The Determinants of Sub-Saharan African Healthcare Professional Training and Capacity Building Efficacy

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ABSTRACT

Introduction

The healthcare system in Sub-Saharan Africa (SSA) is a significant challenge due to the availability and competence of its healthcare workforce. Effective training and capacity-building programs are crucial for improving service delivery and achieving better health outcomes. However, the efficacy of these programs varies widely, influenced by various factors. This scoping review aims to map existing literature to identify key determinants that impact the success of healthcare professional training and capacity-building initiatives within the SSA context.

Methods

The Joanna Briggs Institute (JBI) guideline was used for conducting the scoping review. Eligibility criteria were established using the Population, Concept, and Context (PCC) framework. Research published in English between February 2015 and March 2025 was searched using Proquest, Google scholar, PubMed and Scopus. A standardized data extraction form was created to gather study data. Charting variables helped map evidence, identify gaps, and nature of determinants and outcomes studied. Efficacy was measured to evaluate training and capacity building.

Results

The included studies, spanning from 2017 to 2025, showed a notable increase in publications since 2021. Most studies originated from Uganda, Ghana, Tanzania, Ethiopia, Nigeria, Rwanda, Lesotho, Congo, Liberia, and South Sudan, with fewer studies from other Sub-Saharan African countries. Medical doctors (24% of studies) were the most frequently studied group, followed by midwives (16%), nurses (16%), healthcare professionals (12%), health workers (12%), community health workers (8%), and healthcare workers (8%). In-service training, mentorship, and e-learning were common training methods. The primary determinants were programmatic design, resource availability, technological integration, and clinical practice context. Negative determinants include programmatic deficiencies, infrastructure constraints, individual learner challenges, and systemic barriers.

Conclusion

Healthcare professional training in Sub-Saharan Africa requires well-designed programs with qualified trainers, relevant curricula, and integration into clinical practice. Access to resources, digital technology, and online deployment options is crucial. Challenges include programmatic deficiencies, infrastructure limitations, and systemic barriers. Addressing the shortage and misdistribution of healthcare workers requires a strategic approach, including investment in qualified trainers, technology, infrastructure, supportive organizational cultures, and enabling health system policies.

Keywords: Sub Saharan Africa, Scoping review, Healthcare Professionals, Training, Capacity building, Efficacy.

INTRODUCTION

The efficacy of healthcare professional training and capacity building in Sub-Saharan Africa is a critical determinant of public health outcomes across the continent. A healthcare professional is a person who studies, advises, investigates, supervises, or offers prevention, treatment, rehabilitation, and promotion (Chinchu, 2024). The persistent challenge of strengthening healthcare systems in Sub-Saharan Africa (SSA) hinges significantly on the availability and competence of its healthcare workforce(Agyei and Kumah, 2024). In this context, effective training and capacity-building programs are crucial for improving service delivery and achieving better health outcomes. However, the efficacy of these programs varies widely, influenced by a complex interplay of factors. This scoping review, "The Determinants of Sub-Saharan African Healthcare Professional Training and Capacity-Building Efficacy," aims to systematically map the existing literature to identify and categorize the key determinants that impact the success of healthcare professional training and capacity-building initiatives within the SSA context. By exploring the breadth of evidence, we seek to understand the various individual, institutional, and systemic factors that either facilitate or hinder the development of a skilled and resilient healthcare workforce. This review will provide a comprehensive overview of the current state of knowledge, highlight knowledge gaps, and inform future research and interventions aimed at enhancing healthcare professional training and capacity-building efficacy in SSA.

Existing evidence

The Global Strategy for Health Workforce (HWF) aims to strengthen the health workforce globally, but challenges persist in the African Region. A study by the WHO Regional Office for Africa revealed that the total stock of health workers in 47 countries was around 3.6 million, with 37% being nurses and midwives(Ahmat et al., 2022). The distribution of health workers is uneven, with most in the public sector. The regional density of physicians, nurses, and midwives per 1000 population was 1.55, with only 4 countries having densities exceeding 4.45(Agyei and Kumah, 2024). This highlights the need for substantial investment in the health workforce, based on contextual evidence, to achieve universal access to health services and address the shortage and maldistribution of health workers in the WHO African Region.

Africa's needs-based health worker demand is estimated to rise 21% to 11.8 million by 2030. By 2030, training and education outputs should reach 49%, adding 40% more health staff between 2022 and 2030 would still leave 6.1 million workers needed(Asamani et al., 2024). This shortage affects doctors, nurses, midwives, pharmacists and dentists. Disease prevalence and professional service standards drive the shortfall. The result suggests better HWF design based on country-specific structure and illness burden. The expanding population's health demands require more than doubled HWF available(Asamani et al., 2024).

The determinants of healthcare professional training and capacity-building efficacy in Sub-Saharan Africa will impact the quality, accessibility, sustainability, skill development, and retention of the workforce, hence influencing the performance of healthcare professionals and their contributions to the system.

Aim

To evaluate the determinants of sub-Saharan African healthcare professional training and capacity building efficacy.

Objectives

a) To identify the determinants influencing healthcare professional training efficacy.

b) To map the types of efficacy outcomes measured by identifying the specific metrics and tools used by the authors of the included studies.

c) To identify key knowledge gaps and implications for future research and interventions.

Research questions

These questions served as the basis, guaranteeing that the study have been explored in a manner that was clear, focused, and thoroughly investigated. This study identified four principal research questions;

a) What are the identified determinants that influence the efficacy of healthcare professional training and capacity-building initiatives in Sub-Saharan Africa?

b) What types of outcomes are used to measure the efficacy of healthcare professional training and capacity-building initiatives in Sub-Saharan Africa in the existing literature?

c) What are the knowledge gaps concerning the determinants and measurement of healthcare professional training efficacy in Sub-Saharan Africa, and what are the implications for future research and interventions?

These enquiries offered a thorough review and analysis of evidence-based recommendations and principles for policymakers and stakeholders. The primary objective was to enhance the efficacy and results of training and capacity-building initiatives for healthcare professionals in the Sub-Saharan African region.

Definitions

Healthcare Professional: According to the American Medical Association (AMA), a healthcare professional is anyone suited by education, training and the necessary licensing to perform a medical service. Example: doctors, nurses, midwives, community health workers, frontline health workers etc.

Training and Capacity Building: Programs or initiatives that enhance the skills, expertise, and resources of healthcare staff to boost their performance and sustainability.

Efficacy: The ability of a training or capacity building program to deliver the anticipated result or desired outcome in a real-world situation.

Sub-Saharan Africa: The region of Africa that lies south of the Sahara Desert. It includes of 47 countries.

METHODOLOGY

The Joanna Briggs Institute (JBI) guideline for conducting a scoping review was employed, and the recommended five stages of the procedure were implemented (Hadie, 2024). The steps encompass the formulation of review questions, identification of pertinent research, selection of studies, data charting, and summarization and reporting of results. Eligibility criteria for the framework were established utilizing the Population, Concept, and Context (PCC) framework (Chan et al., 2024). Population (P): Healthcare practitioners; Concept (C): Effectiveness of training and capacity-building; Context (C): Sub-Saharan Africa (SSA). The information obtained from the review was presented utilizing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Review (PRISMA-ScR) (Mattos et al., 2023).

Inclusion and exclusion criteria justified

Inclusion and exclusion criteria served as filters in this scoping review. Inclusion criteria stipulate specific characteristics necessary for inclusion in the review, thereby justifying their relevance to the review question. Conversely, exclusion criteria eliminate certain characteristics to maintain an effective and impartial review, concentrating on the review question while minimizing extraneous bias (Idehai et al., 2024).

Table 1. Inclusion Criteria

Criterion Category	Specific Criteria	Justification
Study Focus	Studies specifically analysing healthcare professional training or capacity-building efficacy.	Answers major review question. Review training and capacity-building efficacy studies.
Population	Studies of Sub-Saharan African healthcare professionals (e.g., doctors, nurses, midwives, community health workers etc.).	Complies with the review question's geographical and professional scope.

Intervention	Studies of training programs, capacity-building initiatives, educational strategies, or system-level factors affecting training and capacity building.	Covers actions and exposures that may affect training and capacity-building.
Outcomes	Training efficacy studies examine knowledge acquisition, skill development, patient outcomes, retention rates, and other impact measures.	Makes sure that the included studies produce data for the "efficacy" review question.
Study Design	Qualitative, quantitative, mixed-methods studies, systematic reviews, meta-analyses, and grey literature.	Covers a wide range of evidence and viewpoints.
Publication Language	English-Language	Recognizes Sub-Saharan Africa's main scientific languages.
Publication Date	February-2015 through March-2025	Comprehensively explains historical and contemporary training efficacy determinants

Table 2. Exclusion Criteria

Criterion Category	Specific Criteria	Justification
Study Focus	Training and capacity-building studies without efficacy and impact assessments.	The review question assesses professional practice and capacity development after initial training, disregarding curriculum-to-results evidence.
Population	Training of healthcare professionals beyond Sub-Saharan Africa.	Geographically and professionally, the review question is irrelevant.
Intervention	Studies on health system strengthening without training or capacity building.	Initiatives that train and develop healthcare workers are the main focus.
Outcomes	Trainee satisfaction and perception studies without linking them to learning, behaviour change, inputs or processes without analyzing outcomes.	The research should examine satisfaction and other results and focus on "how" rather than "how well" training and capacity building.
Study Design	Opinions and editorials without data or analysis.	Do not give review-relevant empirical evidence.
Publication Date	Studies published outside the range of February-2015 through March-2025.	Focus on defined period of interest.

Search Strategy

The review encompassed research published in English. Studies published between 1st February 2015 and 30th March 2025 were considered. The initial search date was 1st March 2025, and a 10-year search limit was considered robust and credible for a scoping assessment. A preliminary restricted search of Proquest and Google Scholar was performed to locate papers on the subject. The databases examined are PubMed, Scopus, Proquest, and Google scholar. Grey literature and unpublished research. The subject headings and keywords employed to query these databases were enumerated. Key search terms and synonyms were identified using Boolean operators 'AND, OR,' (Ahmed, Zapata and Poelzer, 2024); Examples as shown in the table below;

Table 3. Examples of Search type, search string and Rationale used

Search type	Search string	Rationale
PubMed, Scopus, Proquest, Google Scholar	("healthcare professionals" OR "health workers" OR "medical staff" OR "nurses" OR "doctors" OR "clinical staff" OR "midwives" OR "Physicians") AND ("healthcare professional training" OR "health worker training" OR "medical education" OR "nursing education" OR "allied health training" OR "capacity building" OR "workforce development" OR "human resources for health") AND ("determinants" OR "factors" OR "efficacy" OR "effectiveness" OR "barriers" OR "challenges" OR "facilitators" OR "predictors" OR "success factors") AND ("Sub-Saharan Africa" OR "SSA" OR "Africa South of the Sahara")	Combines comprehensive synonyms for key population, concepts, and specifies the geographical region.

The literature search was conducted including a comprehensive evaluation of several search techniques. The chosen references were stored inside the Zotero desktop program. Search results from Proquest, Scopus, PubMed and Google scholar were transferred to the Zotero citation manager and subsequently submitted to the Rayyan QCRI (Qatar Computing Research Institute) systematic review management software.

Flow Diagram

The complete report of the results of the search and the study inclusion process is presented in a PRISMA-ScR flow diagram below.

Fig. 1 PRISMA-ScR flow chart
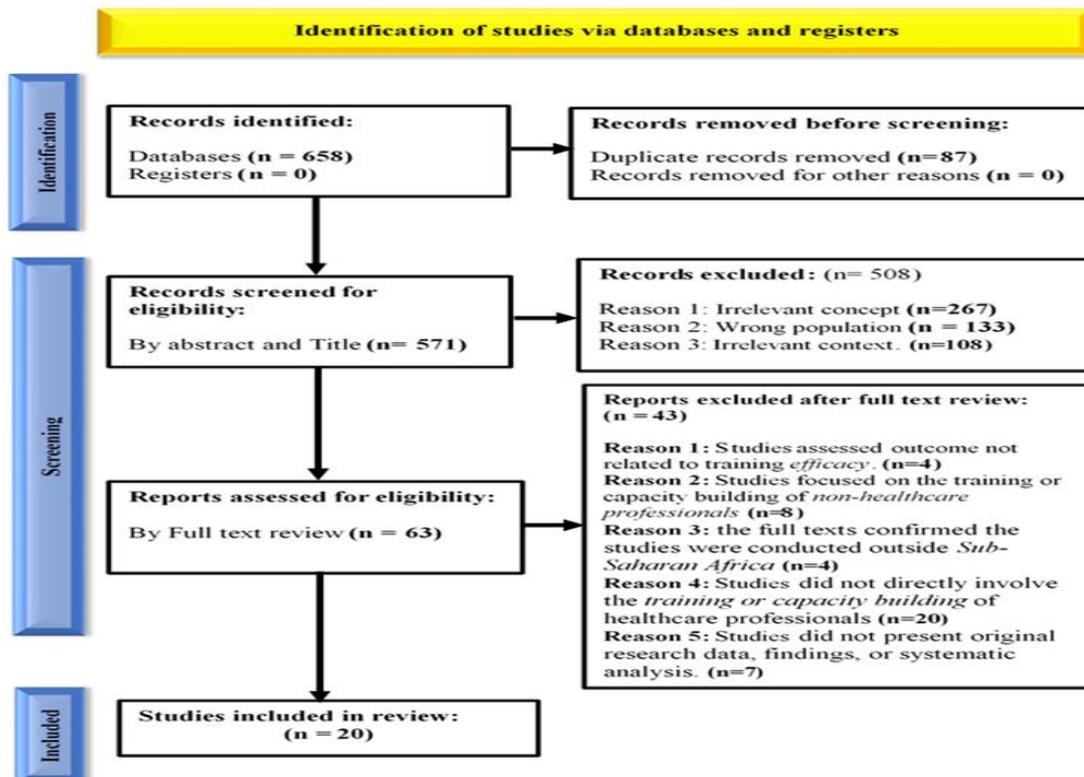
Data Extraction

Direct content analysis approach was used for data extraction and patterns that were identified between studies include: The study characteristics which the researchers have employed during research such as **study design** (e.g. quantitative, qualitative, mixed methods, cohort or quasi-experimental), the population (e.g. Nurses,

Doctors, Physicians, midwives, community health workers healthcare professionals etc.) and context (e.g. Sub-Saharan Africa countries), etc., in each study. A standardized data extraction form was developed to collect relevant information from the included studies.

Charting the data

The variables charted in this study were key pieces of information extracted from each included study, which were systematically recorded to **map existing evidence, identify gaps, and understand the range and nature of the determinants and outcomes studied**. These variables included study characteristics such as:

1. Author(s), Year, Country,

2. Study Title /Focus

3. Study Design

4. Healthcare Professional Cadre(s) Studied

5. Type of Training / Capacity Building Intervention

6. Primary Method(s) Used to Assess Efficacy

7. Key Categories of Determinants Investigated and Reported.

Outcomes of efficacy (dependent variables) were determined from the studies to assess how effective the training or capacity-building efforts were. These measures aligned with the "efficacy" aspect of the research question and included knowledge measured through tests, skills assessed through practical examinations, changes in practice and behavior documented through clinical audits, patient outcomes, healthcare system outcomes, retention rates of healthcare professionals remaining in their roles after training, and job satisfaction.

RESULTS

Characteristics of Included Studies

Search Results and Study Selection

Figure 1 is the PRISMA-ScR flow chart, which illustrates the review selection procedure for the studies that were included from different databases and grey literature sources. The following are the details of the procedure leading to studies included in the review.

Identification:

Following the search, all identified records (n = 658) were collated and exported from the different databases as a RIS file and subsequently uploaded straight to Rayyan QCRI. All duplicates' studies (n = 87) were found and resolved using Rayyan QCRI.

Screening:

The screening method occurred in two phases;

Phase 1 involved the screening of records (n=571) by titles and abstracts for eligibility in accordance with the PCC exclusion criteria for the review. Records potentially irrelevant (n=508) were excluded in full with the following reasons; Irrelevant concept (n=267), wrong population (n = 133) and irrelevant context (n=108).

Phase 2 involved the assessment of the reports (n=63) eligibility that passed the initial screening for the full texts review using the appropriate exclusion criteria. Reports found irrelevant (n=43) were excluded in full with

the following reasons; Studies assessed outcome not related to training efficacy (n=4), studies focused on the training or capacity building of non-healthcare professionals (n=8), the full texts confirmed the studies were conducted outside Sub-Saharan Africa (n=4), studies did not directly involve the training or capacity building of healthcare professionals (n=20), and studies did not present original research data, findings, or systematic analysis, (n=7).

Included:

However, the screening was concluded after evaluating all studies considering the inclusion and exclusion criteria to ascertain their eligibility. Studies that fulfilled the inclusion criteria (n=20) were selected for data extraction.

Table 4. Data Extraction Form: Characteristics of Included Studies

Author(s), Year, Country,	Study Title	Study Design	Healthcare Professional Cadre(s) Studied	Type of Training / Capacity Building Intervention	Primary Method(s) Used to Assess Efficacy	Key Categories of Determinants Investigated and Reported
(Stiles et al., 2021), Uganda	The use of low-cost ruggedized Android tablets to augment in-service training of community health workers in Mukono, Uganda: perspectives and lessons learned from the field.	Qualitative (Interviews)	Community health workers	In-service training	Self-reported practice change, not directly assessed - focused on motivation factors as proxy.	Availability of appropriate training materials/equipment; Inadequate implementation timeline, lack of individualized digital literacy instruction.
(Ayisi-Boateng et al., 2022), Ghana	Educational intervention to enhance the knowledge of Ghanaian health workers on Alzheimer's Disease and Related Dementias (ADRD)	Quasi-experimental	Doctors, nurses, pharmacists,	In-service training	Knowledge test scores	Continuing Medical Education interventions improve knowledge; Current knowledge gaps in ADRD pose a significant challenge
(McGuire et al., 2021), Botswana, Democratic Republic of the Congo (DRC), Ghana, Nigeria and Sierra Leone	Implementation of Online Research Training and Mentorship for Sub-Saharan African Family Physicians.	Mixed-methods	Physicians (Doctors)	Mentorship program	Self-reported practice change	Program feasible and suited for online deployment; Improved mentorship training, flexible and scalability clarity.

(Ndayisaba et al., 2017), Rwanda	A Clinical Mentorship and Quality Improvement Program to Support Health Center Nurses Manage Type 2 Diabetes in Rural Rwanda.	Retrospective cohort study	Nurses	Mentorship program	Self-reported practice change	MESH-QI covered NCD training, clinical mentorship, quality improvement, systematic documentation, and rural adaptability. ; Lack of consistent training, supervision, and competence hinder rural service delivery
(Bryden et al., 2021), Lesotho	Family Medicine Training in Lesotho: A Strategy of Decentralized Training for Rural Physician Workforce Development.	Cohort study	Physicians (Doctors)	In-service training	Self-reported practice change, (portfolio of learning serves as a record of a registrar's progress)	Decentralized family physician training helps retain public sector physicians; solution to hospital-centric training concerns
(Ngusie et al., 2023), Ethiopia.	The effect of capacity building evidence-based medicine training on its implementation among healthcare professionals in Southwest Ethiopia: a controlled quasi-experimental outcome evaluation	Quasi-experimental (pre-post)]	Healthcare professionals	In-service training	Knowledge test scores	Programmatic (qualified and dedicated trainers), well-designed training strategy; Lack of internet connectivity and technical assistance in health institutions hinders EBM practice.
(Hicks et al., 2021), Nigeria.	Acceptability and Potential Effectiveness of eHealth Tools for Training Primary Health Workers From Nigeria at Scale: Mixed Methods, Uncontrolled Before-and-After Study	Mixed methods design	Frontline health workers (FHWs)	In-service training	Stakeholder interviews	Cost-effective VTR digital technology improves knowledge, attitudes, and practices; Lack of electricity, internet, and frontline health workers' workloads limit access to digital technology and online training.

(Otu et al., 2024), Nigeria.	Implementing health worker training on sepsis in South Eastern Nigeria using innovative digital strategies: an interventional study	Quasi-experimental or interventional study	Doctors	In-service training	User satisfaction survey	Content and multimodal delivery of the material (usable app), Programmatic (content relevance)
(Alwy Al-beity et al., 2022), Tanzania.	Health workers' experiences of implementation of Helping Mothers Survive Bleeding after Birth training in Tanzania	Qualitative	Health Workers	In-service training	Self-reported practice change	Programmatic (content relevance); Older age may hinder knowledge acquisition
(Kikaya et al., 2024), DR Congo	Effectiveness of Capacity-Building and Quality Improvement Interventions to Improve Day-of-Birth Care in Kinshasa, Democratic Republic of the Congo	Quasi-experimental	Healthcare providers (midwives, nurses, and doctors)	In-service training	Objective Structured Clinical Exam (OSCE) scores	Programmatic (qualified and dedicated trainers)
(Luke et al., 2025), Liberia	Effectiveness of a short-term oxygen therapy training program in Liberia during and after COVID-19	Cohort	Doctors, physician assistants, nurses, or midwives	In-service training	Objective Structured Clinical Exam (OSCE) scores	Programmatic (qualified and dedicated trainers)
(Perera et al., 2023), South Sudan	"Midwives are heroes of the country": qualitative evaluation of a midwifery education program in South Sudan	Mixed Methods	Midwives	In-service training	Self-reported practice change	Programmatic (Contextually relevant curriculum) & (qualified and dedicated trainers); programs at risk due to certain dependency and conflict-related instability.
(Wood et al., 2024), Senegal and Uganda	Capacity-Building Through Digital Approaches: Evaluating the Feasibility and Effectiveness of eLearning to	Mixed Methods	Health workers	E-learning initiative	User satisfaction surveys	Programmatic (qualified and dedicated trainers), Individual (digital literacy); Technical constraints, lack of hands-on practice,

	Introduce Subcutaneous DMPA Self-Injection in Senegal and Uganda					and platform maintenance
(Stubbe et al., 2024), Uganda	Web-Based Development of Standard Operating Procedures and Midwifery Trainings at Ugandan Birth Clinic in the Framework of Implementing a Quality Improvement System for the MEWU—Midwife Exchange with Uganda	Mixed Methods	Midwives	E-learning initiative	User satisfaction surveys	SOP integration into clinical practice, standardised content, and midwife confidence, increased confidence did not improve morbidity and mortality rates due to unknown factors
(Kibone et al., 2024), Uganda	Community-Based Mycetoma Surveillance in Uganda: Identifying Knowledge Gaps and Training of Community Health Workers to Improve Case Detection	Mixed Methods	Community health workers CHWs	In-service training	Knowledge test scores,	Programmatic (Contextually relevant curriculum), significant knowledge gain; absence of Indigenous nomenclature, protracted decision-making, and transportation challenges
(Rotenberg et al., 2025), Ghana	Participant perceptions of disability training for health workers: a qualitative study in Ghana	Qualitative	health workers	In-service training	Self-reported practice	curriculum integration directly incorporates training content; training techniques lack systematic processes, limited critical communication skills training.
(Vancampfort et al., 2023), Uganda	Efficacy of an 8-hour education intervention on dementia knowledge, attitude and skills in healthcare	quasi-experimental	Healthcare professionals	In-service training	Knowledge test scores	Programmatic (qualified and dedicated trainers), significant improvements in scores post-intervention; lack of

	professionals in regional hospitals: a nation-wide study from Uganda					evidence on the effectiveness of interventions
(Mwansisya et al., 2022), Tanzania	The impact of training on self-reported performance in reproductive, maternal, and newborn health service delivery among healthcare workers in Tanzania: a baseline- and endline-survey.	quasi-experimental	Healthcare workers	In-service training	Self-reported practice change	Programmatic (qualified and dedicated trainers), enhanced intra-operative care, leadership, CEMONC, and RMNH performance; The control group's lack of significant gains
(Mamo et al., 2024), Ethiopia	Training and Active Case Detection to Prevent Leprosy: Effect on Knowledge, Attitude and Skills of Health Workers on Early Diagnosis of Leprosy in a Leprosy Hotspot District in Ethiopia	Quasi-experimental	Healthcare workers	In-service training	Knowledge test scores,	Programmatic (qualified and dedicated trainers), positive factors such as content, delivery, and relevance; Insufficient focus on attitude change, strong negative attitudes, and limited practical application.
(Kiguli-Malwadde et al., 2022), SSA.	Evaluating the impact of a multicountry interprofessional training programme to improve HIV knowledge and clinical confidence among healthcare workers in sub-Saharan Africa: a cohort study	Cohort	Healthcare professionals	In-service training	Knowledge test and self-reported confidence scores	Programmatic (case-based curriculum-design), effective content, sustained knowledge retention, and broad applicability;

Publication Trends

The included studies spanned from 2017 to 2025, with a notable increase in publications observed since 2021, indicating growing research interest.

Reasonable number of the studies originated from Uganda (n=4), Ghana (n=2), Tanzania (n=2), Ethiopia (n=2), Nigeria (n=2), while some from Rwanda (n=1), Lesotho (n=1), Congo (n=1), Liberia (n=1), South Sudan (n=1), but other parts of Sub-Saharan African countries were less represented. One study integrated data from Senegal

and Uganda (n=1), while another included Botswana, DRC, Ghana, Nigeria, and Sierra Leone (n=1). Additionally, one study viewed SSA as a single region (n=1).

The dominant study designs were quasi-experimental or intervention studies (n=7), mixed-methods (n=6), cohort studies (n=4), with fewer qualitative studies (n=3).

Healthcare Professional Groups and Interventions Studied

Doctors (24% of studies) were the most frequently studied group, followed by midwives (16% of studies), Nurses (16% of studies), healthcare professionals (12% of studies), health workers (12% of studies), community health workers (8% of studies), and healthcare workers (8% of studies). Frontline Health workers (4% of studies) and pharmacists were less frequently represented.

Common training and capacity-building interventions investigated included, in-service training workshops (n=16), mentorship programs (n=2), and e-learning initiatives (n=2).

Key categories of determinants investigated and reported

This report synthesizes key determinants from various studies affecting successful healthcare professional training and capacity-building in Sub-Saharan Africa. These include programmatic design, resource availability, technological integration, and clinical practice context.

Programmatic design and delivery: Cornerstones of efficacy

A recurring theme across the studies is the paramount importance of well-designed training strategies and the quality of program delivery. Several determinants consistently emerged in this category:

a) **Qualified and dedicated trainers:** The expertise and dedication of trainers are repeatedly emphasized. Trainers who are knowledgeable, experienced, and dedicated improve scores post-intervention, intra-operative care, leadership, and performance in critical areas like Comprehensive Emergency Obstetric and Neonatal Care (CEMONC) and Reproductive, Maternal, Newborn, and Child Health (RMNH) (Mwansisya et al., 2022).

b) **Contextually relevant curriculum:** Training content that directly addresses the specific needs, challenges, and realities of the local healthcare environment in Sub-Saharan Africa is vital(Kibone et al., 2024). This ensures that learned knowledge and skills are directly applicable and meaningful to the trainees' practice(Perera et al., 2023).

c) **Effective content and multimodal delivery:** In addition to relevance, content quality and presentation factor, the case-based curriculum design promotes knowledge retention and broad applicability (Kiguli-Malwadde et al., 2022). Learning is improved by multimodal delivery of materials, often via user-friendly apps, indicating that how content is delivered is as important as what is delivered (Otu et al., 2024).

d) **Curriculum Integration:** Directly incorporating training content into existing curricula or clinical practice protocols (like SOP integration into clinical practice) strengthens the likelihood of knowledge transfer and sustained behavior change(Stubbe et al., 2024).

e) **NCD Training and holistic improvement (MESH-QI):** Training programs that include clinical mentorship, quality improvement, and systematic documentation are more effective than those that only cover clinical knowledge. Rural adaptability boosts program reach and impact (Ndayisaba et al., 2017).

Resources and technology: Enabling factors

The availability and strategic use of resources, particularly technology, emerged as critical enablers:

a) **Availability of appropriate training materials and equipment:** Access to the necessary tools and resources during training is fundamental for practical skill development and reinforcement(Stiles et al., 2021).

b) **Feasible and suited for online deployment:** Programs designed for online deployment offer flexibility and scalability, potentially overcoming geographical barriers inherent in Sub-Saharan Africa. This "any pace, any place" learning model was noted as a success factor(McGuire et al., 2021).

c) **Cost-Effective VTR Digital Technology:** The utilization of digital technologies like video-taped reality (VTR) can be cost-effective while still yielding improvements in knowledge, attitudes, and practices among healthcare professionals(Hicks et al., 2021).

d) **Tablet use for learning and outreach:** Beyond formal training, the ability to use digital tools like tablets for continuous learning and for community teaching and outreach reinforces knowledge and extends the reach of healthcare services(Stiles et al., 2021).

Systemic and Individual Determinants

Beyond direct programmatic elements, broader systemic and individual factors also play a role:

a) **Decentralized training models:** Specifically, decentralized family physician training was identified as a positive determinant, aiding in the retention of physicians within the public sector. This suggests that bringing training closer to the point of need can have positive workforce implications(Bryden et al., 2021).

b) **Digital Literacy (Individual Factor):** While technology offers significant advantages, individual digital literacy among trainees is a crucial prerequisite for effective engagement with online or tablet-based learning interventions(Stiles et al., 2021). This highlights the need to address foundational skills alongside clinical content(Wood et al., 2024).

c) **Midwife Confidence (and its complex relationship with outcomes):** Increased confidence among midwives was noted as a positive factor. However, one study pointed out that while confidence increased, it did not consistently improve morbidity and mortality rates due to unknown factors(Stubbe et al., 2024). This underscores the complexity of measuring efficacy and the potential for other unaddressed systemic barriers to limit the ultimate impact of training.

Negative determinants and challenges

The studies in this review identify key negative determinants, or barriers, that hinder healthcare professional training and capacity-building in Sub-Saharan Africa. These obstacles demonstrate the difficulty of translating training into regional healthcare service delivery and professional competence improvements.

a) **Programmatic and curricular deficiencies**

Issues in the design, delivery, and ongoing support of training programs frequently undermine their efficacy:

i. **Inadequate Implementation Timelines:** Studies pointed to a lack of appropriate consideration for the time required to effectively implement new training initiatives. Rushed or unrealistic timelines can compromise thoroughness and uptake(Stiles et al., 2021).

ii. **Lack of Individualized Digital Literacy Instruction:** A "one size fits all" approach to digital literacy training proved to be a significant barrier(Stiles et al., 2021). Without instruction tailored to varying baseline competencies, digital learning initiatives struggle to be effective.

iii. **Absence of Consistent Training and Supervision:** Sporadic or inconsistent training efforts, coupled with a lack of continuous supervision, were found to hinder the development and sustained application of competence, particularly impacting rural service delivery(Ndayisaba et al., 2017).

iv. **Hospital-Centric Training Concerns:** A focus on training models primarily based in large hospitals may fail to adequately prepare healthcare professionals for the realities and resource limitations of rural or primary healthcare settings(Bryden et al., 2021).

v. **Unsystematic Training Techniques & Limited Communication Skills Training:** Some training approaches lacked systematic processes, leading to less effective knowledge and skill transfer. Specifically, limited critical communication skills training was identified as a gap, impacting crucial aspects of healthcare delivery(Rotenberg et al., 2025).

vi. **Insufficient Focus on Attitude Change & Limited Practical Application:** Training programs that fail to adequately address attitudes or provide sufficient opportunities for practical application lead to strong negative attitudes among trainees and limit their ability to integrate new knowledge and skills into real-world practice(Mamo et al., 2024).

vii. **Lack of Improved Mentorship Training and Scalability Clarity:** The absence of well-structured and flexible mentorship programs, along with unclear strategies for scaling up effective interventions, restricts the sustained development of healthcare professionals(McGuire et al., 2021).

b) **Infrastructure and Resource Constraints**

Deficiencies in essential infrastructure and resources severely limit access to and the effectiveness of training:

i. **Lack of Internet Connectivity and Technical Assistance:** A significant barrier to the adoption of modern practices like Evidence-Based Medicine (EBM) is the absence of reliable internet connectivity and sufficient technical support in health institutions(Ngusie et al., 2023). This directly impacts access to online resources and continuous learning.

ii. **Limited Access to Digital Technology due to Infrastructure:** Widespread issues like lack of electricity and internet access, compounded by frontline health workers' heavy workloads, severely restrict opportunities for engaging with digital technologies and participating in online training(Hicks et al., 2021).

iii. **Technical Constraints and Platform Maintenance:** Beyond basic access, issues like technical glitches, the absence of dedicated hands-on practice opportunities during digital training, and poor platform maintenance frustrate learning and hinder skill development(Wood et al., 2024).

c) **Individual Learner Challenges**

Certain characteristics at the individual healthcare professional level can impede learning:

i. **Older Age:** Some studies suggested that older age among trainees may hinder knowledge acquisition, indicating potential challenges in adapting to new learning methods or content for certain demographics(Alwy Al-beity et al., 2022).

d) **Broader Systemic and Contextual Barriers**

Wider environmental and systemic issues pose substantial threats to training efficacy:

i. **Dependency and Conflict-Related Instability:** Programs operating in contexts marked by dependency (e.g., reliance on external funding) or conflict-related instability face significant risks, often leading to disruptions or outright failure of training initiatives(Perera et al., 2023).

ii.   **Absence of Indigenous Nomenclature:** The lack of culturally appropriate or indigenous terminology in training materials can create a disconnect, hindering understanding and application of learned concepts(Kibone et al., 2024).

iii.   **Protracted Decision-Making:** Slow or cumbersome decision-making processes within health systems can delay the implementation of crucial training programs or necessary adjustments, impacting their timely relevance(Kibone et al., 2024).

iv.   **Transportation Challenges:** Logistical difficulties related to transportation in often geographically dispersed and under-resourced areas can limit access to training sites for both trainers and trainees(Kibone et al., 2024).

e)   **Challenges in Evidence Generation and Application**

Beyond direct programmatic issues, gaps in knowledge and evaluation further complicate efforts:

i.   **Current knowledge gaps in ADRD:** A specific example highlighted is that existing knowledge gaps in critical health areas like ADRD pose a significant challenge(Ayisi-Boateng et al., 2022). This suggests that even when training occurs, it may be insufficient if the underlying knowledge base is incomplete or not effectively translated.

ii.   **Lack of evidence on the effectiveness of interventions:** A critical barrier to progress is the general absence of robust evidence regarding the effectiveness of many interventions(Vancampfort et al., 2023). This makes it difficult to ascertain which training approaches truly yield desired outcomes and hinders informed policy and practice.

iii.   **Limited comparative gains in control groups:** While this describes an outcome rather than a direct determinant of failure, it points to a broader issue where even established interventions may not achieve significant improvements compared to routine care, implying underlying, unaddressed negative determinants affecting overall impact(Mwansisya et al., 2022).

Outcomes of Efficacy Measured

Based on study outcomes, this report synthesizes the main methods used to evaluate healthcare professional training and capacity-building interventions in Sub-Saharan Africa. Results emphasized immediate learning outcomes and self-reported behavioral changes over objective, higher-level impacts.

In six studies (n=6), knowledge test scores were used to assess whether training programs taught healthcare professionals new information and understanding. To measure theoretical knowledge gains, pre- and post-intervention assessments were common. One study combined knowledge test scores with self-reported confidence scores to assess cognitive gains and trainee readiness (Kiguli-Malwadde et al., 2022).

Nine of the included studies (n=9) used self-reported practice change to assess efficacy beyond knowledge. Training participants' accounts of how their clinical or professional behaviours changed were crucial to studies. Though popular, this method is subjective. A registrar's portfolio of learning provided a more structured, self-generated record of practice development (Bryden et al., 2021).

OSCE scores were a more objective measure of skill demonstration (Kikaya et al., 2024). The practical competence of trainees is directly and verifiably assessed using standardized clinical tasks (Luke et al., 2025). Not often used, OSCE scores reveal how knowledge is translated into skills.

Several studies measured user satisfaction with surveys. Training participants rate the program's quality, relevance, and experience (Wood et al., 2024). User satisfaction can indirectly affect capacity building by influencing motivation, engagement, and future participation (Stubbe et al., 2024).

DISCUSSION

Gaps in the scoping review evidence identified

This scoping review meticulously charted the existing literature, several critical gaps in the evidence base emerged, limiting our comprehensive understanding and ability to draw definitive conclusions on efficacy. These include a methodological limitation in drawing strong causal inferences about the effectiveness of specific interventions or determinants in improving training outcomes. The lack of robust experimental or quasi-experimental studies, as well as a focus on higher-level outcomes, limits our understanding of whether training translates into tangible improvements in healthcare quality and population health.

The identified literature is disproportionately concentrated in a few English-speaking countries in SSA such as Uganda, Ghana, Ethiopia, Nigeria, Tanzania, etc., leaving vast geographical areas and diverse health systems under-researched. Similarly, specific allied health professionals, public health cadres, and specialist medical fields receive less attention than nurses and general practitioners, leading to an incomplete understanding of their unique training needs and challenges.

The nuanced exploration of specific determinants, such as socio-cultural determinants, political will, and economic incentives, is often superficially discussed rather than rigorously investigated. Additionally, specific interventions to overcome diverse digital skill deficits across different age groups or educational backgrounds are not frequently evaluated.

Lastly, the lack of long-term, longitudinal data makes it difficult to ascertain the sustainability of training efficacy, the decay rate of acquired skills, and the enduring impact of determinants on professional development and career trajectories.

Research implications of the findings

The scoping review of healthcare professional training and capacity building in Sub-Saharan Africa suggests several key recommendations for future research. Firstly, it recommends a shift towards causal evaluation, focusing on impact evaluations to establish clear causality between training interventions and their determinants. This will help inform policy and resource allocation. Secondly, holistic outcome measurement should be adopted, integrating objective measures of clinical practice, patient-level health outcomes, and long-term workforce retention rates. This will provide a more complete picture of whether training efforts translate into tangible improvements in health service delivery and population health. Thirdly, context-specific investigations should be embraced, focusing on under-represented regions and professional groups, using mixed-methods approaches to understand the complex interplay of local social, cultural, and political determinants that shape training efficacy. Fourthly, intervention-focused research on barriers, such as inadequate timelines, digital divide, lack of consistent supervision, and infrastructure deficits, should be designed to test innovative, scalable, and contextually appropriate solutions. Finally, economic evaluations, such as cost-effectiveness and cost-benefit analyses, should be increasingly incorporated to guide strategic investments in health workforce development.

RECOMMENDATIONS FOR FUTURE RESEARCH

This study suggests several future research avenues for improving training in healthcare settings. It recommends conducting cluster randomized controlled trials (RCTs) to compare different training methodologies across diverse settings, focusing on patient outcomes and provider practice changes. Longitudinal studies should be prioritized to track the long-term impact of training interventions on knowledge retention, skill decay, practice changes, and professional retention, especially in rural and underserved areas. Mixed-methods research designs should be used to explore the complex interplay of cultural norms, gender dynamics, and local leadership in influencing training efficacy and uptake of new practices. Scalable interventions targeting key barriers should be developed and evaluated. Systematic reviews should be conducted to synthesize higher-quality evidence on training interventions' effectiveness. Cost-effectiveness analyses should be conducted to inform strategic resource allocation and demonstrate value for investment in the health workforce.

Critical analysis of the research strengths and limitations

This study represents a significant contribution to the body of knowledge on healthcare professional training and capacity building in Sub-Saharan Africa, a region critical to global health security.

Research strengths

This research, as a scholarly work, possesses several strengths that contribute significantly to the understanding of healthcare professional training efficacy in SSA. The adherence to the PRISMA-ScR guidelines ensures a transparent and systematic methodology for the scoping review, which is a significant strength in the broader field of evidence synthesis. The comprehensive search strategy, encompassing multiple databases and a dedicated effort to include grey literature, minimizes the risk of publication bias and provides a broad sweep of the existing evidence, which is crucial for a mapping exercise. The systematic data charting process, involving explicit inclusion and exclusion criteria and structured variable extraction, enhances the reliability of the findings. Furthermore, the multi-faceted conceptual framework used to categorize determinants allowed for a nuanced and holistic analysis, reflecting the complex realities on the ground.

Research limitations

However, this research also possesses inherent limitations, some stemming from the nature of a scoping review and others specific to its execution. The most prominent limitation is the deliberate omission of critical appraisal or risk of bias assessment of the included studies. While consistent with scoping review methodology, this means that this study synthesizes evidence without evaluating its methodological quality. Consequently, the findings presented should be interpreted as a map of the existing literature, not as a definitive judgment on the effectiveness of specific interventions. Reliance solely on English language sources potentially excludes valuable insights from other linguistic regions within SSA, which could offer diverse perspectives on local determinants and solutions. While efforts were made to include grey literature, the inherent challenges in systematically accessing all unindexed reports from various local and international organizations mean that some relevant context-specific information may not have been captured.

CONCLUSIONS

To conclude, this study highlights the importance of healthcare professional training and capacity-building initiatives in strengthening healthcare systems in Sub-Saharan Africa. The Joanna Briggs Institute (JBI) guidebook was used for the scoping review, involving five stages. This study highlights the importance of optimizing healthcare professional training and capacity building in Sub-Saharan Africa. Key determinants include well-designed programs with qualified trainers, relevant curricula, and integration into clinical practice. Access to resources, digital technology, and online deployment options is crucial. Challenges include programmatic deficiencies, infrastructure limitations, and systemic barriers. Addressing the shortage and misdistribution of healthcare workers requires a strategic approach, including investment in qualified trainers, technology, infrastructure, supportive organizational cultures, and enabling health system policies.

No critical evaluation was conducted for any of the studies included in this scoping review.

List Of Abbreviations

CEMONC: Comprehensive Emergency Obstetric and Newborn Care

HWF: Health Workforce

MESH-QI: Mentorship and Enhanced Supervision for Health Care and Quality Improvement

NCD: Noncommunicable disease

OSCE: Objective Structured Clinical Exam

PCC: Population, Concept and Context

PRISMA-ScR: Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

RAYYAN QCRI: Rayyan (Qatar Computing Research Institute)

RMNH: Reproductive, Maternal, and Newborn Health

WHO: World Health Organization

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