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Research Article

Building Resilient One Health Systems: Lessons from the COVID-19 Pandemic and Implications for Somalia

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Abstract

The COVID-19 pandemic presented unprecedented challenges to global health systems and economies, underscoring the urgent need for comprehensive strategies to build resilient One Health systems. This paper examines the lessons learned from the pandemic, focusing on its impact on health leadership, finance, and livelihoods, particularly highlighting the vulnerabilities at the human-animal-environment interface. It emphasizes the importance of equitable resource distribution, proactive inter-sectoral collaboration, and sustained investment in public health systems, particularly in low- and middle-income countries (LMICs). The study utilizes a qualitative case analysis methodology, synthesizing reports, academic literature, and policy documents, to explore the specific challenges faced by Somalia, a country with a fragile healthcare system compounded by decades of conflict, during the pandemic. Furthermore, it explores opportunities for strengthening healthcare infrastructure and enhancing disease surveillance through integrated approaches as critical components of building resilience in preparation for future health crises. Anticipated outcomes include identifying critical vulnerabilities and proposing contextually relevant, actionable strategies for resource-constrained settings. The paper concludes with detailed and prioritized actionable recommendations for strengthening One Health systems globally and specifically within the context of Somalia, a nation grappling with unique challenges in its recovery from conflict and building resilient health infrastructure capable of withstanding future shocks.

Keywords

One Health, COVID-19, Somalia, Pandemic Preparedness, Health Systems Resilience, Disease Surveillance, Health Equity, Fragile States

1. Introduction

The COVID-19 pandemic, a defining event of the 21st century, has, by many measures, been the largest disaster in living memory. Conservative estimates suggest over 6.5 million confirmed deaths within the first three years of the pandemic, a figure potentially exceeding 1 in 1,000 people globally. The economic consequences have been equally profound, with initial estimates suggesting a global economic cost potentially reaching upwards of $8.8 trillion under prolonged containment scenarios (Gopinath, 2022 [1]; Asian Development Bank, 2020 [2]). Beyond the immediate economic impact, the socioeconomic ramifications of the pandemic are substantial, representing a significant reversal of development gains. This includes pushing an estimated 71 million additional people back into extreme poverty in 2020 alone, disrupting education for over 90% of the world's students at the peak of school closures (affecting 1.57 billion learners), and

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heightening social inequalities (UNICEF, 2021 [3]; United Nations, 2020 [4]; World Economic Forum, 2022 [5]).

The pandemic exposed critical vulnerabilities in global health systems, particularly the lack of preparedness for rapidly spreading respiratory pathogens and the deep fissures in global health equity. It vividly highlighted the interconnectedness of human, animal, and environmental health, reinforcing the understanding that factors like habitat disruption and increased human-animal contact can drive zoonotic spillover events, the likely origin of SARS-CoV-2 (Adisasmito et al., 2022 [6]; Centers for Disease Control and Prevention, n.d. [8]). It underscored the urgent need for a One Health approach, which recognizes that the health of humans is inextricably linked to the health of animals and the stability of the ecosystems they share (WHO, 2022 [7]; Centers for Disease Control and Prevention, n.d. [8]). This approach necessitates integrated governance structures promoting interdisciplinary collaboration and coordination across sectors – including public health, veterinary medicine, agriculture, and environmental management – to prevent, detect, and respond effectively to emerging health threats (Adisasmito et al., 2022 [6]).

This paper contributes to the literature by synthesizing key lessons from the COVID-19 pandemic's devastating effect on health leadership, finance, and livelihoods, specifically focusing on how these lessons can be leveraged to build robust and adaptive One Health systems. The analysis illuminates the critical incidents and challenges faced by stakeholders during the pandemic. The goal is to leverage these lessons to inform future preparedness and response strategies, especially within the context of strengthening One Health systems globally, with a specific focus on the unique context of Somalia. Somalia, a nation emblematic of fragile state contexts, with a healthcare system severely weakened by decades of conflict and instability, provides a crucial case study (Warsame et al., 2017 [9]; Doctors Without Borders, 2024 [10]). Its limited state capacity, fragmented governance, vast territory with mobile populations, and pre-existing humanitarian crises made it exceptionally vulnerable to the pandemic's multifaceted impacts. By focusing on Somalia, the paper addresses a gap in the literature regarding health system resilience in conflict-affected, low-income settings within a One Health framework, offering insights potentially transferable to similar contexts characterized by fragility and resource constraints. This paper outlines these challenges, reviews the improvements made post-pandemic, and provides actionable recommendations for strengthening One Health systems in Somalia, with a particular emphasis on fostering resilience against future health crises.

2. COVID-19 Pandemic and Health Inequalities

Historically, global health has been shaped by a relatively small group of powerful actors. These include high-income countries (HICs), multinational pharmaceutical companies, and international and multilateral organizations from both the private and public sectors. These actors have largely determined research priorities, funding streams, and the distribution of health interventions, resulting in significant disparities in resource allocation and power dynamics that often disadvantage LMICs (Kentikelenis & Rochford, 2019 [11]). Kuehn, B. M., 2021. High-income countries have secured the bulk of COVID-19 vaccines. JAMA, 325(8), p.710. Available from: https://doi.org/10.1001/jama.2021.0189 (accessed 1 May 2025).

The declaration of a Public Health Emergency of International Concern (PHEIC) for COVID-19 on January 30, 2020, initiated an unprecedented degree of global collaboration (WHO, n.d. [12]). This cooperation facilitated the remarkably rapid development and deployment of COVID-19 vaccines, treatments, and diagnostics. However, the distribution of these life-saving resources was profoundly inequitable. HICs utilized their economic power to secure the bulk of initial supplies through mechanisms like advance purchase agreements directly with manufacturers, often buying doses far exceeding their population needs, leaving LMICs facing significant delays and shortfalls (Kuehn, 2021 [13]; Alkhaldi et al., 2024 [14]). This inequity was further compounded by the limited capacity of many LMICs to manufacture or procure these essential resources, alongside challenges in cold-chain logistics, workforce availability for vaccine administration, and addressing vaccine hesitancy fueled by misinformation and mistrust (Alkhaldi et al., 2024 [14]; Tso et al., 2025 [20]). Furthermore, non-pharmaceutical interventions (NPIs), such as lockdowns and school closures, while effective in some contexts, were often less appropriate or feasible in LMICs due to factors like reliance on the informal economy, crowded living conditions, and limited social safety nets, with economic and social consequences disproportionately felt by vulnerable populations in these settings (Li et al., 2021 [15]).

While the Access to COVID-19 Tools Accelerator (ACT-A) and its vaccine pillar, COVAX, were established to accelerate the production of and access to COVID-19 interventions, they faced significant hurdles. Limited funding, vaccine nationalism practiced by HICs, and export restrictions hampered their ability to fully overcome existing inequities and ensure timely, sufficient supply for LMICs (Eccleston-Turner & Upton, 2021 [16]). The COVID-19 pandemic has consequently spurred intensified calls for more equitable and inclusive global health systems. Activists and policymakers are advocating for marginalized communities to be central in decision-making processes within more democratic and transparent global health governance structures, potentially through mechanisms like a strengthened international pandemic treaty (Lancet Global Health, 2023 [17]). Models for more equitable and globally scalable regional governance, such as the African Vaccine Delivery Alliance (AVDA), are emerging as potential blueprints for regional self-reliance and

coordination (AVDA, 2021 [18]). The pandemic starkly revealed the urgent need for increased domestic and international investment in public health systems, particularly in LMICs, to better prepare these countries for future pandemics by strengthening core capacities like surveillance, laboratory diagnostics, and workforce development (Alkhaldi et al., 2024 [14]).

The rapid development and authorization of COVID-19 vaccines remain an extraordinary testament to the power of scientific collaboration. As of March 2023, approximately 70% of the global population had received at least one dose of a COVID-19 vaccine (WHO, 2023 [19]). However, disparities persist dramatically. While vaccination rates in HICs often exceeded 75%, rates in many low-income countries remained stubbornly below 30% well into 2023, representing a major failure in global solidarity (Alkhaldi et al., 2024 [14]; WHO, 2023 [19]; Tso et al., 2025 [20]). Mathematical modeling indicates that millions of deaths could have been prevented with increased and equitable vaccine coverage, even without considering the broader economic and social benefits of faster global vaccination (Watson et al., 2022 [21]). These inequities stem from a complex interplay of factors including a failure to include LMICs in global decision-making processes, vaccine nationalism, widespread misinformation campaigns, restricted vaccine manufacturing capacity, and significant logistical hurdles in delivering vaccines ("last mile" challenges) within resource-poor settings (Alkhaldi et al., 2024 [14]; Tso et al., 2025 [20]). Recent studies continue to analyze the long-term effects of these inequities – including divergent economic recoveries and erosion of trust – and the ongoing challenges in achieving global health security post-COVID-19 (e.g., Mburu et al., 2025 [22]; Tso et al., 2025 [20]).

3. COVID-19 in Somalia: Situation Analysis and Main Challenges

Somalia, navigating a complex transition from decades of conflict, with one of the world's most fragile healthcare systems, a large internally displaced population (IDP) often living in precarious conditions, and a nascent bureaucracy still recovering from state collapse, faced unique and profound vulnerabilities during the COVID-19 pandemic (CARE, 2020 [23]; Warsame et al., 2017 [9]). The country was potentially less prepared than almost any other country in the world (CARE, 2020 [23]). Decades of conflict have systematically dismantled the health infrastructure, leading to severely limited access to healthcare services, particularly in rural and conflict-affected areas, unacceptably high maternal and child mortality rates (among the world's highest), and a critical shortage of trained medical professionals, equipment, and essential medicines (Doctors Without Borders, 2024 [10]; Warsame et al., 2017 [9]). The onset of the coronavirus threatened to undermine Somalia's recent progress toward crucial international debt relief and risked exacerbating insecurity by potentially tempting the Al-Shabaab insurgency to step up attacks or exploit governance gaps.

Compounding the situation, the virus emerged during a period of heightened political tension between the federal government in Mogadishu, opposition groups, and the country's federal member states. Disputes over resource sharing, electoral processes, and constitutional ambiguities created an environment of mistrust that significantly hampered the coordinated national response to the pandemic. This political fragmentation often led to parallel or conflicting policies and resource allocation challenges between the federal and state levels.

The crisis inflicted a significant economic toll. Containment measures, though implemented with varying degrees of enforcement across regions, disrupted daily livelihoods, particularly for the vast majority relying on informal sector work. Local and regional trade routes were interrupted. The country was already struggling with a devastating desert locust invasion, the worst in decades, which decimated crops and pastureland, further threatening food security. The pandemic compounded this by leading to a significant drop in remittance income, as economic shutdowns around the world affected the earnings of the large Somali diaspora. Remittances constitute a vital economic lifeline for many Somali families, estimated to represent a substantial portion of the national GDP, and the decline severely exacerbated poverty and food insecurity (World Bank, 2016 [24]).

President Farmajo's first term in office was marked by ongoing tension between the federal government and Somalia's regions over the nature of the federal system. The president favored a strong central government, while federal states and other political actors sought to protect their prerogatives within a looser federal model. This political fragmentation hindered the implementation of a unified national strategy for pandemic response. In response to the COVID-19 crisis, federal states implemented their own policies regarding movement restrictions, public gatherings, and resource mobilization, which often mirrored the federal government's measures but sometimes differed in timing or scope, further complicating response efforts and potentially leading to confusion among the populace.

Research Approach: This analysis of the COVID-19 impact in Somalia utilizes a qualitative case study approach. Data was primarily collected through systematic review of publicly available reports from international organizations (e.g., WHO, World Bank, UNICEF, OCHA), news articles and press releases (e.g., CARE [23], MSF [10]), relevant academic literature focusing on health systems in fragile states (e.g., Warsame et al., 2017 [9]), and policy briefs related to Somalia's COVID-19 response and health system challenges during the period 2020-2023. The analysis involved thematic synthesis of information on the reported challenges (health, economic, political), vulnerabilities (infrastructure, governance, population displacement), and response strategies employed (NPIs,

international aid coordination, state-level actions). Findings were interpreted within the broader context of Somalia's socio-political landscape, its history of conflict, and its severe health infrastructure limitations. The focus was on understanding the 'how' and 'why' of the pandemic's disproportionate impact and the complex dynamics of response in this specific fragile setting.

4. Opportunities Arising During the Pandemic

Despite the formidable challenges, the pandemic context also inadvertently created potential strategic openings for Somalia to strengthen its systems, particularly through re-engagement with and support from international partners. These opportunities provide a potential pathway towards building a more resilient health system, provided they are strategically leveraged. Somalia found itself in a favorable position with international financial institutions (IFIs) for the first time in 30 years (World Bank, 2020 [25]). Having successfully navigated the complex process to clear its longstanding arrears to the World Bank, Somalia regained access to concessional financing from the Bank's International Development Association (IDA). This included eligibility for support from the $14 billion fast-track financing facility established specifically to assist countries to prevent, detect, and respond to COVID-19. This funding provided a crucial and timely opportunity to channel resources towards strengthening the under-resourced health system, procuring essential supplies, and implementing critical public health measures.

Simultaneously, Somalia embarked on a three-year macroeconomic monitoring process under the Heavily Indebted Poor Countries (HIPC) Initiative. With over $3 billion in additional debt relief potentially at stake upon successful completion, Somalia had a strong incentive to strike new agreements with IFIs that reflected the rapidly shifting economic conditions caused by the pandemic and other shocks, while preserving momentum on crucial reforms. These reforms included efforts to expand the government's domestic revenue base, improve financial transparency and public financial management, and increase the allocation of funds to essential public services, including health. The pandemic, therefore, provided an unlikely catalyst for Somalia to accelerate progress on financial governance and attract further international support linked to reform benchmarks. Furthermore, a basis for tighter cooperation between Mogadishu and the federal member states existed, despite underlying political tensions. The federal government, as the primary recipient and conduit for international aid, had a crucial opportunity to demonstrate leadership and build trust by overcoming political divides through the fair, transparent, and rapid distribution of assistance (including medical supplies, financial support, and vaccines). Effective coordination of aid distribution was critical not only for the immediate pandemic response but also for strengthening state legitimacy and fostering national unity by ensuring resources reached those most in need across all regions.

5. Post-Pandemic Improvements in Health Systems, Infrastructure, and Service Delivery

The pandemic, despite the immense tragedy it represented, acted as a catalyst spurring tangible and significant improvements in various aspects of Somalia's healthcare system. These improvements, often facilitated by focused international support and government prioritization driven by the crisis, provide a foundation – albeit still fragile – for building a more resilient health system capable of better withstanding future shocks.

1) Strengthening Disease Surveillance: Recognizing the critical weakness exposed by COVID-19, enhancing the capacity for early detection and rapid response became a priority. This involved investing in more functional real-time monitoring systems, establishing more effective information-sharing networks between different health system levels, and strengthening collaboration between human and animal health sectors under the One Health banner. Post-pandemic, the country established additional dedicated disease surveillance centers and a designated national center for public health emergencies and humanitarian crises. Crucially, the National Institute of Health (NIH) was formally established and operationalized. Its explicit mandate includes strengthening national surveillance capabilities, conducting public health research relevant to Somalia, providing training, and coordinating efforts to meet the core capacities required by the International Health Regulations (IHR 2005) (National Institute of Health - Somalia, n.d. [26]). The NIH has already hosted national public health conferences and graduated several cohorts of field epidemiology trainees focused specifically on enhancing disease surveillance on the ground (National Institute of Health - Somalia, n.d. [26]), representing a vital investment in human capital.
2) Investing in Healthcare Infrastructure: Adequate healthcare infrastructure is fundamental for any effective pandemic response. Progress was made in increasing the physical capacity for critical care, including the equipping of at least two major referral hospitals (including Demartino Hospital in Mogadishu) with modern, well-equipped Intensive Care Units (ICUs) and, significantly, independent oxygen plant factories. These oxygen plants reduce reliance on expensive and logistically challenging imported oxygen cylinders, directly benefiting not only COVID-19 patients but all hospital users requiring respiratory support and enhancing overall emergency capacity. Additionally, the establishment of a functional national blood bank and a dedicated na-

tional public health emergency operations center (PHEOC) were major steps forward, significantly improving the country's healthcare infrastructure and coordination capacity for future emergencies. While needs remain vast, especially in rural areas, these represent critical upgrades.

3) Building a Skilled Workforce: Healthcare workers form the frontline during pandemics. Investing in their training, continuous professional development, and occupational safety (including provision of Personal Protective Equipment - PPE) is paramount. Efforts were made to strengthen the recruitment and retention of healthcare professionals, although significant challenges persist, particularly in attracting and keeping skilled staff in remote and insecure rural areas (Warsame et al., 2017 [9]). Targeted training programs related to infectious disease management, critical care, and public health surveillance were implemented, contributing to upskilling the existing workforce.

6. Leveraging Lessons Learned from the Pandemic for Resilience Building

The COVID-19 pandemic provided invaluable, albeit harsh, lessons that must inform future preparedness and response strategies. These lessons are particularly relevant for Somalia, which faces a unique confluence of challenges – fragility, resource scarcity, climate vulnerability, and ongoing insecurity – in building a resilient health system capable of effectively responding to future crises within an integrated One Health framework.

1) Promoting Research and Development: Research and development are critical for advancing our understanding of emerging diseases within the local context and developing effective, contextually appropriate interventions. Encouraging local scientific research, for instance, on pathogen prevalence, transmission dynamics in displaced populations, or effectiveness of specific NPIs in the Somali setting, is vital. Fostering collaboration with international research partners while ensuring equitable partnerships and capacity building and supporting innovation in diagnostics (e.g., rapid, point-of-care tests), therapeutics, and vaccines will enhance preparedness and response capabilities. Somalia can benefit immensely from participating in global research efforts and simultaneously nurturing local capacity for research and innovation, leveraging institutions like the National Institute of Health (National Institute of Health - Somalia, n.d. [26]). Adopting innovative approaches, such as the strategic deployment of mobile health (mHealth) technologies for real-time surveillance reporting from remote areas, appointment reminders, or health education dissemination, or establishing decentralized, community-based diagnostic testing platforms using technologies suitable for low-resource settings (e.g., LAMP assays), drawing lessons from successful implementations elsewhere (World Economic Forum, 2025 [27]; Asiimwe et al., 2024 [28]), could significantly enhance Somalia's capacity for early detection and response.
2) Risk Communication and Community Engagement: Open, honest, and transparent communication is the bedrock of public trust and cooperation during a health crisis (Wise et al., 2016 [29]). Developing effective risk communication strategies that provide timely, accurate, clear, consistent, and culturally sensitive information to the public, using accessible channels and languages, is essential. Critically, community engagement must move beyond simple information dissemination towards genuine partnership. Engaging communities meaningfully in decision-making processes (e.g., planning local response measures, designing health campaigns), actively addressing their concerns and rumors, and incorporating local knowledge and perspectives into response plans will strengthen community resilience, improve adherence to preventive measures, and enhance accountability (Wise et al., 2016 [29]; Gilmore et al., 2025 [30]). In Somalia, effective communication must navigate linguistic and cultural diversity, address varying literacy levels, utilize trusted local channels (e.g., radio, community leaders, religious figures), and overcome limited access to information in certain regions. Furthermore, institutionalizing community participation through mechanisms like health facility committees, participatory budgeting for local health priorities, and establishing clear feedback and accountability loops can build enduring trust and shared responsibility, vital in fragile contexts where state legitimacy may be contested (Gilmore et al., 2025 [30]; Palmer et al., 2009 [31]). Empowering local leaders and Community Health Workers (CHWs), who often serve as trusted intermediaries, is key in this regard (Asiimwe et al., 2024 [28]). These multi-stakeholder collaborations, when properly aligned, ensure sustainability and mutual accountability (Palmer et al., 2009 [32]).
3) Strengthening One Health Collaboration: Recognizing the fundamental principle that human, animal, and environmental health are interconnected is critical for preventing future pandemics, many of which originate at the human-animal interface (WHO, 2022 [7]; Centers for Disease Control and Prevention, n.d. [8]). Enhancing structured and routine collaboration between the health, agriculture, livestock, environment, and wildlife sectors will facilitate the early detection and prevention of zoonotic diseases. This requires moving beyond ad-hoc cooperation to establishing formal mechanisms such as implementing joint surveillance systems (e.g., monitoring pathogens in livestock markets or wildlife populations alongside human cases), developing protocols for joint outbreak investigations, sharing data and ex-

pertise through integrated platforms, and developing integrated policies and strategies (Adisasmito et al., 2022 [6]). In Somalia, this requires concerted effort to address the significant challenges of limited resources, personnel, and infrastructure within the animal health and environmental sectors, potentially through pooled funding mechanisms and joint capacity-building initiatives.

4) Addressing Socioeconomic Determinants of Health: Vulnerabilities exposed during pandemics are often deeply rooted in underlying socioeconomic factors, especially pronounced in fragile states like Somalia (Palmer et al., 2009 [31]). To build true health system resilience, it is crucial to address these determinants through multi-sectoral action. This includes investing in poverty reduction programs, improving access to clean water and sanitation (WASH), promoting food security and nutrition, expanding access to education, and strengthening social protection programs (e.g., cash transfers for vulnerable households). By addressing these factors, we can reduce the underlying vulnerability of communities to infectious diseases by improving baseline health status, reducing overcrowding, and enabling adherence to public health measures. In Somalia, this necessitates addressing the root causes of poverty, conflict, and displacement, alongside long-term investment in basic infrastructure (housing, WASH) and essential services.
5) Establishing Comprehensive Emergency Preparedness Plans: Developing robust, multi-hazard, and well-coordinated national and sub-national emergency preparedness and response plans is essential foundation for effective action. These plans should outline clear roles and responsibilities across government ministries, agencies, and partners, establish unambiguous lines of communication and command structures, and define protocols for rapid response activation, resource allocation (including surge capacity for personnel, beds, and supplies), and logistics/supply chain management. Regular multi-agency drills, tabletop simulations, and post-incident evaluations are crucial to test plans, identify gaps, ensure familiarity among responders, and continuously improve readiness for future pandemics and other health emergencies.

7. Action Points and Way Forward: Strengthening One Health in Somalia

To build a more resilient health system in Somalia, capable of preventing, detecting, and responding to diverse health threats, it is essential to implement a comprehensive and institutionalized One Health approach. The following action points provide a framework for strengthening One Health in Somalia and enhancing its overall health security and resilience:

1) Establish Formal Interdisciplinary Platforms: Create and sustain functional platforms (e.g., a national One Health task force, technical working groups, joint committees) that bring together human health, animal health (livestock and wildlife), environmental health professionals, and other relevant sectors (e.g., water, agriculture, disaster management) for regular communication, joint planning, knowledge sharing, and coordinated decision-making (Adisasmito et al., 2022 [6]). Formalizing these structures with clear terms of reference and dedicated resources is particularly important given Somalia's historically limited inter-sectoral collaboration.
2) Promote Integrated One Health Education and Training: Incorporate One Health principles and competencies into the pre-service and in-service training curricula for healthcare professionals, veterinarians, agricultural extension workers, environmental officers, and other relevant stakeholders. Adapting curricula to reflect the specific zoonotic risks and environmental challenges within the Somali context is crucial for fostering a shared understanding and collaborative mindset from the ground up.
3) Develop Shared Data and Information Systems: Establish mechanisms and protocols (e.g., interoperable or integrated databases, standardized data collection methods, secure information-sharing platforms) for routine sharing of relevant surveillance data (human disease, animal disease, environmental indicators) between human and animal health sectors. Timely data exchange enables early detection of potential cross-species threats and facilitates evidence-based joint risk assessment and response planning, while ensuring appropriate data privacy and security safeguards.
4) Conduct Joint Surveillance, Risk Assessment, and Research: Actively collaborate on surveillance activities (e.g., integrated surveillance at livestock markets, monitoring antimicrobial resistance across sectors) and research projects involving both human and animal health sectors (e.g., joint outbreak investigations, mapping zoonotic disease hotspots, shared laboratory testing capacity, cross-sectoral studies on climate change impacts on health). Research should prioritize Somalia's specific challenges (e.g., camel-borne diseases, Rift Valley Fever) to ensure local relevance and impact.
5) Develop Coordinated Outbreak Response Protocols: Develop and regularly test clear standard operating procedures (SOPs) for joint outbreak response, outlining roles, responsibilities, communication pathways, coordinated public messaging, joint rapid response teams, and synchronized control measures for various zoonotic and other shared threats. Ensuring clear leadership and decision-making authority during joint responses is critical during crises.
6) Enhance Multi-Level Communication Channels: Estab-

lish and maintain effective communication channels (e.g., regular inter-ministerial meetings, technical workshops, shared online platforms, joint field missions) between relevant sectors at national, regional (federal member state), and local (district) levels. Clear, consistent communication fosters mutual understanding, trust, and effective collaboration, especially important when navigating potential language barriers, varying technical capacities, and geographical distances.

7) Engage Diverse Stakeholders Meaningfully: Systematically engage a wide range of stakeholders – including human and animal health professionals, relevant government ministries, academic and research institutions, non-governmental organizations (NGOs), the private sector (e.g., livestock traders), community leaders, and local communities – in joint initiatives, planning workshops, and policy development processes (Wise et al., 2016 [29]). Involving varied perspectives ensures a comprehensive, locally acceptable, and sustainable approach, building ownership and collective responsibility.
8) Align Policy and Regulatory Frameworks: Review and, where necessary, revise national policies, legislation, and regulatory frameworks to explicitly promote and enable One Health collaboration (e.g., harmonizing disease surveillance and reporting requirements, streamlining processes for joint investigations, aligning animal health and public health regulations, developing national antimicrobial resistance action plans). Policy coherence provides a supportive legal and administrative framework for integrated One Health actions.
9) Foster Strategic International Collaboration: Actively engage in regional and international collaborations and One Health initiatives (e.g., Africa CDC, WHO, FAO, WOAH networks) to share experiences, leverage technical expertise, mobilize resources, and adopt best practices. Partnerships facilitate access to crucial funding, technical support, advanced training opportunities, and capacity building, allowing Somalia to learn from other countries' experiences and integrate global standards while adapting them to its unique context (Palmer et al., 2009 [31]).

8. Conclusions and Recommendations

The COVID-19 pandemic has profoundly impacted the world, laying bare the vulnerabilities of interconnected global systems and challenging healthcare systems and economies unlike any event in recent history. Somalia, already facing immense pre-existing challenges linked to conflict and fragility, endured significant hardship but also witnessed remarkable resilience among its healthcare professionals, researchers, communities, and leadership. The pandemic experience underscored, with painful clarity, the critical importance of proactive preparedness, robust surveillance, and adaptive healthcare systems capable of scaling up rapidly during crises.

The One Health approach, with its integrated perspective on human, animal, and environmental health, offers a comprehensive and essential framework to build truly resilient systems equipped for pandemic prevention, early detection, and effective response (WHO, 2022 [7]; Adisasmito et al., 2022 [6]). Leveraging the hard-won lessons from COVID-19 presents a critical opportunity to create a safer, healthier future for Somalia and other vulnerable settings facing similar complexities. Building resilient One Health systems, however, is not a short-term project; it requires unwavering political commitment, sustained multi-sectoral collaboration, predictable financing, and continuous investment in core capacities. The lessons from COVID-19 provide a unique window to re-evaluate existing systems, honestly identify critical gaps, and implement transformative, evidence-based reforms. For Somalia, this is a pivotal moment to leverage the heightened global health security focus and available international support to strategically rebuild and reform its health system, making it fundamentally more resilient, equitable, and responsive to the inevitable health threats of the future.

Based on the analysis presented, the top priority recommendations for strengthening health system resilience through a One Health approach in Somalia are:

1) Strengthening Integrated Surveillance and Early Warning Systems: Substantially invest in advanced, integrated surveillance technologies (including genomics for pathogen characterization and digital platforms for real-time data [27]), enhance laboratory diagnostic capacities for both human and animal pathogens, establish robust, multi-level reporting mechanisms (actively utilizing CHWs and community-based surveillance [28]), and develop national capacity for rapid risk assessment to ensure swift threat identification and enable proactive containment strategies. This forms the cornerstone of early detection.
2) Prioritizing Healthcare Infrastructure and Foundational Capacity Building: Strategically invest in expanding and modernizing essential healthcare facilities (prioritizing primary healthcare access alongside critical care capacity), ensuring sufficient hospital beds, essential equipment (including diagnostics and PPE), reliable utilities (WASH, power), and a well-distributed, trained, and motivated health workforce across the country, particularly focusing on bridging the gap in underserved rural and remote areas (Doctors Without Borders, 2024 [10]). This builds the core capacity to respond.
3) Promoting People-Centered Public Health Communication and Community Engagement: Develop evidence-based, culturally appropriate risk communication strategies utilizing trusted channels, and actively institutionalize mechanisms for meaningful community engagement and participation in health system governance, priority setting, and response efforts. This builds crucial

trust, promotes health literacy, enhances accountability, and empowers individuals and communities as partners in health (Wise et al., 2016 [29]; Gilmore et al., 2025 [30]).

Other vital recommendations include prioritizing contextually relevant research and development (leveraging the NIH [26]) and concertedly addressing the underlying socioeconomic determinants of health vulnerability through multi-sectoral policies and programs (Palmer et al., 2009 [31]). Implementing these recommendations requires a long-term vision and sustained political will, transcending short-term crises.

Abbreviations

ACT-A	Access to COVID-19 Tools Accelerator
AVDA	African Vaccine Delivery Alliance
CHW	Community Health Worker
COVID-19	Coronavirus Disease 2019
FAO	Food and Agriculture Organization
HIC	High-Income Country
HIPC	Heavily Indebted Poor Countries
IDA	International Development Association
IDP	Internally Displaced Population
IFI	International Financial Institution
IHR	International Health Regulations
ICU	Intensive Care Unit
LAMP	Loop-mediated Isothermal Amplification
LMIC	Low- and Middle-Income Country
mHealth	Mobile Health
MSF	Médecins Sans Frontières (Doctors Without Borders)
NIH	National Institute of Health
NPI	Non-Pharmaceutical Intervention
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OHHLEP	One Health High-Level Expert Panel
PPE	Personal Protective Equipment
PHEIC	Public Health Emergency of International Concern
PHEOC	Public Health Emergency Operations Center
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
SOP	Standard Operating Procedure
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization
WOAH	World Organisation for Animal Health

Author Contributions

Abdirazak Yusuf Ahmed is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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Biography

Abdulrazaq Yusuf Ahmed, a distinguished and accomplished Health Systems Specialist and Senior Healthcare Manager, brings a wealth of experience and expertise to the field, with over 15 years of notable accomplishments in healthcare leadership, health systems management, disaster management, research, and academic writing. His comprehensive background and proficiency in public health and infectious diseases make him a valuable asset in the healthcare industry. Currently serving as the Director General of Demartino Public Hospital in Mogadishu, Somalia, Dr. Abdulrazaq has spearheaded the implementation of standardized protocols that have yielded remarkable improvements in patient outcomes, including reduced mortality rates, shortened length of stay, and heightened patient satisfaction scores. As a dedicated Senior Managing Director and Public Health Expert, Dr. Abdulrazaq's strategic leadership acumen, problem-solving skills, and proficiency in data analytics continue to drive positive change in healthcare delivery. His relentless pursuit of excellence underscores his commitment to providing sustainable, high-quality healthcare services and advancing public health initiatives for the betterment of society as a whole. Dr. Abdulrazaq Yusuf Ahmed has made significant contributions in the healthcare sector through his leadership and management skills. He has played a crucial role in improving patient outcomes, responding to emergencies and outbreaks, and strengthening health systems in Somalia.