

Governance Fragility in Health Systems: Developing Early Warning Signals for Systemic Collapse

Roozbeh Hojabri¹, Oleksandra Mazurkevych², Mahmoud Manafi³

¹ Manafi Institute for Saturation Studies (MISS), Researcher, hojabri@manafi-institute.de

²Manafi Institute for Saturation Studies (MISS), oleksandra.mazurkevych@manafi-institute.de

³ Manafi Institute for Saturation Studies (MISS), Researcher, manafi@manafi-institute.de

Abstract

Governance weaknesses may remain hidden within apparently functioning health systems until their effects become visible through implementation failure, institutional dysfunction, or disruption of essential services. This study aimed to identify measurable governance-related early-warning signals associated with increasing risk of systemic health-system collapse.

An exploratory qualitative design combined a structured review of peer-reviewed and institutional literature with semi-structured interviews with 20 purposively selected experts representing health policy, system management, academia, regulation and oversight, health information and monitoring, and crisis and resilience expertise. Inductive thematic analysis was used to identify governance fragility dimensions without imposing a predetermined classification. Candidate early-warning indicators were subsequently prioritized according to systemic relevance, early-warning value, measurability, and ability to distinguish routine governance weaknesses from severe dysfunction.

Six dimensions of governance fragility emerged: strategic planning and policy governance; institutional and regulatory governance; accountability, transparency, and integrity; coordination and implementation capacity; information and evidence-informed governance; and adaptive and crisis governance. From a larger pool of candidate measures, participants prioritized 18 early-warning indicators. This captured persistent strategic failure, plan–capacity mismatch, regulatory and accountability failures, implementation and coordination breakdown, information deficiencies, warning-to-action failure, impaired crisis response, and governance-associated disruption of essential services. Indicators were stratified into five progressive risk levels from Safe to Near to Collapse. Mapping through the SEA model demonstrated that governance fragility can progressively undermine Stability, Efficiency, and Adaptability, with concurrent deterioration across these domains representing the greatest systemic concern.

Governance fragility can be operationalized as a measurable early-warning domain rather than assessed only after governance failure becomes evident. The proposed framework provides a basis for detecting progression from manageable governance weakness toward loss of effective governance control and increasing systemic collapse risk. Prospective validation and cross-system calibration of the proposed indicators and thresholds are required.

Keywords: Health System Governance; Governance Fragility; Health System Collapse; Early Warning Signals; Stability; Efficiency; Adaptability; SEA Model; Health System Resilience

1. Introduction

Governance is a fundamental determinant of how health systems establish priorities, allocate authority, coordinate actors, implement policies, and maintain accountability for system performance. Contemporary conceptualizations extend governance beyond leadership alone and encompass the rules, processes, structures, and institutional relationships through which collective decisions are made and implemented and through which health-system actors interact and coordinate their activities (Mikkelsen-Lopez et al., 2011; Abimbola, 2020; Belloni et al., 2025). Accordingly, governance functions as an enabling mechanism through which other health-system functions including financing, resource generation, and service delivery can operate coherently, making governance relevant not only as an institutional domain but also as a cross-cutting determinant of overall system functioning (Belloni et al., 2025).

Effective governance requires more than the formal existence of policies, institutions, regulations, and planning structures. Previous governance-assessment approaches have incorporated dimensions such as information and assessment capacity, policy formulation and planning, participation and responsiveness, accountability, regulation, strategic vision, rule of law, transparency, coordination, effectiveness, and ethics (Mikkelsen-Lopez et al., 2011; Lokot et al., 2022). Importantly, the existence of governance instruments does not necessarily demonstrate their effective implementation; assessments based primarily on whether policies, regulations, or institutional mechanisms exist may provide limited information about whether they function as intended in practice (Mikkelsen-Lopez et al., 2011). This distinction between formal governance arrangements and their functional capacity is particularly relevant when assessing deterioration rather than simply describing governance structures.

Strategic planning illustrates this distinction. National health policies, strategies, and plans are expected to be evidence-based, aligned with operational plans, regularly monitored and adjusted, and supported by adequate institutional capacity (World Health Organization, 2007, 2014, 2016, 2020, 2025). Critically, the World Health Organization, has emphasized that health strategies should be ambitious while remaining realistic in relation to available resources and the capacities of institutions and staff, thereby linking the quality of strategic governance to the feasibility of implementation (World Health Organization, 2025). More recent governance-assessment approaches similarly emphasize not only the existence of governance arrangements but their capacities, strengths and weaknesses, and their ability to support the formulation and implementation of health policies in context (World Health Organization, 2025). These considerations are especially relevant when major reforms, policy transitions, or strategic commitments exceed institutional or implementation capacity.

Governance becomes even more consequential when health systems are exposed to acute shocks or prolonged structural pressures. Resilience literature commonly describes the capacities of health systems to anticipate or respond to disturbances, absorb their effects, adapt, transform, learn, and maintain essential functions (Belloni et al., 2025; European Observatory on Health Systems and Policies, 2026). Governance has repeatedly been identified as central to these capacities because effective response depends on decision-making, coordination, accountability, transparency, flexibility, monitoring, institutional authority, and the ability to adjust governance arrangements as circumstances change (Belloni et al., 2025). In conflict-affected settings, where multiple governmental, humanitarian, private, and international actors may operate simultaneously, leadership, coordination, accountability, information, strategic vision, and policy implementation become particularly prominent governance challenges (Lokot et al., 2022).

The relationship between governance and systemic vulnerability, however, is not limited to external shocks. Weak or unstable governance may itself contribute to chronic system pressures,

while changes in governance can produce intended as well as unintended disturbances within health systems (Belloni et al., 2025). Governance structures must therefore balance institutional control with flexibility: decentralization, for example, may support responsiveness in some circumstances but can also generate role ambiguity, duplication, and coordination failures, while excessive centralization may constrain participation and context-sensitive adaptation (Belloni et al., 2025). The governance challenge is consequently not simply to maintain institutional structures, but to preserve the capacity to make timely decisions, coordinate actors, implement actions, learn from information, and adapt governance arrangements as system conditions evolve.

This dynamic perspective is consistent with the Stability–Efficiency–Adaptability (SEA) model, which conceptualizes health-system sustainability through the interaction of three fundamental systemic capacities. Stability concerns institutional coherence, continuity, legitimacy, and the preservation of functional order; Efficiency concerns the capacity to translate available resources into sustained system performance; and Adaptability concerns learning, flexibility, and the capacity to reconfigure responses as conditions change. Previous applications of the SEA framework have conceptualized health-system collapse as a progressive, saturation-driven process rather than exclusively as a sudden failure event, with governance, financing, workforce, infrastructure, digital systems, and trust operating as interacting sources of systemic stress. Comparative SEA analysis has further suggested that governance fragmentation and declining institutional legitimacy may undermine Stability, while institutional rigidity and delayed policy reform may constrain Adaptability; accumulation of such pressures can progressively move a health system toward systemic saturation (Manafi, M. 2025, 2026; Hojabri and Manafi ,2026 a,b,c,d,e; Gutowski et al ,2026)

This perspective also highlights an important limitation of conventional health-system assessment. Performance measurement frameworks provide valuable information on efficiency, quality, access, outputs, and outcomes, but may offer less visibility into cumulative structural pressures, nonlinear deterioration, and the gradual erosion of system capacity before conventional performance measures show severe failure. The SEA approach therefore shifts attention from assessing performance alone toward identifying imbalances and vulnerabilities that may precede saturation and collapse. Within this approach, early-warning indicators are intended to identify emerging systemic stress while opportunities for corrective intervention remain available, rather than diagnosing collapse only after widespread functional deterioration has occurred.(Gutowski et al ,2026)

Despite extensive scholarship on health-system governance, important conceptual and measurement gaps remain. Governance frameworks have identified numerous desirable principles and functions, while resilience research has established governance as an important determinant of how health systems respond to shocks; however, the mechanisms connecting governance to resilience remain incompletely theorized, and existing scholarship remains predominantly oriented toward the capacities that resilient systems should possess rather than measurable trajectories through which governance deterioration may progress toward severe systemic dysfunction (Hojabri and Manafi ,2026 a,b,c,d,e; Gutowski et al ,2026 ,Belloni et al., 2025). Existing governance tools also demonstrate the difficulty of moving from broad principles and the formal existence of policies or institutions to indicators that capture their actual implementation and functional consequences (Hojabri and Manafi ,2026 a,b,c,d,e; Gutowski et al ,2026 ,Mikkelsen-Lopez et al., 2011). The unresolved problem is therefore not simply how to define or assess good governance, but how to determine when deterioration in governance ceases to represent a routine governance weakness and begins to signal increasing systemic risk. Building on this gap and the SEA conceptualization of progressive health-system saturation and collapse, this study aims to identify the principal dimensions of governance fragility, translate them into measurable early-

warning indicators, and stratify these indicators according to increasing levels of systemic risk. The resulting framework seeks to examine how deterioration in governance may progressively compromise Stability, Efficiency, and Adaptability, and thereby provide an operational basis for identifying conditions in which governance fragility may contribute to progression toward systemic health-system collapse.

2. Literature Review

Health-system governance has evolved from a relatively narrow focus on government stewardship and formal authority toward a broader understanding of how rules, institutions, actors, relationships, and decision-making processes shape the functioning of health systems. Governance encompasses strategic direction, policy formulation, regulation, accountability, information, participation, coordination, and the institutional capacity required to translate collective decisions into action (Mikkelsen-Lopez et al., 2011; Pyone et al., 2017; Abimbola, 2020). Existing frameworks consequently treat governance not as a single function but as a multidimensional construct involving both the structures through which authority is exercised and the processes through which policies and rules are developed, implemented, monitored, and enforced.

Despite this broad conceptual development, consensus regarding the precise boundaries and measurement of health-system governance remains limited. Mikkelsen-Lopez et al. (2011) observed considerable variation in how governance is conceptualized and noted that much of the earlier literature focused on isolated components—such as corruption, government effectiveness, or community participation—rather than governance as an interacting system of functions. Similarly, the systematic review by Pyone et al. (2017) identified multiple frameworks originating from health systems, development, public administration, and other fields, demonstrating both the breadth of governance concepts and the absence of a single universally accepted assessment approach. These frameworks nevertheless repeatedly converge around information and assessment capacity, policy formulation and planning, participation and responsiveness, accountability, regulation, strategic vision, transparency, and institutional effectiveness.

This multidimensional understanding is also evident in health systems operating under severe pressure. Lokot et al. (2022) found that governance in conflict-affected settings commonly involves accountability, partnerships, policy and strategy, information and intelligence, institutional capacity, participation and consensus, regulation, and transparency. Their review also demonstrated how governance problems become intertwined with operational challenges: unclear roles and responsibilities, weak accountability, short-term approaches, and fragmented coordination can complicate health-system responses when multiple governmental, humanitarian, private, and international actors are involved. Thus, governance is relevant not only to how a health system is formally organized but also to its ability to maintain coherent action under increasingly complex conditions.

Abimbola (2020) advances this interpretation by conceptualizing health-system governance through the rules that govern relationships among system actors and the processes through which those rules are made, changed, monitored, and enforced. This perspective is important because it shifts attention from governance structures alone toward the functioning of governance relationships. The distinction is especially relevant for assessing fragility: institutions and regulations may formally exist while their capacity to influence behaviour, enforce rules, or coordinate actors progressively deteriorates. Abimbola's approach therefore complements governance frameworks that emphasize institutional structures by drawing attention to how governance actually operates across health-system relationships.

From Governance Structures to Governance Measurement

The challenge of translating these broad governance concepts into measurable indicators has been recognized for more than a decade. Mikkelsen-Lopez et al. (2011) distinguished between governance determinants or rule-based indicators, which establish whether a policy, procedure, regulation, or law exists, and governance performance indicators, which assess whether those rules have actually been followed or enforced. This distinction is fundamental because the formal existence of a strategy, regulation, reporting mechanism, or accountability structure does not demonstrate that it is functioning effectively.

Indeed, one of the limitations identified in earlier governance assessment tools is their reliance on questions concerning the existence of policies or institutional arrangements. Mikkelsen-Lopez et al. (2011) explicitly argued that asking whether policies exist provides little information about their implementation. Governance assessment therefore becomes substantially more informative when it moves from documenting structures toward measuring their implementation, enforcement, effectiveness, and consequences.

Pyone et al. (2017) reached a related conclusion through their systematic review of health-system governance assessment frameworks. Several frameworks distinguished rule-based from outcome-based measures, while others proposed quantitative governance scores or indices. One framework, for example, attempted to score governance from very poor to excellent and aggregate governance measures into an overall index; however, the broader literature showed substantial heterogeneity in measurement approaches and limited practical application of many proposed frameworks. The difficulty is therefore not the absence of potential governance dimensions or indicators, but determining which measures meaningfully represent the actual functioning and deterioration of governance.

The more recent WHO Progression Pathway for Governance of Mixed Health Systems represents an important movement toward operational assessment. Rather than prescribing one universal governance configuration, the framework is intended to identify governance arrangements and capacities, assess their strengths and weaknesses, and determine priorities for improvement while recognizing differences among national health systems (World Health Organization, 2007, 2020 , 2025). This context-sensitive approach is important because governance arrangements that function effectively in one institutional environment may not be directly transferable to another.

The WHO progression framework also emphasizes that strategic objectives alone are insufficient. Governments require mechanisms capable of realizing those objectives, appropriate allocation of financial resources, implementation arrangements, and systems for tracking and evaluating change (World Health Organization, 2025). This moves governance assessment closer to a functional interpretation: the central question is not merely whether a strategy exists, but whether governance possesses the capacity to convert strategic direction into implementation.

Strategic Planning, Policy Capacity, and Implementation

Strategic direction is consistently identified as a central governance responsibility, but the literature also demonstrates that planning cannot be separated from implementation capacity. Governance frameworks include strategic vision, policy formulation and planning, institutional capacity, evidence-informed policymaking, regulation and enforcement, decision-making capacity, and the capacity to implement mandated activities. Consequently, a formally sophisticated strategy may coexist with governance weakness when institutions lack the authority, resources, coordination, or implementation capacity necessary to achieve it.

The WHO progression framework makes this relationship explicit by requiring strategic goals to be accompanied by specific policy mechanisms, implementation arrangements, resource allocation, monitoring, and evaluation. This interpretation supports an important distinction between planning failure and implementation failure. The first concerns the adequacy, realism, coherence, and feasibility of strategic direction; the second concerns the capacity of governance structures to translate agreed direction into action.

Greer et al. (2016) similarly place policy capacity alongside transparency, accountability, participation, and organizational integrity within health-system governance. Their approach emphasizes that governance affects both the quality of policy decisions and the ability of institutions to implement them. This is particularly important when policy ambition exceeds available governance capacity: technically desirable policies may still create implementation difficulties if institutional arrangements cannot support their complexity, coordination requirements, or pace of change.

The relationship between strategic ambition and system capacity is therefore important when considering governance fragility. Governance should not be evaluated solely according to whether reforms are ambitious or whether policy change occurs. Rather, the relevant issue is whether strategic commitments are compatible with available institutional, financial, workforce, informational, and implementation capacities and whether mechanisms exist to monitor consequences and modify action when required. The WHO progression approach reinforces this principle by treating governance strengthening as context-dependent and explicitly rejecting a universal one-size-fits-all prescription.

Governance Under Shocks and System Pressure

The importance of functional governance becomes especially visible when health systems encounter acute shocks or prolonged pressures. Belloni et al. (2025) show that health-system resilience is closely associated with governance characteristics including accountability, transparency, legitimacy, responsiveness, integrity, monitoring capacity, inclusiveness, flexibility, trust, and effective leadership. Governance arrangements must also accommodate multiple levels and stakeholders, maintain appropriate legal authority, and retain sufficient flexibility to adapt structures as circumstances change.

Sagan et al. (2021) similarly position governance as a fundamental enabler of health-system resilience during the COVID-19 pandemic, highlighting the importance of coherent decision-making, coordination, communication, and the capacity to mobilize system resources. This perspective suggests that governance failure can propagate beyond the leadership domain because financing, workforce deployment, information flows, resource allocation, and service delivery all depend on decisions being translated into coordinated action.

Evidence from conflict-affected settings reinforces this relationship. Lokot et al. (2022) identified lack of accountability, weak trust in government agencies, inadequate transparency, limited strategic vision, and coordination difficulties among recurring barriers to effective governance. Their review further concluded that substantive evidence on governance in conflict-affected populations remains limited and that governance is often addressed indirectly or without sufficiently explicit theoretical framing. These findings are important because extreme-pressure settings expose governance weaknesses that may remain less visible during routine system operation.

Governance architecture itself can also create trade-offs. Belloni et al. (2025) note that decentralization may support responsiveness but can simultaneously produce confusion over roles and responsibilities, coordination failures, and duplication of effort. The literature therefore does not support a simple assumption that centralized or decentralized governance is inherently more resilient. Instead, governance effectiveness depends on whether authority, coordination, accountability, and adaptive capacity remain functional within the specific system context.

Governance, Resilience, and Adaptability

The relationship between governance and resilience provides an especially important foundation for understanding governance fragility. Blanchet et al. (2017) conceptualized health-system resilience in terms of capacities that allow systems to absorb disturbances, adapt, transform, and continue to exercise control over their structures and functions. This perspective shifts analysis away from simple recovery after a shock toward the underlying capacities that permit systems to remain functional while conditions change.

Belloni et al. (2025) extend this discussion by demonstrating that the governance–resilience relationship is complex, contextual, and dynamic. Their scoping review found that existing theories frequently emphasize forward-looking approaches, preparedness for different scenarios, and institutions capable of responding to shocks while maintaining routine functions. Importantly, they also conclude that the relationship is bidirectional: governance can shape resilience, while shocks and resilience processes can themselves reshape governance; nevertheless, the mechanisms underlying this relationship remain insufficiently theorized.

This limitation is particularly relevant to early-warning research. Much of the governance and resilience literature is prescriptive, describing the capacities that health systems should possess to remain resilient, rather than identifying measurable deterioration trajectories that indicate when those capacities are being lost. Belloni et al. (2025) explicitly characterize much existing scholarship as focused on normative capacities required for resilience. Consequently, resilience literature provides a strong theoretical explanation for why governance matters under pressure but offers a less developed basis for determining when governance deterioration has crossed from manageable weakness into systemic fragility.

From Health-System Performance to Saturation and Collapse

The SEA research stream addresses this problem from a complementary perspective by shifting the unit of analysis from conventional performance toward system capacity, saturation, and collapse risk. Gutowski, Hojabri, and Manafi (2026) argue that dominant health-system performance frameworks primarily emphasize efficiency, quality, access, and process optimization and provide more limited visibility into structural limits, saturation dynamics, adaptive capacity, and systemic stability. Their comparative analysis of performance and excellence models suggests that this imbalance can obscure warning signals such as declining responsiveness, workforce strain, policy rigidity, and other forms of cumulative systemic stress.

Within this research programme, the SEA model interprets health-system vulnerability through the interaction of Stability, Efficiency, and Adaptability. Hojabri and Manafi's early-warning framework conceptualizes collapse as an emergent consequence of sustained imbalance across these dimensions and argues that existing KPI frameworks are insufficiently grounded in collapse dynamics to provide actionable early-warning signals. The framework therefore redirects attention from the question of whether a health system currently performs well toward whether the capacities that sustain its functioning are progressively deteriorating.

The comparative analysis of health-system models further extends this logic by suggesting that collapse vulnerability is not confined to a particular financing or organizational model. Rather, different health systems possess different structural strengths and weaknesses, and risk emerges when pressures progressively undermine their capacity to remain stable, use resources effectively, and adapt to changing conditions. This makes governance particularly important because it can influence all three SEA dimensions through institutional continuity and legitimacy, implementation and resource coordination, and the capacity to recognize and respond to changing threats.

Subsequent SEA-based studies have demonstrated how specific domains of vulnerability can be translated into early-warning assessment. Research on digital saturation examines how increasing technological dependence can shift from a source of efficiency toward a systemic vulnerability when redundancy, interoperability, workforce capability, or recovery capacity becomes insufficient. The associated SEA-based digital assessment work extends this conceptualization toward measurable risk assessment, illustrating how domain-specific vulnerabilities can be operationalized rather than treated solely as general resilience concerns. The continuity of this research stream is reflected in the shared use of the SEA framework across the digital studies and the earlier collapse-oriented work.

The workforce study applies the same logic to human-resource vulnerability by moving from general recognition of workforce pressure toward measurable warning signals and progressive risk assessment. Taken together, these studies establish a methodological progression from identifying a source of systemic stress, to determining how it affects Stability, Efficiency, and Adaptability, and finally to operationalizing deterioration through indicators capable of signaling increasing risk before widespread system failure occurs.

Governance Fragility Through the SEA Perspective

Applying this logic to governance requires a conceptual shift from good versus poor governance toward governance capacity versus progressive governance fragility. A system may exhibit governance weaknesses without approaching collapse, just as it may experience temporary inefficiencies without losing systemic functionality. The critical issue is whether governance problems become persistent, mutually reinforcing, resistant to corrective action, and capable of undermining the core capacities represented by SEA.

From a Stability perspective, governance provides continuity of strategic direction, institutional authority, accountability, regulatory predictability, and coordination. Repeated policy discontinuity, unresolved authority conflicts, weak enforcement, and erosion of accountability can therefore weaken the institutional coherence necessary to maintain system functions. Existing governance frameworks consistently identify strategic vision, accountability, regulation, transparency, and institutional capacity as central components of governance.

From an Efficiency perspective, governance determines whether information, authority, policies, and resources can be converted into coordinated implementation. The literature's distinction between rule-based and performance-oriented governance indicators is particularly relevant here: the existence of a policy or institution is less informative than whether it is implemented and enforced. Policy-to-implementation gaps, coordination failures, delayed corrective actions, and inability to mobilize available resources can therefore represent governance-related efficiency deterioration even when formal governance structures remain intact.

From an Adaptability perspective, governance influences whether health systems can detect changing conditions, process critical information, alter decisions, coordinate responses, and reconfigure institutional arrangements. Resilience scholarship emphasizes flexibility, forward-

looking governance, leadership capacity, preparedness, and the capacity to maintain routine functions while responding to shocks. Loss of these capacities may therefore represent a particularly important transition from ordinary governance weakness toward systemic vulnerability.

The literature establishes that health-system governance is multidimensional, context-dependent, and fundamental to strategic direction, accountability, regulation, coordination, policy implementation, information use, and resilience. It has also generated numerous frameworks, principles, indicators, assessment instruments, and more recent progression models intended to identify governance strengths and weaknesses (Mikkelsen-Lopez et al., 2011; Pyone et al., 2017; World Health Organization, 2025). At the same time, resilience scholarship demonstrates the importance of governance under acute and chronic pressure but remains predominantly oriented toward the characteristics and capacities that resilient systems should possess, while the mechanisms connecting governance changes to resilience remain incompletely theorized (Belloni et al., 2025). Existing governance assessment also retains an important distinction between documenting the existence of rules and structures and determining whether they are effectively implemented or enforced. What remains insufficiently developed is a collapse-oriented framework capable of identifying when deterioration in governance moves beyond routine weakness and begins to represent measurable systemic fragility, which governance signals provide early warning of that transition, and how their severity can be interpreted in relation to increasing collapse risk. The SEA literature provides a foundation for addressing this gap by conceptualizing systemic deterioration through the interacting loss of Stability, Efficiency, and Adaptability and by shifting assessment from conventional performance toward early identification of saturation and collapse-related vulnerability. Accordingly, the present study extends this research trajectory to governance by seeking to identify and operationalize governance fragility as a measurable early-warning domain for systemic health-system collapse

3. Methodology

This study employed an exploratory qualitative design to find governance-related vulnerabilities that may increase the risk of health-system deterioration and systemic collapse and to develop potential early-warning signals for their detection. The study combined a structured review of peer-reviewed literature and relevant institutional reports with semi-structured expert interviews. Twenty participants were purposively selected using maximum-variation sampling to represent different functions involved in health-system policymaking, management, regulation, monitoring, and response to systemic pressures (Table 1).

Table 1. Characteristics of Study Participants

Participant group	n
Health policymakers and senior government officials	4
Health-system managers and senior executives	4
Academics and health-policy/governance researchers	4
Regulatory, legal, and oversight experts	3
Health information, monitoring, and evaluation experts	3
Crisis, emergency, and health-system resilience experts	2
Total	20

Semi-structured interviews were conducted using five open-ended questions (Table 2). The questions were designed to identify governance vulnerabilities, observable signs of deterioration, measurable indicators, and potential warning thresholds without imposing predetermined governance categories.

Table 2. Semi-Structured Interview Questions

No.	Interview Question
1	Based on your experience, what weaknesses or failures in the way a health system is governed can progressively threaten its ability to function effectively or increase its vulnerability to severe dysfunction or collapse?
2	Before these governance problems become severe, what observable changes, patterns, or signals could indicate that governance capacity is beginning to deteriorate?
3	Which of these warning signals could realistically be measured or monitored within a health system, and what indicators or data sources could be used to measure them?
4	For the indicators you consider most important, what changes in level, trend, frequency, duration, or combination with other indicators should be considered a warning that the health system is moving from normal vulnerability toward serious systemic risk?
5	How can deterioration in health-system governance affect the system's ability to maintain essential functions, use resources effectively, and respond or adapt to prolonged pressures or sudden shocks?

Interview and literature data were analyzed using inductive thematic analysis. Recurrent governance vulnerabilities and associated warning signals were identified and grouped into higher-order themes without applying a predetermined governance structure. Findings from the two evidence sources were triangulated to develop the final governance dimensions and candidate early-warning indicators.

Candidate indicators were defined in terms of their measurement approach, potential data source, monitoring frequency, direction of deterioration, and, where supported by evidence or expert consensus, potential warning thresholds. Following the inductive analysis, the resulting factors and indicators were mapped to the Stability, Efficiency, and Adaptability (SEA) dimensions and the WHO Six Health-System Building Blocks. The final governance structure and early-warning indicators are presented in the Results.

4. Results

Analysis of the expert interviews identified governance fragility as a multidimensional process rather than a single organizational or institutional weakness. Participants described governance deterioration as a progressive reduction in the capacity of a health system to establish and maintain strategic direction, translate policies and plans into effective action, exercise institutional and regulatory authority, maintain accountability, coordinate system actors, recognize emerging threats, and respond or adapt before operational problems become systemic.

Thematic analysis of the interviews identified six major dimensions of governance fragility: (1) Strategic Planning and Policy Governance, (2) Institutional and Regulatory Governance, (3) Accountability, Transparency, and Integrity, (4) Coordination and Implementation Capacity, (5) Information and Evidence-Informed Governance, and (6) Adaptive and Crisis Governance. The dimensions and associated fragility factors are presented in Table 3.

Table 3. Governance Fragility Dimensions and Associated Factors Identified by Participants

Governance Dimension	Governance Fragility Factors
1. Strategic Planning and Policy Governance	Weak or unrealistic long-term strategic planning; weak annual operational planning; misalignment between long-term strategic and annual operational plans; mismatch between strategic ambitions and available financial, workforce, infrastructure, technological, and implementation capacity; persistent failure to achieve critical strategic objectives; abrupt policy changes; discontinuity of major programmes following leadership or political change; politically or ideologically driven policy shifts without adequate evidence and impact assessment; simultaneous implementation of multiple major reforms beyond system absorptive capacity; inadequate pre-reform impact, risk, and capacity assessment; inadequate transition planning
2. Institutional and Regulatory Governance	Unclear institutional mandates; overlapping or conflicting authority; fragmentation of regulatory responsibilities; inability to enforce mandatory standards; persistent serious regulatory non-compliance; delayed regulatory intervention despite recognized risks; regulatory capture or inappropriate external influence; weakening of institutional authority over providers and other health-system actors
3. Accountability, Transparency, and Integrity	Unclear accountability for critical decisions and outcomes; persistent unresolved audit and oversight findings; failure to implement required corrective actions; inadequate transparency in major decisions and resource allocation; conflicts of interest; corruption and integrity risks; ineffective accountability mechanisms; recurrence of previously identified governance failures
4. Coordination and Implementation Capacity	Persistent policy-to-implementation gaps; failure to implement critical national decisions; weak vertical coordination between national, regional, and local levels; weak horizontal and intersectoral coordination; conflicting directives; inadequate public–private coordination; inability to mobilize or reallocate resources following critical decisions; repeated implementation delays; failure to correct persistent implementation deviations
5. Information and Evidence-Informed Governance	Delayed availability of critical information; unreliable, incomplete, or conflicting data; failure to incorporate evidence into major policy decisions; failure to recognize or escalate validated warning signals; selective or distorted reporting; weak linkage between monitoring results and corrective decisions; loss of situational awareness during increasing system pressure
6. Adaptive and Crisis Governance	Delayed response to emerging threats; failure to act on validated high-priority warnings; unclear command authority during emergencies; delayed activation of emergency coordination mechanisms; inability to modify ineffective policies; inability to rapidly reallocate authority and resources; inadequate institutional learning; recurrence of previously recognized failures; persistence of ineffective interventions despite evidence of deterioration;

	inadequate transition management during rapidly changing conditions
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Participants emphasized that the existence of formal governance structures did not necessarily indicate effective governance. A health system could possess a national strategy, annual plans, regulatory institutions, monitoring mechanisms, accountability structures, and emergency plans while simultaneously demonstrating substantial governance fragility if these mechanisms failed to influence actual system behaviour.

This distinction was particularly evident in relation to planning. Participants differentiated between the existence of a plan and the capacity to implement it. Five-year or other long-term strategic plans were considered meaningful only when translated into annual operational plans, supported by realistic financing, workforce, infrastructure, and implementation capacity, and accompanied by measurable targets and corrective mechanisms. Persistent failure to achieve critical strategic objectives across successive planning periods was considered substantially more important as a warning signal than overall plan-completion rates.

A related finding concerned the alignment between strategic ambition and system capacity. Participants identified excessively ambitious programmes as a potential source of governance-induced instability when commitments substantially exceeded available financial resources, workforce capacity, infrastructure, technology, or implementation capability. Ambitious reform itself was not considered evidence of governance fragility; rather, risk emerged when major commitments were undertaken without adequate assessment of whether the system possessed the capacity required for implementation.

Participants similarly distinguished policy change from destabilizing policy change. Changes associated with political transitions, ideological orientation, or new leadership were not automatically regarded as governance failures. They became relevant to governance fragility when major programmes were abruptly discontinued or redirected without evidence-based evaluation, impact assessment, transition arrangements, or adequate consideration of consequences for essential health-system functions.

Rapid structural reforms were also identified as a potential source of internal system shock. Participants indicated that simultaneous or large-scale reforms could exceed the absorptive capacity of a health system, particularly where organizational restructuring, financing changes, regulatory reforms, or service-delivery changes occurred within short implementation periods. Under these conditions, governance decisions themselves could contribute to system instability.

The six dimensions generated a considerably larger pool of potential warning signals and measurable indicators than could reasonably be incorporated into a practical early-warning framework. Participants therefore differentiated between general measures of governance performance and indicators capable of signaling deterioration potentially relevant to systemic failure. Candidate indicators were prioritized according to four principal considerations: relevance to systemic deterioration, early-warning value, measurability, and ability to distinguish routine governance weaknesses from severe governance dysfunction.

Particular importance was assigned to indicators reflecting persistent failure rather than isolated events. Participants considered repeated inability to achieve critical objectives, failure to implement mandatory decisions, persistent regulatory non-compliance, failure to complete corrective actions, inability to respond to validated warnings, breakdown of critical coordination, and governance-associated disruption of essential services to be more informative than general measures of administrative performance.

Following prioritization of the larger candidate pool, 18 indicators were selected by the participants as the principal governance-related early-warning indicators for further assessment. These indicators covered the six governance dimensions and included two cross-cutting measures reflecting systemic consequences and accumulation of governance failures. The selected indicators are presented in Table 4.

Table 4. Governance-Related Early-Warning Indicators Selected by Participants

No.	Governance Dimension	Selected Early-Warning Indicator	Operational Measurement
1	Strategic Planning & Policy	Persistent Critical Strategic Target Failure	Percentage of predefined critical health-system strategic targets remaining unmet across ≥ 2 consecutive assessment periods despite documented corrective action
2	Strategic Planning & Policy	Critical Plan–Capacity Mismatch	Percentage of critical strategic or reform commitments for which verified financial, workforce, infrastructure, technological, or implementation capacity remains below the minimum estimated requirement
3	Strategic Planning & Policy	Unassessed Major Reform Exposure	Percentage of major health-system reforms initiated without documented impact, capacity, risk, and transition assessment
4	Strategic Planning & Policy	Critical Programme Discontinuity Following Governance Change	Percentage of active critical programmes discontinued or fundamentally redirected following leadership or major policy change without documented performance-based justification and transition arrangements
5	Institutional & Regulatory	Critical Regulatory Non-Compliance Persistence	Percentage of serious regulatory violations remaining unresolved beyond the mandated corrective period
6	Institutional & Regulatory	Critical Institutional Authority Conflict	Percentage of critical system decisions or actions delayed or prevented because institutional authority or responsibility remains unresolved
7	Accountability, Transparency & Integrity	Unresolved High-Risk Accountability Findings	Percentage of high-risk audit, oversight, or accountability findings remaining unresolved

No.	Governance Dimension	Selected Early-Warning Indicator	Operational Measurement
			beyond the required corrective period
8	Accountability, Transparency & Integrity	Critical Corrective-Action Failure	Percentage of required high-priority corrective actions remaining incomplete after ≥ 2 defined monitoring cycles
9	Coordination & Implementation	Critical Policy Implementation Failure	Percentage of nationally mandated critical health-system actions not implemented within the required implementation period
10	Coordination & Implementation	Critical Inter-Institutional Coordination Failure	Percentage of critical actions or incidents significantly delayed or disrupted because required inter-institutional coordination failed
11	Coordination & Implementation	Critical Resource Mobilization/Reallocation Failure	Percentage of formally authorized urgent resource mobilizations or reallocations not executed within the predefined critical response period
12	Information & Evidence	Critical Decision-Data Latency	Percentage of validated critical health-system information not reaching authorized decision-makers within the predefined decision window
13	Information & Evidence	Critical Information Discordance	Percentage of critical system variables for which authoritative data sources demonstrate discrepancies exceeding predefined acceptable tolerance
14	Information / Adaptive Governance	Critical Warning-to-Action Failure	Percentage of validated high-priority system warnings not followed by documented governance action within the required response period
15	Adaptive & Crisis Governance	Emergency Governance Response Failure	Percentage of qualifying emergencies in which mandated command and coordination mechanisms are not activated within the required timeframe
16	Adaptive & Crisis Governance	Failure to Adapt Ineffective Critical Interventions	Percentage of critical interventions demonstrating persistent ineffectiveness or

No.	Governance Dimension	Selected Early-Warning Indicator	Operational Measurement
			deterioration across ≥ 2 review cycles without substantive modification, escalation, or termination
17	Cross-cutting	Governance-Associated Essential-Service Disruption	Percentage of major disruptions of predefined essential health services in which delayed, conflicting, absent, or ineffective governance action is identified as a major contributing factor
18	Cross-cutting/Systemic	Concurrent Critical Governance Failure	Number or proportion of governance dimensions simultaneously containing indicators within the highest-risk range during the same assessment period

The selected indicators were not intended to constitute an exhaustive measurement system for health-system governance. Rather, they represented a prioritized subset of measurable warning indicators selected from a larger pool because participants considered them particularly relevant to identifying progression from governance weakness toward systemic dysfunction.

The findings suggested that governance deterioration may progress through increasing levels of severity. At earlier stages, fragility may manifest as persistent failure to achieve critical strategic objectives, mismatch between policy commitments and system capacity, insufficient assessment of major reforms, or unresolved regulatory and institutional problems.

With increasing deterioration, the warning pattern shifts from deficiencies in planning or institutional arrangements toward failure of governance action. Critical policies remain unimplemented, corrective actions fail, regulatory violations persist, coordination mechanisms become ineffective, and information reaching decision-makers is either delayed or unreliable.

A more severe condition occurs when the health system identifies a significant threat but the governance structure is unable to respond effectively. The Critical Warning-to-Action Failure indicator was particularly important in this regard because it distinguishes lack of awareness from inability or unwillingness to act despite awareness of a validated threat.

At advanced levels of governance fragility, participants described a transition from governance dysfunction toward loss of effective governance control. This condition is characterized by simultaneous failures in multiple governance dimensions, inability to mobilize or redirect resources, failure of emergency command and coordination, persistence of ineffective interventions, and eventual disruption of essential health-system functions attributable in part to governance failure.

Importantly, participants did not consider deterioration in a single indicator sufficient to establish that a health system was approaching collapse. Each indicator represents a specific governance-related warning signal. The systemic interpretation depends on its severity, persistence, and interaction with deterioration in other governance dimensions.

The Concurrent Critical Governance Failure indicator was therefore included to capture accumulation across dimensions. Simultaneous deterioration of strategic, regulatory, implementation, information, accountability, and adaptive governance functions was considered substantially more concerning than severe deterioration isolated within a single area.

Risk Stratification of the Early-Warning Indicators

To permit systematic interpretation, participants supported classification of each selected indicator into five progressive risk levels Safe; Low Risk; Moderate Risk; High Risk; and Near to Collapse. These levels represent increasing severity of the individual governance warning signal rather than a direct diagnosis of whole-system collapse. Accordingly, an indicator classified as Near to Collapse represents a critical governance condition strongly associated with systemic vulnerability, while the overall risk of health-system collapse requires consideration of multiple indicators and their distribution across governance dimensions.

This distinction allows the framework to identify deterioration before widespread operational failure occurs while avoiding interpretation of an isolated governance problem as evidence of systemic collapse.

The 18 selected indicators therefore provide the basis for the quantitative risk-assessment component of the framework. Each indicator can subsequently be assigned an operational threshold for the five risk categories according to its direction, unit of measurement, expected normal range, and level at which governance control becomes seriously compromised.

Relationship with the SEA Framework and WHO Health-System Building Blocks

Mapping of the findings to the SEA framework demonstrated that governance fragility affects all three dimensions of Stability, Efficiency, and Adaptability. Strategic discontinuity, loss of institutional authority, unresolved accountability problems, and persistent implementation failures primarily threaten Stability by weakening continuity, institutional control, and the ability to maintain critical system functions. Coordination failures, delayed implementation, regulatory dysfunction, and ineffective resource mobilization reduce Efficiency by preventing decisions and resources from being translated into timely system action. Failure to recognize warnings, respond to threats, modify ineffective interventions, or activate crisis governance mechanisms directly compromises Adaptability.

The relationship with the WHO Six Health-System Building Blocks was similarly cross-cutting. Although leadership and governance constitute one of the six building blocks, participants' findings indicated that severe governance fragility can propagate into service delivery, health workforce, health information systems, access to essential medicines and technologies, and health financing.

Governance fragility therefore emerged not only as a discrete weakness within the leadership/governance building block but also as a system-wide vulnerability capable of amplifying deterioration across other health-system components.

Overall, the findings indicate that the early identification of governance fragility requires more than assessment of whether formal governance institutions, strategies, regulations, and accountability mechanisms exist. The more consequential warning signals arise when these mechanisms progressively lose their capacity to translate information into decisions, decisions into implementation, implementation failures into corrective action, and emerging threats into timely adaptation.

The 18 indicators prioritized by participants provide a measurable foundation for detecting this progression. Their subsequent classification across Safe, Low Risk, Moderate Risk, High Risk, and Near to Collapse conditions enables governance deterioration to be incorporated into a structured early-warning framework for systemic health-system collapse.

To translate the selected governance early-warning indicators into an operational risk-assessment framework, each indicator was stratified into five progressive risk levels Safe, Low Risk, Moderate Risk, High Risk, and Near to Collapse based on the severity of deterioration and its potential implications for systemic health-system functioning, as presented in Table 5.

Table 5. Proposed Risk Ranges for Governance-Related Early-Warning Indicators

No.	Early-Warning Indicator	Safe	Low Risk	Moderate Risk	High Risk	Near to Collapse
1	Persistent Critical Strategic Target Failure (% of critical targets persistently unmet)	<5%	5–<10%	10–<20%	20–<35%	≥35%
2	Critical Plan–Capacity Mismatch (% of critical commitments with material capacity deficit)	<5%	5–<10%	10–<20%	20–<35%	≥35%
3	Unassessed Major Reform Exposure (% of major reforms initiated without documented impact, capacity, risk and transition assessment)	0–<5%	5–<10%	10–<20%	20–<30%	≥30%
4	Critical Programme Discontinuity Following Governance Change (% of critical programmes discontinued/redesigned without performance-based justification and transition arrangements)	<2%	2–<5%	5–<10%	10–<20%	≥20%
5	Critical Regulatory Non-Compliance Persistence (% of serious violations unresolved beyond mandatory corrective period)	<2%	2–<5%	5–<10%	10–<20%	≥20%
6	Critical Institutional Authority Conflict (% of critical decisions/actions delayed or prevented by unresolved authority conflicts)	<2%	2–<5%	5–<10%	10–<20%	≥20%
7	Unresolved High-Risk Accountability Findings (% unresolved beyond required corrective period)	<5%	5–<10%	10–<20%	20–<35%	≥35%
8	Critical Corrective-Action Failure (% of high-priority corrective actions incomplete after ≥2 monitoring cycles)	<5%	5–<10%	10–<20%	20–<35%	≥35%
9	Critical Policy Implementation Failure (% of mandated critical health-system actions not implemented within required period)	<5%	5–<10%	10–<20%	20–<35%	≥35%
10	Critical Inter-Institutional Coordination Failure (% of critical actions/incidents disrupted by coordination failure)	<2%	2–<5%	5–<10%	10–<20%	≥20%

No.	Early-Warning Indicator	Safe	Low Risk	Moderate Risk	High Risk	Near to Collapse
11	Critical Resource Mobilization/Reallocation Failure (% of authorized urgent reallocations not executed within required period)	<2%	2–<5%	5–<10%	10–<20%	≥20%
12	Critical Decision-Data Latency (% of critical information not reaching decision-makers within required decision window)	<2%	2–<5%	5–<10%	10–<20%	≥20%
13	Critical Information Discordance (% of critical variables exceeding accepted inter-source discrepancy tolerance)	<2%	2–<5%	5–<10%	10–<20%	≥20%
14	Critical Warning-to-Action Failure (% of validated high-priority warnings without timely documented governance action)	<2%	2–<5%	5–<10%	10–<20%	≥20%
15	Emergency Governance Response Failure (% of qualifying emergencies without timely activation of mandated command/coordination mechanisms)	0–<2%	2–<5%	5–<10%	10–<15%	≥15%
16	Failure to Adapt Ineffective Critical Interventions (% of persistently ineffective critical interventions not modified/escalated/terminated)	<5%	5–<10%	10–<20%	20–<30%	≥30%
17	Governance-Associated Essential-Service Disruption (% of major essential-service disruptions with governance failure as a major contributing factor)	0–<1%	1–<3%	3–<5%	5–<10%	≥10%
18	Concurrent Critical Governance Failure (% of six governance dimensions simultaneously in High Risk or Near-to-Collapse status)	0%	>0–<17%	17–<34%	34–<67%	≥67%

Risk ranges apply to the individual governance indicator and should not be interpreted as a stand-alone diagnosis of whole-system collapse. The overall systemic risk should be determined by the severity, persistence, and concurrent deterioration of indicators across multiple governance dimensions. Lower thresholds are applied to indicators involving regulatory control, emergency response, critical information, coordination, urgent resource mobilization, and essential-service disruption because relatively infrequent failures in these functions may have substantial system-level consequences. These ranges represent proposed early-warning thresholds derived for the framework and should be subjected to empirical validation and calibration across different health-system contexts before use as definitive universal cut-off points.

5. Discussion

This study identified governance fragility as a multidimensional and measurable source of systemic vulnerability in health systems. Six governance dimensions emerged from the analysis, encompassing strategic planning and policy governance, institutional and regulatory governance, accountability and integrity, coordination and implementation capacity, information and evidence-informed governance, and adaptive and crisis governance. From a larger pool of potential measures, participants prioritized 18 indicators considered most relevant to detecting deterioration before governance dysfunction becomes reflected in widespread system failure. The principal contribution of these findings is therefore not simply the identification of governance weaknesses, but their translation into measurable early-warning signals with progressive risk levels.

The findings suggest that governance fragility should be interpreted as a process rather than a binary condition. Health systems may continue to operate despite weaknesses in planning, regulation, accountability, or coordination. However, risk becomes progressively more consequential when weaknesses become persistent, when corrective mechanisms fail, and particularly when the system loses its capacity to recognize deterioration and translate decisions into effective action. This progression distinguishes routine governance deficiencies from governance fragility with potential implications for systemic collapse.

Governance Fragility Through the SEA Model

The SEA model provides an important framework for understanding this progression because governance deterioration does not affect all system capabilities in the same way. Instead, the identified warning signals can undermine Stability, Efficiency, and Adaptability through different but interacting mechanisms.

From the perspective of Stability, governance provides institutional continuity, strategic direction, regulatory authority, accountability, and predictability. Persistent failure of critical strategic targets, discontinuation of essential programmes following governance change, unresolved institutional authority conflicts, regulatory non-compliance, and failure of accountability mechanisms can progressively weaken the institutional foundations required to maintain essential health-system functions. Stability is therefore threatened not merely by the absence of policies or institutions, but by declining confidence that established governance mechanisms can reliably produce and sustain required system actions.

Efficiency will be affected when governance structures remain formally present but fail to translate plans, information, authority, and resources into implementation. Critical policy implementation

failure, inter-institutional coordination breakdown, unresolved corrective actions, and failure to mobilize or reallocate resources illustrate this mechanism. Under these conditions, resources may still exist within the health system, yet governance failures prevent their timely or appropriate use. Governance fragility can therefore produce functional scarcity even before absolute resource scarcity develops.

The relationship with Adaptability is particularly important for early warning. A health system may tolerate substantial inefficiencies or structural weaknesses under relatively stable conditions but become highly vulnerable when confronted with sustained pressure or sudden shock. Critical decision-data latency, warning-to-action failure, inability to modify ineffective interventions, and failure to activate emergency governance mechanisms directly reduce the system's capacity to recognize changing conditions and respond before deterioration accelerates. Loss of adaptability may therefore represent an important transition between manageable governance fragility and rapidly increasing systemic risk.

The three SEA dimensions should not, however, be interpreted independently. The most concerning condition occurs when governance deterioration simultaneously compromises Stability, Efficiency, and Adaptability. A system with weakened institutional stability may temporarily compensate through effective management; a resource-inefficient system may remain functional if it retains strong adaptive capacity; and a stable system may tolerate temporary shocks when rapid adaptation is possible. When all three capabilities deteriorate concurrently, compensatory capacity becomes progressively limited.

This interpretation also explains why no single indicator identified in this study should be considered diagnostic of health-system collapse. A high-risk value for one governance indicator identifies a critical vulnerability within a specific function. The systemic significance increases when severe indicators persist, corrective mechanisms fail, and deterioration spreads across governance dimensions and across the SEA domains.

Planning, Reform, and Governance-Induced Risk

The findings also broaden the conventional interpretation of governance failure. Fragility does not arise exclusively from inactivity, weak leadership, or absence of planning. Governance itself can generate systemic pressure when the scale, speed, or ambition of policy change exceeds the absorptive capacity of the health system.

This is particularly relevant to long-term strategic planning and major reforms. The existence of a five-year strategy or annual operational plan provides limited protection if objectives are disconnected from financing, workforce, infrastructure, technological capability, or implementation capacity. Persistent failure of critical strategic objectives may therefore provide a stronger early-warning signal than the simple existence or completion rate of planning documents.

Similarly, rapid policy changes associated with political, ideological, or leadership transitions should not automatically be classified as governance fragility. The relevant issue is whether such changes disrupt critical programmes, bypass evidence and impact assessment, lack transition arrangements, or exceed available implementation capacity. The proposed indicators therefore assess the measurable consequences and governance conditions surrounding major change rather than the political orientation of the decision itself.

This distinction is important because it introduces the possibility of a governance-induced internal shock. Whereas pandemics, natural disasters, conflict, or economic crises represent external pressures, poorly prepared large-scale reforms can generate substantial internal disruption. A resilient governance system should therefore possess not only the capacity to initiate change but

also the capacity to assess system readiness, manage transitions, monitor consequences, and reverse or modify interventions when emerging evidence indicates harm.

From Governance Performance to Early Warning

Another contribution of the proposed framework is the distinction between conventional governance performance measures and collapse-oriented early-warning indicators. Measures such as the existence of a strategy, number of meetings, policy production, or routine programme-completion rates may describe administrative performance but provide limited information regarding proximity to severe systemic dysfunction.

The indicators prioritized in this study instead emphasize criticality, persistence, failure of correction, and loss of control. Failure to implement a critical policy becomes more concerning when it persists; a regulatory violation becomes systemically relevant when enforcement repeatedly fails; information deficiencies become dangerous when critical warnings cannot reach decision-makers; and coordination weakness becomes a systemic threat when it prevents essential actions during periods of pressure.

The five-level classification from Safe to Near to Collapse should consequently be interpreted as severity levels for each warning signal rather than deterministic predictions of collapse. The proposed thresholds provide an operational starting point for monitoring governance deterioration, but they require empirical calibration across different health-system structures and contexts.

The cross-cutting indicator of concurrent critical governance failure is especially important in this respect. The simultaneous presence of high-risk conditions across several governance dimensions may provide a stronger indication of systemic vulnerability than extreme deterioration in an isolated indicator. Future validation should therefore examine not only individual thresholds but also combinations and trajectories of indicators.

Governance as a Cross-Cutting System Vulnerability

The findings further indicate that governance fragility extends beyond the leadership/governance component of the WHO Six Health-System Building Blocks. Governance decisions influence financing, workforce deployment, information systems, medicines and technologies, and service delivery. Failure in governance can therefore propagate through the other building blocks and amplify vulnerabilities that may initially appear financial, operational, technological, or workforce-related.

The SEA model complements the WHO Building Blocks in this context. The Building Blocks help identify where the consequences of governance fragility appear within the health system, whereas SEA helps explain what systemic capability is being lost: continuity and control through Stability, effective conversion of resources into action through Efficiency, and the ability to recognize and respond to change through Adaptability.

This distinction is particularly relevant for early-warning assessment. Conventional performance frameworks may detect deterioration once outcomes or services have already been affected. A governance-oriented SEA assessment may identify weakening capacity earlier for example, repeated warning-to-action failures or persistent inability to execute corrective actions before disruption becomes visible as widespread service failure.

Several limitations should nevertheless be considered. The proposed indicators and risk ranges are intended as an early framework rather than universally validated thresholds. Governance

arrangements differ considerably across centralized, decentralized, insurance-based, tax-funded, and mixed health systems. The meaning of specific indicators may therefore vary by institutional context. Expert prioritization also introduces judgment into indicator selection. Prospective validation, cross-country testing, sensitivity analysis, and assessment of indicator combinations will be necessary before the proposed ranges can be interpreted as universal cut-off points.

Despite these limitations, the findings suggest that governance fragility can be operationalized beyond broad concepts such as weak leadership or poor accountability. Monitoring the deterioration of critical governance functions through the SEA perspective provides a potential mechanism for distinguishing routine governance problems from conditions in which the health system is progressively losing its capacity to remain stable, function efficiently, and adapt to increasing pressure.

6. Conclusion

Governance fragility represents more than weakness in leadership, regulation, or institutional arrangements. It becomes a systemic threat when the health system progressively loses its capacity to establish realistic strategic direction, translate decisions into implementation, enforce accountability and regulation, coordinate critical actors and resources, recognize emerging threats, and take timely corrective action.

This study identified six dimensions of governance fragility and, from a broader pool of potential measures, 18 early-warning indicators prioritized by participants for their systemic relevance, measurability, and capacity to distinguish routine governance weaknesses from severe dysfunction. Stratifying these indicators from Safe to Near to Collapse provides a structured approach for monitoring the progression of governance-related risk rather than recognizing governance failure only after major disruption has occurred.

The SEA model Stability, Efficiency, and Adaptability provides the central systemic interpretation of these warning signals. Governance fragility threatens Stability by weakening institutional continuity, authority, and control; Efficiency by disrupting the translation of policies, resources, and information into effective action; and Adaptability by reducing the capacity to recognize threats, respond to warnings, modify ineffective interventions, and manage shocks. The greatest systemic risk is expected when deterioration becomes persistent and simultaneously compromises all three SEA dimensions.

Governance should therefore be considered both a distinct health-system function and a cross-cutting determinant capable of transmitting and amplifying vulnerabilities across service delivery, workforce, financing, information, medicines and technologies, and other critical system capacities. Particularly important are warning signals indicating failure of corrective mechanisms, failure to act despite recognized threats, and governance-associated disruption of essential services, as these may indicate progression from fragility toward loss of effective governance control.

The proposed framework should not be interpreted as a deterministic prediction of collapse. Rather, it provides a foundation for identifying when governance weaknesses are becoming systemic risks. Future research should prospectively validate the proposed indicators and thresholds, examine their trajectories and interactions, and determine whether concurrent deterioration across Stability, Efficiency, and Adaptability can reliably distinguish manageable governance fragility from conditions approaching systemic health-system collapse.

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