

Comprehensive Systematic Literature Review of Public Health Supply Chain Studies in Sub-Saharan Africa

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ABSTRACT

The paper presents a systematic comprehensive literature review of Sub-Saharan African public health supply chain studies. It shall involve both formal academic studies and consulting studies where available in the public domain. The key focus of the literature review shall be: to create a themed catalogue of African public health supply chain studies that have been done in academia and by non – academic institutions. The specific objectives of the study shall revolve around: Conducting a systematic literature review of public health supply chain studies in sub-Saharan Africa; Conducting a systematic literature review of non-academic publications in public health supply chain studies in sub-Saharan Africa; Categorising the current publications according to supply chain functions; Determining a database of contributors to public health supply chain studies for academic and non-academic knowledge; and, proposing an approach to develop a database of research in public health supply with both academic and non-academic literature and develop a way forward. The research philosophy adopted for the study was exploratory through desk research of Public health supply chain studies conducted within the last 15 years(2007 – 2022) and themed based on the supply chain functions of the Supply Chain Operations Reference (SCOR) model. The output for the study shall entail: catalogues / documentation of Africa public health supply chain; contribution to easily searchable body of knowledge that informs public health supply chains in sub-Saharan Africa; dissemination through publications in peer reviewed academic journals (at least 5 articles); and dissemination Through International Conferences And Symposiums.

Keywords: Public health supply chain, Systematic literature review, Supply Chain Operations Reference (SCOR) model

BACKGROUND OF THE STUDY

For many years there has been a large interest in Public health supply chain strengthening by non-academic and international actors. However, the vast majority of analytical work done has been within the consultancy paradigm(World Bank, 2011; WHO, 2007; USAID, 2011). This makes a large amount of these research not available to academics and researchers globally. The comprehensive literature review is key in making all the work that has been done in the consultancy and informal paradigms easily available for academics, donors, governments, private sector and generally the health consumer. . The existing studies do not categorise the PHSC studies using the SCOR model (Dixit, Routroy and Dubey, 2019; Bulhuis et. al. 2019; Khorasani et. al. 2019). The establishment of a database of categorized research in PHSC studies would ease the accessibility of knowledge on PHSC and provide guidance in terms of the existing gaps as well as the focus of future research. Categorisation of supply chain functions based on the SCOR model is essential in analysing the studies done on PHSC that have a focus on sub-Saharan Africa. This should be able to identify the gaps that exist in research and inform the choice of future studies. Provision of such a data base for both academic and non-academic PHSC research in sub-Saharan Africa would facilitate research in the correct direction with relevant implications on future studies.

The general objective of the study was: to create a themed catalogue of sub-Saharan African public health supply chain studies that have been done in academia and by non-academic institutions for the last 15 years (2007 – 2022). In general the study aims at developing a comprehensive knowledge repository of PHSC publications. The specific objectives of the study revolved around: Conducting a systematic literature review of academic public health supply chain studies in sub-Saharan Africa; Conducting a systematic literature review of non-academic publications in public health supply chain studies in sub-Saharan Africa; Categorizing the current publications according to supply chain functions; Determining a database of contributors to public health supply chain studies for academic and non-academic knowledge; and, Proposing an approach to develop a database of research in public health supply with both academic and non-academic literature and develop a way forward.

EMPIRICAL LITERATURE REVIEW

The literature review looks at empirical studies on PHSC that have been conducted by both academic and non-academic institutions within the past 15 years. The literature review also explores the approaches that could be used for a systematic literature review as well as the importance of PHSC database.

Studies on systematic literature review of PHSC.

The literature review shall entail systematic literature review of PHSC studies that have been done by academic institutions as well as those that have either been done by non-academics or sponsored by donor institutions such as United States Agency for International Development (USAID), United Nations Children's Emergency Fund (UNICEF), Global Alliance on Vaccines and Immunisation (GAVI), The World Bank, World Health Organisation (WHO) and the rest. The objective is to establish a gap in the non-existence of a database for a comprehensive systematic literature review on PHSC studies in sub-Saharan Africa.

Systematic literature review of PHSC by non-academic institutions in sub-Saharan Africa

A relatively exhaustive search for studies on comprehensive literature review by key International players in the Public Health Supply Chain (PHSC) such as Global Fund, Gates Foundation, UNICEF, GAVI, WHO, USAID revealed nothing significant with regard to a database of PHSC studies in sub-Saharan Africa. The World Bank (2011), did an analysis of private supply and distribution of channels of medicines with a focus on Ghana, Malawi and Mali. This was rather siloed and does not in any way provide an indication of a database for similar studies. In a study sponsored by USAID, Aronovich and Kinzett (2001) did an assessment of the health commodity supply chains and the role of Kenya Medical Supplies Agency (KEMSA). Another USAID sponsored study by Dowling (2011), investigated healthcare supply chains in developing countries. The study explored the distribution of medicines in Low and Medium Income Countries (LMIC) through public or government run system; private not-for-profit; and, private commercial. In a study by Ravi-Shakar *et. al.* (2009) and Yadav (2010), it was observed that more than \$27 billion is spent annually on global health by multi-country financing organisations such as Global Fund to fight AIDS, TB and Malaria; the World Bank, UNITAID, Global Alliance on Vaccines and Immunisation (GAVI); and bilateral donors such as US government, the British government and the Bill and Melinda Gates Foundation. Sridhar and Tamashiro (2010) in a study sponsored by UNESCO looked at vertical funds in the health sector and lessons for Education from the Global Fund and GAVI. Notable is also a WHO (2007) study that reported on the Global Fund strategic approach to health systems strengthening. The studies sponsored by donors and conducted by non-academic institutions fail to show evidence of a database of comprehensive studies done on PHSC in sub-Saharan Africa, a lot of these are important studies but quite siloed.

Systematic literature review of PHSC by academic institutions in sub-Saharan Africa

A systematic literature review of health supply chain and implications for future research undertaken by

Dixit, Routroy & Dubey (2019), revealed that Supply chain (SC) operations, performance measurement, inventory management, lean and agile operation, and use of information technology were well studied and analysed, however, employee and customer training, tracking and visibility of medicines, cold chain management, human resource practices, risk management and waste management were felt to be important areas but not much attention were made in this direction. There are gaps revealed in the discussion of Deliver and Return categorization of the SCOR model. In South Africa, Bvuchete, Grobbelar & Eden (2020) carried out a systematic literature review on the best practices for demand driven supply chain management (DDSCM) in the public health care sector in South Africa. The study aimed at distinguishing the key success factors for the DDSCM approach from those of other industries, and subsequently develop a framework to guide the design of DDSCM for the public healthcare sector. Bvuchete et. al focused more on the Plan, Source and deliver elements of the SCOR model.

In a systematic literature review of factors influencing the scale up of public health interventions in low- and middle- income countries, Bulthuis, Kok, Rawen & Dieleman (2020), added their contribution in the PHSC studies. The systematic review of the literature found that resources, advocacy, the supply chain policies and guidelines were the main factors influencing scale-up related to structure. Training and supervision, scale-up strategy, collaborations, and research and monitoring and evaluation and the social-cultural environment were factors influencing scale-up related to practice and culture, respectively. The interlinkages of the different factors influencing scale-up highlight the importance of a holistic approach to scale-up.

Khorasani, Cross & Maghazei(2020), conducted a systematic review and meta study on lean supply chain management in healthcare. By applying a systematic literature review, this study aimed at identifying the major healthcare problem domains (i.e. target areas) for lean supply chain management (LSCM) and to provide a list of the most common techniques for implementing LSCM in healthcare. Moreover, this study intended to investigate various contingency factors that may have influenced the selection of LSCM target areas or the application of

LSCM techniques by healthcare organisations. Khorasani *et. al*(2019) provides insights for decision-makers in the healthcare industry regarding the benefits of implementing LSCM, and it identifies contingency factors affecting the implementation of LSCM principles for healthcare. Implementing LSCM can help healthcare organizations improve the following domains: internal interaction between employees, supply chain cost management, medication distribution systems, patient safety and instrument utilization.

In their study, Baz, Laguir & Stekelorum (2018), focused on doing a systematic literature review of logistics and supply chain management research in Africa. It provides a comprehensive assessment of theory application regarding the research articles published between 1994 and 2016. A critical review of managerial research on pharmaceutical supply chain was undertaken by Narayana, Pati & Vrat (2014). It is one of the few papers that holistically reviews research progress for a product-specific supply chain, specifically, the pharmaceutical supply chain. Key findings in this review emphasise recent calls for integrated research efforts on value delivery and more studies in emerging economies. In addition to depicting traditional research interest in the manufacturing and distribution environment, the study by Narayana *et. al* (2014) highlights the crucial boundary-spanning roles played by healthcare procurement and R&D in managing the PSC.

A study conducted by Cordeiro, Santos, Angelo & Marajo (2022), was an assessment based on bibliometric analysis and systematic literature review of research directions for supply chains in facing pandemics. Contextually, this study did not focus on sub-Saharan Africa and conceptually was based on the effects of pandemics on resilience of supply chains during outbreaks, in addition to highlighting promising fields of study and the most widely used models to assess supply chains in dealing with covid-19. The proposed study examines the entire PHSC in sub-Saharan Africa as well categorizing the studies based on the SCOR model of supply chain management. A study exploring the Plan, Source, Make and Deliver

functionalities of the SCOR model was conducted by Olaniran, Briggs, Pradhan, Bogne & Ballard (2022). This study explored the extent of community-level stock-out of essential medicines among community health workers (CHWs) in low- and middle-income countries (LMICs) and identifies the reasons for and consequences of essential medicine stock-outs. An interesting systematic literature towards understanding blockchain technology for future chains that was conducted by Wang, Han & Davies (2019) needs to be replicated for PHSC in sub-Saharan Africa. This study’s aim was to investigate the way in which blockchain technology is likely to influence future supply chain practices and policies.

Approaches to systematic literature review for academic and non-academic publications on PHSC studies in sub-Saharan Africa.

Dixit, Routroy and Dubey (2019) undertook a study whose aim was to review the healthcare supply chain literature along various areas and to find the existing gaps. In total, 143 research papers were reviewed during 1996-2017. A critical review was carried out in various dimensions such as research methodologies/data collection method (empirical, case study and literature review) and inquiry mode of research methodology (qualitative, quantitative and mixed), country-specific, targeted area, research aim and year of publication. It is noticeable that Dixit *et. al* (2019), relied on academic papers published within a period of 21 years as opposed to this study that is considering publications in the last 15 years (2007 – 2022). The current studies also categorises the research conducted into the various supply chain functions based on the SCOR model. This study also proposes to use a minimum of 110 academic papers published in reputable journals.

In a systematic literature review (SLR) by Bvuchete, Grobbelar and Eden (2020), a grounded theory-based approach was followed to develop the framework, using the conceptual framework analysis (CFA) process proposed by Jabareen (2009). CFA is a process comprising eight steps. The data sources were mapped, and the concepts identified, deconstructed, and categorised. The concepts were then integrated and synthesised into a framework. A systematic literature review (SLR) was employed to select a representative sample of published articles on the DDSCM approach. This is because the SLR method is an evidence-based process that is intended explicitly to evaluate all published and unpublished literature. It is highly replicable and transparent, and thus minimises bias (Bryman *et. al.* 2010). The SLR process followed in this article is shown in Figure 1. Qualitative content analysis (QCA) was then applied to analyse the articles. QCA is both a qualitative and a quantitative approach, involving the systematic codification and analysis of textual data (Santos *et. al.*, 2014). Another motivation for using an SLR is that it adheres to standardised methodologies to systematically search, filter, review, critique, interpret, synthesise, and report findings from multiple publications on a topic of interest.

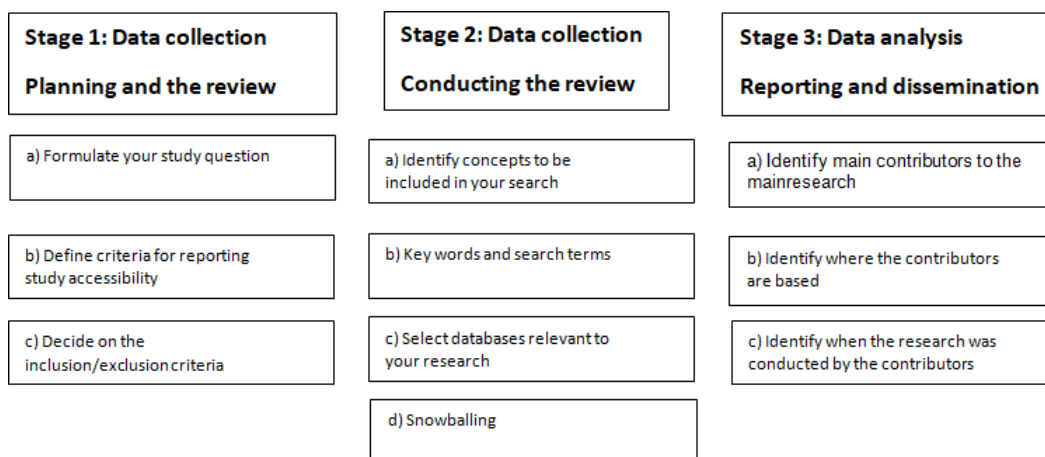


Figure 2.0: Systematic literature review process

Source: Bvchete *et.al*(2020) pp.15

The qualitative systematic literature review by Bulthuis *et. al.* (2020), comprised of the following two databases were used: PubMed and POPLINE. English studies from 2010 to August 2019 were included. Year 2010 was chosen as the cut-off point as described by Milat *et al.*

(2015), and our own first scanning of the literature showed that literature on scaling up has significantly expanded over the past years. The search comprised three different phases. In their systematic study, Khorasani *et. al.* (2020), carried out A systematic literature review was carried out following the method presented by Tranfield *et. al.* (2003). Thereby, 280 peer-reviewed journal articles, published between 1995 and 2018, were selected, profiled and reviewed. In total, 75 papers were also selected for a qualitative analysis, known as meta-study, on the basis of high relevancy to the research objectives. On the other hand, Baz *et. al.* (2018), undertook a structured systematic literature review, a set of 110 articles on SCM research in Africa is assessed. These seems to be similar to the number proposed by this study based on similar studies done by Praha & Srivatsa (2021).

Studies by Narayan *et. al.* (2014), presents a systematic review of research on management in the pharmaceutical supply chain (PSC). Recent PSC literature, published in peer-reviewed academic journals, was collated for content analysis. Research efforts depict a traditional focus on efficiency-improvement, with an emerging interest in process-analysis and technology implementation in the PSC. PSC research is also highly context- specific and focuses on developed economies. These presents a gap in the SCOR model in the domains of deliver and return. There is also a distinct gap in with regard to PSC studies that focus on sub-Saharan Africa.

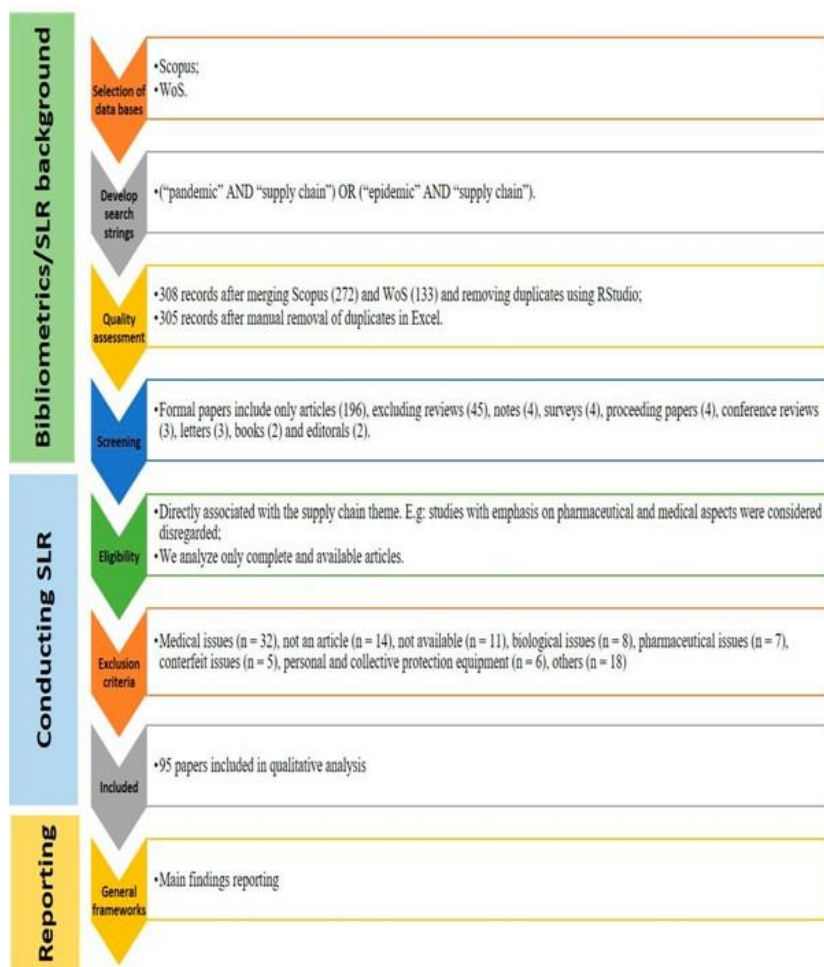


Figure 3.0: Bibliometrics and SLR framework.

Source: Cordeiro *et. al.* (2021) pp. 1315

Cordeiro et. al (2022), conducted a SLR (Figure 2) based on (Preferred Reporting Items for Systematic Reviews and Meta- Analysis (PRISMA) protocol (Moher et al. 2009) to evaluate the effects of pandemic/epidemic events in the SCs. SLR can collect useful information from published primary studies, helping to create an overview of the current state of the art and to identify research opportunities (Shoaib, Lim &Wang, 2020). The approach took into account a large number of studies with different viewpoints in order to identify the main research fields and gaps (Durach, Kembro & Wieland,2017). All titles and abstracts were inspected against the following eligibility criteria (Hosseini, Ivanov &Dolgui,2019) to determine the primary studies sample:(1) directly associated with the supply chain theme. E.g.: studies with emphasis on pharmaceutical and medical aspects were disregarded; and, (2) Analysis done only for complete and available articles. Then, results and main findings were summarised in graphical framework, integrating the constructs in a concept map (Ali, Mahfouz & Arisha,2017).

A systematic review was conducted and reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Olaniran et. al., 2022).This was a systematic literature review on stock outs of essential medicines among community health workers (CHWs) in low- and middle income countries. Five electronic databases were searched with a prespecified strategy and the grey literature examined, January 2006–March 2021. Papers containing information on (1) the percentage of CHWs stocked out or (2) reasons for stock-outs along the supply chain and consequences of stock-out were included and appraised for risk of bias. Outcomes were quantitative data on the extent of stock-out, summarised using descriptive statistics, and qualitative data regarding reasons for and consequences of stock-outs, analysed using thematic content analysis and narrative synthesis.

Importance of a comprehensive database of PHSC studies in sub-Saharan Africa.

The comprehensive data base of PHSC studies would be useful to both academia and non – academic institutions in obtaining information and help in answering some of the following questions of concern: where in Africa are the research being published from? What organisations are conducting the research? Who is funding the research? What supply chain functions / themes have the most and least publications.

PROPOSED RESEARCH METHODOLOGY

The study is to adopt a systematic literature review (SLR) to locate, select, analyses, appraise and evaluate the relevant literature (Dyer and Tranfield, 2009; Mokhtar et. al., 2019). The systematic literature review and the subsequent development of a data base shall be undertake in four phases and illustrated in figure

These shall entail the use of online databases of Google Scholar, Emerald Insight, Jester, EBSCO Host, Taylor and Francis to search articles using the search string: Public health supply chain studies in Africa. The database shall comprise of PHSC studies that have been done within the last 15 years (2007 – 2022) in sub-Saharan Africa. Thereafter categorise the studies based on the SCOR model, level 1 (Table 1.0) supply chain functions (Bolstorff & Rosenbaum, 2003): Plan – involves demand and supply planning management; Source – sourcing information and material acquisition; Make – manufacture and production; Deliver – order management, warehousing and transportation; Return – return of containers.

Table 1.0: SCOR Model level 1 (Process definitions)

SCOR Process	Definitions
Plan	Process that balances aggregate demand and supply to develop a course of action which best meets sourcing, production and delivery requirements.
Source	Process that procure goods and services to meet planned or actual demand.

Make	Process that transforms product to a finished state to meet planned or actual demand.
Deliver	Process that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management.
Return	Process associated with returning or receiving returned products for any reason. These processes extend into post-delivery customer support.

Source: Bolstorff and Rosenbaum (2003).

Table 2.0: SCOR Model level 2 (Process types)

SCOR Process Type	Characteristics
Planning	<p>A process that aligns expected resources to meet expected demand requirements.</p> <p>Planning processes:</p> <ul style="list-style-type: none"> -Balances aggregate demand and supply -Consider consistent planning horizon - Generally occur at regular, periodic intervals -Can contribute to supply-chain response time
Execution	<p>A process triggered by planned or actual demand that changes the state of material goods. Execution process generally involves:</p> <ul style="list-style-type: none"> -scheduling/ sequencing -Transforming products, and/or - Moving products to the next process - Can contribute to the order fulfillment cycle.
Enable	<p>A process that prepares, maintains, or manages information or relationships on which planning and execution processes rely.</p>

Source: Bolstorff and Rosenbaum (2003).

The SCOR model supply chain functions at level 2 (Table 2.0) shall also be considered. These are; Planning – aligning expected resources to meet expected demand requirements; execution – triggered by actual or expected demand; Enable – a process that prepares, maintains, or manages information or relationships on which planning and execution process rely. The various phases of the systematic literature review leading to the development of a database of PHSC studies in sub-Saharan Africa is summarised in figure 1.0

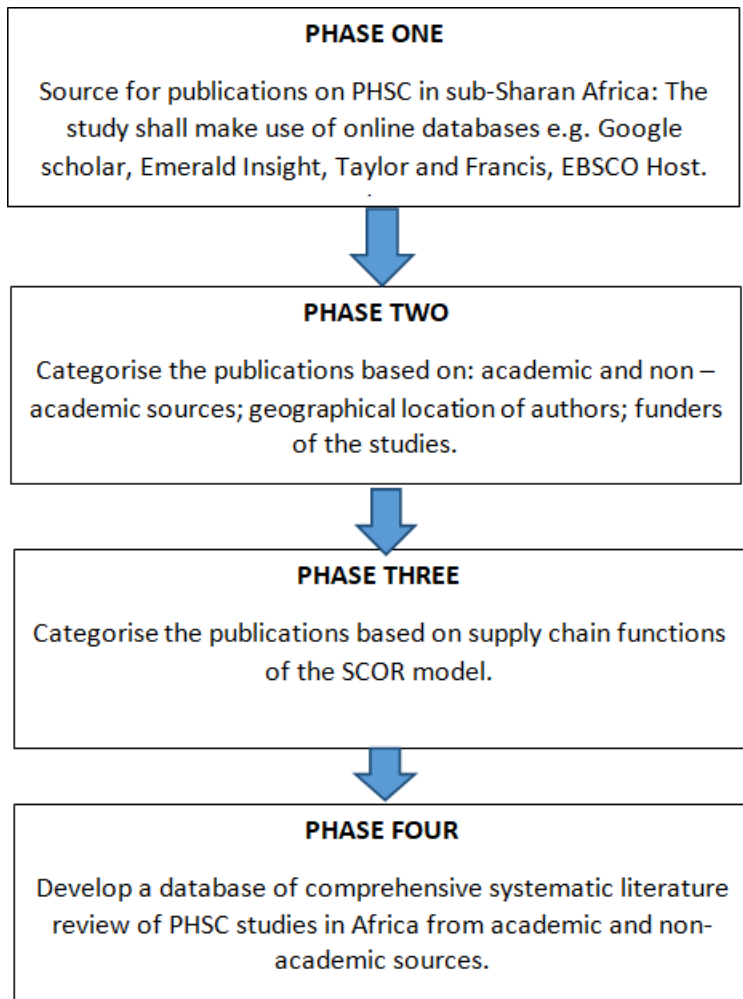


Figure 1.0: Proposed research methodology for the development of a SLR database of PHSC studies conducted in sub-Saharan Africa (2007 – 2022).

A minimum of 110 articles and reports from top ranked academic journals is considered suitable for this study. This is justified by a systematic literature review study that was conducted by Praha & Srivatsa (2021). The study is focusing on PHSC studies in sub-Saharan Africa, therefore, the articles to be reviewed shall be way more than the bare minimum of 110 highlighted.

CONCLUSION

The literature review in this article clearly identifies gaps in the existing studies on PHSC in sub-Saharan Africa. A lot of studies are on LMICs without being specific on the focus of the study. There are contextual, conceptual and methodological gaps that have been identified in the PHSC studies available. The documentation of these studies and the gaps existing thereof would provide good guidance for researchers. The output for the study shall entail: catalogues / documentation of sub-Saharan Africa public health supply chain; contribution to easily searchable body of knowledge that informs public health supply chains in sub-Saharan Africa; dissemination through publications in peer reviewed academic journals (at least 5 articles); and dissemination through international conferences and symposiums. The bottom-line is to enable the respective countries attain Universal Health Coverage by making medicine and health products not only accessible but affordable. The comparative study approach suggested for the study shall entail specific sub-Saharan Africa countries in the Western Africa region, Eastern Africa and South African region on the basis on public health supply chain performance.

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