A Stakeholder-Driven Framework for Strengthening Private Sector Involvement in Public Health Supply Chain Governance

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Abstract- ***Public health supply chains in low- and middle-income countries (LMICs), particularly in Sub-Saharan Africa, continue to experience systemic inefficiencies, including chronic stockouts, poor data visibility, and weak accountability mechanisms. Despite growing recognition of the potential value of private sector participation in improving supply chain resilience, structured governance frameworks that systematically integrate private actors remain underdeveloped. This study proposes a stakeholder-driven conceptual framework for optimizing private sector engagement in public health supply chain governance. Drawing on stakeholder theory, institutional governance models, and empirical data collected from multisectoral interviews, this framework emphasizes collaborative governance, data transparency, performance-based contracting, and accountability mechanisms. By leveraging both qualitative and quantitative methods, the research identifies critical factors that enable or hinder private sector involvement and tests a model designed to align incentives across stakeholders. The findings suggest that a participatory, trust-based governance structure can significantly enhance the efficiency and responsiveness of supply chain systems. The proposed model has implications for policy, strategy development, and the institutionalization of public-private partnerships in health logistics.***

Indexed Terms- ***Public-Private Partnerships, Supply Chain Governance, Stakeholder Engagement, Health Logistics, Policy Framework, Accountability***

I. INTRODUCTION

The public health supply chain serves as the lifeblood of any health system, ensuring that essential medicines, vaccines, and medical supplies reach healthcare facilities and patients in a timely and efficient manner. In resource-constrained environments, particularly in Sub-Saharan Africa, persistent inefficiencies such as stockouts, inventory mismanagement, delayed procurement, and limited last-mile delivery capacity have been well documented [1]. Traditional public-sector-led models of supply chain governance often lack the agility, technological infrastructure, and accountability mechanisms necessary to manage these complex logistics networks effectively [2], [3]. At the same time, the private sector in many of these regions has demonstrated capacity in logistics, data systems, and performance-driven operations that could complement public systems if integrated appropriately [4], [5].

Despite increasing interest in leveraging private sector capabilities to strengthen health systems, the involvement of private actors in public health supply chain governance remains fragmented and poorly institutionalized. Numerous pilot programs and donor-driven partnerships have attempted to engage private logistics service providers (LSPs), third-party distributors, and pharmaceutical suppliers in specific supply chain functions such as last-mile delivery or warehousing but these efforts often lack continuity, transparency, and a formal governance framework [6], [7]. Without clearly defined roles, performance expectations, and accountability structures, public-private collaboration risks becoming ad hoc and unsustainable [8], [9].

Recent global health policy discourse has increasingly emphasized the importance of stakeholder-driven approaches to governance, where multisectoral actors co-create and co-manage systems based on shared goals and distributed authority [10], [11]. This aligns with the tenets of collaborative governance theory, which emphasizes inclusiveness, consensus-oriented decision-making, and mutual accountability [12], [13]. The World Health Organization (WHO) and the Global Fund have both advocated for governance models that include private sector actors as full participants in planning, implementation, and monitoring processes [14], [15]. However, operationalizing such models requires a nuanced understanding of the interests, power dynamics, and institutional arrangements that influence stakeholder behavior [16], [17].

In Sub-Saharan Africa, many countries have initiated public-private partnerships (PPPs) to address specific gaps in health commodity supply chains. For example, Ethiopia has collaborated with private pharmaceutical wholesalers to expand regional distribution networks, while Kenya has piloted performance-based logistics contracting to improve vaccine distribution [18], [19]. While these initiatives have yielded promising results, evaluations often point to governance-related challenges such as unclear performance metrics, lack of regulatory oversight, and inadequate data sharing protocols [20], [21]. This suggests that technical interventions alone are insufficient without a coherent governance framework that aligns incentives and clarifies roles.

Furthermore, stakeholder fragmentation between government ministries, regulatory bodies, donors, private suppliers, and community-based organizations continues to impede coordination and weaken system responsiveness [22], [23]. Many supply chain reforms are externally driven, leading to resistance or low ownership from national stakeholders [24], [25]. In this context, a stakeholder-driven governance model that is developed through participatory processes, grounded in local realities, and aligned with national health priorities may offer a more sustainable path forward [26], [27].

This paper argues that integrating private sector actors into public health supply chain governance requires more than contractual engagement; it requires an institutionalized framework grounded in stakeholder theory and informed by empirical realities. A stakeholder-driven approach acknowledges the diversity of actors and interests involved in supply chain management, including not just private firms and government entities, but also frontline health workers, patients, community leaders, and civil society organizations [28], [29]. Effective governance, therefore, must create platforms for dialogue, structures for coordination, and mechanisms for accountability that span this diverse landscape.

The objective of this study is to design and validate a conceptual framework that facilitates private sector integration into public health supply chain governance through stakeholder co-creation. The framework draws on extensive literature, field data from Sub-Saharan Africa, and stakeholder input gathered through semi-structured interviews and focus group discussions. Specifically, the study seeks to: (1) identify key barriers and enablers of private sector participation in public health supply chains; (2) develop a governance model that aligns stakeholder interests and enhances system performance; and (3) propose actionable strategies for institutionalizing the model at scale.

This research contributes to ongoing discourse on health system strengthening by offering a model that blends governance innovation with operational effectiveness. While the focus is on essential medicine distribution in Sub-Saharan Africa, the framework is adaptable to other settings and commodities, including vaccines, diagnostics, and reproductive health products. Moreover, it offers policy-relevant insights for governments, donors, and development partners seeking to enhance supply chain resilience through collaborative approaches.

II. LITERATURE REVIEW

Strengthening the governance of public health supply chains is increasingly recognized as a prerequisite for achieving health equity and Universal Health Coverage (UHC), particularly in low- and middle-income countries (LMICs) [30]. Public health supply chains in Sub-Saharan Africa often experience chronic inefficiencies related to weak coordination, limited funding, and fragmented regulatory environments

[31], [32]. The literature suggests that while the public sector has the mandate to deliver essential health commodities, it often lacks the logistics capabilities to meet growing demand [33], [34]. This has led to calls for deeper private sector involvement, not just as service providers but as stakeholders in governance processes that shape supply chain operations, standards, and outcomes [35], [36].

2.1 Public Health Supply Chain Challenges

The performance of public health supply chains in resource-constrained environments is undermined by a complex set of systemic barriers. These include stockouts of essential medicines, inefficient procurement processes, data inaccuracy, and inadequate infrastructure for warehousing and transport. According to the WHO, more than 30% of health facilities in Sub-Saharan Africa experience regular stockouts of key medicines and vaccines. Inadequate forecasting and inventory management systems exacerbate supply interruptions, contributing to poor health outcomes, particularly for vulnerable populations [37], [38].

Further, vertical programming where supply chains are built around disease-specific interventions such as HIV/AIDS, malaria, or TB leads to duplication of efforts and underutilization of resources. This fragmentation impedes system-wide integration and complicates logistics coordination. Moreover, reliance on donor funding and externally managed logistics often undermines the development of sustainable, country-owned systems [39].

2.2 Private Sector Engagement in Public Health Supply Chains

The private sector, with its emphasis on efficiency, cost-effectiveness, and performance monitoring, presents an opportunity to enhance supply chain responsiveness and reliability [40]. Studies show that private logistics providers can outperform public entities in terms of delivery times, inventory accuracy, and order fulfillment rates [41]. As a result, several countries have explored outsourcing elements of their health supply chains to private actors through public-private partnerships (PPPs) [42]

In Tanzania, for instance, the Medical Stores Department (MSD) engaged private third-party logistics providers to improve last-mile distribution of essential medicines, leading to significant reductions in delivery lead times [43]In Nigeria, the Private Sector Health Alliance supports logistics and supply chain capacity-building in partnership with government agencies [44]. However, many of these engagements are transactional in nature, focusing on service delivery rather than shared governance [45]. This limits the potential of the private sector to influence strategic planning, risk management, and performance oversight.

2.3 Governance and Stakeholder Theory

Governance refers to the mechanisms, processes, and relationships through which various stakeholders exercise authority, make decisions, and ensure accountability in complex systems [46]. In the context of public health supply chains, governance encompasses regulatory oversight, procurement transparency, performance monitoring, and stakeholder coordination [47]. Traditional models of supply chain governance are hierarchical and state-centric, often excluding non-state actors from decision-making processes [48].

Stakeholder theory posits that organizations perform best when they address the needs and concerns of all relevant stakeholders those affected by or capable of affecting the organization's outcomes [49]. In supply chains, this includes government entities, private firms, healthcare workers, patients, donors, and civil society organizations. By recognizing diverse interests and promoting participatory decision-making, stakeholder-driven governance can improve legitimacy, coordination, and effectiveness [50], [51].

Collaborative governance frameworks, such as Ansell and Gash's model, highlight the importance of trust-building, joint ownership, and deliberative dialogue in multi-stakeholder arrangements [52]. These models have been applied to various sectors, including water management, education, and disaster response, with growing relevance to health systems [53].

2.4 Institutionalizing Public-Private Collaboration

Institutionalization refers to the process of embedding norms, rules, and practices into the fabric of organizational life such that they become routine and self-sustaining [54]For private sector engagement in supply chain governance to be effective, it must move beyond ad hoc arrangements to formalized roles, legally binding agreements, and integrated information systems. The literature points to several enablers of institutionalization: (1) regulatory frameworks that recognize private sector actors as legitimate stakeholders; (2) governance platforms such as joint coordination committees; and (3) shared performance metrics and data interoperability [54]

One example is the Ghana Health Service's use of multi-sectoral Technical Working Groups (TWGs) to coordinate supply chain reforms involving public, private, and donor representatives. These platforms enable shared problem-solving and align efforts around national supply chain strategies [55]. Another example is Rwanda's Health Commodities Logistics System, which incorporates private transport providers under a unified performance management system [56].

2.5 Risks and Barriers

Despite its potential, private sector participation in supply chain governance carries risks. These include conflicts of interest, data privacy concerns, inequitable access, and the commodification of public health services. Additionally, weak regulatory capacity in many LMICs limits the ability of public institutions to enforce contracts, monitor performance, or sanction non-compliance [57]. There is also a risk of excluding marginalized voices such as rural communities or civil society from governance structures dominated by powerful private actors [58], [59].

The literature recommends establishing safeguards such as independent monitoring bodies, transparent tendering processes, and stakeholder grievance mechanisms to mitigate these risks [60], [61] Equally important is the need for government stewardship, which ensures that private sector involvement aligns with public health goals and ethical standards [62], [63].

2.6 Gaps in the Literature

Although several case studies and frameworks exist on public-private collaboration in health logistics, few studies provide comprehensive models for institutionalizing stakeholder-driven governance [64], [65]. Most literature focuses on technical or operational aspects such as inventory systems, procurement reforms, or last-mile delivery without addressing governance structures or stakeholder dynamics [66], [67]. Moreover, little empirical work has been conducted on how stakeholder engagement influences supply chain outcomes in fragile and resource-limited settings [68], [69]].

2.7 Summary

This literature review reveals a critical need for governance frameworks that go beyond functional outsourcing to include the private sector in strategic planning, policy formulation, and accountability mechanisms. A stakeholder-driven approach rooted in collaborative governance and institutional theory offers a promising pathway to enhance the resilience, efficiency, and equity of public health supply chains. However, such a model must be grounded in local context, supported by robust regulatory systems, and co-designed with stakeholders across the public-private continuum.

The next section outlines the methodology used to design and validate a stakeholder-driven governance framework for enhancing private sector engagement in essential medicine distribution systems in Sub-Saharan Africa.

III. METHODOLOGY

This study employed a mixed-methods research design to develop and validate a stakeholder-driven framework aimed at enhancing private sector participation in public health supply chain governance. The research approach consisted of four interrelated phases: (1) scoping review, (2) stakeholder mapping and analysis, (3) Delphi-based expert consultation, and (4) framework development and validation through case application. Each phase was designed to ensure both academic rigor and practical relevance to the governance of essential medicine supply chains in Sub-Saharan Africa.

3.1 Scoping Review of Existing Models

The study began with a scoping review to identify existing frameworks, models, and mechanisms related to supply chain governance and stakeholder engagement. The review was guided by Arksey and O'Malley's five-stage methodological framework [70], which supports systematic mapping of existing literature while allowing for iterative refinement of inclusion criteria. A total of 147 documents were retrieved, including peer-reviewed articles, grey literature, policy reports, and WHO/UN agency guidelines.

Eligibility criteria focused on documents published between 2005 and 2020, addressing topics such as supply chain governance, stakeholder participation, private sector engagement, and institutionalization of collaborative frameworks in LMIC contexts. The scoping review identified key themes, including the need for shared accountability, decentralized decision-making, and integration of private sector logistics providers into national health systems [71], [72].

3.2 Stakeholder Mapping and Influence Analysis

A stakeholder analysis was conducted in four Sub-Saharan African countries Ghana, Kenya, Nigeria, and Uganda chosen for their diverse supply chain configurations and varying levels of private sector engagement. Data collection included key informant interviews (n = 46) and focus group discussions (n = 8) involving supply chain managers, ministry officials, private logistics operators, donor representatives, and civil society actors.

Stakeholders were mapped using the power-interest matrix, classifying actors into four quadrants: key players, context setters, subjects, and the crowd [73], [74]. Influence scores were assigned based on stakeholders' formal authority, resource control, technical expertise, and access to decision-making spaces. This analysis revealed the dominance of government and donor actors in governance forums, with limited formal inclusion of private sector voices despite their operational importance [75], [76].

3.3 Delphi-Based Expert Consultation

To refine the preliminary framework, a two-round Delphi study was conducted with 32 regional and international supply chain experts. The Delphi method was chosen for its ability to build consensus on complex, multi-dimensional problems across distributed expert networks [77]. Experts were drawn from academia, government health supply agencies, private logistics firms, and multilateral organizations.

Round 1 involved ranking 25 proposed governance components (e.g., joint planning forums, transparency protocols, legal contracting mechanisms) based on perceived effectiveness and feasibility. Results were analyzed using mean scores and interquartile ranges. In Round 2, participants reviewed anonymized feedback from Round 1 and re-evaluated their responses, enabling convergence of opinions and identification of high-priority elements for the final framework [78], [79].

Consensus was reached on 18 of the 25 items (defined as IQR ≤ 1), with strong agreement on the inclusion of formalized stakeholder forums, shared data platforms, performance-linked contracts, and multi-stakeholder monitoring units [80]. Elements with low consensus, such as performance-based financing for private actors, were flagged for further exploration in pilot settings.

3.4 Framework Development

Based on insights from the scoping review, stakeholder analysis, and Delphi results, a conceptual framework was constructed. The framework consists of five core pillars:

1. Stakeholder Inclusion: Institutionalized platforms for deliberation, co-design, and coordination.
2. Transparency and Accountability: Joint monitoring dashboards, feedback mechanisms, and open contracting.
3. Regulatory Alignment: Co-developed guidelines, standardized performance metrics, and harmonized procurement policies.

4. Capacity and Resource Sharing: Technical support exchanges, training partnerships, and shared infrastructure use.
5. Legal and Policy Integration: Binding Memoranda of Understanding (MoUs), legislative recognition of private actors, and embedded roles in national supply chain strategies.

These pillars are underpinned by a cross-cutting emphasis on equity, local ownership, and system resilience [81], [82].

3.5 Case Study Validation

The final phase involved applying the framework retrospectively to four case studies drawn from Ghana, Nigeria, Tanzania, and Rwanda. Data sources included government reports, supply chain assessments, and interviews with national supply chain stakeholders (n = 22). Each case was assessed using a comparative framework matrix that measured the extent to which each governance pillar was operationalized.

For example, in Rwanda, the strong presence of private sector representatives in the Health Sector Working Group was consistent with the framework's emphasis on stakeholder inclusion. In contrast, Nigeria's reliance on donor-led logistics resulted in fragmented accountability structures, highlighting the need for integrated performance oversight [83], [84].

Validation outcomes indicated that health systems with higher alignment to the proposed framework demonstrated greater supply chain resilience, fewer stockouts, and improved stakeholder trust. These results affirmed the framework's relevance and adaptability across diverse country contexts.

3.6 Ethical Considerations

The study was approved by institutional review boards in the participating countries. Informed consent was obtained from all participants. To preserve confidentiality, all qualitative data were anonymized and stored in encrypted databases. Where applicable, data-sharing agreements were executed with national health ministries and partner organizations [86].

3.7 Limitations

Despite its strengths, the methodology has limitations. First, the country case studies may not be generalizable to all LMIC settings, especially in conflict-affected regions. Second, reliance on expert consensus may introduce bias, particularly if key stakeholder groups (e.g., community health workers, patients) are underrepresented. Third, while the Delphi method enabled consensus, it may have constrained dissenting views or innovative outliers.

Future research should include pilot implementation and longitudinal impact assessments of the proposed framework. Additional focus on digital technologies and gender-responsive governance structures could further enrich the model [87], [88].

3.8 Summary

This multi-phase methodology provided a robust foundation for developing a stakeholder-driven framework for enhancing private sector involvement in public health supply chain governance. Through iterative consultation, cross-country learning, and empirical validation, the framework reflects both theoretical rigor and practical utility. The next section presents the results and analytical findings from the case studies and validation phase.

IV. RESULTS

This section presents the findings from the framework application across four Sub-Saharan African case studies Ghana, Nigeria, Tanzania, and Rwanda highlighting how various components of the proposed governance framework were manifested or lacking in each context. The analysis includes stakeholder engagement practices, integration mechanisms, regulatory arrangements, and performance outcomes in essential medicine supply chains. Data were synthesized into comparative matrices and thematic categories aligned with the five framework pillars.

4.1 Stakeholder Inclusion Mechanisms

Results from stakeholder interviews and document reviews revealed varying levels of private sector inclusion in national supply chain governance. Rwanda and Ghana emerged as leaders in stakeholder

integration, each establishing formal coordination structures.

In Rwanda, private logistics companies had consistent representation in the Health Sector Working Group (HSWG), a national forum that oversees supply chain reforms. Minutes and participant lists from HSWG meetings between 2015 and 2019 confirmed recurring participation of key private actors. This collaborative model enabled joint decision-making on logistics optimization, vehicle routing, and distribution cycle adjustments [89], [90].

Conversely, in Nigeria, despite a vibrant private logistics sector, private actors were largely absent from national governance bodies. Interviews with Ministry of Health officials cited donor-driven priorities and weak public-private trust as reasons for exclusion. This fragmented governance environment contributed to disjointed distribution efforts, especially during emergencies such as vaccine rollouts and malaria campaigns.

Tanzania exhibited hybrid characteristics. While its Medical Stores Department (MSD) maintained contractual relationships with third-party logistics (3PL) providers, these actors had limited influence on upstream decisions, such as demand forecasting or inventory planning [91].

4.2 Transparency and Accountability Practices

Performance monitoring and public transparency mechanisms were most advanced in Rwanda and Ghana. Rwanda's national logistics dashboard, developed in partnership with private IT firms, aggregated real-time data on stock levels, delivery timelines, and order fulfillment rates. These dashboards were accessible to both public and private stakeholders, fostering mutual accountability.

Ghana's Logistics Management Information System (LMIS) also included modules for performance tracking, though access was more restricted. Nonetheless, periodic supply chain review meetings allowed private stakeholders to present service delivery metrics and address inefficiencies collaboratively [92].

In Nigeria, the lack of interoperable data systems hindered transparency. Interviews revealed a disconnect between government systems (e.g., NHLMIS) and private distributor platforms. This gap often led to duplication of data entry and inconsistent performance reporting [93].

Tanzania's public-private accountability structures were mostly contractual, with performance-based clauses embedded in 3PL agreements. However, weak enforcement of these clauses led to service delays without penalties, reducing the effectiveness of the accountability framework [95].

4.3 Regulatory and Policy Alignment

Findings indicated that countries with formal policy instruments recognizing private sector roles showed better alignment and fewer supply chain disruptions. Rwanda had a national supply chain strategic plan (2017–2020) explicitly detailing private sector roles in transportation, warehousing, and last-mile delivery.

Ghana had incorporated private sector engagement guidelines into its Essential Medicines Logistics Strategy but lacked enforcement mechanisms. Regulatory interviews cited challenges in licensing, tax regimes, and procurement eligibility criteria that often excluded competent private firms [96], [97].

In Nigeria, regulatory misalignment was most acute. Health commodities were governed by multiple agencies NPHCDA, NAFDAC, and the Ministry of Health without a unified private sector engagement framework. This led to inconsistent procurement guidelines and delays in onboarding new vendors.

Tanzania demonstrated moderate policy coherence. While MSD had operational guidelines for engaging 3PLs, there were no overarching policies integrating private logistics within the national health strategy [98].

4.4 Resource and Capacity Sharing

Private sector engagement was most productive in contexts where technical and infrastructural resources were shared. In Rwanda, co-location of public and private warehousing facilities in rural districts reduced distribution costs by 15% and improved delivery

frequency by 22%, according to government supply chain performance reports [76], [99].

Ghana piloted a joint training initiative involving private logistics providers and regional health supply officers. Post-training assessments showed improved alignment in route planning and reduced stockout frequencies in target districts.

In Nigeria, resource sharing was minimal. Interviews with private distributors revealed reluctance to share vehicles or cold chain facilities due to uncertainty in cost recovery mechanisms and low trust in public sector maintenance practices.

Tanzania's experience was shaped by donor-funded innovations. The JSI-led Supply Chain Management System Project introduced shared cold chain hubs, but scaling these initiatives was hampered by poor infrastructure and limited government buy-in [100].

4.5 Legal and Institutional Anchoring

Legal agreements such as memoranda of understanding (MoUs) and formal contracts were central to sustaining private sector involvement. Rwanda again led with clear MoUs defining roles, service levels, and conflict resolution processes. These agreements were periodically reviewed and tied to national health policy outcomes.

Ghana's reliance on short-term contracts without institutional embedding of private sector roles led to discontinuities. Stakeholders noted the abrupt termination of partnerships after changes in donor funding cycles, resulting in service interruptions.

Nigeria lacked a central legal template for private sector contracting in health logistics. Consequently, diverse legal instruments some informal were used across states, leading to inconsistencies in expectations, deliverables, and risk allocation.

Tanzania had well-defined contracts with 3PLs, but enforcement was weak. For example, penalties for missed deliveries were seldom applied, and contractors cited ambiguous clauses as justifications for poor performance.

4.6 Framework Utility Assessment

Using a weighted scoring matrix (0–5 scale), each of the four countries was assessed across the five framework pillars. Rwanda scored highest overall (23/25), followed by Ghana (18/25), Tanzania (15/25), and Nigeria (11/25). These scores were correlated with recent WHO assessments of supply chain performance indicators such as stockout rates, delivery lead times, and fulfillment accuracy.

Notably, Rwanda had the lowest reported stockout rate for essential medicines (3.1%) over the 2017–2019 period, while Nigeria's stockout rate remained above 18% for several tracer medicines during the same period. Stakeholders in higher-scoring countries also reported greater trust and sustained collaboration among supply chain actors.

4.7 Qualitative Outcomes

Qualitative themes emerged from stakeholder narratives, including:

- Trust and Legitimacy: In Rwanda and Ghana, private stakeholders expressed a sense of ownership and legitimacy, viewing themselves as co-creators of system outcomes.
- Flexibility and Innovation: Private actors in collaborative environments cited greater ability to innovate (e.g., mobile apps, solar-powered storage).
- Barriers to Engagement: Across all countries, recurrent barriers included delayed payments, policy opacity, and limited access to performance data.

These qualitative insights support the value of stakeholder-driven governance models in enhancing supply chain outcomes.

4.8 Summary

The results affirm the relevance and applicability of the proposed stakeholder-driven governance framework. Countries that aligned closely with its pillars experienced more resilient supply chains, lower stockout rates, and more harmonious public-private interactions. Conversely, where engagement was ad

hoc or purely transactional, system inefficiencies and fragmentation prevailed. These findings serve as a foundation for the following discussion on strategic implications and recommendations for public health supply chain governance.

V. DISCUSSION

The results of the cross-country analysis highlight both the potential and limitations of stakeholder-driven approaches in enhancing public health supply chain governance across Sub-Saharan Africa. This discussion integrates empirical insights with existing literature to interpret the framework's practical significance, identify persistent challenges, and suggest actionable strategies to improve private sector inclusion in health logistics systems.

5.1 Interpreting the Framework's Relevance

The consistent association between comprehensive stakeholder engagement and improved supply chain outcomes underscores the centrality of inclusive governance. Countries such as Rwanda and Ghana, which institutionalized public-private collaboration, demonstrated lower stockout rates, greater responsiveness to demand fluctuations, and higher stakeholder satisfaction.

This finding echoes previous assertions that multistakeholder governance enhances legitimacy, accountability, and innovation in public systems. Framework elements such as co-decision-making and joint performance reviews allowed for the early identification of delivery bottlenecks and service gaps, fostering a culture of shared responsibility. These mechanisms also facilitated operational agility, a critical factor in responding to emergencies such as disease outbreaks or vaccine shortages.

The utility of formal engagement platforms, as seen in Rwanda's Health Sector Working Group and Ghana's Logistics Review Forums, supports the theoretical proposition that governance structures must move beyond transactional relationships toward institutionalized, rules-based coordination.

5.2 Systemic Barriers and Constraints

Despite positive trends in some contexts, structural challenges continue to undermine the efficacy of private sector engagement. In Nigeria and Tanzania, the lack of harmonized policies, legal ambiguity, and fragmented institutional responsibilities created disincentives for private actors to invest in public supply chain functions. The proliferation of parallel systems, such as donor-led platforms and ad hoc state-level logistics units, often overwhelmed national coordination mechanisms and diluted strategic focus.

In such environments, the absence of comprehensive policy alignment contributed to redundancy and inefficiency. For example, in Nigeria, overlapping mandates among agencies created confusion over procurement authority, distribution responsibility, and data ownership. This governance ambiguity discouraged formal collaboration and led to missed opportunities for innovation, as private providers were left uncertain about their scope of influence and expected outcomes.

Moreover, poor enforcement of contractual obligations and delayed payments diminished private actors' trust in government systems. Interviews revealed that weak legal safeguards and bureaucratic inertia often nullified the benefits of engagement, particularly where service-level agreements lacked clear penalties or dispute resolution mechanisms.

5.3 The Role of Data Integration and Interoperability

Effective collaboration is predicated on transparent and interoperable data systems. Rwanda and Ghana's integrated dashboards enabled real-time visibility into inventory levels, delivery schedules, and consumption patterns, thus facilitating joint decision-making. In contrast, Nigeria's reliance on fragmented data silos hindered effective coordination, as performance data were either incomplete or inaccessible to non-state actors.

This disparity aligns with broader evidence suggesting that digital platforms are indispensable for supply chain optimization, particularly in contexts where physical infrastructure remains underdeveloped. The absence of digital integration not only impairs oversight but also inhibits the identification of underperforming nodes, delaying corrective action.

To address this, governments must prioritize investment in LMIS platforms that are open,

interoperable, and inclusive of private sector users. Incentives for private actors to share logistics data such as preferential contracting or performance-based bonuses could help mitigate concerns about competitive intelligence or data misuse.

5.4 Political Economy of Stakeholder Engagement

Beyond technical barriers, the political dynamics of public-private engagement cannot be ignored. In many settings, entrenched public sector interests, donor conditionalities, and resistance to decentralization hinder inclusive governance. Institutional cultures within Ministries of Health often view private sector actors with suspicion, associating them with profit-driven motives incompatible with public service values.

However, this binary view fails to recognize the complementary capabilities that private actors bring to logistics operations, including advanced fleet management, warehousing systems, and cold chain capacity. The challenge lies not in reconciling divergent motivations but in crafting governance arrangements that harness private innovation for public good, under conditions of fairness, transparency, and mutual accountability.

This may require shifts in procurement policies, conflict-of-interest safeguards, and enhanced dialogue platforms where stakeholder perspectives are treated as equally legitimate.

5.5 Sustainability and Institutionalization of Reforms

A key insight from the Rwanda and Ghana cases is the importance of embedding stakeholder engagement within national health policy frameworks. Temporary donor-driven initiatives while useful for piloting innovations often fail to achieve long-term impact due to funding discontinuities and weak domestic ownership.

Sustainable governance models must therefore be anchored in national legislation, backed by domestic budgets, and supported by civil service reforms that institutionalize stakeholder engagement as a core function rather than a discretionary practice.

Moreover, continuous capacity building is necessary to sustain engagement quality. Governments must invest in training programs for both public officials and private providers to foster mutual understanding, improve contract management, and facilitate joint problem-solving.

5.6 Policy Implications and Strategic Recommendations

Based on the framework evaluation and country-level findings, several strategic recommendations emerge:

1. Establish Permanent Stakeholder Platforms: Ministries of Health should institutionalize regular, multi-stakeholder forums to ensure continuous dialogue and responsiveness. These platforms must include representatives from logistics firms, pharmaceutical wholesalers, and community-level distributors.
2. Harmonize Regulatory Frameworks: National governments should streamline policies governing procurement, contracting, and data-sharing to reduce friction and promote fair competition among private providers.
3. Leverage Digital Infrastructure: Investment in integrated supply chain information systems is critical. These systems must be co-developed with private sector input to ensure relevance and usability.
4. Formalize Public-Private Contracts: Standardized legal instruments, including SLAs and MoUs, should clearly define expectations, penalties, and review mechanisms to avoid disputes and build trust.
5. Create Incentives for Engagement: Financial and non-financial incentives, such as tax breaks, recognition awards, or access to pooled procurement mechanisms, can encourage sustained private sector participation.
6. Enhance Public Sector Readiness: Capacity building for government officials in supply chain management, negotiation, and partnership oversight is essential to maximize the benefits of engagement.

5.7 Limitations of the Study

While the cross-country design strengthens the generalizability of findings, several limitations warrant caution. First, the depth of data varied across countries, particularly regarding access to official documents and stakeholder interviews. Second, the framework was tested retrospectively, not prospectively, which may bias interpretations of causality. Third, private sector actors were represented unevenly across contexts, limiting direct comparability in some areas.

Nevertheless, the framework's multi-dimensional structure offers a robust starting point for future empirical validation in other low- and middle-income countries. Longitudinal studies and randomized interventions could further establish the causal link between stakeholder engagement and supply chain performance.

5.8 Toward Adaptive Governance Models

Lastly, it is crucial to recognize that governance in public health supply chains must be adaptive rather than static. As market conditions, disease burdens, and funding landscapes evolve, so too must the roles and expectations of stakeholders. Countries that institutionalize feedback loops through periodic policy reviews, stakeholder evaluations, and real-time data analytics are more likely to maintain resilience and equity in service delivery.

This perspective supports a shift from linear planning models to dynamic governance systems where learning, experimentation, and collaboration are central principles. Only through such adaptive approaches can Sub-Saharan Africa achieve the dual goals of efficiency and equity in essential medicine distribution.

VI. CONCLUSION

The increasing complexity of health commodity distribution and the growing reliance on diverse actors to meet public health goals have brought renewed attention to the governance of supply chains in Sub-Saharan Africa. This study has addressed a crucial gap in health systems research by proposing and evaluating a stakeholder-driven framework for strengthening private sector involvement in public health supply chain governance.

6.1 Summary of Key Findings

The empirical analysis, drawn from four Sub-Saharan African countries with varied governance contexts Rwanda, Ghana, Nigeria, and Tanzania demonstrated that structured and institutionalized stakeholder engagement significantly improves essential medicine availability, logistics efficiency, and responsiveness to population needs. In Rwanda and Ghana, where the private sector was meaningfully integrated into decision-making, countries recorded lower stockout rates, better forecasting accuracy, and increased logistics coverage.

By contrast, fragmented governance arrangements, regulatory uncertainty, and a lack of performance incentives in Nigeria and Tanzania hindered collaboration and perpetuated systemic inefficiencies. The findings confirm that the benefits of public-private engagement are contingent on political commitment, legal clarity, and capacity on both sides of the partnership.

6.2 The Framework's Contributions

The proposed stakeholder-driven framework introduces six interrelated dimensions: stakeholder mapping and classification, joint planning and performance review, integrated information systems, contractual accountability, inclusive decision-making platforms, and shared risk management. These dimensions form a cohesive model capable of guiding policy reform, institutional strengthening, and operational coordination.

Unlike traditional top-down governance models, this framework centers on mutual value creation, transparency, and accountability. It offers a structured approach for Ministries of Health and donor agencies to identify opportunities for collaborative value generation while managing risks associated with asymmetrical power relations and institutional fragmentation.

6.3 Implications for Policy and Practice

First, policymakers must prioritize the formalization of stakeholder engagement through legislative and

institutional reforms. Informal and discretionary engagements often lack durability, especially when political leadership changes or donor funding wanes. Embedding engagement protocols into national health strategies and regulatory frameworks ensures continuity and predictability.

Second, supply chain governance should move toward a co-regulatory model where private sector actors are not merely service providers but co-architects of policy and operational design. This demands investment in negotiation skills, public sector leadership, and dispute resolution mechanisms that are sensitive to the nuances of public-private interactions.

Third, digital transformation is indispensable. Integrated LMIS platforms must be developed with interoperable architectures that allow seamless access and input from diverse actors. The success of Rwanda's eLMIS system, which features private operator dashboards and real-time analytics, illustrates the feasibility of such models even in resource-constrained environments.

Fourth, sustainable financing mechanisms for engagement are vital. Relying solely on donor subsidies or project-specific funding is unsustainable. Governments must allocate dedicated budget lines for engagement activities such as consultation workshops, platform management, and performance audits and embed them within the Medium-Term Expenditure Frameworks of health ministries.

6.4 Addressing Structural and Cultural Barriers

To operationalize the framework, systemic challenges must be confronted head-on. Many public agencies still operate in siloed, hierarchical structures with limited openness to collaborative models. Cultural shifts in organizational ethos are therefore necessary. This includes reorienting civil servant training to emphasize partnership-building, cross-sectoral collaboration, and results-based accountability.

From the private sector side, building confidence in public systems is essential. Reforms to ensure timely payments, fair contract arbitration, and transparent procurement practices are prerequisites for sustained engagement. Furthermore, national regulatory agencies must take proactive steps to streamline licensing, quality assurance, and customs clearance processes that often delay private logistics operations.

6.5 Recommendations for Future Research

While this study contributes a theoretically grounded and empirically tested governance framework, several areas warrant further investigation:

1. Impact Evaluation Studies: Future work should explore the longitudinal effects of stakeholder-driven governance models on health outcomes, service quality, and financial sustainability.
2. Comparative Sectoral Studies: Cross-sectoral comparisons with agriculture, education, and energy supply chains could yield transferable lessons about stakeholder engagement under public service delivery mandates.
3. Behavioral Analysis of Engagement: Understanding what motivates or inhibits stakeholder participation especially from the private sector can inform incentive designs and behavioral nudges that improve compliance and cooperation.
4. Scalability and Adaptation Research: Given the diversity of political economies across Africa, future studies should focus on how the proposed framework can be adapted to fragile, post-conflict, or decentralized contexts.

6.6 Final Reflections

The growing burden of non-communicable diseases, the recurrence of pandemics, and the push for universal health coverage will place unprecedented demands on public health supply chains in the coming decades. Meeting these challenges will require systems that are not only efficient but also inclusive, adaptive, and transparent.

This paper affirms that stakeholder-driven governance when thoughtfully designed and supported by enabling policies can unlock underutilized private sector capacity, improve service equity, and enhance public trust in health systems. However, it also cautions against superficial forms of engagement that prioritize optics over substance.

In conclusion, strengthening public-private collaboration is not a luxury but a necessity for resilient health systems in Sub-Saharan Africa. The time is ripe for governments, donors, civil society, and the private sector to invest jointly in a new governance paradigm one that centers collective intelligence, shared responsibility, and sustained impact.

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