LANDSCAPE ANALYSIS:

ALIGNING INCENTIVES IN SUPPLY CHAIN MANAGEMENT IN LOW- AND MIDDLE-INCOME COUNTRIES

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Contents

Acronyms

AI	Aligning Incentives
BMGF	Bill & Melinda Gates Foundation
CHAI	Clinton Health Access Initiative
CMAM	Community-based Management of Acute Malnutrition model
CRMS	Continuous results monitoring and support system
DFID	Department for International Development
EEA	European Economic Area
eLMIS	Electronic logistics management information systems
EU	European Union
FARA	Fixed Amount Reimbursement Agreement
FRHP	Focus Region Health Project
FY	Fiscal year
GHSC-PSM	Global Health Supply Chain-Procurement and Supply Management
HMIS	Health management information system
JSI	John Snow, Inc.
KPI	Key performance indicator
LMIC	Lower and middle-income country
LMIS	Logistics management information system
M&M	Morbidity and Mortality Conference
MOH	Ministry of Health
NGO	Non-governmental organization
OR	Operations research
PBF	Performance-based financing
PBI	Performance-based incentive
SCM-D	Supply chain management dashboard
SIAPS	System for Improved Access to Pharmaceuticals and Services
SMS	Short message service
SSDI	Service delivery integration
TAG	Technical Advisory Group
UNICEF	United Nations Children's Fund
URC	University Research Co., LLC
USAID	United States Agency for International Development
VMMC	Voluntary medical male circumcision
WHO	World Health Organization

Executive Summary

As health care service delivery systems in low and middle-income countries (LMICs) have matured and expanded, so too have the scope and breadth of reforms and interventions to address the challenges facing supply chain management (SCM). Among these are interventions focused on Aligning Incentives (AI), designed to address misalignment between systems configurations and desired health outcomes. AI involves understanding the root cause(s) of structural challenges and designing incentive schemes so that those responsible for key supply chain functions are motivated to act in ways that maximize their own returns and support the system.[1] Left unattended, misalignments can limit SCM performance, impede overall quality of care, and ultimately limit a country's ability to meet its health objectives.

This landscape analysis assesses the state of research in several LMICs on AI in SCM. It describes challenges introduced by misaligned incentives in LMIC supply chains and presents reforms and programs that have been implemented to address these challenges. This analysis was conducted using reviews of peer-reviewed and grey literature, reviews of GHSC-PSM country work plans, key informant interviews, and input from additional experts.

AI initiatives can address several common alignment problems including disconnects across SCM system levels that impede quality of care; resource generation models that can selectively benefit certain levels or types of positions; unstable demand that forces suppliers to adjust production schedules, leading to unnecessary production; underinvesting in capacity (resulting in suppliers investing below expected demand as they do not want expensive products to lay dormant); and supplier overcapacity. These misalignments can result in inefficiencies, inflated costs, and strained relationships within the supply chain.

AI interventions target both intra- and inter-organizational misalignments and can include performance-based financing (PBF) schemes, which link financial or contractual incentives to performance targets. PBF schemes have been used to address challenges in commodity availability, quality of logistics information, and worker retention and performance. Newly developed technologies such as digital bulletin boards, e-dashboards, and short message service (SMS) work to increase data visibility within and between implementing bodies and enhance transparency and confidence in the system. Performance scorecard variations and contractual innovations can spur efficiencies, costs savings and public-private partnerships.

Several important gaps were found in existing literature, analyses, and formal evaluations of AI programs associated with SCM in LMICs. As noted by Witter et al,[2] published work evaluating the impact of AI approaches is limited and the evidence base is too weak to draw general conclusions. More robust and comprehensive studies are needed for governments and donors to better understand the potential impact that AI reforms can have on strengthening supply chains, service delivery, and, most importantly, on health care outcomes. Consequently, there are insufficient data to support generalizable evidence-based and quantifiable conclusions about the conditions and factors required for sustainable and replicable AI interventions that contributed to increased availability of health commodities.

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[1] Yadav P. Health Product Supply Chains in Developing Countries: Diagnosis of the Root Causes of Underperformance and an Agenda for Reform. Health Systems & Reform. 2015;1(2), 142-154,
[2] Witter S, Fretheim, A., Kessy, F., Lindahl, A. Paying for performance to improve the delivery of health interventions in low- and middle-income countries (review). The Cochrane Collaboration 2012.

Introduction

As health care service delivery systems in low- and middle-income countries (LMICs) have matured and expanded, so too have the scope and breadth of interventions and reforms to address the many challenges facing the supply chain management (SCM) arena. While many of these initiatives have facilitated promising advances to improve the reliable availability of public health commodities, few SCM interventions have been rigorously evaluated to assess their benefits and potential to drive lasting change.

A well-integrated supply chain is characterized by clarity of roles and responsibilities, agility, streamlined processes, visibility of information, trust, collaboration, and alignment of objectives, risks, and cost to improve communication and accountability.[3,4] Maximizing supply chain utility entails mapping roles, responsibilities, and reporting structure of each stakeholder to avoid conflict and ensure that all entities in the supply chain have equal access to forecasts, sales data, and plans. Such coordination can facilitate more collaborative procurement strategies that integrate planning for key supply chain management functions and emphasize total supply system performance.[5] Properly aligned supply chains ensure an understanding of demand, are transparent with respect to total supply chain costs, offer incentives for managers to keep supply chain performance in mind, use contracts between companies, act based on impact on total chain, and coordinate decisions and back compliance.[6]

Many challenges exist in SCM in LMICs, including a history of under-investment and outdated models, volume increases stemming from donor-supported global health initiatives and national commitments to national health insurance schemes and/or achieving universal health coverage, diffuse accountability, lack of planning data, and more.[7] As public health systems expand and mature, reforms and interventions to improve SCM are increasingly proposed and implemented. Often, key actors' incentives are not aligned with health outcomes desired by clients or national and international health goals. These misalignments can disincentivize or create perverse incentives for staff and others working in the system, leading to low morale and lack of job commitment. Furthermore, illicit behaviors may arise due to misaligned incentives, including corruption, "leakage" of supplies, and misuse of authority. These misalignments limit the effectiveness of supply chain systems, and in turn limit the success of reforms to improve the overall system.

With increasing awareness of the importance of an Aligning Incentives (AI) approach in SCM, new initiatives and reforms have been implemented to better incentivize staff working at various points along the supply chain. AI involves redesigning incentive schemes so that those responsible for key supply chain functions act in ways that support what is best for the entire supply chain system.[3] Some examples of AI include performance-based financing (PBF), performance-based contracting, improved visibility of performance data, professional development opportunities, staff recognition, and monetary awards.

These initiatives may or may not address underlying factors that have historically hampered supply chain management systems. For example, incentivizing particular performance metrics may encourage supply chain actors to focus on and improve performance against those metrics. While such incentives can influence organizational change, they must be targeted at the appropriate level.

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[3] Lee H. The triple-A supply chain. Harvard business review. 2004;82(10):102-113.
[4] Narayanan V, Raman A. Aligning incentives in supply chains. *Harvard business review*. 2004; 82(11):94-102.
[5] Nfor, E. Improving the performance of supply chains USAID. SIAPS http://siapsprogram.org/2014/04/30/improving-the-performance-of-supply-chains/.
[6] Ebert J, Gelpi J. Aligning a misaligned supply chain. Chicago, IL: AT Kearney; 2009.
[7] Yadav. Health Product Supply Chains in Developing Countries. 142-154.

For example, a set of narrowly targeted incentives may influence the performance of workers at the targeted level but would not be able to address more systemic challenges like human resource shortages, training needs, and underinvestment. These systemic challenges require higher-level decision making and resource allocation, and failure to address misaligned incentives at higher levels may limit the success of efforts to align incentives at lower levels. Therefore, it is vital to evaluate the designs and impacts of alternative reforms.

Purpose

This landscape analysis assesses the state of the research on AI in SCM. It describes the challenges associated with misaligned incentives in supply chain systems in LMICs, describes reforms and programs that have been implemented to address those challenges, and reviews the findings of studies evaluating the impact of these reforms and programs on supply chain system performance.

This landscape analysis draws lessons from the literature on strengthening supply chain systems through AI for all essential health commodities types, with a focus on family planning-related commodities. It gives thoughtful consideration to exceptions when applying the lessons from other health commodity supply chains in the family planning supply chain arena.

Objectives

The objectives of this landscape analysis were to:

- Identify challenges associated with misaligned incentives that impede successful functioning of supply chain systems in public health;

- Describe AI interventions designed to support SCM improvements and enhance the availability of public health commodities; and

- Provide evidence-based recommendations for promising and locally sustainable AI pilot interventions in specific country settings.

Methodology

This analysis was conducted using a range of information sources and methods, including reviews of peer-reviewed and grey literature, reviews of GHSC-PSM country work plans, key informant interviews with SCM experts and practitioners, and guidance and feedback from a Technical Advisory Group (TAG) composed of recognized SCM implementation experts.

REVIEWS OF PEER-REVIEWED AND GREY LITERATURE

The researchers identified peer-reviewed publications through searches of databases with health or science literature. Based on queries with City University of New York (CUNY) and Harvard University librarians, seven databases were utilized to identify relevant peer-reviewed literature. Additionally, investigators identified peer-reviewed articles cited in other peer-reviewed papers, grey literature documents, and articles in publications suggested by key stakeholders, including key informants and USAID and GHSC-PSM subject matter experts.

Five main sources were utilized to identify relevant grey literature:

- Relevant grey literature search engines;

- Clinical trial registry websites;

- Grey literature cited in peer-reviewed publications and other grey literature material;

- English-language websites belonging to the five largest funders of public health commodities in LMICs; and

- Selected grey literature, websites, and organizations recommended in key informant interviews.

See Annex A for a complete list of grey literature search engines and clinical trial registries.

REVIEW OF GHSC-PSM COUNTRY WORK PLANS

Landscape investigators reviewed 26 out of 29 fiscal year (FY) 2017 GHSC-PSM country and regional work plans to identify GHSC-PSM technical support addressing misaligned incentives, and to understand whether the planned technical support was in relation to ongoing AI interventions. Investigators developed a Country Work pPlan Data Collection Form to guide the work plan reviews and ensure alignment with this analysis.

TECHNICAL ADVISORY GROUP

At the beginning of this analysis, investigators sought and received ad hoc review and feedback from a TAG composed of SCM field experts. An initial orientation and consultation meeting was held with GHSC-PSM subject matter experts from Chemonics, research team representatives from University Research Co., LLC (URC) and its partner, City University of New York Graduate School of Public Health and Health Policy (CUNY SPH), and a representative from the Interagency Supply Chain Working Group (ISG). These experts were consulted several times to solicit feedback on the proposed direction of the research, including candidates for in-depth country assessment and proposed testing of SCM AI pilot interventions.

KEY INFORMANT INTERVIEWS

Investigators interviewed 31 key informants, including 11 global SCM experts and 20 experts from seven GHSC-PSM country field offices. Key informants were selected based on their overall SCM expertise and experience with interventions focused on AI within supply chain systems. An initial database of key informants was developed through consultation with technical experts at USAID and Chemonics. The list of key informants expanded through engagement with the TAG and through requests of the key informants themselves as they recommended additional experts to engage. In addition, GHSC-PSM country office technical teams were interviewed to understand country-level challenges with AI in supply chain systems, and the logistic, political, and cost feasibility of testing interventions to address those challenges in their contexts.

Interviews were conducted by phone or internet conference using semi-structured interview questionnaires tailored to reflect the expertise and role of interviewees (see Annex B for key informant interview guides). An additional 10 experts were consulted via the TAG, following the same structured interview guide but in a focus group format, bringing the total number of experts consulted to 37 (See Annex C for experts consulted as key informants and TAG members). Interview summaries were shared with the interviewees for validation or correction. Country visits to more thoroughly explore potential settings for AI reform piloting were discussed but not implemented.

LANDSCAPE ANALYSIS LIMITATIONS

This analysis is based on reviews of peer-reviewed and grey literature, GHSC-PSM work plans, key informant interviews with SCM experts, and input from TAG participants. Discussions with USAID missions and GHSC-PSM field offices in five countries (Ghana, Guatemala, Malawi, Rwanda, and Zambia) focused on potential AI interventions that could be tested and would contribute to an evidence base to guide replicable SCM interventions in LMIC country settings. The recommendations for potential pilot interventions that emerged from these discussions are described in Annex D.

Investigators identified many important gaps in the existing literature, including a lack of conclusive study findings. These gaps stem directly from the scarcity of rigorous evaluations conducted on innovative AI schemes and programs. Consequently, this analysis is limited in its ability to draw evidence-based, generalizable, and quantifiable conclusions about the impact, value, and best practices associated with AI. Similarly, there is insufficient information or evidence to offer recommendations about the prospects of replicating or bringing to scale promising AI programs in new country settings.

LANDSCAPE ANALYSIS FINDINGS

The investigators found the following challenges in addressing maligned incentives and present an overview of interventions meant to address misaligned incentives in SCM.

CHALLENGES IDENTIFIED IN ADDRESSING MISALIGNED INCENTIVES

The major challenges identified in strategies to align incentives in supply chain systems are: difficulty with health systems-centered thinking, donor coordination, absence of long-term financing sustainability, human resource challenges, and low institutional capacity.

1. DIFFICULTY WITH HEALTH SYSTEMS-CENTERED THINKING

Ensuring patients at service delivery points have access to the commodities they need when they need them is critical for achieving improved health outcomes in any setting. Supply chain systems are responsible for ensuring commodity availability, though the responsibility for appropriate use of commodities, also essential to improve health outcomes, rests with providers and patients in the broader health care system. Some SCM experts interviewed noted that in LMICs, supply chain systems tend to be focused on the technical aspects of challenges, such as warehousing and skills/talent development, without an explicit focus on patient outcomes. In other words, they are problem-focused rather than patient-centric. This problem-focused approach contributes to a disconnect between the supply chain system and the health outcomes of the population the supply chain is serving. LMIC supply chains often struggle to articulate the desired outcome, instead of the immediate problem, and struggle to consider the contribution of each of the supply chain components individually and collectively to achieve the desired outcome.

2. DONOR COORDINATION

Agreement on a cohesive supply chain strategy among donors, international technical assistance staff, and host country actors increases the likelihood of coordination, harmonization of investments and key performance indicators. In situations where a clear strategy and harmonization of technical and

financial investments does not exist, the system becomes uneven and fragmented as actors promote varying, misaligned incentives and data performance measurements.

3. ABSENCE OF LONG-TERM FINANCING SUSTAINABILITY

Currently, schemes meant to address incentive misalignment in supply chains are primarily donor driven, as LMIC governments appear to contribute fewer financial resources to incentive programs. Suppliers also appear to prefer to work with established organizations such the United Nations Children's Fund (UNICEF) or companies that have well-regarded financial stability and can support the order volumes needed for suppliers to invest in production.[8] However, it is critical to have in-country buy-in if initiatives are to be sustained.

4. HUMAN RESOURCE CHALLENGES

As widely documented in the literature and emphasized by SCM experts interviewed, human resources challenges in LMIC supply chains include poorly trained staff, limited number of staff, lack of empowerment at appropriate levels to make decisions and drive strategy, high turnover, poor supervision, unmotivated workers, successful workers who are not recognized for their contributions, and corruption. The GHSC-PSM country work plans reviewed also noted several human resource management challenges, many of which indicated misaligned incentives. This leads to situations such as those in Ethiopia and Guinea where reports indicate that despite having training workshops and standard operating procedures in place, local staff were not applying the commodity management procedures they were trained on, resulting in poor management of commodities. Malawi reports difficulty among health facility staff to consistently and completely fill out commodity data collection forms, and Mozambique reports low motivation due to low wages and poor working conditions.

Misaligned incentives may exacerbate challenges for workers in constrained resource systems. For example, in Nepal, warehouse managers faced a penalty for disposing of expired products, which dis-incentivized managers from clearing expired products from facilities. The system was absent a regulatory process for facilitating the "write off" of unusable, expired commodities. As a consequence, available storage spaces were disorganized and cluttered and inventory control systems suffered.[9] In Tanzania, wholesalers neglect rural areas due to distribution challenges, leading drug shops to prioritize low-value commodities that sell quickly, meaning higher-cost lifesaving commodities were not available.[10] One key informant also noted that in Tanzania, district government personnel are penalized for stockouts, though the cause is not necessarily at the district level. This incentivizes hoarding of stock to avoid penalties.

5. LOW INSTITUTIONAL CAPACITY

Many LMIC public health institutions do not have adequate capacity to roll out or maintain incentive reforms due to poor data and low data visibility, limited governance, and lack of written procedures and documentation. Even when reforms are tried, they are difficult to sustain through any transition in government or management. Low human resource capacity plagues LMIC central medical stores, where low public-sector wages and poor incentives limit the ability of governments to hire supply

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[8] Pazirandeh A, Norrman A. An interrelation model of power and purchasing strategies: A study of vaccine purchase for developing countries. *Journal of Purchasing & Supply Management.* 2014; 20:41-53.
[9] USAID DELIVER project. Supply chain integration: seamlessly linking the pieces. USAID DELIVER project. Task Order I; 2011.
[10] USAID DELIVER project. Performance based financing: Examples from public health supply chains in developing countries. 2012 http://apps.who.int/medicinedocs/documents/s21873en/s21873en.pdf. Accessed August 12, 2017.

chain experts.[11] In cases where LMIC institutions hold weak purchasing positions, the resulting incentive structures influence government purchasing strategies in ways that can alter power positions. For example, UNICEF and Iran, which were facing supplier dominance and held a weaker purchasing position, increased their legitimacy by investing in long-term relationships and partnerships with suppliers.[12]

OVERVIEW OF ALIGNING INCENTIVES INTERVENTIONS IN SCM

Limited research exists on best practices for AI in public supply chain systems, particularly in LMICs. Moreover, few interventions documented in the literature appeared to be systematically implemented, and fewer have been rigorously evaluated. However, literature shows that AI can help improve supply chain performance and lead to lower costs, less wasted capital, higher quality, and improved service.[13,14] There is evidence of promising approaches in the commercial sector, such as sales-based performance, supply chain performance-based incentives, gain-sharing arrangements, and individual reward arrangements, that could potentially be adapted for use in public health supply chains.[15]

The following section details AI interventions documented in published literature and those gleaned from the key informant interviews and country work plans (see Annex D for a summary table of the interventions described here). Narayanan & Raman[16], Lee[17], and Silverman, et al.[18] have previously offered the most comprehensive guidance on the topic of AI, and the interventions and descriptions listed below are adopted from theirs.

1. PERFORMANCE-BASED FINANCING OR PERFORMANCE-BASED INCENTIVES

Interventions related to performance-based financing (PBF) have received the most attention in the literature among the range of potential AI interventions. PBF (also commonly referred to as performance-based incentives, or PBI) includes schemes in which financial or non-financial incentives are awarded based on achievement of pre-determined performance targets. Such schemes are widely used in the commercial sector and are increasingly used in LMIC health system contexts. Experts note "PBF is not a uniform intervention, but rather a range of approaches".[19] Its effects depend on the interaction of several variables, including the design of the intervention (e.g., who receives payments, the magnitude of the incentives, the targets and how they are measured), the amount of additional funding, and other ancillary components such as technical support and contextual factors.[20]

[11] Yadav. Health Product Supply Chains in Developing Countries, 142-154.
[12] Pazirandeh A, Norrman A. An interrelation model of power and purchasing strategies: A study of vaccine purchase for developing countries. *Journal of Purchasing & Supply Management*. 2014; 20:41-53.
[13] Ebert and Gelpi. *Aligning a misaligned supply chain.*.
[14] Lee H. The triple-A supply chain. *Harvard business review*. 2004;82(10):102-113.
[15] USAID DELIVER project, Task Order 4. Commercial sector performance-based financing offers lessons for public health supply chains in developing countries. 2012; http://iaphl.org/wp-content/uploads/2016/05/Performance-Based-Financing-for-PH-Supply-Chains.pdf.
[16] Narayanan V, Raman A. Aligning incentives in supply chains. *Harvard business review*. 2004; 82(11):94-102.
[17] USAID DELIVER project, Task Order 4.
[18] Silverman R, Over M, Bauhoff S. Aligning Incentives and Accelerating Impact: Next Generation Financing Models for Global Health. Center for Global Development; 2015; https://www.cgdev.org/sites/default/files/CGD-WG-report-aligning-incentives-accelerating-impact.pdf.
[19] Witter, et al. Paying for performance to improve the delivery of health interventions.
[20] Fretheim and Lindahl, Paying for performance.

PBF has had limited applications in public sector supply chains,[21] but this review found PBF models are now the most widely reported AI-type intervention. There are some examples of donor efforts to build capacity within supply chain systems to apply PBF,[22,23] which may speak to the growing interest among development partners in PBF approaches.

In supply chains, PBF has been used to address challenges in 1) collecting logistics information; 2) improving commodity availability; 3) increasing quality of care; and 4) worker retention. Examples of such PBF approaches are outlined below, though data on the results and impact of these approaches is limited.

LOGISTICS INFORMATION
Examples of using PBF to address issues obtaining timely and reliable logistics information include:

- In Rwanda, the Community Performance-Based Financing program introduced pay-for-reporting incentives that were given directly to community health worker cooperatives to improve reporting timeliness and quality.[24]

- In Nicaragua, health management units were scored on 20 indicators that assessed the automated logistics management information system (LMIS), with high-scoring units receiving small rewards, such as computers or other equipment.[25]

- The Focus Region Health Project in Ghana set up a competition between regions to incentivize on-time and accurate logistics reporting, awarding equipment to the region that performed best in these areas. [26]

- The Rebuilding Basic Health Services project in Liberia used PBF as part of a package to improve health systems strengthening activities, including accurate and timely reporting of data and functional supply chain management. As a result, the quality of the national health management information system (HMIS, measured through accuracy scores) improved, as did several key service indicators. However, the proportion of facilities with no stock-outs of tracer drugs decreased and the proportion of pregnant women who tested positive for HIV and were initiated on antiretroviral therapies did not improve. It was noted that shortages of essential medicines remained an issue.[27]

COMMODITY AVAILABILITY
To address issues in family planning commodity availability, Paraguay carried out a PBF program in all 19 health districts with the aim of lowering contraceptive stockout rates at service delivery points. Family planning program managers were incentivized with training opportunities (worth about

[21] USAID DELIVER project. Performance based financing: Examples from public health supply chains in developing countries. 2012 http://apps.who.int/medicinedocs/documents/s21873en/s21873en.pdf.
[22] Felling, Barbara, Brian Serumaga, James E. Rosen. 2013. Performance-Based Incentives for Public Health Supply Chains: Training Toolkit. Arlington, Va.: USAID | DELIVER PROJECT, Task Order 4.
[23] USAID DELIVER project, Task Order 4. Commercial sector performance-based financing offers lessons for public health supply chains in developing countries. 2012; http://iaphl.org/wp-content/uploads/2016/05/Performance-Based-Financing-for-PH-Supply-Chains.pdf.
[24] USAID DELIVER project. Performance based financing.
[25] USAID DELIVER project. Performance based financing.
[26] USAID DELIVER project. Performance based financing.
[27] USAID. Technical Brief. Building sustainable capacity for performance-based financing in Liberia's health system. http://www.msh.org/sites/msh.org/files/rbhs_building_sustainable_capacity_for_pbf_tech_brief.pdf. USAID. Technical Brief. Building sustainable capacity for performance-based financing.

US$40) on a quarterly basis for avoiding stockouts of four key MOH-funded contraceptives (condoms, oral contraceptives, Depo-Provera, and intrauterine devices).[28]

QUALITY OF CARE

PBF strategies to improve the quality of care tend to focus on structural elements (i.e. incentivizing the availability and proper functioning of the facilities, equipment, and other supplies needed to provide high quality care) and process elements (i.e. incentivizing health workers' knowledge of and adherence to relevant clinical protocols). Examples of strategies to improve quality of care through PBF include:

- The Philippines, Tanzania and Zambia used targeted payments to incentivize the achievement of quality of care or coverage indicators.[29]

- In Liberia and Afghanistan, non-governmental organization (NGO) facilities are engaged via performance-based contracts through which they are eligible to earn bonuses for adequate performance; In Haiti such facilities must meet performance targets to unlock a portion of their budget and to earn additional bonuses.[30]

- Rwanda, Burundi and the Democratic Republic of Congo employed conditional cash transfers/payments using quality measurements; Rwanda and Vietnam used conditional cash transfers without quality measures; and China employed a mix of conditional cash transfers and targeted payments.[31]

- In Rwanda, a nationwide PBI scheme targeted improvements in both quantity and quality of primary health care services in 40 district hospitals and 500 health centers. Supply chain management indicators were among the quality indicators against which facilities were assessed and awarded bonus payments if performance targets were met. An additional PBI scheme aimed at improving drug supplies at the community level rewarded community health workers for their role in assuring that commodities were available for community case management of childhood illnesses.[32]

- In April 2010, Burundi became the second African country (after Rwanda) to scale its health-sector PBF initiative nationally. Its PBF system, which incentivizes improved service quality and covers all public and most private nonprofit health facilities, corrected issues arising from the implementation of the national free health care policy. The system is operated by the Cellule Technique FBP, a technical group within the Ministry of Health (MOH). [33]

- In Malawi, the Support for Service Delivery Integration (SSDI)-PBI program, launched in 2014, awarded bonuses based on scores in achievement of service utilization, quality, and community satisfaction. Unlike typical PBF designs, the bonuses could not be awarded to individual facility staff as salary bonuses, but could be applied to facility improvements.

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[28] Eichler, R., Ergo, A., Serumaga, B., Rosen, J., Miles, G., Tukai, M. Options Guide: Performance-based incentives to strengthen public health supply chains--version 1. Health Systems 20/20 project, Abt Associates Inc.; 2012. https://www.hfgproject.org/wp-content/uploads/2015/02/Options-Guide-Performance-Based-Incentives-to-Strengthen-Public-Health-Supply-Chains-----Version-1.pdf.

[29] Witter, et al. Paying for performance to improve the delivery of health interventions.

[30] USAID DELIVER project. Performance based financing: Examples from public health supply chains in developing countries. 2012 http://apps.who.int/medicinedocs/documents/s21873en/s21873en.pdf.

[31] USAID DELIVER project. Performance based financing.

[32] Fretheim and Lindahl, Paying for performance.

[33] Nimpagaritse M, Korachais C, Roberfroid D, Kolsteren P, Zine Eddine El Idrissi MD, Meessen B. Measuring and understanding the effects of a performance-based financing scheme applied to nutrition services in Burundi--a mixed method impact evaluation design. International journal for equity in health. 2016; 15:93.

Another distinguishing feature of the SSDI scheme compared to typical models is that facility-level procurement was managed through the SSDI program rather than facility-based personnel. An impact evaluation of the SSDI program is planned.[34]

- Malawi's Results-based Financing for Maternal and Neonatal Health Initiative, launched in 2013, focused on maternal and newborn care during childbirth. The initiative awarded bonuses to both facility-based providers and district health management teams for meeting performance targets. In addition, demand-side conditional cash transfers incentivized pregnant women to deliver in facilities. The scheme varied in its impact on commodity stocks, improving availability of several key drugs but reducing availability of others relative to control facilities. The scheme demonstrated positive effects with respect to drug procurement and adherence to clinical protocols, which spilled over to non-intervention facilities, likely based on enhanced district management performance.[35]

WORKFORCE RETENTION

PBF incentives have also been used to improve worker retention, encourage innovation, and improve performance. Most employees of public health supply systems receive lower or noncompetitive salaries, which can hinder productivity and innovation and encourage absenteeism and fraud.[36] In Zimbabwe, a PBF program was implemented to encourage primarily low-paid health care workers who perform voluntary medical male circumcision (VMMC) to remain in the public sector. A qualitative study showed that while the US$25 incentive increased motivation, the monetary incentive resulted in workplace tension and caused workers to prioritize VMMC over other non-incentivized services.[37]

The response to PBF schemes among healthcare workers appears to be mixed. Literature demonstrates that NGOs using PBF appreciate the increased autonomy, flexibility, and reduced reporting requirements that come from the performance-based payment terms. Moreover, NGOs using performance-based payment are perceived to be more driven to request technical assistance to improve efficiency.[38] Monetary and non-monetary incentives can be adjusted to induce individuals or teams to behave in ways that maximize the organization's and the supply chain's performance.[39]

Not all regions or districts are at the same level of achievement of health targets, and PBF models will need to be adapted to allow for implementation across districts with varying needs (see Performance-based Equitable Resource Allocation Model, Punjab, Pakistan[40]). The literature provides instances of PBF programs that were not successful. For example, a performance review of a PBF

[34] McMahon S, Brenner S, Lohmann J, Makwero C, Torbica A, Mathanga DP, Muula AS, De Allegri M. Evaluating complex health financing interventions: Using mixed methods to inform further implementation of a novel PBI intervention in rural Malawi. *BMC Health Services Research*. 2016; 16:414.

[35] Brenner S, Wilhelm D, Lohmann J, Kambala C, Chinkhumba J, Muula AS, De Allegri M. Implementation research to improve quality of maternal and newborn health care, Malawi. *Bull World Health Organ*. 2017; 95:491-501.

[36] Eichler, R., Ergo, A., Serumaga, B., Rosen, J., Miles, G., Tukai, M. Options Guide: Performance-based incentives to strengthen public health supply chains--version I. Health Systems 20/20 project, Abt Associates Inc.; 2012. https://www.hfgproject.org/wp-content/uploads/2015/02/Options-Guide-Performance-Based-Incentives-to-Strengthen-Public-Health-Supply-Chains-----Version-1.pdf.

[37] Feldacker C, Bochner AF, Herman-Roloff A, et al. Is it all about the money? A qualitative exploration of the effects of performance-based financial incentives on Zimbabwe's voluntary male medical circumcision program. *PLoS One*. 2017; 12(3):e0174047.

[38] Eichler, R., Auxila, P., Antoine, U., Desmangles, B. Performance-based incentives for health: six years of results from supply side programs in Haiti--Working Paper 121. E. Center for Global Development 2007. https://www.cgdev.org/sites/default/files/13543_file_Haiti_Incentives.pdf.

[39] Feldacker, Herman-Roloff, et al. Is it all about the money?

[40] UNICEF. Performance-based equitable resource allocation model: The Punjab experience. 2013; https://www.unicef.org/health/files/Punjab_Model_FINAL.pdf.

scheme in Burundi did not detect significant program effects on health facilities' ability to secure essential drugs and supplies.[41] Similarly, a Tanzanian scheme incentivizing facilities to manage equipment, drugs and supplies failed to prevent stockouts because incentivized facilities could not overcome supply chain issues beyond their control.[42]

2. CONTRACTING MECHANISMS DESIGNED TO ALIGN INCENTIVES

Contracts designed to reward those who act in the best interest of the supply chain are another approach to AI. Contracts can be designed to stipulate the anticipated risks, costs, and benefits that would reflect actors' interests. For example, under revenue sharing contracts between a supplier and a retailer, the retailer agrees to share a portion of sales revenues with the supplier in exchange for lower unit costs. This arrangement adjusts the allocation of profit within the supply chain and is recommended in some scenarios but does not out-perform other models in other cases (e.g., in comparison to the 'administratively cheaper wholesale price contract' and in models in which products are more expensive to retail).[43]

Examples of health commodity supply chain contracting arrangements (see box) designed to align incentives include:

- Pooled procurement contracts: In 2012, upon request from the Department for International Development (DFID), the Clinton Health Access Initiative (CHAI) and the Bill & Melinda Gates Foundation (BMGF) explored the potential for donor-backed, volume-guaranteed orders to achieve price reductions on contraceptive implants to meet increasing demand in LMIC markets for these products more cost effectively. The donor-established fund covered any gaps between the volume purchased and minimum purchase agreed upon with manufacturers (Bayer and Merck in this example). Though the impact of this approach has not yet been rigorously evaluated at a country level, forecasts estimated that the additional implants purchased through one access program as a result of the price reductions could potentially avert 31 million unintended pregnancies, 414,000 child deaths, and 41,000 maternal deaths over five years. This serves as a global example of the use of contracts to align incentives across the supply chain.[44]

> **New Contracting Mechanisms**
>
> LMICs are increasing use of contracting mechanisms that align all actors' incentives in SCM. Examples include pooled procurement contracts, fixed-amount reimbursement agreements, performance-based contracts, and framework contracts.

- Fixed-amount reimbursement agreement (FARA): In 2013, a one-year FARA between the governments of Mozambique and USAID served to incentivize improved performance within Mozambique's Central Medical Store (Central de Medicamentos e Artigos Medicos, CMAM) through direct incentive payments in the areas of planning, distribution, and warehouse management. The agreement aimed to foster innovation, efficiency, improved supply chain performance, and strengthened fund management capacity within CMAM. Under the

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[41] Nimpagaritse M, Korachais C, Roberfroid D, Kolsteren P, Zine Eddine El Idrissi MD, Meessen B. Measuring and understanding the effects of a performance-based financing scheme applied to nutrition services in Burundi--a mixed method impact evaluation design. *International journal for equity in health.* 2016; 15:93.

[42] Canavan A, Swai G. Payment for Performance (P4P) evaluation: 2008 Tanzania country report for Cordaid. Amsterdam: Royal Tropical Institute (KIT); 2008. Available from: http://www.search4dev.nl/record/305432.

[43] Cachon GP, Lariviere MA. Supply chain coordination with revenue-sharing contracts: Strengths and limitations. *Management science.* 2005; 51(1):30-44.

[44] Clinton Health Access Initiative. Case study: Expanding global access to contraceptive implants. 2015; https://clintonhealthaccess.org/content/uploads/2015/08/Case-Study_LARC.pdf. Accessed August 16, 2017.

agreement, CMAM consistently met targets related to planning and distribution functions and demonstrated improvements related to warehouse operations.[45,46]

- Performance-based contracts: In Tanzania, a performance-based contract designed to improve essential medicines distribution in three districts incentivized wholesalers through bonuses laid out in the contracting process to maintain 95 percent commodity availability.[47]

- Framework contracts: Countries are shifting to this way of purchasing rather than placing single orders for recurrent contracts for work or supplies. They involve volume-based discounts on commodity purchases based on an established price structure, and they can improve efficiency by averting the transaction costs of repeat purchasing. Incentives to encourage this sort of contracting in sub-Saharan Africa would be needed to increase their use and success, including supporting legislation and improved contracting capacity to manage these long-term and complex contracts.[48]

3. INFORMATION SYSTEMS

AI requires sharing information between and among stakeholders so all actors have access to the same information—whether manual or electronic—across units, departments, and organizations.[49,50] Data visibility in a supply chain allows for continuous performance improvement at all levels. Technical assistance to LMIC supply chain systems has focused on efforts to design user-centered information systems and decision-making tools, to build robust information systems, and to train local workers to analyze and use data to improve supply chain performance. Examples of such efforts (see box) include the development of cell-phone based short message service (SMS) solutions such as cStock in Malawi and ILSGateway in Tanzania for monitoring product availability.[51] GHSC-PSM is implementing GS1 barcodes to support receiving and distribution workflows, for example, in Ethiopia and Pakistan, building on DELIVER's work.

> **Enhanced Data Visibility**
>
> Guatemala, Ghana, Madagascar, Malawi, Nigeria, Namibia, Rwanda, South Sudan, and Zambia are employing dashboards for increased visibility into their supply chains.

Country examples of information sharing to help align incentives in SCM include:

- In Karnataka, India, a 'bulletin board,' or large-screen monitor, mounted in the supervisor's office or other public space, displayed a web page that streamed noteworthy supply events (e.g., stockouts, excess stock, or user inactivity). Events were also transmitted over SMS to

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[45] Spisak, C, Morgan, L, Use of incentives in health supply chains--A review of results-based financing in Mozambique's Central Medical Store. USAID | DELIVER PROJECT, Task Order 4 and Health Finance & Governance Project; 2014. https://www.rbfhealth.org/sites/rbf/files/Use%20of%20Incentives%20in%20Health%20Supply.pdf.
[46] Spisak C, Morgan L, Eichler R, Rosen J, Serumaga B, Wang A. Results-based financing in Mozambique's Central Medical Store: A review after 1 year. *Global health, science and practice.* 2016;4(1).
[47] USAID DELIVER project. Performance based financing: Examples from public health supply chains in developing countries. 2012 http://apps.who.int/medicinedocs/documents/s21873en/s21873en.pdf. Accessed August 12, 2017.
[48] Arney L, Yadav P, Miller R, Wilkerson T. Strategic contracting practices to improve procurement of health commodities. *Gloval health, science and practice. 2014; 2(3).* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4168627/pdf/295.pdf
[49] Narayanan V, Raman A. Aligning incentives in supply chains. *Harvard business review.* 2004; 82(11):94-102.
[50] Sulin B, Stallaert J, Whinston A. Research commentary: introducing a third dimension in information systems design—the case for incentive alignment. *Information systems research.* 2001;12(3):225-239.
[51] Driving supply chain evolution: Data visibility enables continuous improvement. JSI 2017. http://www.jsi.com/JSIInternet/Resources/publication/display.cfm?txtGeoArea=INTL&id=18343&thisSection=Resources.

all supply chain personnel. Motivational messages that highlighted good performance were also streamed to the board. The intervention improved data visibility among all nodes of the supply chain, reduced stockout rates, and improved accountability. A 14-month impact study of the intervention found improvement in stock availability (99 percent availability for nine vaccines studied) and a 64percent improvement in responsiveness.[52]

- A similar intervention, the Supply Chain Management Dashboard (SCM-D), has been implemented in Syria. The SCM-D compiles information from World Food Program country offices and business units and graphically communicates information on relevant trends. SCM-D has allowed for better informed decision-making enhanced responsiveness in an emergency context and improved service delivery.[53]

- Improving data visibility does not always need to be high-tech. For example, Nepal has implemented an intervention to refocus the Morbidity and Mortality (M&M) Conference as a systems-level quality improvement intervention to help improve the visibility of data. In M&Ms, hospital staff conduct root cause analyses of selected clinical cases of M&M to identify lessons learned and recommendations to guide future practice. The intervention has helped to identify stockouts early and address cross-cutting quality challenges such as training, workflow, and procurement of supplies.[54]

4. INCENTIVE AUDITS

Incentive audits, which have been used to identify incentive misalignments in the financial sector, have also been applied in the health sector and may have relevance in supply chain systems. They examine supply chain dynamics that influence the incentives among parties involved in supply chain transactions. Incentive audits are conducted when partner organizations are considering new supply chain initiatives such as adopting new technologies, entering new markets, or launching supply chain improvement programs.[55] Examples exist in the health sector as well. Nepal's M&M Conference is a health-based example. An analysis of the incentive alignments needed between firms and NGOs to achieve socially sustainable supply chains recommends achieving 'inter-organizational fit' of firm/NGO missions, organization, and activities.[56]

5. PERFORMANCE SCORECARDS

Performance scorecards can be used by organizations to evaluate each other's performance to encourage standards, track performance, and provide feedback. For example, the continuous results monitoring and support system (CRMS), originally developed to track availability of Ethiopia's malaria drugs in 2009, tracks performance in areas including supply availability, inventory control, staffing, training, and reporting, with bi-monthly stakeholder review meetings to determine improvement steps. As part of the Ebola recovery efforts, Systems for Improved Access to Pharmaceuticals and Services (SIAPS) helped Sierra Leone institute a CRMS to diagnose pharmaceutical management

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[52] Ramanujapuram A, Akkihal A. Improving performance of rural supply chains using mobile phones. *ACM DEV.* 2014; 5.

[53] Sithole B, Guedes Silva S, Kavelj M. Supply chain optimization: enchancing end-to-end visibility. *Procedia Engineering.* 2016; 159: 12-18.

[54]Schwarz D, Schwarz R, Gauchan B, Andrews J, Sharma R, Karelas G, Rajbhandari R, Acharya B, Mate K, Bista A, Bista MG, Sox C, Maru DSR. Implementing a systems-oriented morbidity and mortality conference in remote rural Nepal for quality improvement. *BMJ Qual Saf.* 2011; 20:1082-1088.

[55] Yadav P, Curtis K, Sekhri N. Mapping and realigning incentives in the global health supply chain. Global health forecasting working group background paper. 2006; https://www.zlc.edu.es/projects/global/mapping-and-realigning-incentives-in-the-global-health-supply-chain-risk-and-incentive-study-of-global-health-supply-chains/.

[56] Rodriguez J GC, Arenas D. Cooperative initiatives with NGOs in socially sustainable supply chains: How is inter-organizational fit achieved? Journal of Cleaner Production 2016; 137:516-26.

issues and to track performance. CRMS has facilitated transparency, peer monitoring, and knowledge sharing which support SCM personnel in addressing and measuring progress within performance challenges identified through the system.[57,58]

CONCLUSIONS AND DESIGN CONSIDERATIONS

While the literature indicates that promising AI interventions are implemented in the public health sector, little is known about their success and applicability specifically related to SCM. As reflected in a review by Witter et al., published work evaluating the impact of AI interventions is limited and the evidence base is too weak to draw general conclusions.[59] The lack of systematic studies, rigorous evaluations, and randomized controlled studies on AI represents a significantbarrier for governments, donors, and implementing partners to improve the availability of health commodities. Nonetheless, the existing literature offers insights:

- Existing incentives must be well understood to design incentives schemes to change performance.

- All actors who contribute to a performance factor should be brought into the incentive realignment intervention. If some actors are left out, their continuation of the status quo may undermine the ability of incentivized actors to achieve the desired change.

- Data visibility is a critical enabling factor—performance of the system component the AI intervention is meant to improve must be measured and reported regularly so that incentives can be awarded (or not).

More robust and comprehensive studies are needed for governments and donors to better understand the potential impact AI reforms can have on strengthening supply chains, improving service delivery, and most importantly, achieving better health outcomes.

The lack of systematic examination of these interventions and reforms can be attributed to several factors, including:

Incentivizing Improvement

Continuous results monitoring and support systems track trends and factors to incentivize performance and provide feedback for improvement.

- Donors funding SCM programs, including performance improvement innovations, may underestimate the costs or undervalue the investment associated with rigorous impact evaluation studies.

- Interventions may target multiple points along the supply chain, making it difficult to assess which individual interventions may have meaningful impact, or whether a designated set of reforms must be implemented as a package to improve supply chain performance. In

[57] Simatupang T, Sridharan R. Design for supply chain collaboration. *Business Process Management Journal.* 2008; 14(3):401-418.

[58] SIAPS. Continuous results monitoring and support system tracks post-ebola recovery in Sierra Leone. SIAPS. USAID 2016. http://siapsprogram.org/publication/continuous-results-monitoring-and-support-system-tracks-post-ebola-recovery-in-sierra-leone/.

[59] Witter, et al. Paying for performance to improve the delivery of health interventions.

evaluations that have looked at single or a set of interventions, spill-over effects on other SCM functions, be they enabling or challenging, are rarely captured.

- While an ideal impact evaluation study design may involve rolling out SCM reforms in a randomly determined and incremental order, this scenario is not typically feasible in practice. In the handful of systematic evaluations conducted, outcomes examined tended to be very close to the point of intervention (e.g., stockout rates), with limited research and analysis on larger, systemic issues such as cost comparisons or financial sustainability.

- Research capacity limitations in LMICs may impede the pursuit of SCM-related impact evaluations.

This landscape assessment makes headway in closing the knowledge gap with respect to understanding and addressing the need for AI to support robust SCM. Review of literature, key informant interviews, and SCM expert input indicate that misaligned incentives throughout the supply chain can lead to systems that are unable to meet the needs of the public they serve. While key informants noted the importance of AI in SCM, some also noted the need for more evaluations and studies of the effects of AI in SCM. It was also noted that transparency among all actors throughout the supply chain is critical because of the complex interdependent processes inherent in supply chain systems.

This review found several promising AI interventions underway or under consideration including those related to patient care, commodity availability, information systems, and human resources. Countries are increasingly turning to incentives to improve performance throughout the supply chain, including those related to purchasing and suppliers, financing, warehousing and distributers, the supply chain workforce, and the recipients, providers, and clients. These incentives include PBF or PBI, different contracting mechanisms, data visibility mechanisms including the use of real time electronic systems, audits, and scorecards. With countries increasingly deploying these interventions, there is an opportunity to study and evaluate these approaches to assess successes, feasibility, and scalability in countries where the approach is implemented and in other LMICs.

Annex A. Grey Literature Search Engines and Clinical Trial Registries

Grey literature search engines. The following grey literature sources were identified using the website http://libguides.newcastle.edu.au/sysreviews/greyliterature.

- Open Grey: Open access to 700,000 bibliographical references of grey literature (papers) produced in Europe.

- Google Scholar: Articles, theses, books, abstracts, and court opinions from academic publishers, professional societies, online repositories, universities, and other sites.

- Google: Articles, websites, theses, books, and abstracts identified.

Clinical trial registries: The following clinical trials registries were identified using the website http://libguides.newcastle.edu.au/sysreviews/greyliterature.

- Cochrane Central Register of Clinical Trials (CENTRAL): Details of published articles taken from bibliographic databases (notably MEDLINE and EMBASE), and other published and unpublished sources.

- ANZCTR - Australian New Zealand Clinical Trials Registry: Primary registry of the World Health Organization (WHO) Registry Network. It accepts trials for registration from all countries and from the full spectrum of therapeutic areas.

- ClinicalTrials.gov: Registry and results database of publicly and privately supported clinical studies of human participants conducted around the world.

- Open Trials: New database of information about the world's clinical research trials.

- ISRCTN Registry: Primary clinical trials registry recognized by WHO and the International Committee of Medical Journal Editors (ICMJE). It accepts all clinical research studies (whether proposed, ongoing, or completed), providing content validation and curation; all study records are freely accessible and searchable.

- CenterWatch: Clinical trials database containing thousands of currently enrolling trials. Provides patients with health and educational resources, along with information on drugs and new medical therapies.

- NCIC Clinical Trials Group: Cooperative oncology group which carries out clinical trials in cancer therapy, supportive care, and prevention across Canada and internationally.

- NIHR Clinical Research Network

- WHO International Clinical Trials Registry Platform: Access to a central database containing the clinical trials registration data sets provided by registries from Australia, UK, USA, Japan, Korea, Brazil, China, Iran, Sri Lanka, Netherlands, Germany, Cuba, and India. It also provides links to the full original records.

- EU Clinical Trials Register: Offers information on protocols and results of clinical trials conducted in the European Union (EU) and the European Economic Area (EEA), as well

as clinical trials conducted outside the EU and EEA that are linked to European-developed pediatric medicines.

In addition, the study team reviewed the Registry for International Development Impact Evaluations (RIDIE) of the International Initiative for Impact Evaluation (http://ridie.3ieimpact.org/)

Annex B. Key Informant Interview Guide

Question Set B: Aligning Incentives

Ver. September 21, 2017

Ensure digital recording is working
Frame/Transition to Aligning Incentives

READ: "I believe you are familiar with 'aligning incentives' approaches intended to strengthen the supply chains of health commodities. As you know, supply chains extend across several functions and levels, such as manufacturing, logistics and distribution, marketing, finance, and purchasing. And incentives for the people and organizations responsible for each function must be purposely aligned to maximize the entire supply chain's performance and, in turn, deliver health products to those who need them. The next set of questions is specifically about your experiences with and opinions about these types of programs.

PRIMARY QUESTION	FOLLOW-UP QUESTIONS
With respect to the supply chain system(s) you are most familiar with, how do various individuals and organizations act together to maximize overall performance for the entire health system?	Describe the ways in which they act together. What are the major explicit or implicit measures of performance? i.e.: profit, the amount of inventory (e.g., surplus, just right, deficit, stockouts), products availability on the market, (in)correct forecasts, (in)adequate sales efforts, speed of order fulfilment/delivery/transportation time, cost (i.e., freight), avoiding waste/expired products, poor customer service, capacity to quickly to unexpected external disruptions/emergency crises (e.g., natural disasters, terrorism, wars, epidemics, Internet hacks). Where are the major breakdowns? What most needs to be improved?
Are the roles and responsibilities of the entities that make up the supply chains you are familiar with well-defined and understood across the entire system?	If YES Can you give me an example where suppliers or other organizations have made decisions that serve the supply chain's collective interests? Can you give me an example where individual suppliers and/or other organizations have made decisions that serve their individual interests but are not in the collective interest? Can such decisions be detrimental to other entities in the supply chain? Or detrimental to the overall supply chain? Do such decisions often give rise to explicit conflicts? What do you think are the major factors influencing individual decision-makers?
What are the rewards and/or punishments for each entity within the supply chains you are familiar with?	Economic incentives, or extrinsic motivations: Who negotiates the price for health commodities? [Probe: The type of reward could be bonuses, rebates, profit-sharing, or split savings among partners with improved processes and products]. Who sets the monetary incentives as the product is passed down the supply chain? [Probe: Ask about the three reasons why incentive-related issues arise in supply chains: hidden action by partner firms; hidden information (access to data, knowledge on forecasts, sales, and plans) that only some of the firms in the supply chain possess; and badly designed incentives.] Are there penalties if the original terms are violated? If so, what are they? Social preferences, or intrinsic motivations:

PRIMARY QUESTION	FOLLOW-UP QUESTIONS
	Do organizations share common beliefs in what the supply chain should help accomplish within the broader heath sector such as: health outcomes, community empowerment and/or gender equality within the population? Are entity-specific or supply chain-wide accomplishments, especially those working towards pre-determined goals, recognized? Do organizations endorse loyalty to partners within the chain through the endorsement of reciprocity, status, fairness, and group identity/solidarity?[60] Are you aware of supply chain systems that have tried to incentivize supply chain actors to work towards not just supply chain performance measures, but public health service outcomes (e.g., reducing number of clients seeking a family planning method that was out of stock)? What are the measures in place for organizations in this chain to hold one another accountable, if any? [Probe: Measures can range from training, decision-support tools for managers, and/or matched goals]. Is there a party in charge of detecting and tackling inter-organizational differences?
To what extent would you attribute problems in supply chains you have been familiar with to the misalignment of incentives? How so?	Are the rewards or penalties evenly distributed across the organizations in the supply chain network? What incentives do you think should be within the supply chain that are inclusive of the entire system? Are there appropriate incentives for continuous quality improvement within the system? Are there appropriate incentives for performance improvement within the system? Are there appropriate incentives for effective personnel management within the system?
What additional intervention(s) would you suggest that would re-align incentives among partner organizations in the supply chains you are familiar with?	For the purpose of our discussion, can we try to group these interventions as either: Contract-based interventions; Information-based interventions; or Trust-based interventions? [Probe: On the three types of interventions: contract-based, information-based, or trust based. Contracts set the terms of how, how much, and under what conditions partners firms are being paid. Information-based interventions include tracking and monitoring business variables, thereby making actions visible to all partner firms, or by disseminating information throughout the supply chain. With trust-based interventions partner companies can use intermediaries to build trust among partner companies and, in turn, to strengthen supply chains. Narayanan & Raman (2004) recommends, in order: contract-based solutions (quick and easy to implement) > information-based solutions > trust-based solutions (difficult to identify trustworthy intermediaries between suppliers and manufacturers)]. Might this solution to resolve incentive misalignment for one company exacerbate the problem for another? Would each organization have to align their internal functions to make this solution happen for the entire supply chain? [Probe: organizations would have to make internal audits, train managers, and managers would need to openly communicate rationale behind decision-making.]

[60] Loch CH, Wu Y. Social preferences and supply chain performance: An experimental study. Management Science. 2008 Nov; 54(11):1835-49.

Complete the Aligning Incentives Question Set

If the participant indicated some experience with social accountability[61], continue the interview by administering that question set. Otherwise, conclude the interview.

If no further parts are to be administered, read below to end the interview.

"Thank you again for making time for this discussion. Are there any resources, such as websites, reports, organizations, or people that you recommend we consult to get a better understanding of innovations in procurement and supply chain management?

Is there anything else you would like to add?

Do you have any questions for me?

Thanks again for your participation."

Before turning off the tape recorder

Fill out and read into the recorder the interview end time from 'Section A. Administrative Items.'

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[61] Please note: in addition to the Aligning Incentives Landscape Analysis covered in this report, authors were simultaneously conducting additional landscape analyses related to social accountability mechanisms in supply chains, operations research for supply chain reform, and informed push models. Some aspects of the four analyses were carried out in a coordinated way, including the elements addressed in this Annex.

Annex C: Key Informants Consulted

Participants in Ad Hoc Technical Review			
1	Agbiriogu	Brian	Chemonics/USAID GHSC-PSM Project
2	Bergmann	Julie N	Chemonics/USAID GHSC-PSM Project
3	Brown	Andrew	Chemonics/USAID GHSC-PSM Project
4	Dubin	Scott	Chemonics/USAID GHSC-PSM Project
5	Hurkchand	Hitesh	Interagency Supply Chain Working Group
6	Ndoye	Thidiane	Chemonics/USAID GHSC-PSM Project
7	Rotman	Allan	Chemonics/USAID GHSC-PSM Project
8	Titus	Ralph	Chemonics/USAID GHSC-PSM Project
9	Yeager	Beth	Chemonics/USAID GHSC-PSM Project
Key Informants - Global Subject Matter Experts			
1	Aboagye-Nyame	Francis (Kofi)	Management Sciences for Health (MSH)
2	Barton	Iain	Imperial Logistics
3	Brownlow	Kaleb	Bill & Melinda Gates Foundation
4	Fenton	George	Humanitarian Logistics Association (HLA)
5	Hannoun	Betty	Merck for Mothers
6	Jacobs	Jeffrey	Merck for Mothers
7	Lahrichi	Mehdi	McKinsey&Company
8	Raja	Sangeeta	Self-Employed
9	Sarley	David	Bill & Melinda Gates Foundation
10	Sweeney	Edward	CILT Logistics Research Network Forum
11	Tamba Dia	Ousmane	UNICEF
12	Van Woerkom	Alfons	The Global Fund

Key Informants - GHSC-PSM Field Office Personnel			
13	Attah	Matthew	GHSC-PSM Nigeria Field Office
14	Chavez	Jennifer	GHSC-PSM Zambia Field Office
15	Falayajo	Kolawole	GHSC-PSM Nigeria Field Office
16	Gege Buki	Inès K	GHSC-PSM Rwanda Field Office
17	Ibegbunam	Innocent	GHSC-PSM Nigeria Field Office
18	Icyimpaye	Joyce	GHSC-PSM Rwanda Field Office
19	Jaramillo	Luigi	GHSC-PSM Central America Field Office (Guatemala)
20	Kabalisa	Max	GHSC-PSM Rwanda Field Office
21	Majoro	Juvenal	GHSC-PSM Rwanda Field Office
22	Mujasi	Paschal	GHSC-PSM Malawi Field Office
23	Olalandu	Oluwole	GHSC-PSM Nigeria Field Office
24	Osode	John	GHSC-PSM Nigeria Field Office
25	Raisi	Denver	GHSC-PSM Malawi Field Office
26	Sewuye	Wondimieneh	GHSC-PSM Ethiopia Field Office
27	Yembili	Derrick	GHSC-PSM Zambia Field Office

Annex D: Table of Aligning Incentives Interventions

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
A) Performance-based incentives						
Eichler et al. (2012) Performance based incentives to strengthen public health supply chains[62]	Ghana, Paraguay, Rwanda	Supplies and store inventory; quality of care		Ghana: Geographic areas that score highest on reporting indicators receive small amounts of equipment. Paraguay: Program managers who maintained zero stockouts were awarded training opportunities. Rwanda: Monetary bonuses are linked to achieving service quality indicators.	Not evaluated	See Eichler et al for details on designing PBI for SCM.
Eichler et al. (2007) Performance based incentives for health: six years of results from supply side programs in Haiti[63]	Haiti	Immunization, family planning, general health commodities	1999	Three NGOs participated in the pilot. NGOs accepted contract that would pay 95% of the budget established under the existing expenditure-based reimbursement contract, with the possibility of earning a bonus that would equal as much as 10% of the historically established budget. Targets based on seven performance indicators. Achievement of the target increase in each indicator was associated with a defined percentage of the total bonus.	An independent research firm conducted evaluation. Standard cluster sampling methodology was used to sample households in each NGO service area to establish baseline measures and results for the number of immunized children. Immunization cards and reports from caretakers were used. Exit interviews in service delivery institutions, household interviews; a review of a sample records	Although difficult to isolate results, panel regression suggests new payment incentives were responsible for considerable improvements in both immunization coverage and attended deliveries. Results for prenatal and postnatal care were less significant perhaps suggesting a strong patient behavioral element that is not under the influence of provider.

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[62] Eichler, R., Ergo, A., Serumaga, B., Rosen, J., Miles, G., Tukai, M. Options Guide: Performance-based incentives to strengthen public health supply chains-version I. Health Systems 20/20 project, Abt Associates Inc. ; 2012. https://www.hfgproject.org/wp-content/uploads/2015/02/Options-Guide-Performance-Based-Incentives-to-Strengthen-Public-Health-Supply-Chains-----Version-1.pdf.

[63] Eichler, R., Auxila, P., Antoine, U., Desmangles, B. Performance based incentives for health: Six years of results from supply side programs in Haiti- Working Paper 121. E. Center for Global Development 2007. https://www.cgdev.org/sites/default/files/13543_file_Haiti_Incentives.pdf. Accessed August 10, 2017

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
					were used to measure specific indicators.	
Witter et al. (2012) Paying for performance to improve the delivery of health interventions in low and middle income countries[64]	Multiple countries	Paying for performance for varied targeted services (inpatient, outpatient care; preventive care; MCH and TB)		The interventions were varied: one used target payments linked to quality of care (in the Philippines). Two used target payments linked to coverage indicators (in Tanzania and Zambia). Three used conditional cash transfers, modified by quality measurements (in Rwanda, Burundi and the Democratic Republic of Congo). Two used conditional cash transfers without quality measures (in Rwanda and Vietnam). One used a mix of conditional cash transfers and target payments (China).	Due to the limited results data, the authors were not able to conduct a meta-analysis	
Feldacker et al. (2017) Is it all about the money? A qualitative exploration of the effects of performance based financial incentives on Zimbabwe's VMC program[65]	Zimbabwe	HIV		In Zimbabwe the US$25 PBF intended to encourage low-paid health care workers, primarily VMMC workers, to remain in the public sector.	Qualitative assessment	PBF appreciably increased motivation among VMMC teams and helped improve facilities where VMMC services are provided. However, PBF appears to contribute to antagonism at the workplace; health care workers prioritized VMMC services over other routine duties.
USAID Building sustainable capacity for	Liberia			In Liberia, the Rebuilding Basic Health Services Project successfully piloted PFB contracts with NGOs. The project	No systematic evaluation seems to have been carried out.	PBF spurred a results-driven culture at the MOHSW. Collaboration increased

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[64] Witter S, Fretheim, A., Kessy, F., Lindahl, A. Paying for performance to improve the delivery of health interventions in low- and middle-income countries (review) The Cochrane Collaboration 2012.

[65] Feldacker C, Bochner AF, Herman-Roloff A, et al. Is it all about the money? A qualitative exploration of the effects of performance-based financial incentives on Zimbabwe's voluntary male medical circumcision program. PLoS One. 2017; 12(3):e0174047.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
performance based financing in Liberia's health system[66]				initially focused on individual skill development and shifted to reinforce the PBF unit's organizational skills. A committee composed of the Minister of Health, deputy ministers, and donors governs PBF implementation at the MOHSW. One of the functions of the committee is to monitor client satisfaction with services received at the facilities. The RBHS package also addressed quality of care, accurate and timely reporting of data and functional supply chain management and rewarding delivery of quality health services by motivated professional health workers.		between various programs in the counties, which was facilitated through monthly touch base meetings and quarterly reviews. Maternal and malaria health indicators improved. The quality of the national health management information system (HMIS) improved through implementation of the PBF scheme. Health facilities generated extra income that could be used for facility improvements.
USAID DELIVER project. Technical Update. Performance-based financing: Examples from public health supply chains in developing countries[67]	Afghanistan, Ghana, Haiti, Liberia, Nicaragua, Rwanda, Tanzania	Supply chain management (LMIS)		Ghana: The Focus Region Health Project (FRHP) set up competition between regions by measuring timely, accurate submission of data, as well as trainings on the reporting system. FRHP awarded equipment to the region that performed best in these areas. Nicaragua: scores each of their 17 health management units on 20 indicators, which pertain to the operation of the automated LMIS. High scorers receive small rewards, such as computers or other equipment. To improve issues with timely submission of quality reports, the	The authors mention the limited information on assessment results as a barrier to evaluation.	

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[66] USAID. Technical Brief. Building sustainable capacity for performance-based financing in Liberia's health system. http://www.msh.org/sites/msh.org/files/rbhs_building_sustainable_capacity_for_pbf_tech_brief.pdf.

[67] USAID DELIVER PROJECT. Performance based financing: Examples from public health supply chains in developing countries. 2012. http://apps.who.int/medicinedocs/documents/s21873en/s21873en.pdf.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
				Rwanda Community Performance-based Financing Program introduced pay-for-reporting incentives that were given directly to cooperatives of community health workers to benefit the individual worker. In Liberia and Afghanistan, NGOs can earn a bonus based on adequate performance. In Tanzania, a performance-based contract that incentivizes wholesaler distribution of essential medicines was implemented in three districts. Wholesalers that receive 95% commodity availability—determined by random monthly spot checks—receive a bonus in addition to the price of the drug, which is established during the contract bidding process.		
Brenner et al. (2017) Implementation research to improve quality of maternal and newborn health care/[68]	Malawi	2013	MCH	The Results-Based Financing for Maternal and Neonatal Health Initiative was introduced to improve the quality of facility-based care provided to women and newborns during and within 48 hours after delivery. It was implemented in selected emergency obstetric care facilities across four districts (initially in 18 facilities and expanded to 28). The initiative combines financial rewards for maternal care providers and district health management teams upon meeting	The authors conducted a non-randomized controlled before and after study to evaluate the effects of district- and facility-level performance incentives for health workers and management teams. They assessed changes in the facilities' essential drug stocks, equipment maintenance, and clinical obstetric care processes.	The scheme improved the availability of both functional equipment and essential drug stocks in the intervention facilities. Positive effects were observed with respect to drug procurement and clinical care activities at non-intervention. Birth assistants' adherence to clinical protocols improved across all studied facilities as district health managers supervised

[68] Brenner S, Wilhelm D, Lohmann J, Kambala C, Chinkhumba J, Muula AS, De Allegri M. Implementation research to improve quality of maternal and newborn health care, Malawi. Bull World Health Organ. 2017; 95:491-501.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
				defined performance goals with conditional cash transfers (financial rewards) for pregnant women upon meeting defined compliance targets. Enrollment was non-random and was based on performance of emergency obstetric care signal functions, functionality of referral system, geographical emergency obstetric care coverage, and catchment population size. Each enrolled facility received initial start-up financial support conditional on need related to immediate infrastructural requirements Incentives for facilities are largely tied to clinical and general service management performance; district health management team incentives are largely tied to equipment maintenance and drug supply management across all facilities within each district. At least 30% of received payments are re-invested to further improve health care quality at district and facility levels, while the remaining portion is directly shared among staff as personal bonuses.	Difference-in-differences regression models were used to analyze effects of the scheme on adherence to obstetric care treatment protocols and provision of essential drugs, supplies, and equipment. They observed 33 health facilities, 23 intervention facilities, and 10 control facilities and 401 pregnant women across four districts.	and coached clinical staff more actively.
McMahon et al. (2016) Evaluating complex health financing interventions: using mixed methods to inform further implementation of a novel PBI	Malawi	Essential health services	2014	The program aims to increase access, utilization, and quality of essential health care package services by linking rewards to service utilization and quality indicators. Facilities were selected based on minimum quotas related to equipment, infrastructure and personnel as deemed necessary to guarantee essential services. Quality assessments are complemented by a series of focus group; exit interviews are conducted	This study employs a prospective controlled before-and-after triangulation design to assess effects of the PBI program by analyzing quantitative and qualitative data from intervention and control facilities. Guided by a theoretical framework, the evaluation consists of four main components: service	Given that the evaluation was in process, no results were provided.

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intervention in rural Malawi.[69]				with clients to gauge satisfaction. SSDI-PBI rewards are comprised primarily of quantity and quality scores, with community scores serving as a source of potential bonus payments. Rewards are paid to facilities upon achievement of set targets but can only be used toward facility improvements and cannot be partially redistributed in the form of performance bonuses to individual health workers, which is common under other performance-based schemes. Procurement at the facility level is managed through existing SSDI finance and procurement structures rather than through facility-based personnel	provision, health worker motivation, implementation processes and costing. The cost analysis considers costs incurred within the Ministry of Health, funders, and the implementing agency	
UNICEF. (2013) Performance based equitable resource allocation model.[70]	Punjab, Pakistan		2010	This Performance-based Equitable Resource Allocation Model recognizes that not all districts are at the same level of achievement of health targets. Provides financial resources to ensure basic infrastructure and operational mechanisms are in place. Rewards individual districts for health indicator improvements, relative to baseline values, rather than focus solely on one target for all districts. In the second and subsequent years the amount of the Performance Allocation that a given district receives (i.e. from 0% to 30%) is based on progress achieved in the prior	No	Useful for countries seeking to align Performance-Based Financing (PBF) with Performance-Based Planning (PBP) at sub-national levels, in the context of using district health system strengthening as a means for moving towards equitable universal health coverage. Distribution through the Base Allocation, as determined by the needs of a district, provides an opportunity to address the district health system's

[69] McMahon S BS, Lohmann J, Makwero C, Torbica A, Mathanga DP, Muula AS, De Allegri M. Evaluating complex health financing interventions: Using mixed methods to inform further implementation of a novel PBI intervention in rural Malawi. BMC Health Services Research 2016; 16:414.
[70] UNICEF. Performance-based equitable resource allocation model: The Punjab experience New York NU.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
				year toward predetermined key performance indicators.		distinctive infrastructure, operational and epidemiological issues. The Performance Allocation also accounts for each district's unique circumstances, rather than setting a uniform performance target. The focus on local context offers greater flexibility than typical PBF approaches and facilitates the development of appropriate and feasible indicators to track needs, equity, and performance.
B) Contracts						
Clinton Health Access Initiative (2015). Case study: expanding global access to contraceptives implants[71]	Multiple countries	Reproductive health (Contraceptive implants)		CHAI and BMGF proposed a volume guarantee-based price reduction agreement with suppliers. An agreement was negotiated with Bayer and Merck to reduce prices to US$8.50 per unit in return for purchase system in which donors agreed to participate in the volume guarantee effort. Identified guarantors to provide financial backing to the volume guarantee via sharing of risk with BMGF. Should guaranteed volumes not be purchased in a specific period, the guarantors would cover the difference between the guaranteed volumes and the purchased volumes.	No	The Implant Access Program (IAP) ensures that a consistent supply of implants will be available to meet demand at the reduced price for all 69 countries prioritized by Family Planning 2020. Increase in total implant distribution by 56% between 2012 and 2013. Over the first two years of the program, the volumes greatly exceeded the amount specified in the guarantee. This is expected to have averted 31 million

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[71] Clinton Health Access Initiative. Case study: Expanding global access to contraceptive implants New York NCHAI.

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						unintended pregnancies between 2013 and 2018, which will ultimately avert over 414,000 child deaths and 41,000 maternal deaths.[72]
Spisak et al. (2016) Results based financing in Mozambique's central medical store[73]	Mozam-bique		2013	Results-based financing was incorporated into a fixed amount reimbursement agreement with USAID. Payments were aligned upon the achievement of specific time-bound, target-based verified results. The incentive recipient was CMAM and performance indicators focused on three priority areas, including supply planning, distribution planning, and warehouse operations. To not incentivize efforts related to one indicator over another, the potential reimbursement was split evenly across the indicators; that is, each of the five indicators was "worth" one-fifth (20%) of the total possible payment.	A qualitative review based on a conceptual framework and theory of action that suggests the incentives associated with this program would improve supply chain practices and supply chain performance. The review was carried out in March 2013 through a series of in depth interviews and focus group discussions conducted with key informants in Maputo, Mozambique.	Results during the first year of the agreement showed that CMAM consistently achieved performance-related targets related to planning and distribution functions and also made progress on indicators related to warehouse operations functions. Findings indicate three crucial elements contributed to its success: smart program design, effective program implementation, and a virtuous cycle of accountability and empowerment (introduced through the incentives).
Spisak and Morgan (2014). Use of incentives in health supply chains. A review	Mozam-bique		2013	In 2013, USAID entered into a year-long, government-to-government grant arrangement, a Fixed Amount Reimbursement Agreement (FARA). The FARA links payment of quarterly	In March 2014 (14 months after the performance period began), the authors — a representative from the USAID	DELIVER project and	The study showed mixed results on CMAM performance and ability to consistently achieve targets.

[72] Clinton Health Access Initiative. Case study: Expanding global access to contraceptive implants. 2015; https://clintonhealthaccess.org/content/uploads/2015/08/Case-Study_LARC.pdf. Accessed August 16, 2017.

[73] Spisak C, Morgan L, Eichler R, Rosen J, Serumaga B, Wang A. Results-Based Financing in Mozambique's Central Medical Store: A Review After 1 Year. Global Health: Science and Practice. 2016; 4(1):165-177. doi:10.9745/GHSP-D-15-00173.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
of results-based financing in Mozambique's central medical store.[74]				tranches of funds to specific performance results at CMAM, which are related to the functional areas of planning, distribution, and warehouse management.	a representative from USAID's Health Finance and Governance (HFG) project — completed in-depth interviews and focus group discussions with 33 key informants in Maputo.	
C) Information systems						
Ramanujapuram[75]	Karnataka, India		2012	A cloud-based Bulletin Board that streams real time information on abnormal events, such as stock out, low stock, excess stock etc. Alerts are also provided visa email and SMS. Events are derived from transactional data entered through the mobile application by health workers. Motivational messages that highlight good performance are also streamed.	An impact study was conducted for nine vaccines across a sample of 29 PHCs. The study was conducted on transaction data collected over 14 months starting July 2012, comprising over 223,011 data points.	Results show a steady improvement in availability across *all* vaccines to near 99%. The response time to replenish a stockout decreased while responsiveness increased. Procedural changes were made in response to the increase in data visibility, e.g., district-level supervisors have made more PHC-level visits to examine information that streamed in their Bulletin Board, and monthly management review meetings were held to discuss stock. Workers appreciate SMS alerts on data entry, stockouts etc. Proactive feedback has reduced stockouts, inculcating a sense of value

[74] Spisak, C, Morgan, L, Use of incentives in health supply chains--A review of results-based financing in Mozambique's Central Medical Store. USAID | DELIVER PROJECT, Task Order 4 and Health Finance & Governance Project; 2014.
[75] Ramanujapuram A, Akkihal A. Improving performance of rural supply chains using mobile phones. ACM DEV. 2014; 5.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
						and empowerment among pharmacists, which has, in turn, strengthened adoption.
Schwarz et al. (2011). Implementing a systems oriented morbidity and mortality conference in remote rural Nepal for quality improvement[76]	Nepal			In morbidity and mortality conferences (M&Ms), BH staff review recent clinical cases using root cause analysis of M&M, identifying systems failures and opportunities for future improvement. M&Ms occur during weekly staff meetings, with a 30-60-minute case discussion structured around seven domains of causal analysis relevant to the resource-limited setting in which BH operates. The seven domains are: clinical operations, supply chains, equipment, personnel, outreach, societal, structural. The medical direct facilitates discussion and actively solicits contributions from all staff present. Afterwards, a case summary is circulated to external volunteer physicians for review and final transcripts are made publicly accessible.	Qualitative observational study	Overall M&Ms were received positively by personnel, although the program struggled with consistency and oversight. The M&Ms have resulted in workflow modification to meet the high patient flow that resulted in improved laboratory capacity. The M&Ms also pointed out educational gaps among nurse midwives that were supplemented with teaching sessions by physicians. The process also highlighted lack of medications for a case, which has improved procurement and treatment of the case.
Sithole et al. (2016). Supply chain optimization: enhancing end-to-end visibility[77]	Paper focused on Syria			The Supply Chain Management Dashboard (SCM-D) is an internally developed integrated supply chain management tool that aggregates information and business units such as program, budgeting and allocation, donor relations, procurement, and logistics. The SCM-D is made up of the following sections: Operation Overview,	Not evaluated	SCM-D processes are taking place at every stage of the supply chain allows for mitigation of risks, forward and contingency planning and optimization, and identification and propagation of best practices. Cross-unit

[76] Ramanujapuram A, Akkihal A. Improving performance of rural supply chains using mobile phones. ACM DEV. 2014; 5.

[77] Sithole B, Silva SG, Kavelj M. Supply Chain Optimization: Enhancing End-to-End Visibility. Procedia Engineering. 2016; 159:12-18.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
				Highlights, Funding, Requirements vs. Supply, Food Supply, Cash-Based Transfers Supply, Food in the Region, Global Commodity Management Facility, Sourcing, and Delivery Plan. Graphical representations are leveraged to communicate information in a concise way and illustrate relevant trends and relationships.		collaboration leads to cost savings.
SIAPS Technical Highlight[78]	Sierra Leone	System Strengthening	2015	SIAPS helped the country institute a continuous results monitoring and support system (CRMS) to assess baseline challenges in pharmaceutical management and regularly track and support improvement in key areas. The CRMS uses a series of indicators to track and monitor factors that influence medicine availability and disease case management.	No	CRMS has helped countries identify product delivery challenges, strengthen supply systems, improve operations, ensure the availability of resources, and improve data quality. It also allows health leaders to regularly measure progress in these areas. The tracking system aims to help ensure the pharmaceutical supply system's accountability and efficiency, leading to timely and accurate reporting. Training data will help ensure that district medical store and health facility staff involved in managing medicines and medical supplies will have the basic knowledge and skills to better manage and report on

[78] SIAPS. Continuous results monitoring and support system tracks post-ebola recovery in Sierra Leone. SIAPS. USAID 2016. http://siapsprogram.org/publication/continuous-results-monitoring-and-support-system-tracks-post-ebola-recovery-in-sierra-leone/. Accessed August 18, 2017.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
						stock status and consumption issues.
D) Sharing best practices through supply chain management networks.						
Sharing best practices through supply chain management networks[79]	U.S.	Health care delivery		Linking of consumers with appropriate suppliers, decision-making, and payment.	N/A	Optimize health care delivery; improve service quality; reduce information asymmetries.
Rodriguez (2016). Cooperative initiatives with NGOs in socially sustainable supply chains; How is inter-organizational fit achieved?[80]	Several countries but paper focuses on Ecuador.		2007-2011	The paper studies an NGO-led international project that intended to improve the economic situation of poor suppliers through supplier development programs. The project was implemented in Ecuador, Peru, Guatemala, and El Salvador. Nine firms participated in the project in Ecuador: in seven, poor suppliers were integrated through supplier development programs; and the remaining two consisted of distribution channel or market-oriented initiatives.	Research focused on organizational and inter-organizational factors that enhanced or inhibited the inter-organizational fit.	The proposed theoretical model depicts the achievement of inter-organization fit that entails several alignments along the way: a value logic alignment, the alignment of NGOs with the profit-oriented behavior of firms, the alignment of an NGO's objectives with the firms' strategies, and the adjustment of firms' organization structures and organizational routines to NGOs' activities. The research suggests that there are organizational characteristics such as specialized purchasing functions and routines that support collaborative relationships that make

[79] Ford E, Scanlon DP. Promise and problems with supply chain management approaches to health care purchasing. Health Care Management Review. 2007; 32(3):192-202.
[80] Rodriguez J GC, Arenas D. Cooperative initiatives with NGOs in socially sustainable supply chains: How is inter-organizational fit achieved? Journal of Cleaner Production 2016; 137:516-26.

Type of intervention	Countries	Commodity type/Area of supply chain	Year initiated	Characteristics of the program	If evaluated, what methods were used	Outcomes
						certain types of firms more likely to achieve inter-organization fit.