

Development of pharmacy education programmes in sub-Saharan Africa: a scoping review

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Abstract

Objectives: This scoping review aimed to explore the development, implementation, and evaluation of pharmacy education programmes in sub-Saharan Africa. Objectives include:

- legislative frameworks governing pharmacy education programmes
- competency standards underpinning pharmacy practice
- accreditation standards applied to pharmacy education programmes
- models of pharmacy education and training

Methods: Records describing pharmacy education programmes originating from the 49 countries within sub-Saharan Africa were considered for inclusion. Database searches of CINAHL, Embase, MEDLINE (EBSCO) were undertaken and supplemented by grey literature. Search strings were developed using the JBI's population, concept, context framework. Records were independently screened for inclusion by two reviewers. Findings were presented using narrative summaries, tables, and figures.

Key findings: One hundred thirty-nine eligible records were retrieved. Most records originated from South Africa ($n=30$) and Nigeria ($n=23$). Thirty-one countries out of 49 (63%) returned zero country-specific results. Types of evidence sources varied across included records, with reviews ($n=25$, 18%), cross-sectional studies ($n=22$, 16%), and reports ($n=20$, 14%) most prominent. Legislative frameworks governing pharmacy education were described by 35 records (25%), competency standards by 49 records (35%), accreditation standards by 44 records (32%), and models of pharmacy education and training by 136 records (98%).

Conclusions: This review provides insight into the development, implementation, and evaluation of pharmacy education across sub-Saharan Africa. Models of pharmacy education and training are well described, particularly for South Africa and Nigeria. However, there are significant information gaps in the literature for 31 countries. Future research should focus on investigating pharmacy education in sub-Saharan Africa not captured by records within this review.

Keywords: sub-Saharan Africa; pharmacy education; legislative frameworks; competency standards; accreditation standards

Introduction

In recent years, the pharmacy profession has advanced significantly and is now accepted as an integral part of the healthcare system in most developed countries. This contrasts with the position of pharmacy in many developing or low- and middle-income countries [1]. Many of the world's poorest countries are found in Africa, where significant health inequalities exist between population groups. Challenges include lack of access to food, shelter and safe drinking water, insufficient sanitation infrastructure, high infectious disease burden, and reduced availability of fundamental healthcare services [2]. In these countries, healthcare may not reach the poorest of the population [3].

Evidence supporting the benefits of pharmacist care in terms of improved clinical outcomes, public health impact, and reduced healthcare costs is compelling [4, 5], particularly for the utilization of pharmacists with extended scopes of practice [6, 7]. Pharmacists are one of the most accessible healthcare providers, ideally positioned to improve patient access to care in terms of safe and quality medicines and pharmaceutical services [8]. However, the current pharmacy workforce in Africa is insufficient to meet the region's needs in this regard. Africa has the most severe shortage of healthcare professionals worldwide, with significantly fewer pharmacists in terms of absolute capacity per capita [9]. Coupled with the region's complex population, societal, and health needs, this

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underscores the urgent need to ensure that the pharmaceutical workforce is both sufficient in size and adequately prepared to meet these challenges [10].

This review aims to explore the literature on pharmacy education programmes that have been developed, implemented, or evaluated in the 49 countries in sub-Saharan Africa. Pharmacists require university education to at least degree level in most countries [5]. Tertiary or third-level education encompasses formal education beyond secondary level in public or private institutions such as universities, vocational schools, and technical training courses [11]. Pharmacy education, in the context of this review, is understood as a structured educational programme in pharmacy education institutions designed to equip students with the knowledge and skills needed to register as qualified pharmacists in their practice locations.

Progression of pharmacy education programmes to improve graduate pharmaceutical care abilities has been significant in many countries across recent decades; however, some lag behind [12]. In developing regions such as sub-Saharan Africa, advancement or expansion of pharmacy practice and roles to improve provision of quality healthcare is dependent on parallel developments in pharmacy education. An understanding of current standards for pharmacist education, including educational models, legislative frameworks, competency standards and accreditation standards, is therefore essential. The absence of an in-depth and comprehensive review on the subject for this region supports the need for a scoping review of pharmacy education programmes.

A preliminary search for existing scoping reviews and systematic reviews on pharmacy education programmes in sub-Saharan Africa conducted using the Embase (Elsevier) database (26 results) and Joanna Briggs Institute (JBI) Evidence Synthesis database (19 results) returned zero reviews. To the extent of the author's knowledge, no scoping review on pharmacy education programmes in sub-Saharan Africa has been completed to date. For this reason, a scoping review was considered the most suitable approach to ascertain what educational frameworks or programmes have been developed, implemented, or evaluated in sub-Saharan Africa. This approach intended to provide a broad overview on current literature available and to determine the need for future systematic reviews or other forms of research on pharmacy education in this region.

The overall aim of the scoping review was to describe existing literature on the development, implementation, and evaluation of pharmacy education in sub-Saharan Africa. Specific review objectives were to:

- identify and describe the development, implementation, and evaluation of legislative frameworks governing pharmacy education programmes in sub-Saharan Africa;
- identify and describe the development, implementation, and evaluation of competency standards underpinning pharmacy practice in sub-Saharan Africa;
- identify and describe the development, implementation, and evaluation of accreditation standards applied to pharmacy education programmes in sub-Saharan Africa;
- identify and describe the development, implementation, and evaluation of various models of pharmacy education and training programmes (i.e. pharmacy institutional programmes; pharmacy practice settings; practice placement settings).

Review question

How has pharmacy education and training been developed to date in sub-Saharan Africa?

Materials and methods

A protocol for this scoping review was registered in March 2024 with the Open Science Framework (OSF) [13]. JBI methodological guidance for scoping reviews was used in conducting the review [14]. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews was used in reporting of the review [15]. All supplementary data for the scoping review are publicly available within the OSF protocol reference provided.

Inclusion criteria

Inclusion criteria for this review were developed using the population, concept, context framework as per JBI [14].

Population

Records involving one or more countries within the sub-Saharan Africa region as defined by the United Nations Educational, Scientific and Cultural Organization (UNESCO) [16], encompassing 49 countries in total, were eligible for inclusion (Supplementary Appendix SI). Included countries were as follows: Angola; Benin; Botswana; Burkina Faso; Burundi; Cameroon; Cape Verde (Cabo Verde); Central African Republic; Chad; Comoros; Democratic Republic of the Congo; Republic of Congo; Ivory Coast (Côte d'Ivoire); Djibouti; Eritrea; Eswatini (Swaziland); Ethiopia; Gabon; Gambia; Ghana; Guinea; Equatorial Guinea; Guinea-Bissau; Kenya; Lesotho; Liberia; Madagascar; Malawi; Mali; Mauritania; Mauritius; Mozambique; Namibia; Niger; Nigeria; Rwanda; São Tomé and Príncipe; Senegal; Seychelles; Sierra Leone; Somalia; South Africa; South Sudan; Sudan; Tanzania; Togo; Uganda; Zambia; Zimbabwe.

The geographic focus on sub-Saharan Africa aimed to identify specific challenges, successes, and innovations in the education of pharmacists, contributing to a more comprehensive understanding of healthcare development in the region.

Concept and context

JBI's concept and context were combined within the search strings. The concept/context of interest was the development, implementation, and evaluation of pharmacy education programmes in sub-Saharan Africa. Pharmacy education programmes encompass the various educational and training models, including institutional programmes, pharmacy practice settings, and practice placement settings. Records describing legislative frameworks governing pharmacy education programmes, competency standards underpinning pharmacy practice, and accreditation standards applied to pharmacy education programmes were eligible for inclusion in line with review objectives. Records describing continuing professional development (CPD) and micro-credentials for pharmacists were also eligible for inclusion.

Types of evidence sources

No limitations were applied to the types of records eligible for inclusion in this scoping review. Sources included

cross-sectional studies, both analytical and descriptive, qualitative and quantitative studies, reviews, including systematic and international reviews, comparative analyses, surveys, reports, assessments, and evaluations. Government and university frameworks, policy documents, and legislation frameworks were also eligible for inclusion.

Exclusion criteria

Countries not considered to be within the sub-Saharan Africa region as defined by UNESCO.

Records that do not specifically address the development, implementation, and evaluation of pharmacy education programmes in sub-Saharan Africa. Non-English language records will not be included in the final review.

Search strategy

A comprehensive search strategy was designed consisting of white and grey literature searches. White literature searches were conducted on 6 March 2024 and employed the use of three electronic databases, namely CINAHL (EBSCO), Embase (Elsevier), and MEDLINE (EBSCO). Database search strings were developed with the input of an information retrieval specialist employed by the Library of Trinity College Dublin. Population search terms included specific controlled vocabulary terms for the region, e.g. the Medical Subject Headings term 'Africa South of the Sahara' for MEDLINE, as well as a keyword search of the 49 sub-Saharan African countries including endonyms and exonyms as listed in the [Supplementary Appendix SII](#). A proximity search was utilized combining the population, concept, and context elements to improve search specificity. The OSF protocol contains the final search strings used.

Grey literature searches were carried out via the Google search engine. Sequential searches for each country were completed using standardized terms reflecting the review objectives and concept/context combined with the relevant country-specific identifier set out in the [Supplementary Appendix SI](#). Searches were completed during the period 01 to 29 May 2024. The first 20 results displayed for each search were screened for inclusion.

Grey literature search strings:

- 1) 'Pharmacy legislation' AND 'education' AND '[country as per [Supplementary Appendix SI](#)]'
- 2) ('Pharmacy competency' OR 'Pharmacy competencies') AND 'standard' AND '[country as per [Supplementary Appendix SI](#)]'
- 3) ('Pharmacy accreditation standard' OR 'Pharmacy accreditation standards') AND '[country as per [Supplementary Appendix SI](#)]'
- 4) 'Pharmacy education' AND '[country as per [Supplementary Appendix SI](#)]'
- 5) 'Pharmacy training' AND '[country as per [Supplementary Appendix SI](#)]'

For the search strategy, no limitations were placed on publication date or language for white or grey literature searches; however, a language limit (English only) was implemented at the screening and inclusion stages for practical reasons.

Record selection

Retrieved records were uploaded to the reference manager EndNote v20 (Clarivate Analytics, PA, USA) and duplicates

removed. Remaining records were managed within Covidence (Veritas Health Innovation, Melbourne, Australia) for title and abstract and full text screening. Title and abstract screening required agreement of two independent reviewers. Full text records were reviewed against review inclusion criteria, also with agreement required by two reviewers. Conflicts identified during the screening process were resolved through discussion between the two original reviewers and a third-party reviewer.

Data extraction

Data from included records were extracted, working in pairs, using a data extraction instrument developed for this review and based on the JBI data extraction template ([Supplementary Appendix SIII](#)). Modifications made to the JBI template included (i) country/region, (ii) aim/objectives of study, (iii) specific review objectives (legislative frameworks governing pharmacy education programmes, competency standards underpinning pharmacy practice, accreditation standards applied to pharmacy education programmes and pharmacy education and training models, (iv) study outcomes or listed themes, (v) author's general conclusions, and (vii) conflict of interest statements. Methodological quality appraisal of included records was not performed in accordance with the overall review aim which was to identify and describe existing literature on pharmacy education in sub-Saharan Africa.

Data charting and presentation

Results are presented sequentially by review objective, with findings described by narrative summary and illustratively supported with data displayed through tables, charts, and figures, e.g. pie charts, bar charts, and illustrative maps. Abbreviations used within this scoping review are presented in [Table 1](#).

Results

Search and selection

Searches identified a total 1331 records: 1300 from electronic databases and 31 from grey literature. Four hundred twenty-two records were identified as duplicates and removed. Title and abstracts of the 909 remaining records were screened against review criteria, with 623 excluded due to irrelevance. Two hundred eighty-six records progressed to full text screening, with 147 excluded due to not meeting review criteria. Citation details for the 147 records excluded at full text screening stage, along with reasons for exclusion, are provided in the [Supplementary Appendix SIV](#).

A total of 68 records were excluded due to no full text being available. These records were mainly included in collections of abstracts submitted to conferences or symposia. Sixty-six records were excluded on 'wrong/concept', i.e. they did not describe the development, implementation, or evaluation of legislative frameworks, accreditation standards, competency standards or education, and training programmes relating to pharmacy education in sub-Saharan Africa. For example, several records described one of these elements in relation to professionals other than pharmacists such as pharmaceutical technicians. Four records were excluded due to 'wrong population', as they concerned regions outside sub-Saharan Africa. Nine records were excluded due to 'lack of valuable information'. All records retrieved were in English.

Table 1. Abbreviations used within the scoping review.

Bachelor of Pharmacy (BPharm)
Continuing professional development (CPD)
Doctor of Pharmacy (PharmD)
East African Community (EAC)
Economic Community of West African States (ECOWAS)
Good Pharmacy Education Standards (GPES)
Health Professional Council of Zambia (HPCZ)
Higher Education Authority (HEA)
Higher Education Councils (HECs)
International Pharmaceutical Federation (FIP)
Joanna Briggs Institute (JBI)
Medical Subject Headings (MeSH)
National Universities Commission (NUC)
Open Science Framework (OSF)
Pharmaceutical Society of Kenya (PSK)
Pharmacy Council of Nigeria (PCN)
Philosophical Doctorate (Ph.D.)
Population, concept, context (PCC)
Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)
South African Pharmacy Council (SAPC)
Southern African Development Community (SADC)
United Nations Educational, Scientific and Cultural Organisation (UNESCO)

One hundred thirty-nine records were ultimately included in this scoping review. Citation details for all included records are detailed in the [Supplementary Appendix SV](#). Completed data extraction forms for each included record are available from <https://osf.io/75ykyz/files/osfstorage>. [Figure 1](#) illustrates the search and screening process as described above.

Records by region

The [Supplementary Appendix SVI](#) displays included records listed by region and type of evidence.

Most records ($n=117$, 84%) were specific to a single country, with 22 records involving multiple countries. These included records pertaining to multiple sub-Saharan African countries or the region as a whole, global or cross-continental records including at least one sub-Saharan Africa country, e.g. records involving Commonwealth countries, or economic sub-regions of sub-Saharan Africa, such as the East African Community (EAC).

Eighteen individual countries were represented by country-specific records, namely Angola, Benin, Botswana, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Liberia, Malawi, Namibia, Nigeria, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe. The majority related to South Africa (30, 22%), followed by Nigeria ($n=23$, 17%) and Namibia ($n=12$, 9%). [Figure 2](#) displays the number of included records by country.

Zero country-specific records were returned for the remaining 31 countries in sub-Saharan Africa, meaning 63% of countries in sub-Saharan Africa were not represented. These were namely Burkina Faso, Burundi, Cameroon, Cape Verde/Cabo Verde, Central African Republic, Chad, Comoros, Djibouti, Equatorial Guinea, Eritrea, Eswatini/Swaziland, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lesotho, Madagascar, Mali, Mauritania, Mauritius, Mozambique, Niger, Republic of Congo, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Somalia, South Sudan and Togo. However, five of these countries were mentioned as part of two global records involving multiple countries (Burundi, Cameroon, Eswatini,

Mali and Senegal) [17, 18]. [Figure 3](#) displays a representative map of sub-Saharan Africa displaying the number of included records per country.

Results by review objective

[Figure 4](#) displays the number of included records grouped by review objective [legislative frameworks governing pharmacy education programmes ($n=25$); competency standards underpinning pharmacy practice ($n=49$); accreditation standards applied to pharmacy education programmes ($n=44$); and models of pharmacy education and training programmes ($n=136$)]. The breakdown by development, implementation, and evaluation is also displayed. There was considerable overlap of review objectives across records.

Legislative frameworks governing pharmacy education

Legislative frameworks governing pharmacy education were described in the fewest included records ($n=35$, 25%). Implementation of legislative frameworks was most frequently described ($n=25$), followed by evaluation ($n=9$), while a single record described a combination of development, implementation, and evaluation. Several national bodies are responsible for regulation of pharmacy education under various legal frameworks across sub-Saharan Africa. Regulation is typically the responsibility of a combination of higher education councils (HECs), professional bodies for healthcare professionals, pharmaceutical associations, or independent councils for the pharmacy profession. Country-specific information was retrieved for six countries: Angola, Ghana, Nigeria, South Africa, Tanzania, and Zambia. The information provided on legislative frameworks governing pharmacy education in included records was typically limited, often consisting of a single sentence.

Pharmacy education within regional economic communities of sub-Saharan Africa has been well described by the International Pharmaceutical Federation (FIP) [19]. In EAC countries, responsibility for regulation of pharmacy education

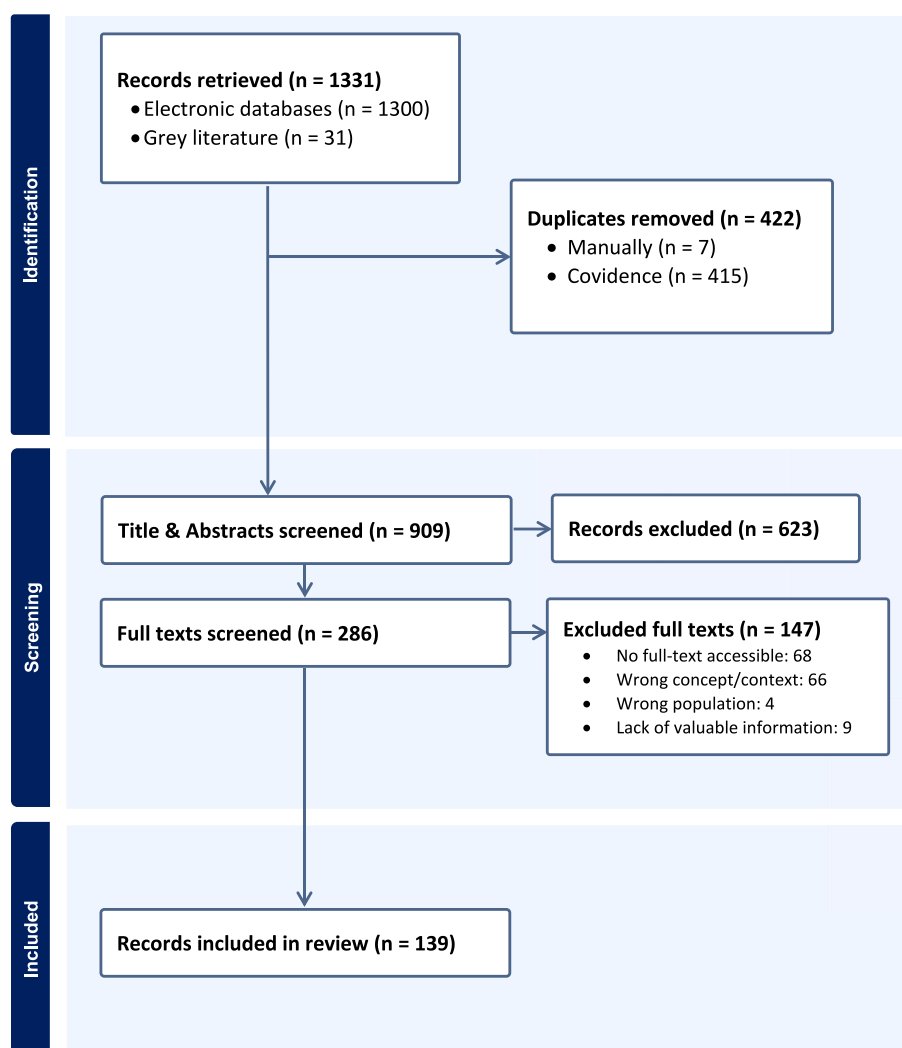


Figure 1. PRISMA diagram displaying record selection process.

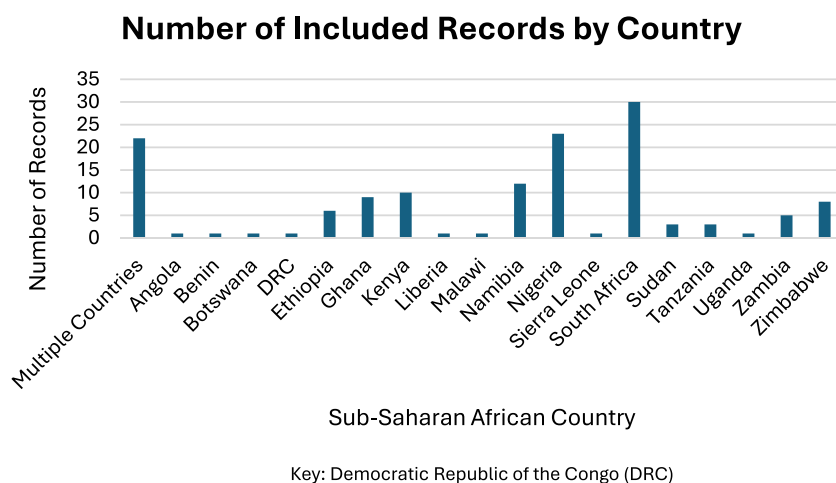


Figure 2. Bar chart displaying the number of included records by country.

is shared between professional bodies and HECs. Within the Southern African Development Community (SADC), councils for health professions and pharmaceutical associations in individual countries regulate pharmacy education and licensure of pharmacists [20, 21]. Restructuring processes have begun in some countries such as Zambia to form an independent council for the profession of pharmacy [10].

In Angola, pharmacy schools are regulated by the Ministry of Higher Education [22]. The Ghana Pharmacy Council certifies pharmacists and coordinates their training and licensing after undergraduate (BPharm) education [23]. The legal framework for education of healthcare workers in Ghana is fragmented according to the FIP; however, the introduction of the Health Workforce Observatory of the Minister of

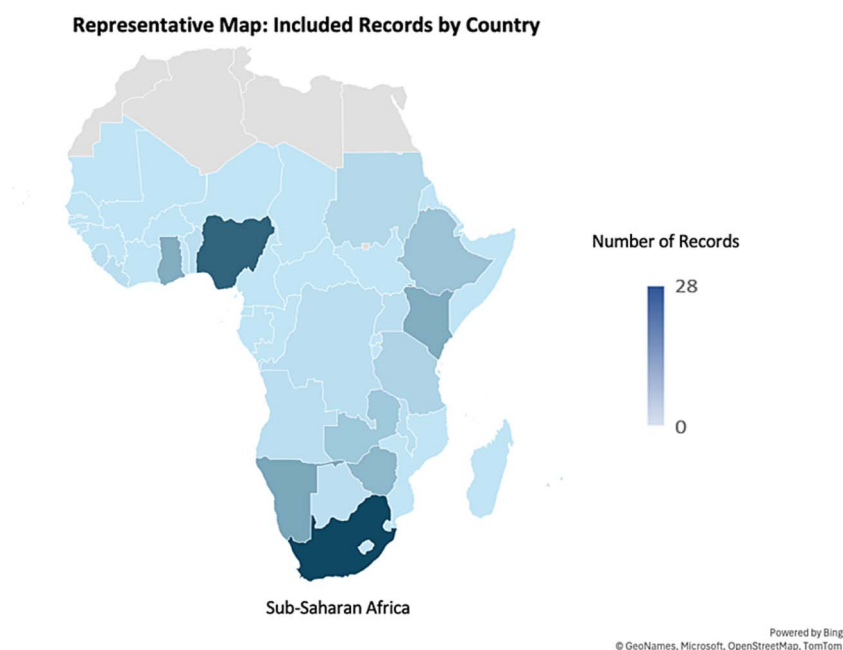


Figure 3. Representative map of sub-Saharan Africa displaying the number of records by country.

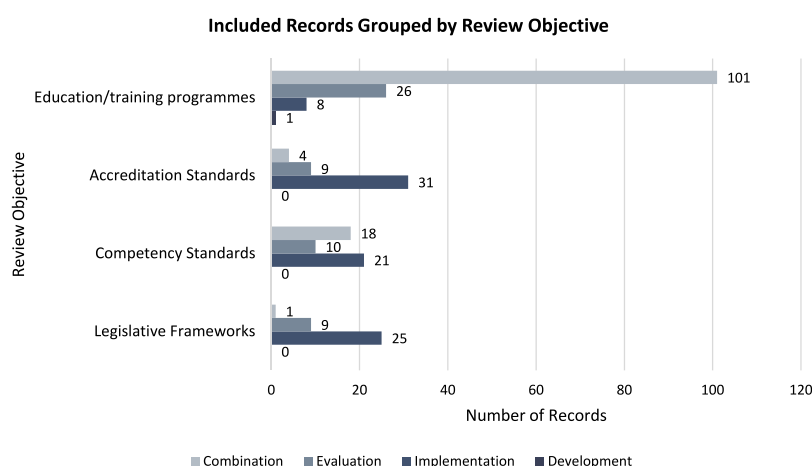


Figure 4. Bar chart displaying the number of included records grouped by review objective.

Health was intended to address this [24]. The Commission for Universities is the regulatory body for all higher education in Tanzania, which has reportedly directed higher learning institutions to transform curricula from content-based to competency-based to address the various needs of the country [24].

Pharmacy education in Nigeria is regulated by the Ministries for Health and Education [25], the National Universities Commission (NUC) (established under the federal Ministry of Education and responsible for approval of higher education institutions providing degree programmes and approval and quality assurance of university academic programmes) [26], and the Pharmacy Council of Nigeria (PCN) [27]. Established under the Pharmacists' Council of Nigeria Act, the PCN is responsible for determining standards of knowledge and skills to be obtained before registering as a pharmacist [28].

Institutions in Zambia providing professional pharmacy training and their educational programmes are regulated by the Higher Education Authority [29] and the Health

Professional Council of Zambia (HPCZ) [30], which is also responsible for regulation of CPD for all health practitioners [31]. Pharmacy education in South Africa is governed by the Pharmacy Act (53 of 1974), which designates the South African Pharmacy Council (SAPC) as the Regulator [20]. The SAPC has published Good Pharmacy Education Standards for pharmacy higher education, which stipulate formal requirements for pharmacy curricula [21]. Completion of CPD activity for pharmacists was made a legal requirement in 2020 under a Board Notice by the SAPC [32, 33].

Competency standards underpinning pharmacy practice

Competency standards underpinning pharmacy practice were described in 35% of included records ($n = 49$). Implementation was described in 21 records, evaluation in 10, and a combination of development, implementation, or evaluation in 18 records. Prescribed core competencies or graduate-level outcomes underpinning design of pharmacy curricula were described for several countries, including Nigeria [28] and

South Africa [20]. Standards of knowledge and skills to be obtained by pharmacists are determined by the Pharmacy Board of Sierra Leone [34]. In 2017, Doctor of Pharmacy (PharmD) was mandated for all universities as the minimum level of competency for future pharmacists by the PCN [35].

Competency standards have been developed in some sub-Saharan countries based on guidelines such as the FIP Global Competency Framework, FIP Sustainable Development Goals, country-specific workforce capacity and healthcare needs, and through collaboration with other national pharmacy bodies or schools of pharmacy internationally [10, 36]. The FIP describes national competency standards or frameworks in place or in development in countries including Malawi, Namibia, Zambia, Zimbabwe, Ghana and Kenya [10, 19]; however, authors of a 2021 global systematic review evaluating pharmacy-related competency frameworks were unable to locate such frameworks for Ghana or Zimbabwe [37]. The Pharmaceutical Society of Kenya has published a Code of Ethics for pharmacists which includes both a general pharmacist competency framework and a specific community pharmacist competency framework [38]. The scoping review identified actual published competency standards or frameworks for South Africa [39] and Kenya [38] only.

Accreditation standards applied to pharmacy education programmes

Accreditation standards applied to pharmacy education were described in 32% of included records ($n=44$). Implementation of these was by far the most frequently described ($n=31$), with evaluation described by nine records and a combination of development, implementation, or evaluation by four records. In general, details of accreditation standards were limited to listing the relevant accrediting bodies, with little detail provided on specific criteria within standards. In EAC countries, university curricula must be established based on the relevant HEC's guidelines for curriculum development. Educational programmes are also accredited by pharmaceutical regulatory bodies in some countries. Within the SADC, individual countries have both pharmaceutical associations and councils for health professions which regulate pharmacy education.

Accreditation bodies and processes for pharmacy education programmes and institutions are briefly outlined for countries including Ghana (National Accreditation Board, Ghana Pharmacy Council, Ministries of Health and Education) [10, 23], Kenya (Commission for University Education, Pharmacy and Poisons Board) [10, 40], Malawi (Ministries of Health and Education) [10], Namibia (National Council for Higher Education, Pharmacy Council of Namibia and Namibia Qualifications Authority) [10], Nigeria (Ministry of Education, Professional Regulatory Body, NUC) [10], Tanzania (Pharmacy Commission for Universities) [10, 41], Uganda (National Professional Organizations, Ministry of Education) [10], and Zambia (Higher Education Authority [HEA] and HPCZ) [10, 29].

According to a 2016 commentary, no accreditation standards or guidelines for pharmacy education exist in Angola; however, the National Association of Pharmacists (also known as *Ordem dos Farmacêuticos de Angola*) has responsibilities for updating knowledge of pharmacy professionals on pharmacy practice topics and organization

of educational programmes such as internships and postgraduate courses [22]. A harmonized PharmD curriculum developed for the Economic Community of West African States (ECOWAS) specifies that programmes should be evaluated and accredited by the relevant national or regional regulatory bodies; however, full details of accreditation criteria are not specified [42]. CPD programmes are also accredited by national pharmacy bodies in many countries, e.g. the PCN in Nigeria [35] and South Africa's SAPC [43].

Models of pharmacy education and training programmes

Models of pharmacy education and training programmes were described by almost all included records ($n=136$, 98%). The vast majority described a combination of development, implementation, and evaluation ($n=101$), while 26 solely concerned evaluation, eight solely implementation, and one record described development alone.

Undergraduate pharmacy education

Historical development of pharmacy education for specific sub-Saharan African countries was well described. Across sub-Saharan Africa, the Bachelor of Pharmacy (BPharm) degree is currently the most common requirement to register as a pharmacist; however, the PharmD model is being adapted in some countries. Details of BPharm programmes were described for Angola [22], Ethiopia [44, 45], Ghana [19, 46], Kenya [47], Liberia [48], Namibia, Nigeria [26, 49] South Africa [50, 51], Tanzania [52], Zambia [29, 30], and Zimbabwe [53]. BPharm duration varies from 4 to 6 years and typically combines pharmaceutical sciences, experiential learning including practical clinical experience, and research. In most sub-Saharan African countries, the BPharm is followed by a 1-year internship, with some countries, e.g. South Africa, requiring a further year of mandatory community service in an under-resourced area [10].

PharmD is offered mainly in francophone countries [10], and varying stages of PharmD development and implementation were described for Ghana [19], South Africa [51], Nigeria [49], and Zambia [29].

Trends towards reform and developments of undergraduate curricula were also evident, including a shift towards integrating clinical pharmacy practice skills, experiential learning, and modernized teaching and learning methods such as case-based [54], problem-based, and team-based learning into curricula. In the ECOWAS region, harmonization efforts have taken place in response to variation in the scope, standards, and emphasis of pharmacy education and training, lack of common basic competencies, and differing standards of pharmacy practice. A harmonized curriculum for undergraduate pharmacy training using a 6-year PharmD model designed for regional integration was published in 2015 [42].

Postgraduate pharmacy education at university level

Most pharmacy schools across sub-Saharan Africa offer postgraduate education to the level of Masters or Ph.D. in various fields [10], with some countries having recognized pathways to advanced pharmacy practice or specialization for pharmacists in fields such as clinical pharmacy, industrial and regulatory practice, and veterinary pharmacy [36]. Such postgraduate programmes were described for Ethiopia, Ghana,

Kenya, Namibia, South Africa, Tanzania, Zambia, and Zimbabwe [10]. Postgraduate programmes have commonly been developed through international collaboration with schools of pharmacy with relevant expertise and experience of postgraduate programme delivery, such as in Ethiopia [36] Ghana [55], Namibia [56], and South Africa [51]. Clinical pharmacy is a major focus of pharmacy education in sub-Saharan Africa in recent years in line with international changes in pharmacy practice [28]. In terms of advancing clinical pharmacy practice and capacity, pre-registration internship programmes and postgraduate diploma programmes are in place, such as in Kenya [19]. International collaborations with schools of pharmacy (predominantly USA based) to provide international pharmacy practice placements or rotations at undergraduate level and postgraduate level were also described and evaluated [47, 57].

Programmes for qualified pharmacists and continuing professional development

Mandatory participation in CPD activity for pharmacists was described for Ghana [58], Kenya [59], Nigeria [36], South Africa [32], Zambia [31], and Zimbabwe [53], with several using an annual points-based system. The Ethiopian CPD system is reportedly under development at the time of this review [60]. A 2018 survey demonstrated that community pharmacists engage with, and have good attitudes towards, CPD, particularly workshops, but desire more CPD opportunities and support [60]. A survey including Ghanaian pharmacists reported a wide variety of role-specific CPD programmes [58]. A Commonwealth analysis pointed to low pharmacist CPD participation rates in Nigeria [36], while several South African records describe challenges and barriers to CPD including time constraints and a challenging online recording system [33]. Support for specific, relevant CPD programmes addressing modern practice needs was high among surveyed pharmacists in Zambia, with preference for conferences/symposia and interactive workshops and didactic lectures least preferred [31]. A wide variety of education and training programmes for practicing pharmacists in diverse practice areas were described in included records. These were mainly focused on clinical topics, e.g. antimicrobial stewardship [61], family planning [62], infectious diseases such as human immunodeficiency virus /acquired immunodeficiency syndrome [47], and renal disease [59] but also areas like communication skills [63] and supply chain management [48].

Types of evidence

Types of evidence sources included in this scoping review varied widely, with some overlap within categories. The majority of included records were reviews ($n=25$), with multiple types including desktop and literature review. Only one systematic review was included which was a global study concerning pharmacy-related competency frameworks. Cross-sectional studies ($n=22$), reports ($n=20$), descriptive studies ($n=15$), commentaries/editorials ($n=14$), case studies ($n=11$), interventional studies ($n=7$), and mixed-methods studies ($n=6$) were retrieved. A further category containing types of evidence appearing least frequently was referred to as 'other' ($n=19$). From database searches, 'other' record types included randomized controlled trial ($n=1$), prospective study ($n=2$), qualitative study ($n=5$), pilot study ($n=1$), longitudinal cohort study ($n=1$), evaluation ($n=2$), concept paper ($n=1$), scoping visit ($n=1$), and two records whose

methods could not be defined but were described by the authors as 'research article' and 'project'. From grey literature searches, 'other' record types consisted of case report ($n=1$), competency standards ($n=1$), code of ethics ($n=1$), and evaluation ($n=1$). Figure 5 displays a breakdown of included records by evidence type.

Discussion

Regional distribution of literature

The uneven distribution of literature describing pharmacy education across sub-Saharan Africa demonstrates that pharmacy educational models, standards, and pharmacy practice have been developed, implemented, and evaluated to varying degrees between countries. This reflects differences in both health and education system evolution across the region, in part due to unique and complex historical, political, and economic development of each country. Legislative frameworks governing pharmacy education, competency standards underpinning pharmacy practice, accreditation standards applied to pharmacy education programmes, and models of pharmacy education and training programmes were well described for certain countries such as South Africa and Nigeria. However, large information gaps were evident as 63% ($n=31$) of sub-Saharan countries were not represented by country-specific records included in this scoping review and seven countries returned only one record each. Further research is needed to determine the current landscape of pharmacy education in these areas. A more focused information gathering exercise tailored to underrepresented countries to identify information that may not be accessible through conventional literature searches may be warranted, e.g. through engagement with national pharmacy representative bodies, pharmacy regulators, or local and global pharmacy education networks. A comprehensive mapping of pharmacy education models and standards in the region will serve to highlight the development already undertaken in some countries, with the need for other countries to better align with global pharmacy practice standards.

Legislative frameworks governing pharmacy education programmes

Legislative frameworks governing pharmacy education programmes were described by less than a third of included records, and information was limited to implementation. Legislative frameworks differ across regions of sub-Saharan Africa, with numerous national bodies responsible for regulation of pharmacy education and training. Detail on how such legislative frameworks were developed is lacking.

Competency standards underpinning pharmacy practice

Competency standards underpinning pharmacy practice were described in just over one-third of included records. Evidence of the development of national and regional competency standards and frameworks in line with guidance from global pharmacy organizations such as the FIP is promising in terms of the modernization of pharmacy practice in sub-Saharan Africa; however, the lack of information for many countries within this region is concerning. According to a global 2021 systematic review of pharmacy-related competency frameworks [37], pharmacy practice framework development requires scale-up

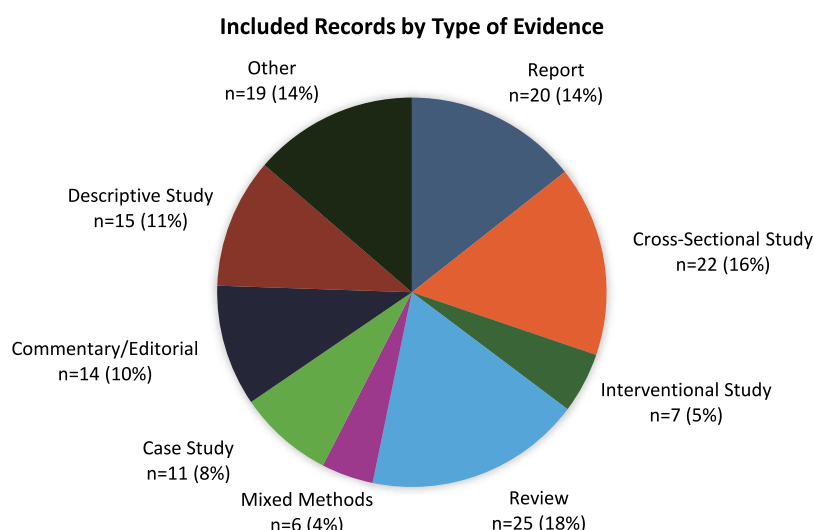


Figure 5. Pie chart displaying the number of included records by type of evidence.

in Africa. To align pharmacy education and training with advancing pharmacist roles and clinical practice globally, competency standards reflecting the requirements of modern pharmacy practice are needed in all regions.

Accreditation standards applied to pharmacy education programmes

Less than one-third of included records contained information on the development, implementation, or evaluation of accreditation standards, and data were almost completely limited to implementation. Again, the lack of data for a large proportion of sub-Saharan countries and reports of a lack of national standards for pharmacy education in one country (Angola) are not optimal. Development of pharmacy education and training programmes must be underpinned by robust and well-enforced accreditation standards for educational institutions and programmes to ensure the quality of graduates produced is adequate to meet the healthcare needs of the region.

Models of pharmacy education and training

Development, implementation, and evaluation of models of pharmacy education and training were found to be well described across sub-Saharan Africa across almost all included records. BPharm is the typical pharmacy educational qualification model at undergraduate level, with variations in structure, duration, and content of programmes across countries. Some regional efforts to harmonize curricula with a move towards PharmD models in some countries is reflective of global trends towards advanced pharmacy practice. Postgraduate pharmacy education has been initiated in recent decades and has expanded to Masters and Ph.D. programmes being provided by multiple sub-Saharan countries. Introduction of mandatory CPD activity for all pharmacists in several countries is also promising and supports the need for life-long learning for pharmacists as practitioners in the ever-evolving healthcare field; however, efforts to ensure CPD is carried out across all countries are needed to ensure consistently high quality of pharmaceutical care and practice across the region. The move toward advanced pharmacy practice globally, such as the adoption of PharmD programs, presents an opportunity for sub-Saharan African countries to align pharmacy education and training with these trends. Strengthening regional

and international collaborations could facilitate knowledge sharing and capacity building in this regard as has happened in other healthcare areas [64].

Types of evidence

A broad body of evidence types were retrieved as part of this review. As this was a scoping review, no methodological quality appraisal was carried out for included records. However, a high proportion of commentary/editorial type records (10%) and non-systematic review methodologies may suggest a lack of robustness for certain records. This informs the need for further systematic reviews on this subject to allow for a robust and scientific analysis and evaluation of pharmacy education in the region which will allow comparison with the global picture.

Strengths and limitations

This review provides comprehensive insight into the development, evaluation, and implementation of pharmacy education across many countries in sub-Saharan Africa in terms of legislative frameworks governing pharmacy education programmes, competency standards underpinning pharmacy practice, accreditation standards applied to pharmacy education programmes, and models of pharmacy education and training programmes. Significant gaps in the literature relating to a majority of sub-Saharan countries are also highlighted. Adherence to methodological guidance for the conduct of scoping reviews ensured a rigorous review process, and a comprehensive search strategy was employed as described in the scoping review protocol [31].

Restricted grey literature searches were a potential limitation of the review as screening was restricted to the first 20 results returned for each search term, without allowing for systematic bibliography searching or further sequential searches. Some included records pointed to the existence of other records which may have been pertinent to this review, particularly in terms of competency standards. For example, a 2017 FIP global report on pharmaceutical education and the workforce [19] referred to professional competency statements for entry level pharmacy license applicants in Zimbabwe. A more forensic grey literature search process to locate and screen such records may have increased robustness of the review process.

Database and grey literature searches were restricted at the screening and inclusion stage to records published in English; however, some included records pointed to the existence of papers in other languages which may have been relevant, e.g. a 2016 commentary [22] referred to a Cape Verde Bachelor of Pharmacy curriculum but its bibliographical references were reported in Portuguese. Expanding search parameters to include records published in other major languages of sub-Saharan Africa may have retrieved a wider pool of records.

Conclusion

This scoping review comprehensively maps the existing white and grey literature describing the development, implementation, and evaluation of pharmacy education across sub-Saharan Africa. Models of pharmacy education and training are well described for many countries across the region, particularly South Africa and Nigeria, with less comprehensive detail available for legislative frameworks governing pharmacy education, competency standards underpinning pharmacy practice, and accreditation standards applied to pharmacy education programmes. However, there is a paucity of information on the development, implementation, and evaluation of pharmacy education and training for over 60% of sub-Saharan countries. Further research should focus on regions not represented in this review using alternative methodology, e.g. through engagement with national and international pharmacy representative organizations and networks with the necessary country-specific knowledge and experience. Finally, there is a need for future systematic reviews to assess the quality of literature available and draw conclusions around the quality and effectiveness of pharmacy education in sub-Saharan Africa to produce an adequate pharmacy workforce and inform future practice and educational development needs.

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Author contributions

All authors contributed to the conception and design of the study. Search strings were developed and conducted by F.C., C.D., G.H., L.M., A.S., C.R., V.S., and T.R. Screening, data extraction, analysis and production of all figures and tables was undertaken by F.C., C.D., G.H., L.M., and A.S. A.S. drafted the article, and all authors contributed to re-drafting and revising critically. All authors gave final approval for publication. The authors have no conflicts of interest to declare.

Supplementary data

Supplementary data is available at *International Journal of Pharmacy Practice* online.

Conflict of interest

None declared.

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Research ethics committee approval

Research ethics approval was not required for this scoping review as no use or participation of animal or human subjects or processing of personal data was involved.

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