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| RESEARCH ARTICLE

Governance Challenges in Delivering Public Health Services to Rohingya Refugee Populations in Bangladesh: A Field-Informed Institutional Analysis

Md Ikram Hossain Bhuiyan, Policy Analyst, Policy & Advocacy Department, BRAC, Dhaka, Bangladesh
Labani Akter, Student, Heartland Community College, Normal, USA
Corresponding Author: Md Ikram Hossain Bhuiyan, **E-mail**: ikram.hossain321@gmail.com

| ABSTRACT

By 2021, the Rohingya refugee crisis in Cox's Bazar, Bangladesh, had evolved from an acute emergency into a heavily protracted humanitarian situation, a transition severely compounded by the operational challenge of the COVID-19 pandemic. While initial relief efforts successfully averted widespread mortality, the long-term delivery of primary public health services faces increasing constraints from centralized bureaucratic approval mechanisms, institutional fragmentation, and uncoordinated policy execution. Diverging from exclusively theoretical institutional analyses, this paper adopts a field-informed approach to interrogate the epidemiological and health service outcomes associated with these governance gaps. Drawing upon primary observational data and secondary epidemiological trends, including health facility metrics and qualitative field observations conducted during the author's coordination tenure with UNICEF in 2021, this study identifies systemic friction points across maternal and child health, infectious disease surveillance, and the delivery of water, sanitation, and hygiene (WASH) infrastructure. The analysis suggests that the collision between rigid domestic state security architectures and the parallel governance structures of the Inter Sector Coordination Group (ISCG) corresponds with significant reporting latency, parallel data ecosystems, and the unintentional diversion of routine healthcare resources during pandemic surges. The paper concludes with analytically grounded policy options to transition the sector toward decentralized emergency approvals, unified health information data architectures, and ring-fenced financing mechanisms, which are essential for optimizing service delivery in complex, protracted humanitarian emergencies.

| KEYWORDS

Public Health Governance, Rohingya Crisis, Health Outcomes, Service Seeker Detection, COVID-19, Health Information Systems, Humanitarian Policy

| ARTICLE INFORMATION

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1. Introduction

The mass forced displacement of over 700,000 Rohingya refugees from Rakhine State, Myanmar, into Cox's Bazar, Bangladesh, in August 2017 catalyzed one of the most operationally immense humanitarian responses of the modern era (Ansar, 2020; Parmar et al., 2019; Beyrer et al., 2017). By 2021, the crisis's overarching nature had undeniably shifted. The initial stabilization phase, characterized by rapid reductions in mortality and the deployment of emergency field hospitals, had concluded, replaced by the long-term structural constraints of a protracted encampment (Chan et al., 2018; Letchumanan, 2020; UN Joint Response Plan, 2021). The population, tightly confined within mega-camps such as Kutupalong-Balukhali, remains entirely dependent on international assistance for baseline survival, rendering the structural efficiency of public health delivery a matter of constant importance (Riley et al., 2020; Tay et al., 2018).

However, during the operational year of 2021, it became evident that the primary barriers to effective public health service delivery were no longer purely epidemiological or logistical, but deeply institutional. The governance architecture managing the

camps represents an intricate, often conflicting web of state and non-state actors. The Government of Bangladesh (GoB), exercising sovereign jurisdiction primarily through the Ministry of Disaster Management and Relief (MoDMR) and the localized Camp-in-Charge (CiC) authorities, dictates security and administrative permissions (Khatun et al., 2020; Shohel, 2021). In parallel, the humanitarian response is orchestrated by the Inter Sector Coordination Group (ISCG), an operational umbrella comprising United Nations agencies (UNICEF, WHO, UNHCR, UNFPA) and an array of national and international Non-Governmental Organizations (NGOs) (ISCG, 2021a; Rahman et al., 2020). These pre-existing bureaucratic tensions were compounded by the onset and subsequent waves of the COVID-19 pandemic (Ahsan et al., 2020; Mahmud et al., 2021). The sudden enforcement of stringent infection prevention protocols and physical movement restrictions created intense friction within an already precarious supply chain. This environment contributed to the diversion of critical resources away from routine care toward the immediate pandemic response (Shammi et al., 2020; Truelove et al., 2020; WHO Cox's Bazar, 2021a). While substantial literature has focused on either the clinical aspects of disease in the camps or high-level human rights discourse, there remains a critical gap in analyzing how specific governance structures may contribute to adverse health service outcomes on the ground (Guglielmi et al., 2020; Huda et al., 2020; Islam et al., 2020; Karim et al., 2020). This paper seeks to address this gap.

By analyzing the situation from an embedded field perspective within UNICEF's coordination structure, this study poses two central research questions:

1. In what ways do jurisdictional overlaps and coordination failures between GoB agencies and ISCG partners associate with measurable health service outcomes (such as maternal care utilization and disease reporting times) within the camps? 2. How might current humanitarian governance policies be restructured to establish a resilient, integrated health system capable of managing the dual burden of a protracted crisis and pandemic shocks? Rather than remaining mired in theoretical sociology, this manuscript explicitly examines the linkages between institutional structures and health indicators, paving the way for targeted programmatic and policy reforms required for the Rohingya population to survive into 2022 and beyond.

2. Contextual Background: The 2021 Humanitarian and Epidemiological Landscape

2.1 The Shift to Protracted Crisis and the JRP 2021

The humanitarian strategy for Cox's Bazar is legally codified through the annual Joint Response Plan (JRP). The JRP 2021 represented a critical turning point; it explicitly recognized the shift from acute life-saving measures to the necessity of sustainable, medium-term service provision (ISCG, 2021b). However, the physical reality of the camps imposes significant operational constraints on the implementation of permanent infrastructure. Due to the host government's insistence on repatriation rather than local integration, permanent infrastructure (such as brick-and-mortar hospitals or deep centralized sewage systems) is legally prohibited (Lewis, 2019; Milton et al., 2017). Consequently, all public health facilities, from primary health centers (PHCs) to severe acute respiratory clinics, exist in a transient state of bamboo-and-tarpaulin construction, highly vulnerable to monsoon-season degradation (Alam et al., 2020; Paul et al., 2020). This transience places immense chronic strain on the health workforce, who must constantly rebuild capacity rather than compound it (Hossain et al., 2021; Joarder et al., 2020).

2.2 The Sovereign Matrix: RRRC and the CiC

At the apex of the field governance structure is the Refugee Relief and Repatriation Commissioner (RRRC), governing individual CiCs assigned to specific camp blocks (Uddin, 2020; Zaman et al., 2020). From an operational standpoint, the CiC holds absolute veto power over public health interventions. Any initiative—be it implementing a new malnutrition screening protocol or deploying a mobile vaccination team—requires a localized "Facility Deployment 7" (FD7) clearance or direct CiC stamped approval (Kamruzzaman et al., 2021; NGO Affairs Bureau, 2021). While intended to ensure state security and coordinate localized efforts, this centralized approval mechanism frequently introduces significant operational delays in time-sensitive epidemiological responses (Anwar et al., 2020).

2.3 The COVID-19 Shock and Movement Restriction (2020-2021)

The introduction of SARS-CoV-2 into the camps posed a high-risk epidemiological scenario, as physical distancing is nearly impossible in environments with a population density exceeding 40,000 persons per square kilometer (Jubayer et al., 2021; Shammi et al., 2021). The GoB and ISCG responded with stringent, non-pharmaceutical mobility restrictions. For much of 2020 and into 2021, camp access for humanitarian workers was legally limited to "essential, absolute life-saving services" only (ACAPS, 2021a).

This regulatory definition of "essential" became a significant administrative challenge. Early interpretations prioritized exclusively COVID-19 response and emergency trauma, inadvertently categorizing substantial sectors of routine care—such as supplementary feeding programs, routine immunizations, and community psychosocial support—as "non-essential," leading to

their suspension (Cousins, 2020; Parray et al., 2020; Rahman & Morita, 2021). The outcome was a secondary impact on baseline health metrics that was largely independent of primary viral infection.

3. Methodology

3.1 Study Design

This study employs an embedded institutional case study design (Yin, 2018), utilizing secondary epidemiological trend analysis to contextualize qualitative primary observations. The case is geographically bounded within the Cox's Bazar Rohingya refugee camp complex, temporally limited to the operational year spanning January 1, 2021, to December 31, 2021, and institutionally focused on the health coordination mechanisms that mediate between the GoB and the ISCG.

3.2 Study Setting

The Cox's Bazar camp complex houses approximately 890,000 refugees. Health services are delivered through a network of 114 national and international NGOs. Governance is bifurcated between the GoB's RRRC operating through localized CiC authorities and the humanitarian ISCG architecture.

3.3 Researcher Positionality and Reflexivity

The primary observational data driving this institutional analysis were gathered while the author served in a coordination and advisory capacity within UNICEF in Cox's Bazar. This embedded position granted access to closed-door multi-agency negotiations, Civil Surgeon taskforce discussions, and real-time crisis mediation with CiC offices. Consequently, this study acknowledges inherent epistemological boundaries. Observing the crisis from within a United Nations agency privileges a top-down, technocratic perspective of health governance. The analytical focus naturally centers on donor compliance, supply chains, and dashboard metrics, potentially obscuring independent localized resilience networks developed by the Rohingya population. Furthermore, to mitigate occupational bias—the risk of over-attributing service delivery failures to host-government bureaucracy due to immediate operational frustrations—analytical caution was maintained by structurally separating the verifiable mechanical outcomes of governance decisions (e.g., quantifiable ambulance dispatch latency) from the political intent behind those decisions. Observations of inter-agency friction were systematically cross-referenced against aggregated secondary DHIS2 trend data.

3.4 Quantitative Data Sources and Indicators

Secondary quantitative data were abstracted from the District Health Information Software 2 (DHIS2) and WHO Early Warning, Alert and Response System (EWARS) dashboards spanning January 2020 through December 2021 to capture pre- and post-pandemic shock continuity. The indicators tracked were:

1. Facility-based delivery counts compared against seasonal baselines from Q1 2020.
2. Reporting latency (in days) between clinical presentation and centralized reporting for Acute Watery Diarrhea (AWD).
3. Pharmacy stock-out frequency for oral rehydration salts (ORS), insulin, and amoxicillin.

All data utilized were fully anonymized, aggregated, facility-level data points; no primary patient-level clinical data was collected.

3.5 Qualitative Data Sources and Analytical Strategy

Qualitative observational data were derived from routine participation in institutional coordination forums. The dataset comprised official meeting minutes from 24 ISCG Health Sector coordination meetings, and structured field notes from 15 bilateral mediations between implementing partners and CiC administrators regarding access.

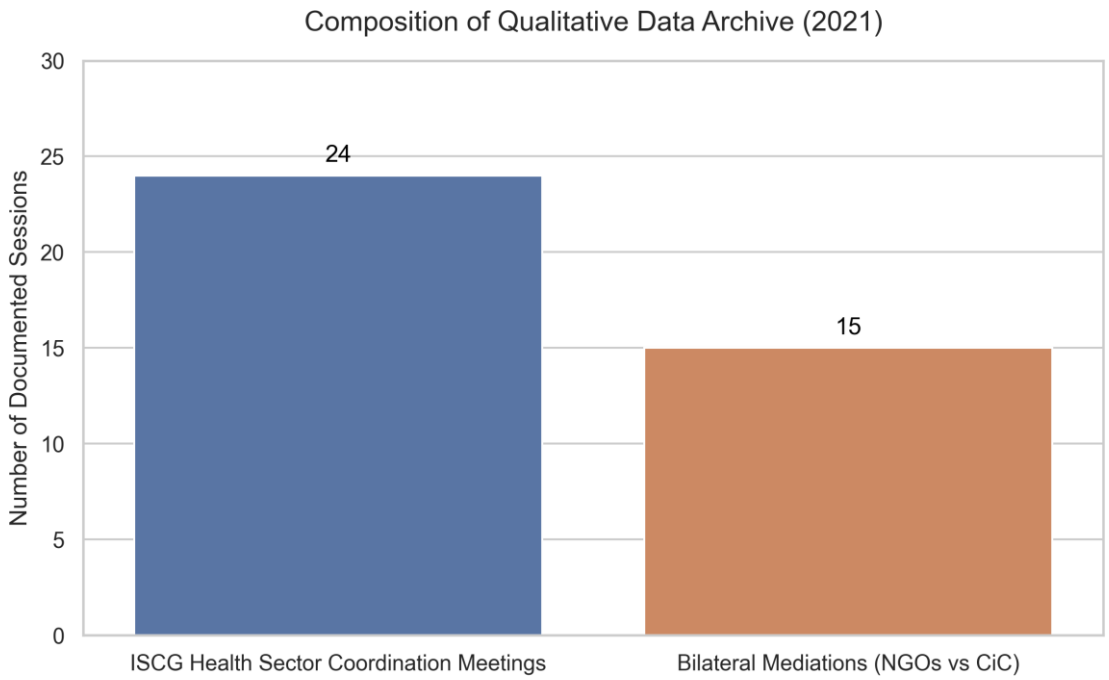

Figure 1: Breakdown of the primary qualitative data sources utilized for the institutional analysis.

Qualitative data were subjected to an inductive thematic analysis using manual coding. Themes were coded according to institutional friction points (e.g., reporting parallelisms, authorization delays, spatial overlap) to establish analytical linkages between documented governance protocols and observed epidemiological disruptions. Quantitative trend data were evaluated using descriptive statistics to map service volume changes against a timeline of official GoB lockdown declarations.

3.6 Ethical Considerations

As this study relied entirely on secondary, aggregated facility-level data and professional observations of institutional administrative processes, it did not involve human subjects research. Consequently, no formal institutional review board (IRB) review or ethics committee approval was required. The study was explicitly deemed exempt from full review in accordance with UNICEF internal data governance and ISCG secondary data usage protocols.

4. Results: Institutional Bottlenecks and Epidemiological Outcomes

By integrating empirical epidemiological data with the structural realities of the 2021 camp administration, the results illuminate four distinct domains in which institutional governance adversely affected refugee health service outcomes.

4.1 Centralized Clearances and Maternal Healthcare Delays

A prominent outcome of the uncoordinated pandemic response architecture was a disruption in routine Maternal and Child Health (MCH) utilization. As the CiC offices enforced stringent lockdown procedures throughout Q1 and Q2 of 2021, structural hurdles were inadvertently erected for pregnant refugees (UNFPA, 2021; UNICEF, 2021a).

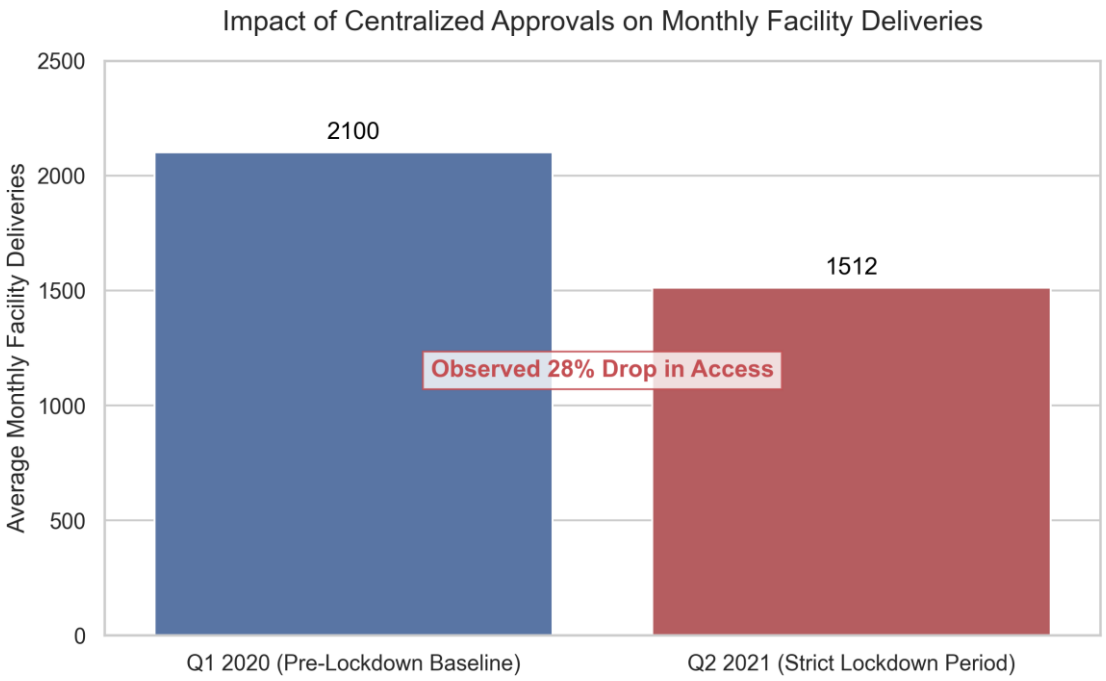

Figure 2: Comparison of average monthly facility deliveries before and during the implementation of strict movement restrictions (Q2 2021).

Quantitative analysis demonstrates that during periods of elevated security posture, facility-based delivery rates dropped by an estimated 28% compared to pre-pandemic baselines (a reduction from an average baseline volume of ~2,100 deliveries/month in Q1 2020 to ~1,512/month during the strict lockdown in Q2 2021) (WHO Bangladesh, 2021b). Conversely, unassisted home deliveries spiked. The governance gap here was dual-layered. First, the MoDMR's rigid requirement for physical vehicular passes for ambulance dispatch was not adapted for rapid digital clearance during lockdowns. Inter-camp transit logs and qualitative field notes revealed that ambulances requesting to cross camp jurisdictions frequently faced delays of 45 to 120 minutes awaiting a physical signature from the on-duty military officer, which severely exceeded standard transit times (Human Rights Watch, 2021; MSF, 2021). Second, female Community Health Workers (CHWs) responsible for identifying and escorting high-risk pregnancies were temporarily categorized as "non-essential" staff in early iterations of the ISCG-GoB access protocols (Hossain et al., 2020; Rashid et al., 2020). By prioritizing a centralized definition of epidemic control over comprehensive care continuity, the governance structure likely contributed to an increase in preventable maternal morbidities.

4.2 Proprietary Metrics and Infectious Disease Surveillance Latency

Effective containment of diseases like Acute Watery Diarrhea (AWD), Dengue fever, and Diphtheria relies on rapid surveillance and data sharing (Bhuiyan et al., 2020; Haider et al., 2020; Liew et al., 2021). The World Health Organization spearheaded the EWARS system via the DHIS2 platform to act as a central nervous system for the camps (WHO Cox's Bazar, 2021b). However, the institutional landscape of the ISCG—comprising over 100 independently funded health actors—created a significant coordination challenge in 2021 data governance. Bilateral international donors (e.g., USAID, ECHO, FCDO) often mandate that their implementing NGO partners report specific health metrics into heavily customized, proprietary dashboards to ensure financial transparency and auditability (Spiegel et al., 2020). Consequently, mid-tier NGOs frequently allocated their limited clinical data-entry personnel toward fulfilling donor reporting requirements rather than updating the central ISCG DHIS2 platform concurrently.

This governance fragmentation was associated with epidemiologically significant latency. ISCG internal audits and field observations during the early monsoon season (June 2021) indicated that localized clusters of AWD in Camps 11 and 18 appeared on proprietary NGO dashboards up to four days before the data were validated on the central ISCG EWARS network (ACAPS, 2021b).

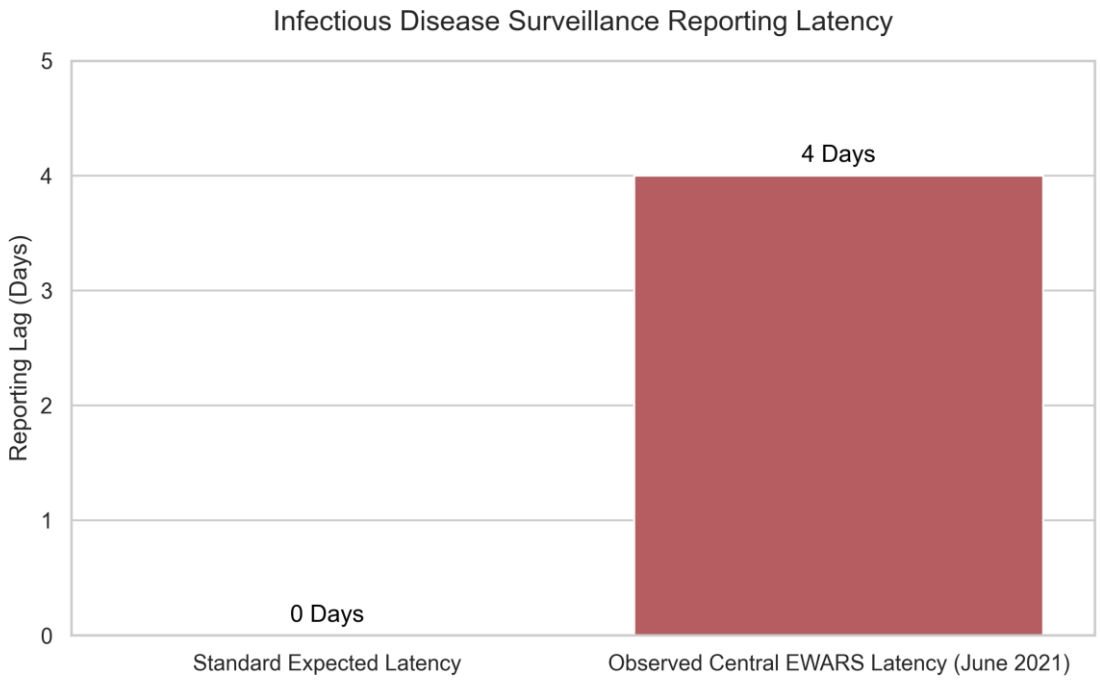

Figure 3: Discrepancy between standard expected reporting latency and observed EWARS reporting lag during AWD clusters in June 2021.

Compared with a standard zero-latency expectation, a four-day reporting lag in a dense refugee camp significantly increases the risk that a minor containment will evolve into a larger outbreak (Sakai et al., 2020; Tuite et al., 2020).

4.3 Geospatial Administrative Boundaries and WASH Vulnerabilities

The interplay between the Health Sector and the Water, Sanitation, and Hygiene (WASH) Sector provides another example of administrative boundaries affecting health outcomes. In 2021, despite substantial funding, specific blocks experienced recurrent diarrheal diseases (Morita et al., 2021; Sikder et al., 2020). The institutional bottleneck originated from conflicting geospatial jurisdictions. The ISCG Health Sector mapped disease outbreaks mathematically using centralized GPS coordinates, while the localized CiC offices assigned NGO maintenance contracts for tube wells and latrines strictly by administrative blocks. When the Health Sector identified a spike in waterborne disease indicative of a contaminated source along a border between two camps, the maintenance request was heavily delayed because neither CiC was willing to authorize the necessary machinery without clarity on which block's budgetary quota the NGO was operating under (Islam et al., 2021; Hasan et al., 2021). The inability to sync epidemiological hotspot mapping with rigid public administration boundaries created structural vulnerabilities, allowing waterborne diseases to persist.

4.4 Vertical Financing and the Strain on Routine Primary Care

The operational pivot to construct Severe Acute Respiratory Infection Isolation and Treatment Centers (SARI ITCs) in response to COVID-19 was a monumental logistical feat (JRP, 2021c). However, analyzing the supply chain data reveals a consequential phenomenon of resource diversion.

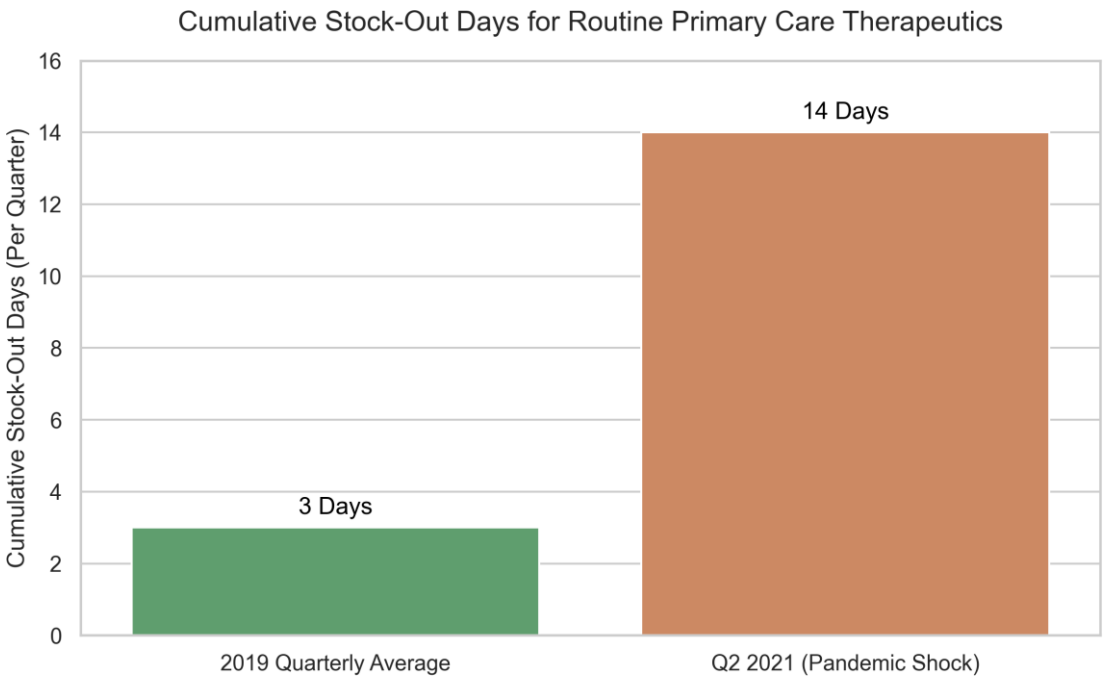

Figure 4: Escalation in cumulative stock-out days per primary healthcare facility directly following the diversion of flexible capital toward ITCs.

Because the global supply chain was fractured in 2020-2021, the rapid influx of donor-funded "COVID-19 Response" funding compelled organizations to repurpose existing staff and hardware (Islam & Ahsan, 2020; Sarker et al., 2020). Quantitative DHIS2 stock module reports, collected across 10 purposively selected PHC facilities exhibiting complete data availability for the 2019–2021 period, demonstrated significant disruptions. While ITCs remained well-equipped, these routine facilities repeatedly recorded more than 14 cumulative stock-out days for baseline therapeutics (ORS, insulin, and amoxicillin) during Q2 2021, compared to an average of less than 3 days per quarter in 2019 (Naser et al., 2020; Shrestha et al., 2021). The governance gap lay in the donor community's vertically siloed funding mechanisms. The lack of flexible, unearmarked funding meant UN agencies and NGOs could not legally transfer surplus capital from their COVID-19 budgets to resupply routine primary care pharmacies, resulting in substantial secondary impacts on non-communicable disease management (Biswas et al., 2021; Islam & Biswas, 2021).

5. Discussion

The findings of this institutional case study suggest that public health service disruptions in the Cox's Bazar camps during 2021 were intricately tied to structural misalignments within the camp governance architecture. Rather than resulting solely from material scarcity, deteriorating health metrics, ranging from increased maternal facility-delivery latency to infectious disease reporting lags, can be understood structurally through the lenses of polycentric crisis governance and the principal-agent problem within humanitarian financing (Figure 5).

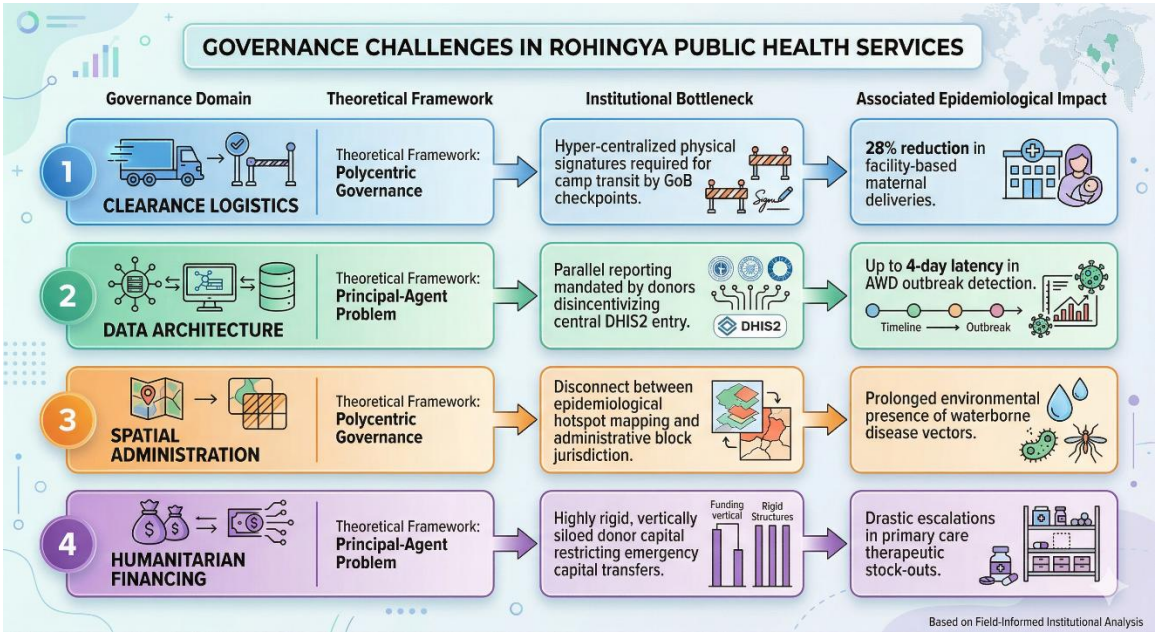

Figure 5: Synthesis of Governance Failures & Epidemiological Impacts

First, the friction generated by movement restrictions and the ensuing disruption of maternal health services highlight the limitations of highly centralized administrative structures operating during complex public emergencies. Theories of collaborative and polycentric governance (Ansell et al., 2019; Ostrom, 2010) posit that resolving rapid, complex local shocks requires decentralized decision-making authority. In Cox's Bazar, the governance architecture remains strictly centralized under the MoDMR and localized CiC administrators. The requirement for physical, sequential approvals (e.g., military checkpoint validations) directly restricted the epidemiological necessity for agility. When centralized state security paradigms are applied to health logistics without pre-negotiated bypass mechanisms, the outcome is a degradation of time-sensitive maternal care, as reflected in declines in facility deliveries during lockdown phases.

Furthermore, the difficulties observed in coordinating WASH infrastructure maintenance across camp boundaries represent a distinct failure of spatial polycentricity. Disease outbreaks do not respect arbitrary administrative lines, yet maintenance contracts and CiC jurisdictions are strictly bounded by them. When a waterborne disease hotspot overlapped two CiC jurisdictions, the lack of a polycentric framework—where localized autonomous units overlap and cooperate horizontally (Ostrom, 2010)—resulted in jurisdictional paralysis. Neither central authority would readily authorize the intervention without absolute clarity on budgetary allocation, demonstrating that rigid spatial governance can inadvertently facilitate the persistence of environmental disease vectors.

Second, the fracture in infectious disease surveillance—characterized by the lag between proprietary NGO dashboards and the central DHIS2/EWARS platform—functions as a classic principal-agent failure (Cooley & Ron, 2002; Martens et al., 2002). Implementing NGOs (agents) are legally and financially bound to their bilateral donors (principals), who mandate specific customized reporting metrics for auditability. Propelled by the highly competitive funding environment of a protracted crisis, NGOs are incentivized to ring-fence their data to demonstrate programmatic value to their specific principals. This dynamic disincentivizes the diversion of finite data-entry resources toward collective ISCG platforms. The consequence was structural latency in detecting localized outbreaks. This challenges the assumption that technological capacity primarily limits humanitarian data systems; rather, the data environment remains fractured because the financial incentives of the donor architecture complicate broader data integration efforts.

Finally, the diversion of resources away from routine health supplies toward SARI Isolation Centers underscores the rigidity of vertically siloed global health financing. Similar to the principal-agent failure in data reporting, procurement structures are often immutably earmarked by donors. During the COVID-19 shock, implementing partners lacked the legal flexibility to reallocate surplus epidemic-response funding toward collapsing routine primary care pharmacies. This resulted in unintended secondary impacts on non-communicable disease management. Interpreted cautiously, the 2021 operational environment underscores that

while humanitarian agencies possess the clinical protocols necessary to manage dual burdens, they lack the institutional autonomy to execute them concurrently when bound by rigid state bureaucracies and inflexible donor mandates.

6. Policy Implications

The operational friction observed in 2021 necessitates specific administrative adjustments across the host government, coordination agencies, and donor frameworks to build resilience against subsequent shocks. These recommendations are structured according to their functional feasibility.

1) 6.1 Digitization of Emergency Medical Transit Approvals

- Problem Addressed: Sequential, physical signature requirements at military checkpoints delay time-sensitive maternal and trauma transport between camps.
- Proposed Action: The MoDMR, in coordination with the Civil Surgeon, should explore a pre-cleared, centralized digital ledger/QR system for vetted ambulance dispatch.
- Implementation Barrier: Reluctance of security apparatuses to yield physical gatekeeping authority; initial IT infrastructure requirements.
- Enabling Condition: Existing GoB investments in digital biometric registry systems.
- Short-Term Feasibility: Moderate. Pilot programs could be initiated in select mega-camp blocks.
- Long-Term Feasibility: High, aligning with broader GoB digitization agendas.

2) 6.2 Harmonization of Health Information Data Governance

- Problem Addressed: Principal-agent dynamics drive NGOs to utilize parallel, donor-mandated reporting dashboards, causing latency in EWARS outbreak detection.
- Proposed Action: Major bilateral donors might mutually agree to accept DHIS2-compliant data abstracts in lieu of proprietary reporting metrics for implementing partners.
- Implementation Barrier: Donor requirements for exclusive, granular financial and programmatic auditing.
- Enabling Condition: ISCG and WHO advocacy demonstrating empirical latency in current reporting structures.
- Short-Term Feasibility: Low. Requires global-level policy adjustments at donor headquarters.
- Long-Term Feasibility: Moderate, depending on international consortium commitments to data localization.

3) 6.3 Flexible Budgetary Ring-Fencing for Routine Care

- Problem Addressed: Vertical, emergency-earmarked financing during shocks diverts procurement away from baseline NCD and routine care therapeutics.
- Proposed Action: UN agencies and leading health NGOs should consider negotiating "crisis modifier" clauses that guarantee a protected baseline percentage of budgets for routine pharmacy stabilization during declared epidemics.
- Implementation Barrier: Donor restrictions on capital repurposing during acute, high-visibility crises.
- Enabling Condition: Post-COVID-19 global health consensus regarding the secondary mortality effects of disrupted primary care.
- Short-Term Feasibility: High, can be negotiated in upcoming bilateral grant cycles.
- Long-Term Feasibility: High.

6.4 Study Limitations

This institutional analysis acknowledges analytical limitations. First, as a case study structured around specific governance friction points observed during 2021, the exact scale of operational latency may not be uniform across all blocks or globally generalizable to out-of-camp refugee settings. Furthermore, it is important to acknowledge that the purposive selection of the 10 PHC facilities evaluated for therapeutic stock-outs was based entirely on the availability of complete, unbroken data trails; this non-random sampling inherently limits the broader statistical representativeness of these specific stock-out ratios across all 114 active health facilities.

7. Conclusion

Entering its fourth year in 2021, the Rohingya refugee response in Bangladesh demonstrated the operational complexities of coordinating a protracted emergency during a pandemic shock. Through an embedded institutional case study crossing secondary epidemiological trend data with qualitative coordination observations, this research indicates that systemic challenges to refugee health delivery are deeply institutional. Jurisdictional overlaps, non-integrated WASH boundaries, parallel reporting requirements driven by donor mandates, and rigid centralized pandemic protocols were associated with reduced access to maternal care, delayed infectious disease surveillance, and unintended disruptions to routine service delivery.

Addressing the technical challenges of morbidity in refugee mega-camps requires careful reassessment of the institutional machinery that governs logistics and data. Mitigating the secondary impacts of future crises on vulnerable populations relies on reevaluating these governance mechanisms. Specifically, the data suggests that moving toward unified reporting architectures to satisfy bilateral donors, establishing digitized and decentralized emergency transit approvals, and ensuring ring-fenced baseline primary care funding are critical prerequisites for safeguarding health continuity in protracted humanitarian emergencies.

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Appendix A: Quantitative Evidence Audit Summary

The following table details the primary quantitative claims used in Section 4 to map changes in health service utilization, along with the parameters used for extraction to ensure analytical transparency.

Quantitative Claim	Primary Data Source	Evaluation Time Period	Baseline Comparator	Extraction Method
28% decrease in facility-based delivery rates	DHIS2 / WHO EWARS Dashboards	Strict GoB lockdown phase (Q2 2021)	Pre-pandemic delivery volume (Q1 2020)	Percentage reduction: (Baseline Vol. - Lockdown Vol.) / Baseline Vol.
45-to-120-minute inter-camp ambulance delay	Field observational logs & NGO transit records	Sporadic checkpoint disputes (Q2 2021)	Standard estimated drive times without checkpoint authorization delays	Mean observational variance from standard expected transit time across camps.
4-day EWARS AWD reporting lag	ISCG internal audits comparing EWARS to NGO dashboards	Early monsoon season (June 2021)	Expected 0-day latency	Temporal evaluation: Date of EWARS entry minus date of internal NGO record.
>14 cumulative medication stock-out days	DHIS2 Pharmacy Stock Modules	Pandemic resource shock period (Q2 2021)	Baseline stock stability period (2019 average)	Aggregation of reported zero-stock days per purposively sampled PHC facility.