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Financing of Healthcare Supply Chains in Low- and Middle-Income Countries

A Novel Conceptual Framework

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Abstract

Development assistance for health is declining rapidly, and public healthcare supply chains are facing urgent shortfalls in resources. Governments are moving to increase domestic financing of their healthcare supply chains. Yet the financing of supply chains is a neglected policy area, and one where countries face significant challenges. Too often, financing is slow, unpredictable, fragmented, inflexible, dependent on donors, and inefficient. As a result, populations suffer from limited and unreliable access to essential medicines and diagnostics. The neglect is partly due to the reality that health financing and supply chain policymakers work in institutional and disciplinary silos, are backed by different global health agencies and donors, and lack a common understanding or language to develop robust national policies.

Following a review of prior theoretical work and case studies, and engagement with policymakers and experts, this CGD Policy Paper proposes a novel conceptual framework that integrates the functions and policy domains of the two fields. It defines financing of supply chains as "the policies and practices necessary to provide financial resources to the supply chain, and ensure their optimal use, in order to achieve health system goals." The framework articulates integrated sectoral governance as a prerequisite for success and then details 10 distinct functions across four phases of the supply chain: planning, procurement, delivery, and monitoring. First, countries must plan the financing of supply chains, including raising funds, setting priorities, budgeting, and regulating markets. Second, countries must finance procurement and effectively execute procurement budgets, including both "direct" procurement by higher-level budget holders and "indirect" procurement carried out by healthcare facilities. Third, countries must finance an effective delivery system that ensures efficient warehousing and the timely last-mile distribution of commodities to healthcare facilities. Finally, robust monitoring is needed to enable data-informed decision making, including setting the priorities for future cycles.

This framework is intended to provide a new way of thinking about supply chains. In time, we hope this will lead to a new community of practice, countries strengthening their policies and sharing their experience, and better global guidance.

POLICY PAPER 362 • SEPTEMBER 2025

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The authors are very grateful to members of the Working Group on Improving the Financing of Supply Chains for the rich discussions that helped guide the shape of this paper. Ed Llewellyn, Mila Nepomnyashchiy, and Prashant Yadav all provided insightful feedback on earlier drafts of the framework, for which we are extremely grateful. Thanks are also due to Rachel Bonnifield and Mila Nepomnyashchiy for their excellent review comments.

The Center for Global Development is grateful to the Gates Foundation for contributions in support of this work.

Pete Baker, Katherine Klemperer, Yacine Fatime Ndao, Maraki Fikre Merid, Cheryl Cashin, Anooj Pattnaik, and Ibnou Khadim Diaw. 2025. "Financing of Healthcare Supply Chains in Low- and Middle-Income Countries: A Novel Conceptual Framework." CGD Policy Paper 362. Washington, DC: Center for Global Development. https://www.cgdev.org/publication/financing-healthcare-supply-chains-low-and-middle-income-countries-novel-conceptual

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Acronyms

ARC	Africa Resource Centre
CBHI	community-based health insurance
CGD	Center for Global Development
KEMSA	Kenya Medical Supplies Authority
LMICs	low- and middle-income countries
MOH	Ministry of Health
MSD	Medical Store Department (Tanzania)
NHIF	National Health Insurance Fund (Kenya)
OOP	out-of-pocket
PFM	public financial management
PVS	prime vendor system
SEN-PNA	SEN–Pharmacie Nationale d'Approvisionnement (Senegal)
SVS	Stock Visibility System
WHO	World Health Organization

Introduction

The financing of healthcare supply chains—defined here as "the policies and practices necessary to provide financial resources to the supply chain, and ensure their optimal use, in order to achieve health system goals"—is crucial to the performance of healthcare in all countries. Yet it is a neglected policy area, and one where countries face significant challenges. Too often the financing is slow, unpredictable, fragmented, inflexible, dependent on donors, and inefficient, which contributes to limited and unreliable access to essential medicines and diagnostics. For example, World Health Organization (WHO) data from various low- and lower-middle-income countries indicates that, from 2010 to 2019, the percentage of health facilities with a core set of essential medicines available and affordable on a sustainable basis ranged from just 8 percent to only 41 percent.[1] Indeed, stockouts seem to be becoming more common: a study of low- and middle-income countries (LMICs) found that health centres' average stockout levels increased from 7.79 percent in the period from 2006 to 2015 to 14.28 percent from 2016 to 2021.[2]

When medicines are not available in the public sector, and not covered by pooled public finance, patients' care is interrupted and their health suffers. Those who can are forced to seek other options, resulting in high out-of-pocket (OOP) expenditures. In Ghana, 35 percent of insured people have to resort to paying privately in pharmacies due to drug stockouts in the public sector.[3] Nearly half of private spending on primary healthcare (most of which is OOP) is for medicines.[4] Globally, over 1 billion people spend at least 10 percent of their family budget on healthcare,[5] and in Africa alone, OOP payments push 150 million people into or deeper into poverty.[6] Thus, the financing of supply chains is a vital determinant of five health system objectives: health impact, financial protection, responsiveness, efficiency, and equity.

With plunging health aid and shifting socio-political global dynamics, now is an especially important time to consider the financing of domestic supply chains. LMIC supply chains have historically received substantial support from donors; in particular, the USAID Global Health Supply Chain – Procurement and Supply Management project supported countries to the tune of US$1.15 billion in 2024. With the dismantling of USAID, countries will need to work out how to fill this void. Faced in addition with the broader trend of diminishing multilateralism, countries will need to rely more heavily on domestically financed supply chains. Doing so will entail a rapid scaling up of their current capacity as well as optimising their systems' efficiency and value for money.

To support countries in tackling this challenge, the Center for Global Development (CGD) and the Africa Resource Centre (ARC) convened a working group of experts and policymakers from the health financing and supply chain fields, with a mandate to identify the most pressing issues stemming from poor supply chain financing and propose policy solutions.[7] To do this required the development of a novel conceptual framework that integrates the health financing and supply chain fields. This paper develops that framework, which we will subject to testing, further research, expert deliberation, and later revision.

Aim and methods

This paper aims to produce the first comprehensive conceptual framework on the financing of public healthcare supply chains and to explain the key concepts involved. The approach was iterative. An initial draft framework

was developed by looking for connections between existing conceptual frameworks and maturity models in the supply chain and health financing fields. This draft was then updated by reviewing case studies from Kenya,[8] South Africa,[9] Senegal,[10,11] Indonesia,[12] Tanzania,[13] Uganda,[14] and three provinces in Pakistan;[15–17] mappings of the financing of supply chains in Ghana, Ethiopia, Nigeria, and Tanzania;[18] and key papers that looked at the intersection of the fields. Finally, the framework was revised through consultations with key experts in the field. This process included deliberations in a full meeting of the working group in April 2025, and during a workshop preceding the International Health Economics Association congress in July 2025 that brought in insights on the experience of participants from more than 15 countries.

Scope and definitions

Part of the challenge in combining disciplines is uncertainty around terminology and scope. In this paper, we define the financing of supply chains as the policies and practices necessary to provide financial resources to the supply chain, and ensure their optimal use, in order to achieve health system goals. Supply chains include not just the commodities in the supply chain, but all the "physical and informational resources required to deliver a good or service to the final consumer," including infrastructure such as warehouses, staffing, management, logistics, and data systems.[19] Annex A provides a glossary of further terms to guide the reader.

This framework has been developed to cover the supply chains for health commodities, a category that includes medicines as well as supplies and medical equipment. We have also taken three decisions to limit the scope, based on the framework's intended role of informing government policymaking on the financing of supply chains. The framework will focus on the following:

1. **Public financing** of supply chains, inclusive of both the public and private sectors; OOP expenditures within the private sector are out of scope
2. **Domestic financing** of supply chains, with donor financing covered only with regard to how it interacts with domestic financing
3. **National and subnational** supply chain policies, rather than supranational solutions such as market shaping, pooled procurement efforts, and/or regional manufacturing

The remainder of this paper is organised as follows. First, we briefly review the existing frameworks in the supply chain and health financing disciplines. Then, we present the new conceptual framework, with subsections laying out the details and example policy problems within each stage. We end by summarising our upcoming research agenda.

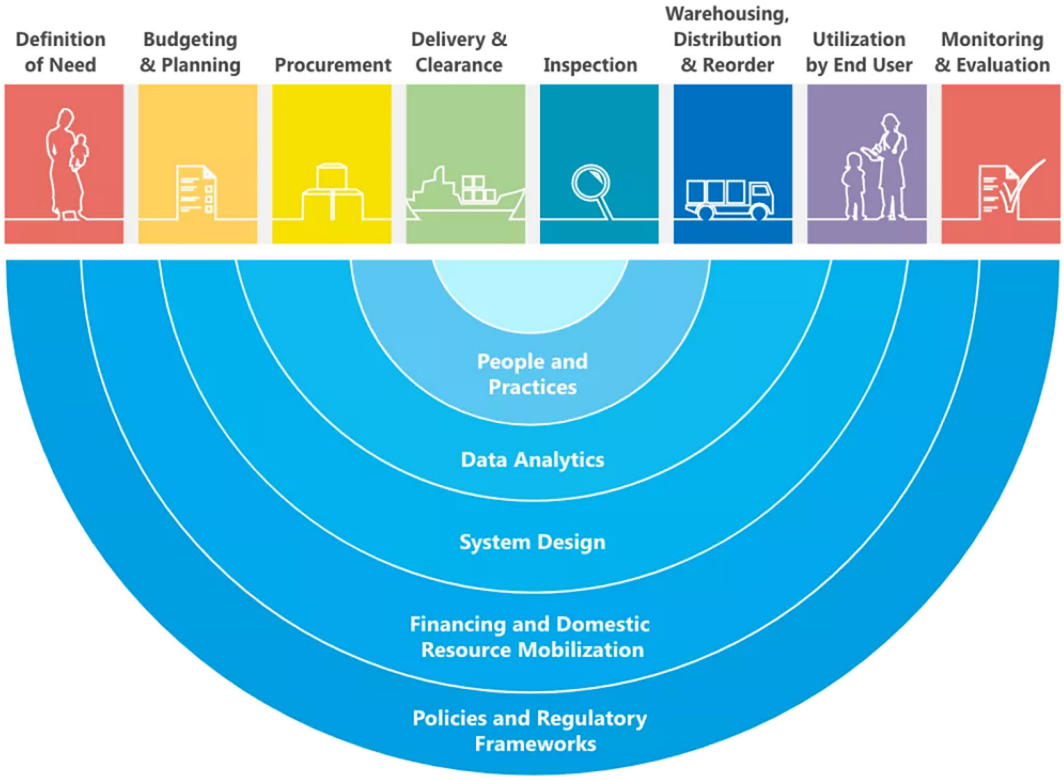
Background: Existing frameworks

Understanding the challenge of financing supply chains requires a novel integration of existing supply chain and health financing concepts. In this section, we introduce the key frameworks currently used in each field.

Supply chain framework

For the purposes of developing the integrated framework, we consider supply chains to execute a simplified four-stage cycle of planning, procurement, delivery,[a] and monitoring (see Box 1), adapted from the UNICEF Supply Chain Maturity Model[21] (Figure 1).

FIGURE 1. UNICEF supply chain maturity model



Source: Supply Chain Maturity Model. UNICEF Supply Division. Accessed 12 August 2025. https://www.unicef.org/supply/supply-chain-maturity-model.

a We recognise that the term "delivery" can mean different things to those in the health financing and supply chain communities. In this paper, we use the term as defined in the Association for Supply Chain Management's Supply Chain Operations Reference model, to mean the management of logistics, warehousing, transportation, and inventory to facilitate the efficient and timely distribution of products.[20]

BOX 1. Supply chain framework, simplified from UNICEF maturity model

Planning: Developing strategic and operational plans to forecast demand, allocate resources, and optimise supply chain processes for effective healthcare delivery

Procurement: Managing the sourcing, contracting, and procurement of health commodities to ensure continuous availability and minimise supply disruptions

Delivery: Coordinating logistics, warehousing, transportation, and inventory management to facilitate the efficient and timely distribution of healthcare products

Monitoring: Assessing the performance of the supply chain through tracking product and information flows, utilising data and technologies, human resources, and financial management

While all healthcare supply chains need to cover these four stages, the structure of supply chains (including procurement) varies greatly across countries. Historically, countries have used five different "operating models" to organise their supply chains:[22]

1. **Central medical store:** A centralised government agency buys and distributes medicines.
2. **Autonomous supply agency:** A semi- or fully autonomous pharmaceutical supply agency centrally conducts procurement and distribution.
3. **Direct delivery system:** Government agencies contract suppliers (at the central level) to directly deliver medicines to districts and major facilities. Suppliers are responsible for storage and distribution.
4. **Pre-qualified vendor(s):** Governments contract with one or more "primary" vendors which are then responsible for distribution to districts and major facilities.
5. **Private supply:** Facilities directly procure from the private sources of their choice.

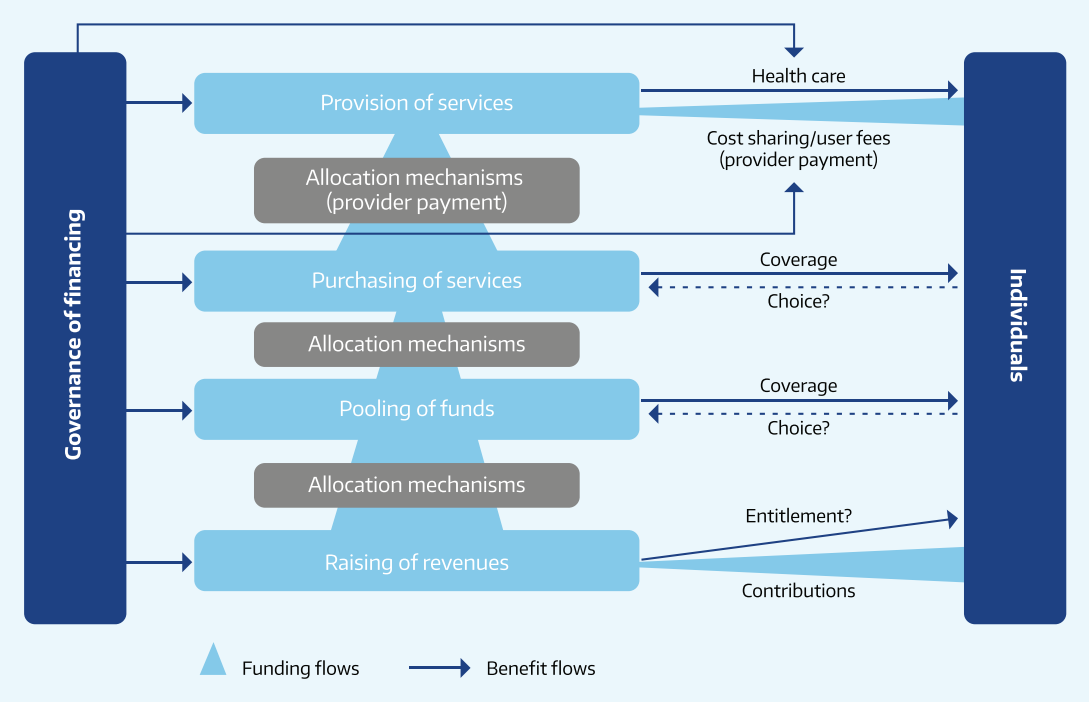
While these are useful archetypes, it must be noted that most countries use a combination of these approaches to cover their whole health sector, often adopting different models for different categories of commodities. For example, countries may use different models for drugs versus equipment, and for essential medicines versus donor-funded vaccines.

Health financing framework

Health financing is a crucial function of a health system, controlling how money is raised and spent on healthcare.[23] It is a key step towards achieving the broader health system goals of universal health coverage and protection against the financial risk of ill health.[24] The WHO considers health financing to entail three key functions: revenue raising, pooling of funds, and purchasing of services (Figure 2).[25] Revenue raising refers to the way in which money enters the health system from different sources. This includes domestic sources (OOP payments at the point of use, prepaid insurance schemes, and government budgets) as well as external aid money from donors. By focusing on who is paying into the system, it enables insight into whether the burden is equitably distributed. Pooling refers to the accumulation of prepaid funds in "pools," such as insurance funds or the national treasury, which can be used to

purchase goods and services on behalf of some or all of the population. It also implies "risk pooling"—the extent to which young and old, rich and poor, urban and rural, sick and healthy share the risk of paying for future healthcare. Finally, purchasing refers to the payment or allocation of resources to providers of healthcare services. Ideally, this purchasing should be "strategic," using evidence and data to define what benefits are provided, how, and to whom, and by which service provider, in order to achieve health system objectives. This differs from procurement in that purchasing specifically refers to payment for *services*, while procurement refers to payment for commodities and capital investment.

FIGURE 2. Health financing arrangements and the population



Source: Kutzin J, Witter S, Jowett M, Bayarsaikhan D. *Developing a National Health Financing Strategy: A Reference Guide*. World Health Organization; 2017.

Importantly, this WHO framework addresses only the financing of health services and makes no reference to supply chains and no explicit reference to commodities or other inputs. It perhaps (incorrectly) assumes that the financing of supply chains is a downstream problem managed by facilities, and thus sits within the purchasing function in the framework. However, many LMICs allocate their funding directly to central procurers, bypassing the purchasing function. More fundamentally, every step of the health financing framework has important interactions with the supply chain, which the current framework does not elucidate. For example, entitlements defined in health benefits packages must be aligned with procurement lists and pharmaceutical policies to effectively prioritise health expenditures, and revenue raising through user fees on drugs can dramatically change how supply chain actors are funded.

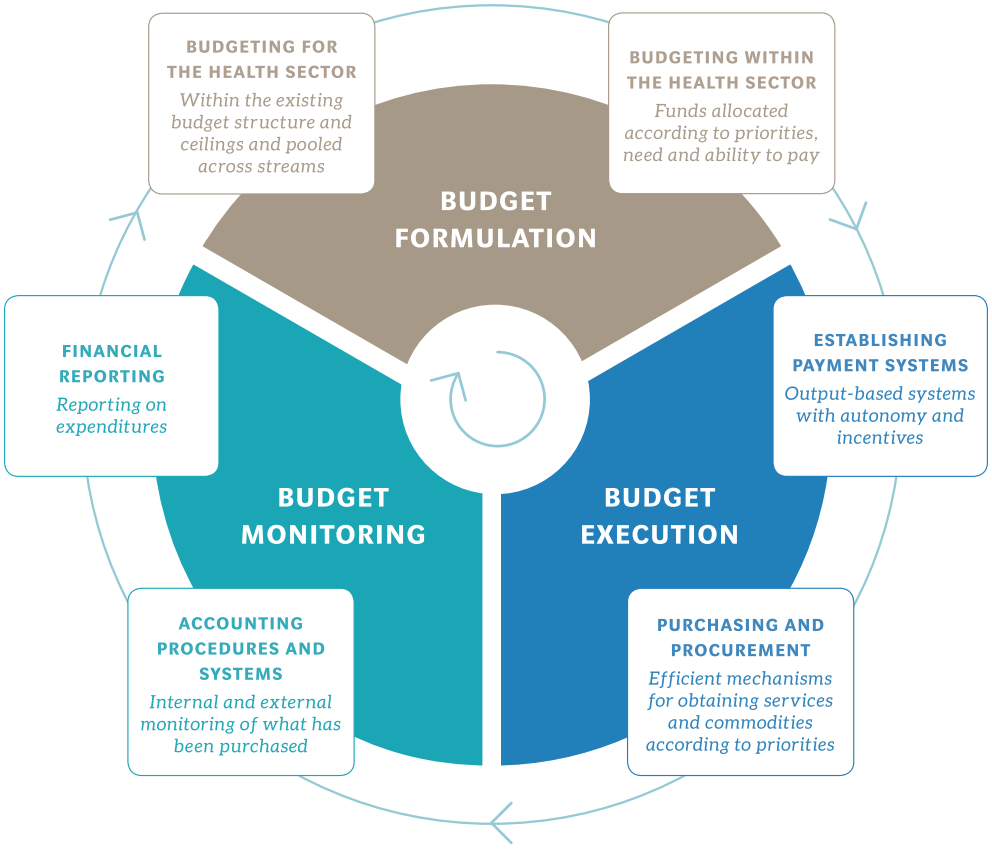
The health financing framework also does not consider the importance of timely delivery of commodities, which in turn is dependent on the timely flow of resources. For this we need to consider public financial management (PFM) systems, including those managed by health facilities and insurance agencies.

Public financial management framework

Health financing policies, including those that deliver effective financing of supply chains, are operationalised through PFM systems. PFM systems comprise three stages: budget formulation, budget execution, and budget monitoring[26] (see Figure 3). An effective PFM system at the central, district, and facility level would enable fiscal discipline (i.e., effective control over the budget), strategic allocation (i.e., in line with government priorities), and efficient service delivery (i.e., achieve the best levels of public services given available resources).[27] To achieve these aims, a PFM system should be:

- **Reliable and expeditious:** Budgets should be implemented as agreed, with contracts paid in a timely manner and goods and services procured when planned, at appropriate quality and price.[28]
- **Operationally and allocatively efficient:** PFM systems should allocate resources to strategic priorities and achieve maximum value for money in service delivery.[29]
- **Transparent and accountable:** It should be possible to track fund flows to have oversight over the full system and improve planning.[30]
- **Predictable, but flexible when needed:** Effective management of programmes requires predictability of resources to prevent potentially deadly stockouts, but at the same time, systems must be flexible enough to respond to crises and to allow providers flexibility to respond to strategic incentives.[31]

FIGURE 3. Public financial management cycle



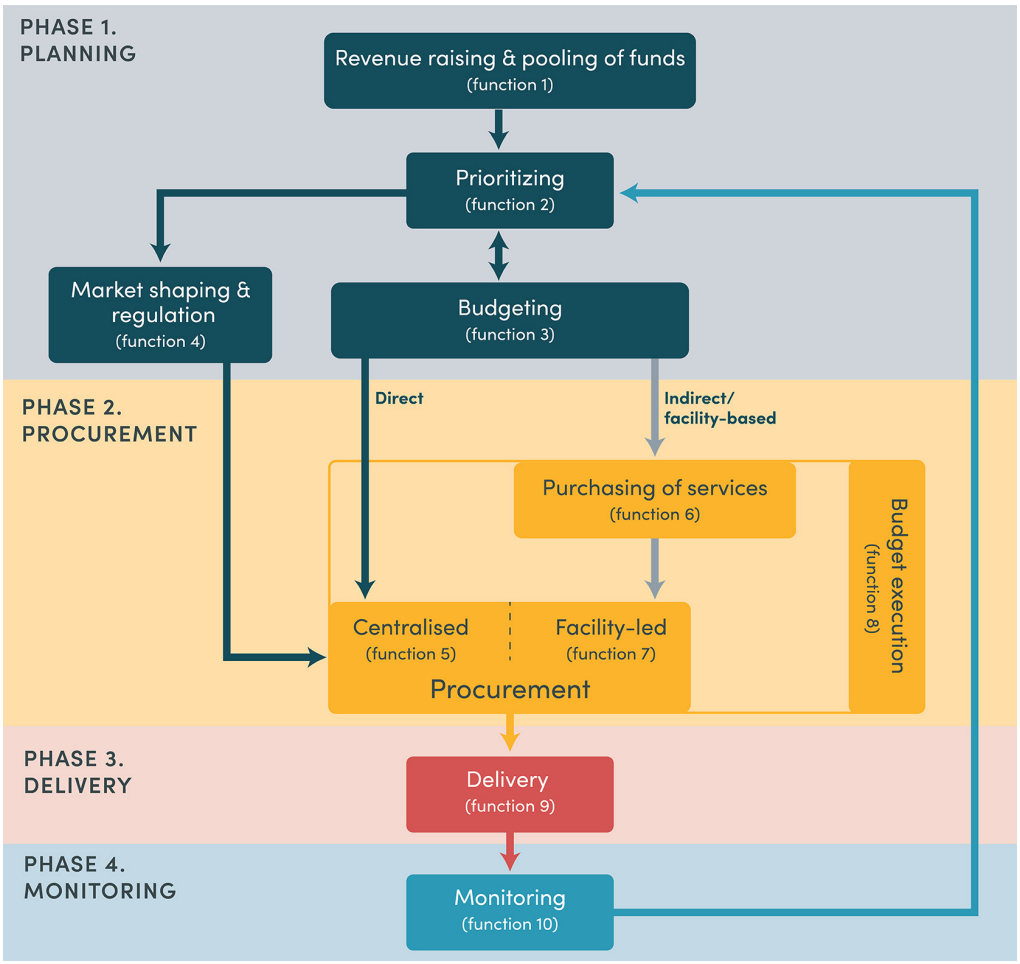
Source: Cashin C, Bloom D, Sparkes S, Barroy H, Kutzin J, O'Dougherty S. *Aligning Public Financial Management and Health Financing: Sustaining Progress Toward Universal Health Coverage*. World Health Organization; 2017.

Each of these three frameworks covers aspects crucial to a complete understanding of the financing of supply chains. While they are currently stand-alone frameworks, there are clear points of intersection. In the next section, we propose a way to integrate the frameworks to provide a comprehensive overview of the financing of supply chains.

Proposed conceptual framework

Incorporating the insights from the three frameworks, as well as case studies, key papers, maturity models, discussions with experts, and the deliberations of the working group, we propose a framework for the financing of supply chains comprising 10 key functions (Figure 4). These 10 functions can be categorised into four phases that align with the simplified supply chain framework: planning, procurement, delivery, and monitoring. In addition to the 10, a prerequisite is that a range of politically powerful sectoral actors work together, including national and subnational budget holders, procurement agencies, insurance agencies, service providers, the private sector, and donors. Therefore, **integrated sectoral governance**, at the ministerial or head-of-state level, is critical. Below, we lay out each phase, describe the 10 key functions, and illustrate them with example policy problems and solutions from case studies.

FIGURE 4. Financing of supply chains: proposed conceptual framework



Phase 1: Planning

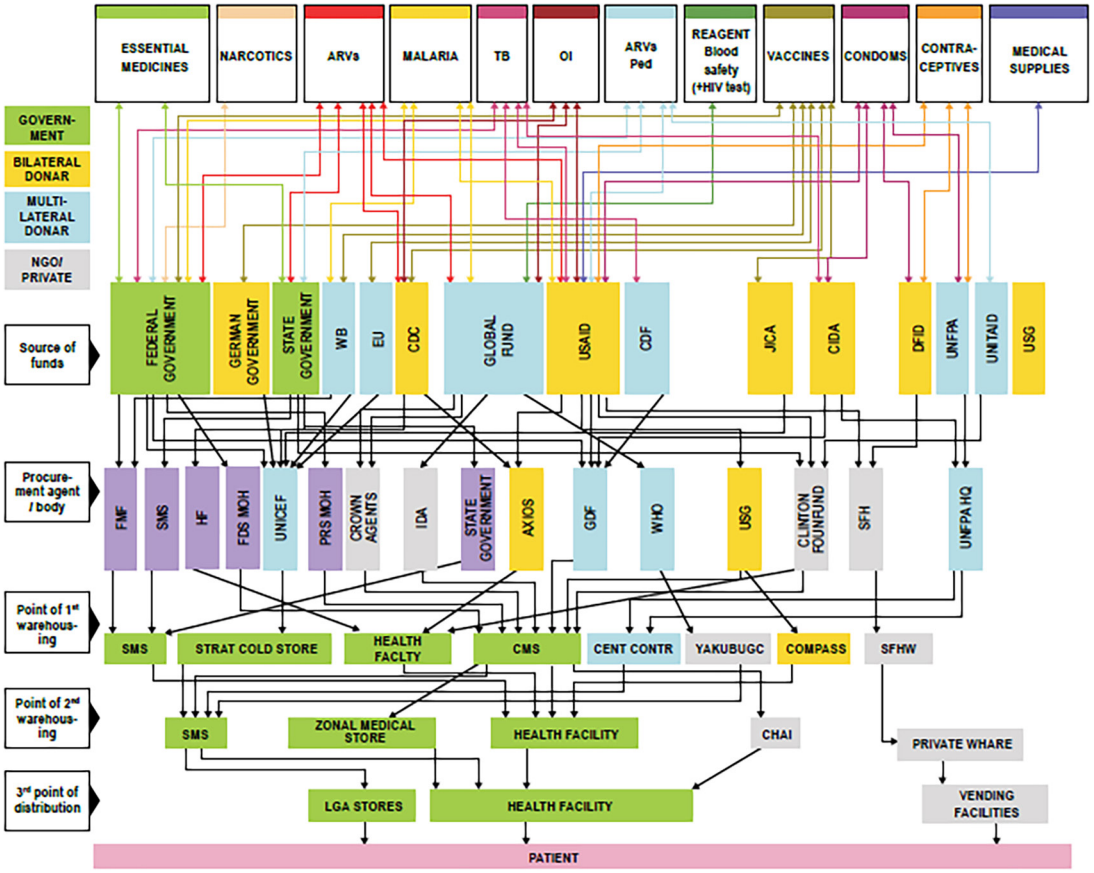
Functions 1–4: Revenue raising and pooling, prioritising, budgeting, and market shaping and regulation

The planning phase of the financing of supply chains, as with all health system building blocks, starts with **revenue raising and pooling of funds**, with the total budget determined by political negotiations, the needs of the health sector, and the competing needs of other sectors. This is a key function, and problems here are the origin of many of the subsequent supply chain challenges—for example, donor dependence and fragmentation. With revenue raised and pooled, and a sector budget cap agreed, the next stage is to **set priorities** that are within this budget cap, and ensure that **budgets are formulated** in detail to enable the execution of these priorities. This process differs in each country, and it is often iterative. Multi-year medium-term expenditure frameworks may be developed on the basis of high-level priorities and national health sector strategic plans, followed by an annual process of setting budgets and matching them to forecasting of commodity needs and refined sector priorities. The priority setting process may include the definition of entitlements under a benefits package, as well as setting procurement lists and defining clinical guidelines.[32] With priorities and budgets set, the government may wish to intervene through **market shaping and regulation** of the private sector, to ensure that downstream procurement gets good value for money.

Example policy problem: The supply chain budget is fragmented

The planning phase is challenging because multiple funders, and therefore multiple budgets, contribute to the financing of supply chains in all LMICs. Sources may include a central national budget, an extrabudgetary national health insurance fund, and off-budget donor financing. Donor involvement can be especially fragmenting if external donor procurers do not follow domestic processes. For example, 22 different partners procure drugs on behalf of Nigeria,[33] but only 11 percent of partner procurement is based on Nigeria's official essential medicines list. Figure 5 demonstrates the complexity of medicine procurement in Nigeria. The situation is yet more complicated in a fiscally federal or highly devolved state, where each local state or district may have the autonomy to decide its own health budget. For example, in Kenya the 47 counties manage their own health budgets[8] (see Box 2).

FIGURE 5. Medicine procurement in Nigeria



Source: Collaborative Africa Budget Reform Initiative. *Procurement of Medicines and Medical Products: A Comparative Case Study.* Collaborative Africa Budget Reform Initiative; 2020.

Each of these budgets may contain lines that can be considered to *directly* finance the supply chain (for example, a national budget line for the central medical store(s)) or to *indirectly* finance it via payment to a health facility (for example, an insurer may reimburse a facility at a specific tariff for treating a patient, and then the facility procures from the supply chain). Countries are increasingly using this *indirect* approach alongside moving away from input or line-item budgets, towards greater use of programmatic budgets and strategic purchasing policies.[34] Indeed, a review in 2019 found that 107 out of 135 LMICs were beginning to shift away from inputs towards structuring budgets according to programmes (e.g., HIV or immunisations), outputs, or delivery of policy objectives.[35] This enables a range of strategic purchasing methods to be deployed to match resourcing of health services to national priorities, which can in turn promote more rational and efficient procurement and use of commodities by facilities.

This combination of multiple funders, fragmented budgets, and both direct and indirect funding routes presents a substantial policy coordination challenge, as these budgets must, in the end, cover *and steer the priorities for* all

aspects of the supply chain, including planning and management, infrastructure, staffing, information systems, and commodities. There are five categories of potential coordination solutions here:

1. Combining pools of finances (domestic and/or donor)
2. Donor–government coordination (e.g., sector-wide approaches, compacts)
3. Sectoral coordination mechanisms (e.g., federal–state coordination bodies)
4. Integration of planning policies (e.g., health benefits packages, essential medicine lists, procurements lists, purchasing and provider payment)
5. Regulation and technological solutions (e.g., requiring all procurement to be carried out through a standardised process and/or through a standard e-procurement platform)

Box 2 shares Kenya's recent experience with category 4: defining an essential pharmacy package to coordinate the prioritisation and financing of drugs between budgets.

BOX 2. Kenya: Using an essential pharmacy package to reduce the impact of fragmented budgets

Kenya runs a decentralised healthcare system, with a national Ministry of Health (MOH), 47 counties, and a National Health Insurance Fund (NHIF). The result is 49 budgets that impact the supply chain,[8] with the MOH responsible for commodities for national-level hospitals and donor-supported programmes such as HIV; the NHIF responsible for paying health facilities for services covered by the insurer; and the 47 counties responsible for facilities and supplies not covered by the NHIF. The system was further fragmented by the 2023 reform of national health insurance schemes, which created three separate funds under a new umbrella, the Social Health Insurance Fund.[36]

This budget fragmentation makes it challenging to plan for essential commodities from the different funding streams. Nevertheless, as of November 2024, efforts are being made to integrate essential health commodities supply chain planning and budget formulation under the essential insurance benefits package[37] with the essential pharmacy package formulation process.[38] This includes the process of selecting essential commodities to consider for each level of care and the services covered under the Social Health Insurance Fund. This integration helps streamline the "indirect" budgeting process by creating an integrated understanding of the types and costs of essential commodities required at the primary care level and the appropriate price to purchase services that need these essential medicines.

Summary of key policy levers in the planning phase

Table 1 shows example policy levers in the planning phase that have significant implications for the financing of the supply chain. Revenue raising and pooling is determined by overall health financing policies such as insurance reforms, combining pools, and user fee policies, as well as donor coordination policies such as sector-wide approaches. Prioritising in the supply chain can be improved through tools such as national health sector strategic plans and the specification of a health benefits package, essential medicines lists, and procurement lists. The effective

implementation of these priority setting mechanisms are in turn dependent on the design of long-term policies such as health system decentralisation and sector coordination mechanisms.[32] Budgeting for the supply chain can be strengthened by ensuring that budgets are informed by priorities, population health needs, and consumption forecasts; reforming the structure of the budget (e.g., input-, programme-, or output-based); shifting to multi-year budgeting; and ensuring credibility by avoiding within-year adjustments to central procurers.[34] Finally, market shaping and regulation policies can be directly revised, or long-term reforms can be carried out in the operational model of the supply chain—for example, introducing a prime vendor system (PVS) with centrally agreed prices or other forms of contract frameworks.

TABLE 1. Example policy levers in the planning phase

Function	Example Policy Levers
1. Revenue raising and pooling	Combining or harmonising funding pools for different revenue sources
	Replacement of user fees with prepaid financing options
	Donor coordination and sector budget support
	Decentralisation
2. Prioritising	Regional resource allocation formulas
	National health sector strategic plan
	Health benefits package, essential medicines list and/or procurement list
3. Budgeting	Informed by priorities and consumption forecasts
	Budget structure reforms
	Shifting to multi-year budgets
	Avoiding mid-year adjustments
4. Market shaping and regulation	Market intelligence
	Pharmaceutical policies
	Price negotiations and policies
	Quality assurance regimes
	Supply chain operational model reforms (e.g., PVS with centrally agreed prices)

Phase 2: Procurement

Functions 5–8: Direct centralised procurement, indirect facility-led procurement via purchasing of services, and budget execution

With governance in place, budgets and priorities set, and markets regulated, the procurement phase begins. As with budgets discussed in the planning phase, this phase is split into two routes: the *direct* route and the *indirect facility-based* financing route. The direct route is conceptually the simplest, with direct allocation of resources from a budget holder to a procurer for **centralised procurement**.[b] For the indirect route, budget holders must first **purchase services** to provide resources for **facility-led procurement** of commodities. This means that central planners may have less oversight over what is needed, financed, or procured in the indirect route. The two streams are unpacked and laid out in a flow diagram in Figure 6, with green showing the movement of finances and blue showing the

b Procurement itself is a multistep process that interested readers can see discussed in a previous CGD paper.[39]

movement of supplies. This figure is a simplification—it is intended to capture the main flows, and every country will vary from this in a range of unique ways.

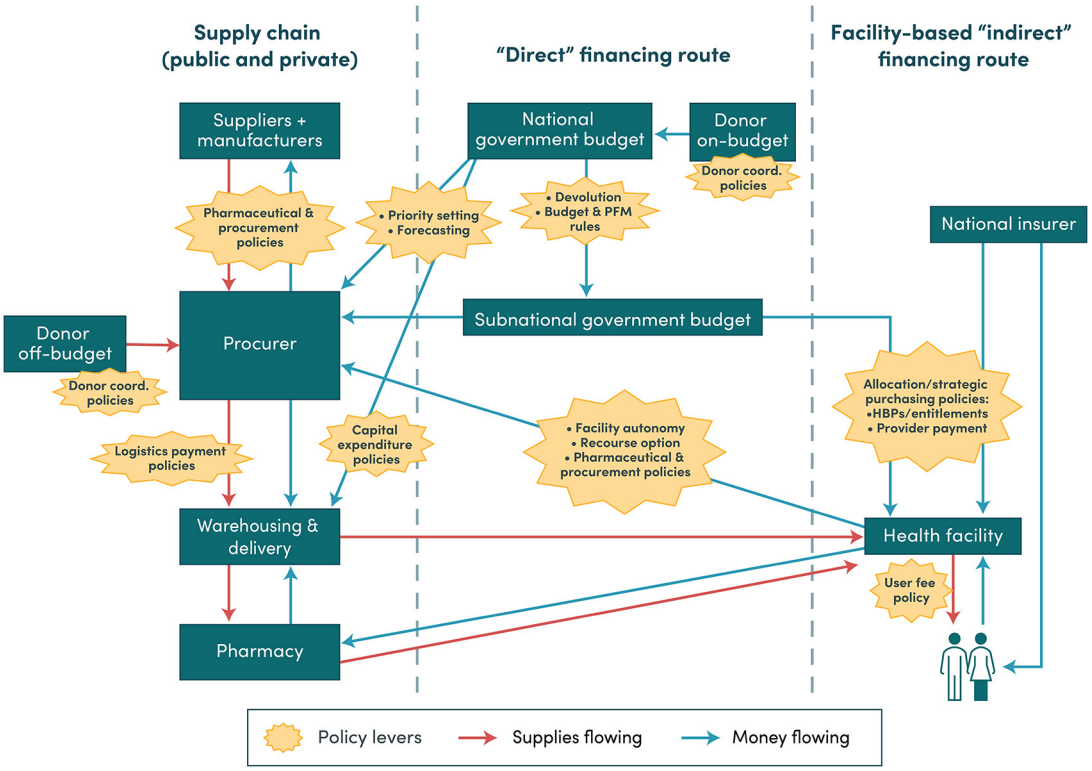
For the direct route, a national or subnational ministry (usually Health) allocates resources to a procurement agency. This procurement agency may be the central medical store(s), or it may take a variety of forms, including a private agency, as per the overall operating model of the supply chain. This agency then negotiates, tenders, and pays domestic and international suppliers and covers the cost of warehousing, delivery, logistics, and dispensing from a pharmacy, before the facility receives the commodities. Capital costs may be recovered in this process or may be allocated separately.

The indirect route illustrated in Figure 6 shows that the government (and public insurers) must first purchase services, which involves the allocation of resources to service providers. This can be a simple transfer of resources, or it can be strategic, using precisely defined benefits packages and provider payment policies to seek value for money. The facility can now use its budget, which can include revenues from user fees where applied, to procure commodities from the supply chain. The amount it can use for this may be flexible or may be predefined by the payer. This route may involve the same procurer and supply chain as the direct route, or it may use a different one, including allowing the facility to purchase from a local pharmacy, depending on facility autonomy policies. If the primary procurer fails or has stockouts, then "recourse" policies may kick in to give facilities more freedom to procure from other suppliers.

Finally, the procurement phase involves frequent and large transfers of public finances. Efficient **budget execution**, underpinned by effective and appropriate PFM rules, is required for this phase to ensure that commodities reach the facility and the patient in time.

To explore these concepts further, we now look at how the procurement phase is impacted by three specific policy challenges: poorly managed decentralisation, poor budget execution, and donor dependency.

FIGURE 6. Major flows of commodities and finances in supply chains



Note: HBPs = health benefits packages; PFM = public financial management.

Example policy problem: Decentralisation presents opportunities for and risks to health system objectives

The benefits and challenges of decentralisation in healthcare financing and planning are the subject of an ongoing policy debate—for example, whether to plan and procure commodities at the national level, or whether to shift budget and decision-making power to district or facility levels. Such decisions have significant impacts on the procurement phase. One common finding from the procurement literature is that centralised pooled procurement aggregates demand and increases purchasing power, producing efficiency savings.[39] For example, drug prices were found to be 24 to 72 percent cheaper in China once procurement was centralised.[40] Yet this result may be in tension with the finding that decentralisation and direct facility financing can both improve the responsiveness of supply chains and potentially reduce stockouts.[39]

Further research is needed, however, to go beyond this dichotomy and look at exactly which functions are most appropriately centralised and decentralised, and what the key contextual factors for success or failure are for each approach. For example, the benefit of decentralisation may not materialise if the decentralised level lacks the capacity, cash flow, and PFM system to deliver on its role.[8] Similarly, the Tanzanian Jazia PVS suggests that the responsiveness of centralised systems can be improved if an appropriate secondary or "recourse" financing mechanism is established, with facilities procuring from the private sector when the primary mechanism suffers a stockout[41] (see Box 3). The "right" degree of decentralisation, and of which procurement functions, for a particular country will

therefore depend on its policy context and current health system goals, and these will need to be balanced by political pressure for localisation of democratic accountability.

BOX 3. Tanzania: Improving responsiveness of centralised procurement through a recourse financing mechanism—the Jazia Prime Vendor System

Health commodities in Tanzania were historically financed through government funds sent to the Medical Store Department (MSD) for centralised procurement, which, in turn, supplied districts and facilities based on need. However, under this system, the country suffered from **frequent stockouts of essential medicines**—due to insufficient MSD funds and bureaucratic and inefficient health supply chain systems.[42]

Therefore, under reforms carried out in 2017, district health managers and facilities have been enabled to use donor and locally raised funds to procure from private suppliers when the MSD lacks stock.[39] This change was complemented with a second important reform, known as the **Jazia PVS**. Previously, facilities bought commodities from multiple private suppliers, which helped address insufficiencies and stockouts but led to cost inefficiencies, delays, and quality issues. The Jazia PVS model is a public-private partnership in which the regional government selects **one pharmaceutical vendor** as the main supplier for **district-level pooled orders**, improving **supply chain efficiency** and reducing costs with a single contracted vendor per region.

The prime vendor was chosen through a competitive tender based on quality, delivery standards, and a two-year framework contract with agreed prices. Managed centrally at the district level, this pilot programme began in Dodoma in 2014. From 2014 to 2018, tracer medicine availability increased by 36 percent, thanks to faster deliveries and high order fulfilment.[41] The programme expanded to two more regions in 2016. While it was reportedly launched across all 26 regions of mainland Tanzania in 2018,[43] becoming part of the Health Sector Strategic Plan IV,[44] reports have indicated delays in scaling.

Example policy problem: Partial budget execution undermines procurement

Timely and efficient budget execution is particularly important for ensuring predictable procurement and thus preventing disruption to the supply chain, which could lead to stockouts.

LMICs, however, show pervasive under-execution of health budgets, averaging around 87 percent execution—representing an average annual loss of around $4 per capita.[45] This is not general to all LMIC budgets but is especially prevalent for health budgets which are systematically implemented at a lower rate. For example, health budget execution is an average of 4 percent worse than education budget execution. It is also getting worse over time: between 2010 and 2020, low-income country health budget execution rates declined by 1.6 percentage points annually.[45] Moreover, execution is not consistent across health budget categories: budget execution for healthcare worker salaries is protected, while budgets for goods are often not fully implemented.

The causes of under-execution in procurement differ within the direct and indirect (facility-based) financing routes. Within the direct route, delays in the allocation of financing between government budget holders is a major contributor, as is the case in Kenya's decentralised system (see Box 4). The indirect, facility-based route faces additional challenges at

the provider payment stage. For example, in insurance systems, delays in claims processing can delay finance reaching facilities, and the payments facilities receive may not match their true procurement costs. These factors combine to prevent facilities from being able to execute procurement plans and pay suppliers (see the Ethiopia example in Box 5) which may result in them refusing to supply health commodities in the future, further weakening supply chains.[46]

BOX 4. Kenya: Slow budget execution leads to under-procurement of medicines

A case study in Kenya found that four counties executed less than half of their medicines budget, despite the fact that the allocated amount was insufficient to meet needs.[47] One cause is delays in allocation of funds from the National Treasury. Over 75 percent of county revenue comes from this source, making counties highly reliant on the National Treasury. When national allocations are delayed, counties often run up outstanding bills, which are then given higher priority than medicine orders, meaning future procurement is delayed.

The four counties in the case study all had pending bills to Kenya Medical Supplies Authority (KEMSA), ranging from 33.1 million to 106.9 million Kenyan shillings (US$260,000 to US$830,000). Before KEMSA agreed to service future orders, protracted negotiations were required, further delaying the process—sometimes to the point where supplies were then out of stock at KEMSA itself. The outstanding bills to KEMSA also starved KEMSA of much-needed funds, meaning it struggled to pay suppliers, which were then reluctant to continue supplying KEMSA. As a result, KEMSA was only able to fill between 50 and 60 percent of county orders.

Delays are compounded by complex and time-consuming bureaucratic systems, with purchase orders requiring signatures from several different departments. Since Kenyan PFM rules dictate that funds must be spent within the financial year, these delays explain why many counties fail to execute their full medicines budgets.

The impact of the slow execution, lengthy procurement processes, and low order fill rate was visible in the form of stockouts of essential medicines. For 17 tracer products assessed, stockout rates on the day of visit and over six months were between 21 and 50 percent.

BOX 5. Ethiopia: Delayed claims processing inhibits procurement

Historically, health commodities in Ethiopia have been financed through a combination of government line-item budgets, user fees, donor contributions, and fee-for-service community-based health insurance (CBHI).[48] Under the CBHI scheme, commodities are funded separately, with facilities receiving retrospective payment for dispensed medicines. However, there is frequent misalignment between these payments and the actual procurement costs, especially when facilities have to procure from private suppliers due to stockouts in the Ethiopian Pharmaceuticals Supply Service.[49] Additionally, facilities struggle due to slow claims processing (with delays in providers putting together claims and purchasers vetting them and calculating payment) and thus delayed reimbursement payments.

Therefore, a capitation system is being piloted whereby commodities are bundled with services and facilities manage pooled per capita funds.[50] Early results from this pilot have shown that the prospective payment system has improved reliability of revenue for facilities,[51] allowing for improved facility procurement and so resulting in increased availability of essential medicines.

Example policy problem: Donor dependency puts procurement at risk

Historically, donors have provided substantial support across both the direct and indirect procurement routes, including in-kind donations. The United States is a good case study of this, having provided large-scale support across all aspects of procurement and supply chain management, from planning to procurement to product delivery. The support was predominantly managed by Washington-based staff and contractors. For nine countries, US supply chain aid was equivalent to over 10 percent of their domestic government health expenditure.[52] This reliance on aid financing, remote support, and international expertise for core procurement functions will make the ongoing rapid and forced transition from US support even more challenging. Governments previously reliant on this will need to replace the financing, the expertise, the infrastructure, and the procurement functions. As part of this process, countries may choose to organise their own pooled procurement mechanisms (such as the initiative carried out by the Pan American Health Organization, and a nascent mechanism being developed by the Africa Centres for Disease Control and Prevention) to ensure that they continue to access the best prices for the highest-quality commodities.

Summary of key policy levers in the procurement phase

Table 2 (and Figure 6) shows a non-exhaustive list of policy levers in the procurement phase that can impact the financing of the supply chain. The direct route is highly impacted by decentralisation policies, which divide the national pool into subnational pools, but this route can be improved through appropriate reforms such as setting national procurement standards, lists, and prices and developing the skills and capacity of decentralised budget holders. The indirect route can be improved by strategic purchasing policies, including specification of health benefits packages and provider payment rules, as well as by facility autonomy legislation and user fee policies. Both routes are impacted by the overall procurement operational model, pharmaceutical policies and lists, and public procurement rules, as well as by budget execution factors such as PFM rules and speed. Finally, both routes can be improved by better alignment with each other, but this rarely done.

TABLE 2. Example policy levers in the procurement phase

Function	Example Policy Levers
5. Direct financing – centralised procurement	Decentralisation
	Public procurement rules
	Procurement operational model
	Pharmaceutical policies and lists
6. Indirect financing – purchasing of services	Strategic purchasing policies
	Health benefits packages
	Provider payment methods, design, and rate-setting
7. Indirect financing – facility procurement	Public procurement rules
	Procurement operational model
	Revolving drug funds
	Facility autonomy
	Recourse option
	User fee policy
8. Budget execution	PFM rules
	Budget structure
	Budget carryover to following year
	Procurement operational model

Phase 3: Delivery

Delivery (function 9) is the phase that is most neglected by the health financing community, yet efficient distribution up to the last mile to health facilities is a key challenge for all healthcare supply chains. The distribution costs, including storage and transportation costs, constitute a significant expense (up to 50 percent of the logistics cost of a product[53]). Indeed, transportation costs alone can sometimes exceed the value of distributed medicines.[54] Questions about how to finance these distribution costs, whether to centralise or decentralise this financing, how many distribution tiers to use, and whether to outsource to third-party logistics providers continue to be a source of ongoing policy debate in most countries.[55]

One specific challenge we will now look at in more detail is when delivery is tied to revenue raising, through cost recovery policies. This approach requires efficient PFM throughout multiple layers of the health system, and when this fails, the supply chain becomes underfunded and collapses.

Example policy problem: Payment to logistics providers is slow and bureaucratic

The Bamako Initiative continues to have a substantial impact on the financing of logistics, particularly in West Africa, and is a good example of how important the financing approach is to the performance of last-mile delivery. Adopted in 1987 by 20 countries, the initiative is a primary healthcare financing strategy that includes a cost recovery mechanism. This financing model is dependent on OOP payments from patients, with a percentage of the profit margin on the medicines' costs used to cover distribution and supplies.[56]

In countries such as Senegal (see Box 6), this cost recovery process can be lengthy and complex, with multiple different PFM control steps across the healthcare pyramid. In Senegal, this slow cost recovery delayed payment to third-party logistics providers under the "Yeksina model," leading to the termination of the outsourcing and a shift back to insourcing.[57] However, the key issue remains unresolved: the financing of distribution costs (either outsourced or insourced) being 100 percent dependent on the slow cost recovery mechanism.

BOX 6. Senegal: Lengthy cost recovery processes hamper financing of distribution

SEN–Pharmacie Nationale d'Approvisionnement (SEN-PNA) is the public institution in charge of the supply and distribution of essential medicines and health products in Senegal, covering 30 percent of the population's need. The remaining 70 percent is managed by five private-sector wholesalers.[10] Donors procure products for health programmes, with payment of operational costs to SEN-PNA ranging from 5 percent to 10 percent.[58] Free-of-cost products are managed by the national universal health coverage agency.

The original Yeksina model was an outsourced distribution model with logistics costs covered through the collection of 25 percent of health facilities' profit margin on the products.[58] However, it sometimes took up to 18 months before SEN-PNA recovered the costs. With this lengthy process, SEN-PNA could not sustain the push model with outsourced logistics, and the repetitive payment delays resulted in stopping the logistics contracts.

The main impact areas of the Yeksina failure include increased stockouts, from 2 percent in 2018 to up to 45 percent in 2023 in some districts, and a lack of visibility into logistics data, affecting demand and supply planning accuracy.

However, the Yeksina model was relaunched in March 2023, this time with no outsourcing. It is built on the gradual enrolment of districts based on their capacity (equipment and human resources) and their agreement to contribute 15 percent of their profit margin on the products (reduced from 25 percent) to fund the scheme.[59] With the phase 1 relaunch, the stockout rate decreased from 45 percent to 12 percent, and 100 percent of the profits owed were recovered to fund stock replenishment,[60] showing that the effective and efficient operation of Yeksina improves stock availability. However, delays are still noted on payments/reimbursements, creating ongoing cash flow challenges that risk impacting future supply chain performance.

Summary of key policy levers in the delivery phase

Policy levers that improve the financing of the delivery phase include reform to the source of funding (e.g., cost recovery), speeding up and simplifying PFM processes, reducing the number of distribution tiers, and appropriate outsourcing or insourcing decisions (Table 3). One underused solution is financial instruments such as "factoring," which allows a bank to act as an intermediary, speeding up payment to logistics firms and later recovering the funding from the government. This is common outside the health sector.[61]

TABLE 3. Example policy levers in the delivery phase

Function	Example Policy Levers
9. Delivery	Reform source of funding
	PFM rules
	Outsourcing/insourcing
	Distribution tiers
	Finance instruments such as factoring

Phase 4: Monitoring

The final function (10) of the supply chain is effective **monitoring** of supply chain data.[62] Data on the use of commodities enables accurate demand-based planning and thus can inform budget formulation and enable the prioritisation of allocations to the highest-impact services. However, due to fragmented supply chains with separate management approaches, lack of standardised digitised data collection, and limited analytical capacity, data on consumption is not available for use by decision makers. Instead, quantification and forecasting methods are often based on historical procurement as a proxy for demand, preventing strategic supply chain planning and reducing budget formulation accuracy. Similarly, tracking data on financial flows in the supply chain and in health facilities can detect blockages and ensure that liquidity is maintained for procurement of commodities, and ensure that funds are spent on the top priorities of the health system. However, this data is also lacking in many regions. Countries may need to consider creating systems to mandate or incentivise actors to collect data.

Even where data on individual functions exists, a more widespread challenge is the lack of data integration. Integrated digital real-time data on *both* supplies and finance offers the potential to substantially improve the allocative efficiency of the health system, focusing resources where they are needed, reducing stockouts, and reducing unnecessary overstocking. However, data on finance and cash flows is rarely integrated with supply chain data. For example, while financial management and information systems have been implemented in many countries to support the integration of PFM processes, often financed by the World Bank,[63] this data is often housed separately from healthcare and supply chain data, preventing effective planning.

Finally, countries may struggle with insufficient capacity to collate, parse, and analyse supply chain finance data. As countries implement improved monitoring systems, it will be important to simultaneously consider how to ensure that this data can be effectively used to support improvements to supply chain financing.

Example policy problem: Data collection is insufficient to optimise financing of supply chains

Improved data visibility—for example, on stock at each level, on supply chain performance indicators, and on financial flows—can improve supply chain outcomes. In Tanzania, the introduction of an electronic logistics management information system reduced stockout rates by 13 percentage points, from 35 percent to 22 percent.[64] South Africa's public health supply chain is another good example of how digitised, complete, and transparent tracking of essential health medicines, from procurement to delivery across both public and private sectors, can support efficient demand-driven planning and therefore improve budget formulation (see Box 7).

BOX 7. South Africa: Improving demand-driven supply chain management and formulation with the Stock Visibility System and Visibility and Analytics Network

South Africa's public healthcare system faces persistent challenges in ensuring the availability and timely delivery of medicines. The traditional push-based supply chain approach, reliant on forecasting, has proven inadequate in addressing high variability in demand.[65] Therefore, South Africa has moved towards a demand-driven supply chain management model, a transformative pull-based approach guided by actual patient consumption data, leveraging existing digital and technology systems for tracking supply chain performance.

A key precursor to the demand-driven planning for medicines and health products in South Africa is the Stock Visibility System (SVS), implemented by USAID in over 3,000 primary healthcare clinics across South Africa to capture real-time inventory tracking and essential medicine availability and consumption data at the patient level.[66] Building on the successes of the SVS, the Visibility and Analytics Network was thereafter implemented at the level of the National Department of Health and other private-sector partners to ensure that real-time consumption data at the primary care level was aggregated to the national level for decision makers and to streamline/optimise procurement planning and supply chain management overall. The SVS and Visibility and Analytics Network were successfully scaled across most of South Africa's public health supply chain at various levels, providing the data-monitoring inputs required for demand-driven planning and budget formulation.

These interventions allowed for demand-driven supply chain management and directly addressed inefficiencies such as wastage caused by the traditional forecasting model, enabling healthcare facilities to transition towards more agile, data-driven replenishment of stocks and health commodities. As a result, budget formulation is more accurately matched to demand and consumption patterns, further strengthening the financial performance and sustainability of South Africa's public healthcare supply chain system.

Summary of key policy levers in the monitoring phase

The monitoring phase can be improved through policies to standardise, integrate, and digitise data collection, as well as policies such as contracts and provider payment methods that can incentivise data collection (Table 4).

TABLE 4. Example policy levers in the monitoring phase

Function	Example Policy Levers
10. Monitoring	Data standards
	Data integration
	Digitalisation and system interoperability
	Quantification and forecasting
	Incentivising data collection through contracts and provider payment methods

Conclusion and proposed research agenda

In this paper, we have proposed a novel framework that integrates health financing, public financial management, and supply chain concepts to provide a comprehensive overview of the 10 functions required in the financing of supply chains. In explaining this framework, we have gone through each phase in isolation to detail some of the key issues which can arise. However, it is important to note that the functions discussed are all ultimately linked within the wider system. Accordingly, issues that arise in one phase of the framework can impact later functions. For example, if functions in the planning phase are disrupted, then procurers do not have the budget to pay for appropriate quantities of medicines. If budgets are not executed efficiently, then facilities may lack the cash flow to contract logistics providers to carry out delivery. If monitoring is not conducted, then future planning efforts are hampered by a lack of understanding of need and demand. Ultimately, issues at any stage of the framework can snowball to result in patients being unable to access the medicines when and where they need them and at affordable prices. This framework can therefore help countries develop comprehensive strategies to diagnose and improve their systems for financing supply chains across all 10 functions.

The framework should be considered a draft and will need to be tested for applicability and coverage. This will be done through country case studies and thematic research papers on specific policy areas (see Table 5). The framework will also be tested through the deliberations of the working group and wider consultations; to that end, we welcome all comments and suggestions from readers. We also recognise that the working group cannot cover all the important policy questions in this space, and we encourage other researchers and funders to investigate the additional questions that we have laid out in Annex B.

This is, we hope, the start of a new way of thinking about supply chains, which in time will lead to a new community of practice, countries strengthening their policies and sharing their experience, and better global guidance. Ultimately, the goal is better-financed supply chains and patients getting the timely healthcare they need.

TABLE 5. Working group–commissioned research products to test the draft novel framework

Research Output	Topic
Case study	Remediar system for procuring essential medicines in Argentina
Case study	Recent health financing and procurement reforms in Mexico
Case study	Assessing the applicability of the conceptual framework in Kenya
Case study	Assessing the applicability of the conceptual framework in Senegal
Rapid review	*USAID's Role in Global Health Supply Chain Programs and Implications of Aid Cuts*[52] (published June 12, 2025)
Thematic research paper	Governance and coordination of the financing of supply chains
Thematic research paper	Decentralisation of procurement functions
Thematic research paper	Developing a supply chain finance instrument in health commodity distribution
Thematic research paper	Best practices and use cases in health finance and supply chain data integration
Thematic research paper	Procurement options for previously donor-funded commodities

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Annex A: Glossary of key terms

Budgeting	The process of elaborating a detailed plan for the future showing how resources will be acquired and used during a specific time period.[67]
Capital Expenditure	The funds used to acquire, upgrade, or maintain physical assets such as buildings, equipment, and technology.[68] These represent a longer-term investment than operating expenses.
Centralised Procurement	The Ministry of Health budget holder (whether at the national or district level) procures on behalf of all facilities in the region.
Delivery	The supply chain phase entailing coordinating logistics, warehousing, transportation, and inventory management to facilitate the efficient and timely distribution of healthcare products.
Direct Facility Financing	The direct provision of government or external funds to a health facility to meet the operational requirements of the health facility.[69] This decentralisation of financial resources directly to health facilities aims to improve health system performance by enhancing autonomy, transparency, and fiscal accountability at the facility level.[70]
Direct Supply Chain Financing	Direct allocation of resources from a national or subnational budget holder to a procurer for centralised procurement.
Domestic Financing for Health	The mobilisation, allocation, and deployment of domestic financial resources to ensure that healthcare systems can adequately cover population needs. It is a critical building block for resilient and sustainable health systems and is key to ensuring the long-term sustainability of national responses.[71]
Financing of Supply Chains	The policies and practices necessary to provide financial resources to the supply chain, and ensure their optimal use, in order to achieve health system goals.
Health Financing	The process of raising, pooling, and spending money on healthcare. It is a core function of health systems that can enable progress towards universal health coverage by improving effective service coverage and financial protection.[25]
Health Systems Strengthening	The process of identifying and implementing changes in policy and practice in a country's health system, so that the country can respond better to its health and health system challenges.[67] Changes should improve one or more of the functions of the health system, leading to better health through improvements in access, coverage, quality, or efficiency.
Indirect Supply Chain Financing	Allocation of resources from national or subnational budget holders to purchase services, explicitly or implicitly providing resources for facility procurement of commodities.
Market Shaping	Implementing strategies to influence supply and demand through market interventions and policy reforms to enhance accessibility and affordability. Examples include initiatives such as pooled procurement and tools such as volume guarantees.
Monitoring	The supply chain phase that entails assessing performance through tracking product and information flows, utilising data and technologies, human resources, and financial management.
Operational Expenditure	The funds spent on ongoing everyday costs such as wages, commodities, and rent.
Planning & Prioritisation	Developing strategic and operational plans to forecast demand, allocate resources, and optimise supply chain processes for effective healthcare delivery.
Procurement	Managing the sourcing, contracting, and procurement of health commodities to ensure continuous availability and minimise supply disruptions.

Public Health Supply Chain	The links and the interrelationships among the organisations, people, resources, and procedures involved in getting commodities to the healthcare consumers.[72]
Purchasing	The allocation of pooled funds to healthcare providers for the delivery of health services.[73]
Revenue Raising	The ways in which money is brought into the health system.[23] This includes out-of-pocket payments at the point of use, prepaid insurance contributions, and taxes, as well as any external aid.
Strategic Purchasing	The allocation of pooled funds to healthcare providers, where these allocations are linked to information on provider performance and behaviour and the health needs of the population.[73] Strategic purchasing involves a continuous search for the best ways to achieve health system goals.[74]
Supply Chain	The physical and informational resources required to deliver a good or service to the final consumer.[19]

Annex B: Additional research questions

- How can wider health financing policy levers (e.g., health benefits packages, strategic purchasing reforms) improve the coordination of multiple supply chain financing streams?
- How can health system priorities (e.g., health benefits packages or essential medicines lists) be translated into supply chain budget priorities?
- What are good examples of segmentation of supply chain financing by product type?
- How can LMICs best prepare for the transition from aid-financed supply chains?
- What is the optimal design for a secondary "recourse" model, given the characteristics of the primary model and health financing context?
- How can private providers gain access to publicly managed pooled procurement?
- What policies can ensure quality, safety, and value for money of supplies with decentralised or facility financing?
- What innovative approaches exist to finance diagnostics?
- How can public financial management systems be improved to speed up payment and cash flow to logistics providers?
- What are the available supply chain finance mechanisms for public-sector logistics providers?
- What are sustainable and equitable financing models for the delivery of essential commodities to remote locations?
- What innovative approaches, including digitisation, technology, and use of tools, can improve data analysis for strategic planning (and thus operational performance) quantification, costing, and forecasting? And for other key functions such as allocation and execution?
- How can maturity of the financing of supply chains be measured? How can current UNICEF/WHO, etc., tools be adjusted to include it?
- How can we incentivise data collection across sectors, including the private sector?
- Can better data collection and analysis increase trust, accountability, and transparency; encourage on-budget donor support; and increase domestic resource mobilisation?
- How can we develop a better understanding of cost-benefit analysis (and the value of information) and the return on investment for data collection?