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Health System Resilience in Conflict Zones: Lessons from Ukraine, Gaza, and Nigeria

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Abstract

An overwhelming stress is imposed upon health systems by armed conflict, creating breakdown of service delivery and destroying infrastructure. Furthermore, it leads to relocation of health workers, and paralysis of governing structures essential for coordinated effort. This paper analyzes the resilience of the health system-the ability of a health system to withstand, react to, and recover from sudden crises and to provide necessary services by comparing three conflict-endangered countries: Ukraine, Gaza, and northeastern Nigeria. Based upon an analyzing framework built with a health systems-building-blocks model, the paper examines how the countries suffered health service interruption, limited health workforce capabilities, weak medical supply channels, underdeveloped health information systems, ineffective financing, and lack of competent governance; and how domestic and international actors tried to uphold resilience amid acute vs protracted armed conflict scenarios. Although there are marked contrasts in conflict intensity and duration and international capacity response between these three regions, the recurring resilience strategies among them such as tasks division to community health workers, remote/mobile service provision, telemedicine, and humanitarian coordination networks, in particular WHO Health Cluster system can be observed. This paper suggests that resilience should be

treated not as an institutional feature, but as an actor-dependent process driven by interactions between security contexts, humanitarian accessibility and initial strengths of systems. The policy implications for governance of global health security, international human law implementation, and pre-conflict investment for system resilience are presented.

Keywords: health system resilience, conflict zone, global health security, Ukraine, Gaza, Nigeria, humanitarian health governance.

Introduction

Armed conflict is an immensely serious and prolonged health threat to populations (Truppa et al., 2024). Beyond battle deaths, the health systems to which people rely on for normal, and emergency, medical care are damaged – hospitals destroyed or turned to other purposes, health workers killed, displaced, or unable to reach them, supplies chains for medicines, and vaccines are broken and the surveillance systems to alert to a disease outbreak collapsed just when there is one (Ager et al., 2015). These systems collapses are an increasingly characterized by the WHO less as purely a humanitarian issue and rather as health security -as problems in one setting are prone to generating international cross- border risks in terms of disease spread, massive population displacement, protracted conflict and wider regional instability (WHO, 2007).

This paper addresses the concept of health system resilience (defined generally as the capacity of a system to prepare for, respond to, and recover from shocks while continuing to deliver the functions core to its existence – Kruk et al., 2015), in a comparison between three contemporary contexts of armed conflict differing significantly in nature of the crisis, its duration and international profile: the Russian invasion in Ukraine since Feb 2022 (WHO, 2023), the outbreak of fighting in Gaza since Oct 2023 (Mills et al., 2026), and the extended insurgency in northeastern Nigeria by Boko Haram and Islamic State West Africa Province (ISWAP) since 2009 (Ager et al., 2015).

The choice of these three cases is informed by deliberate purpose rather than random chance. Ukraine is an intensive inter-state conflict within middle-income, relativement health system- rich pre-war and very well-supported setting (WHO, 2024). Gaza is an acute, severe, conflict set within a blockaded high-density and already health system impoverished setting with blocked access for the humanitarian aid (Mills et al., 2026), and Nigeria a 'low-intensity but protracted insurgency' context within a lower-middle-income country, the weakly resilient system of which predated the onset of conflict, the whole in the face of relatively little international support or profile (Ager et al., 2015). Together, the three cases provide a comparative framework within which the characteristics of three resilience strategies vary in their capacity to support a system against the background differences in the types of conflict.

Literature Review

Conceptual Framework: Health System Resilience Under Conflict

The World Health Organization health systems building blocks of service delivery, health workforce, health information systems, essential medicines, financing, and leadership/governance inter-act in any functioning health system (WHO, 2007). In conflict situations, each component block undergoes stress

at once in a non-linear way, and this 'at once' characteristic differentiate conflict-induced health systems shocks from other events like natural disasters or disease epidemics not influenced by political or human action (Truppa et al., 2024).

The existing scholarship in resilience breaks this down by looking at system functions over a temporal span; it uses " absorptive capacity" to talk about retaining function during and using available capacity, " adaptive capacity" to describe changes to structure or procedure that an entity makes to take account of an event, and " transformative capacity" to describe restructuring of the entire system that occurs after an event has been weathered (Blanchet et al., 2017). Recent systematic reviews have reiterated that absorption and adaptation are the most described types of health systems response to shocks in fragile and conflict-affected settings, transformation is rare, though still "mentioned" (Truppa et al., 2024), and the present analysis categorizes the kind, not degree, of resilience described in the various case studies according to this tripartite taxonomy.

Literature relating to conflict shows that attacks on healthcare-intentional or not- are unique kinds of stress that effect health systems not only in operational, but also in legal ways since targeting facilities and personnel is a war crime defined in law within the Geneva Conventions (Geneva Convention I, 1949; Protocol I, 1977). This latter category is seen as inextricably related to the operational, since health systems can hardly be " resilient" to an attack that the rule of law cannot even inhibit, much less redress (Truppa et al., 2024).

Methodology

This study adopts a qualitative comparative case-study design which uses secondary data sources namely; humanitarian situation reports, peer review articles and world organization databases from 2020-2026 (Yin, 2014). The health systems building blocks as outlined in six frames of frameworks are used to describe each case; focus is also directed on; (a) identified interruptions of each building block, (b) resistance identified and response made and the type of resistance, namely absorptive, adaptive or transformational (Blanchet et al., 2017). Selection criteria was based on the most-different-systems framework which has selected contexts varied on their type of conflict (interstate, intrastate or insurgency), period of conflict (acute and protracted) and pre-conflict capacity of the health system (Yin, 2014) hence establishing resistance strategies across diverse starting circumstances rather than a single conflict type.

Case Study: Ukraine

Health facilities and workers have faced continuous, documented attacks by various sources and methods since the start of the large-scale invasion in Feb 2022. The WHO Surveillance system documented more than 1000 attacks in the first 15 months of large-scale invasion and more than 2000 in the first 2 years (WHO, 2023, 2024). In 2024, there have already been 487 reported attacks on health care, an increase from the previous year and bringing the total number of attacks to over 2500 in all of Ukraine since the large-scale invasion. 86% of these attacks targeted health facilities and the percentage of those targeting facilities has recently increased on nearly a daily basis since December 2023, with significant use of heavy weaponry.

Since February 2022, some 200 ambulances have been destroyed or damaged each year on average.

In front line and occupied oblasts, health facilities have been physically destroyed, and elsewhere they have absorbed mass influxes of patients, including numerous cases from trauma incidents and internally displaced people (WHO, 2024).

Despite devastating, prolonged attack, the Ukraine prewar health system is a moderately high-resource system, with an established well-trained health work force and functioning e-health records. Decentralizing trauma care to front-line stabilization points, large-scale war surgery training and use of telemedicine in ongoing chronic disease management of those displaced to remote areas are two of the forms of "rapid adaptation" taking place (Ager & Callahan 2024). Pre war, e-health enabled relatively swift adaption for tracking of the electronic health records of individuals, as they moved not only within Ukraine, but into nearby states as well, a capacity not present in the two cases discussed.

Mental health burden represents an additional, likely long-term challenge to resilience, as Post Traumatic Stress, Depression and Anxiety levels have risen among civilian and health workers (WHO, 2024). 10 million people in Ukraine are at risk of various mental health problems, ranging from "mild-to-severe" disorders (WHO, 2025). To this day, 4.7 million have been provided access to essential health services during 2024 by WHO and 15 million nation-wide ever since Feb 2022 (WHO, 2025 & WHO, 2024, accordingly). One can argue Ukraine's transformative capacity: "ability to restructure the system... To address needs that will almost certainly not evaporate when active conflict ceases" (Truppa et al., 2024) is very little tested.

Case Study: Gaza

The health system in Gaza reached the worst crisis in history post intensification of conflict from Oct 2023, in a system which already experienced a much tighter constraint system post the decade and half long blockade of Gaza (Mills et al., 2026). Analyzing the HeRAMS (Health Resources and Services Availability Monitoring system of theWHO) across the 35 Gaza hospitals between Oct 2023-Oct 2024 clearly revealed a swift breakdown in the hospital system capacity - 71.4% hospitals were partially functional by 28 Oct 2023 and 28.6% were partially nonfunctional. Low functionality never surpassed 33% after Dec 2023 and was at its lowest of 13.9% by Apr 5, 2024 (Mills et al., 2026).

Twice during the period, both on Jan 21 2024 and Feb 17 2024, two points had the highest numbers of non-functional hospitals- 25 out of 35, or 71.4% hospitals were completely unavailable (Mills et al., 2026).

Shortage of fuels, drugs and water severely impact even partially functioning health facilities. A large-scale death toll of health workers coupled with stringent humanitarian access controls of medical supplies resulted in the precarious resupply of even essential disposable medical devices (UNRWA, 2026). As per WHO in 2026-only a little over half of Gaza hospitals remained partially available along with 58% of health centers partially available and zero facilities fully available (WHO, 2026).

However, in Gaza the prior impacts of the blockade on the infrastructure of the pre-conflict system in addition to labor retention and equipment maintenance have left it more limited in absorptive capacity than Ukraine's before the current crisis (Mills et al., 2026). The observed coping strategies have been narrowing in scope, mainly limited to international NGOs with their creation of makeshift field hospitals,

extensive triage during a system's limited capacity, and the use of few, partly functional, facilities in a dense and very displaced setting (UNRWA, 2026). The collapse of nutrition with increasing incidences of acute childhood malnutrition shows the interplay of a health system in failure resulting from the armed conflict with food insecurity; which was not the case in Ukraine (Mills et al., 2026).

Humanitarian access limitations-in the form of check-point delays, restricted convoy approvals and moving evacuation orders impacting facilities, have served as a second form of resilience in Gaza. This stands in contrast with the Ukraine context, where humanitarian access has been more stable, as has demonstrated a context in Gaza in which restriction, even without physical damage, is likely to be a reason for system collapse (UNRWA, 2026). UNRWA has continued health services via mobile teams, mobile clinic sites, and centralized telemedicine, and it provides tens of thousands of patient consults annually (UNRWA, 2026).

Case Study: Northeastern Nigeria

Boko Haram and ISWAP insurgency in the states of Borno, Yobe and Adamawa has had a profoundly different pattern of conflict; much less intense at any point in time than Ukraine or Gaza, but having dragged on for over a decade and being characterized by discrete rather than a single event of displacement waves (Ager et al, 2015). Work on resilience of health systems in Yobe state highlighted the destruction of health facilities, loss of health personnel to relocation or attack by insurgency, theft of medical equipment, and deterioration of maternal/newborn health services (Ager et al, 2015). "Population movement and movement restriction had an important role in shaping the provision of access to services" (Ager et al, 2015) where the human resource for health capability of the state has greatly reduced by people of the state (particularly non-native ones) emigrating from the state and the discontinuing of support programs bringing in external experts (Ager et al, 2015).

Only around 32% of births in Yobe states were delivered in health facilities, which gives one an indication on access to health facilities and how conflict might exacerbate these problems (Ager et al, 2015). Primary health care infrastructure in the concerned states were weak before conflict thus making them even more frail during conflict times as they were in fact weakened, and not induced, by war (Ager et al, 2015).

The key stressor to health systems has been displacement in this case; with millions of internally displaced persons gathering mostly around Maiduguri and other large garrison centers has brought host facilities far past its limit (Ager et al, 2015). "Perhaps most notable resilience failure is the re-emergence of vaccine preventable diseases, which now includes a second round of wild poliovirus transmission, clearly resulting from an accumulated history of zero access to basic vaccination services that was inaccessible during the conflict" (WHO, 2024), thus threatening all efforts for polio eradication in West Africa.

Task-shifting to community health workers and the provision of healthcare by outreach and mobile health teams to populations located in areas of intermittent access to security, along with the integration of delivery of health services within the regional humanitarian cluster coordination system (Ager et al., 2015) have been widely utilized adaptive mechanisms. The dedication and motivation of staff-particularly local staff residing in the state- has maintained quality of healthcare and allowed for flexible

deployments of human resources (Ager et al., 2015). Unlike Ukraine and Gaza however, the case in Nigeria has received relatively far fewer donations and media coverage compared with documented needs, with definite implications for human resource needs and costs of resilience-building (Ager et al., 2015).

Comparative Analysis

Several cross-cutting patterns emerge from the analysis above:

Pre-existing system capacity and its effect on absorptive capacity. Ukraine's relatively strong pre-war system created a larger base absorptive capacity compared to Gaza's (conflict reduced system), or Nigeria's (underdeveloped primary health system), proving that pre-existing investments are disproportionately amplified in conflict contexts (Truppa et al., 2024).

The destruction of infrastructure doesn't alone determine adaptive capacity. Gaza's case shows even with some infrastructure intact, access limitations in terms of people, medicine and fuel brought the system down irrespective of direct damage - an important difference for humanitarian law & diplomacy, treating restrictions and physical damage differently (UNRWA, 2026).

Task-shifting/decentralization emerges as a key mechanism of adaptation in all three contexts. The different conflict type notwithstanding, the three situations converged toward similar strategies of adaptation: mobile care/outreach teams, a stronger reliance on community health workers and more points of access for services are all central characteristics in every system considered (Ager et al., 2015; Ager & Callahan, 2024). Indeed, systematic reviews show that absorption and adaptation are the two most commonly referenced capacities of health resilience in post conflict settings (Truppa et al., 2024).

Global attention & resource allocations are disproportionately allocated according to health need. Nigeria, by highlighting a case of health damage accumulation through a protracted, relatively low intensity conflict, illuminates disparities among conflicts regarding sustained international attention that is germane for global health security prioritization (Ager et al., 2015).

Transformational capacity is the most under-developed aspect in all three cases. "Systematic reviews establish that transformation is poorly discussed in research on fragile and conflict affected countries (Truppa et al, 2024)"351. In no case is it clear that a definitive transition has occurred from adaptive coping to true post conflict system transformation, though Ukraine has the most robust institutional support to achieve this once conflict itself is over (Truppa et al, 2024).

Discussion and Policy Implications

The implications of these findings for global health security policy are several. First, the findings uphold the idea of pre-conflict health system strengthening as security preparedness, not just development: The capacity for absorption at the outbreak of conflict appears to influence long-term outcomes (Truppa et al., 2024). Second, the case of Gaza, in particular, enhances the argument that a lack of humanitarian access should be viewed as a health-system stressor in and of itself within global health security, and not as a disconnected humanitarian access question apart from health outcomes (UNRWA, 2026).

Third, convergence toward both task-shifting and decentralisation across all three cases points to how pre-existing preparedness in terms of these adaptations – not on-the-fly adjustment post-onset – has the potential to reduce adaptation duration in future crises (Ager & Callahan, 2024). Fourth, the stark difference between a case and two humanitarian access cases of the level of the global attention they receive raises a question of global health security equity; investment decisions may track conflict visibility and geopolitical saliency over demonstrated health system's needs, implying that agencies such as the WHO Health Emergencies Programme may systematically deprioritize protracted, low-visibility, complex emergencies (Ager et al., 2015).

Finally, all three of the cases demonstrate an ongoing deficiency in the accountability for attacks on the health sector in armed conflict under international humanitarian law; the improvement of such accountability should be seen as one component in health system resilience strengthening policy, not apart from it (Truppa et al., 2024).

Limitations

All of these secondary analyses use reports, much of which were written under active conflict with resulting implications for the verification and completeness of data (Yin, 2014). Reports were also published with varying frequency and completeness- Ukraine and Gaza with extensive media and agency reports over longer periods and Northeast Nigeria less so and it's possible this data reflects the comparative gravity of the Nigeria case more poorly than the conflict itself (Ager et al, 2015). Thirdly, the three cases studies are not finalized but ongoing cases so that the claims on transformative capacity presented can, and should be, tested as cases develop (Truppa et al, 2024).

Conclusion

We need to rethink resilience in health systems operating in a conflict setting not as an intrinsic feature of an institution but as a co-created process, resulting from the combination of a pre-existing system capacity, the types and time scales of conflict and the humanitarian space provided to health actors (Truppa et al., 2024). By comparatively assessing the situation of Ukraine, Gaza and north-eastern Nigeria we propose that task-shifting, decentralization and the mobility of healthcare providers emerge as consistent coping mechanism across a broad variety of conflicts, while the other two dimensions of resilience absorptive and transformative capacity remain heavily contingent on pre-conflict funding of health systems and post-conflict international commitments, respectively (Ager et al., 2015; Ager & Callahan, 2024). Global health security must be grounded in an understanding of protection of humanitarian access, respect for IHL and pre-conflict health system investment as interrelated, rather than distinct, tools.

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