, donor coordination, operational harmonisation, and national strategy alignment constitute persistent preoccupations [5]. System resilience arises from a dynamic combination of interconnected elements that together enable change and effectiveness over time. The upper-tier frameworks offer high-level categorisation of the constituent factors, reflecting literature-driven conceptions of system health and resilience and grouping protective factors commonly associated with internal exit as distinct categories [9]. Each element retains import regardless of the problem at hand, but the enduring health and security crisis in Syria highlights a third conceptual representation that discerningly diversifies elements and shading underscores their contextual nature [12].

Gaps, Challenges, and Ethical Considerations

Health systems in conflict-affected countries face substantial challenges to effective functioning, leading to the emergence of potential resilience strategies that remain poorly understood [6]. Focused reviews of emphasized topics such as separate analyses of these strategies at a system level and across diverse country case studies have yet to consider local health needs and inequities, the potential for eroded rehabilitation gains to reduce the relevance of recovery-oriented strategies, or the limited attention to: the implications and contextual adaptation of resilience approaches for the maintenance or restoration of health systems and interventions beyond medical care; and the ethical dilemmas associated with resilience initiatives that remain[7]. Notably, the gap in understanding the indicative typology of overarching objectives pursued and issues of equity within these strategies has received little international attention [4]. Efforts to strengthen concurrent recovery prospects in addition to resilience have also received minimal focus. Health system resilience strategies are mainly classified into reinforcing

mechanisms, such as expert deliberation, adaptive planning for diverse potential developments, and prioritisation of foundational building blocks, to navigate strongly fluctuating contexts [5]. The tensions between service clustering to deepen remaining capacities and decentralisation as a means of facilitating continued care are particularly pronounced in protracted settings, where dispersed national support systems further amplify fragmentation and climate change challenges [6]. The congruence of well-being promotion, equity enhancement, and collective stress alleviation as core objectives of the strategies employed at this system level remains unexplored, despite their central importance in other capacity-related sectors [7]. A typology of the ethical concerns likely to arise within the resilience domain is particularly needed, alongside associated frameworks for subsequent configuration. On the whole, health systems in conflict-affected settings confront multiple opportunities for disentangled research on resilience strategies and concurrent recovery prospects [10].

Practical Recommendations for Policymakers and Practitioners

Political violence and armed conflict expose health systems to critical shocks, undermining the capacity to deliver essential services and increasing morbidity and mortality [10]. Fragile and conflict-affected settings present common threats that affect the health workforce, service delivery, supplies, information systems, infrastructure, and security [9]. Across diverse contexts and according to multiple studies, these threats elicit specific adaptations to governance, health workforce management, service delivery, health information systems, supply chain management, community engagement, financing, and collaboration with external actors. Sanitized summaries of these adaptations reinforce their transferability across contexts and point to the value of integrating resilience-building measures into post-conflict recovery efforts [11]. Health systems operating in conflict settings routinely confront significant threats to the provision of essential health services. The adaptability of a health system to such threats, and its subsequent access to resources to support the delivery of health services, constitutes the resilience of the system [12]. Political violence disrupts service provision and delivery across service delivery modalities and support structures, which include the health workforce, infrastructure, supplies, health management information systems, and social engagement linkages [6]. In addition, other attentions are displaced by the increased conflict demands and pressures so that health and health service provision matters are deprioritized under extreme duress, including the different modalities by which the health service can be resumed [5]. Resilience mechanisms define how health and health service provision are disrupted and become altered by the stress induced through ongoing conflict pressures. Resilient health systems and services display these adaptive behaviours, including when the normal resources, structures, and modalities of operation are not available or severely reduced within these conflict modes [7]. The extensive experience and feedback of health systems in these conflict conditions have led to a rich account of resilient behaviours in the verbal, institutional, operational, accessible, participatory, and equity dimensions of health and health provision systems [4].

Case Synthesis: Comparative Insights from Emblematic Contexts

Health systems facing protracted armed conflict are highly vulnerable to a unique combination of threats that can compromise their capacity to deliver essential healthcare in support of health, well-being, and resilience outcomes [11]. Comparative analysis of numerous illustrative case studies has identified a selection of strategies across seven domains that have been successfully adapted and reconceptualized in response to these extreme conditions [12]. Collectively, these strategies constitute an initial inventory of resilience-building interventions that health system leaders can consider and adapt to the distinct socio-political, security, economic, demographic, and epidemiological characteristics of their conflict-affected context [12-18].

CONCLUSION

Health systems operating in conflict-affected environments confront multifaceted and intensified threats that challenge their ability to deliver essential services. Evidence from diverse settings demonstrates that resilience emerges from a dynamic interplay of adaptive governance, workforce capacity building, flexible service delivery, robust information systems, community engagement, and strategic financing. Effective resilience strategies require context-specific adaptations, including decentralization, contingency planning, and integration of external support, while maintaining attention to equity and ethical considerations. Strengthening these mechanisms can mitigate the impact of armed conflict, preserve essential health services, and facilitate post-conflict recovery. Moving forward, research and policy must prioritize systematic evaluation of resilience interventions, emphasizing locally informed, ethically sound, and sustainable approaches that balance immediate service continuity with long-term health system recovery.

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