

SYSTEMATIC REVIEW OPEN ACCESS

Who Funds Research in Ghana? A Scoping Review of Published Articles in the Last Decade

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ABSTRACT

Background: Research and innovation are crucial drivers of economic and social development in any country. However, the sources and allocation of research funding can significantly impact the priorities, quality, and impact of the research conducted. This scoping review aims to map and characterize research funding sources in Ghana over the last decade.

Methods: A systematic search of the literature was conducted using electronic databases such as PubMed, Scopus, Web of Science, and Google Scholar. Relevant studies published between January 2014 and March 2024 were included, and data on the funding sources for research projects in Ghana were extracted and analyzed.

Results: The search identified 246 relevant studies. The research funding landscape in Ghana is characterized by diverse funding sources. Of the total included studies, the most frequently acknowledged funders were the Bill and Melinda Gates Foundation (4.4% of studies), the United States Agency for International Development (3.6%), and the National Institutes of Health (3.3%). Funding supported research across multiple sectors, including health, agriculture, education, environmental sustainability, and social development.

Conclusion: The findings of this scoping review demonstrate that research funding in Ghana is multifaceted, with a mix of international, national, and local sources. However, the heavy reliance on international donors suggests a need for strengthened domestic funding mechanisms to ensure alignment with national priorities.

1 | Introduction

Research and innovation are widely recognized as critical drivers of economic and social development in any country [1]. The ability to generate new knowledge, develop innovative solutions, and translate research findings into practical applications can have far-reaching impacts on a nation's competitiveness, quality of life, and sustainable progress [2, 3]. In the context of Ghana, a lower-middle-income country in West Africa, the role of research funding and its allocation has become an increasingly important topic of discussion and analysis [4, 5].

Historically, Ghana has made significant strides in promoting a vibrant research ecosystem, with the establishment of various

academic and research institutions, as well as the implementation of policies and strategies aimed at fostering a culture of research and innovation [6, 7]. However, the availability and sources of research funding have been a persistent challenge as the country navigates competing priorities and limited resources [4, 8]. Understanding the landscape of research funding in Ghana is crucial, as it can provide insights into research priorities, the alignment between funding and national development goals, and the potential gaps or imbalances that may exist.

This scoping review aims to map and characterize research funding sources in Ghana over the last decade. By synthesizing the available literature, the review seeks to identify the diverse

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sources of research funding, the thematic areas and sectors that receive the most support, and the emerging trends or shifts in the funding landscape over time. Such an understanding can inform policymakers, research institutions, and other stakeholders in Ghana as they work to strengthen the research ecosystem and enhance the impact of research on national development.

2 | Methodology

This scoping review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for scoping reviews (PRISMA-ScR) guidelines [9] to ensure a thorough and transparent analysis of the research funding landscape in Ghana. The review protocol was registered with the Open Science Framework (OSF) and can be accessed at <https://doi.org/10.17605/OSF.IO/TPUK5>.

2.1 | Definition of Funding Data and Literature Search Strategy

Unlike high-income countries with centralized grant databases such as the National Institutes of Health (NIH) RePORTER system in the United States, Ghana currently lacks a unified, publicly accessible database of research grants awarded by government and private sector institutions. Therefore, this review utilizes funding acknowledgements in peer-reviewed literature as a proxy for research funding. While this approach focuses on realized research outputs rather than initial grant allocations, it provides the most verifiable metric of the active research funding landscape in Ghana [10].

A comprehensive search of the literature was conducted across the electronic databases including PubMed, Scopus, Web of Science, and Google Scholar. The search terms used were ((“research funding” OR “research grant*” OR “funding agency” OR “funding source” OR “funding organisation”) AND (“Ghana” OR “Ghanaian”)) AND ((“research” OR “science” OR “technology” OR “innovation”) AND (“policy” OR “strategy” OR “governance” OR “capacity” OR “infrastructure”)). In addition to the database searches, the reference lists of the included studies and relevant review articles were manually scanned to identify any additional eligible studies.

2.2 | Study Selection

The eligibility for the inclusion of studies was determined by two independent reviewers who screened the titles/abstracts and full text of the identified records. Studies were included based on the following criteria:

1. The study was conducted in Ghana (defined by the study site being located in Ghana and/or the primary author affiliation being a Ghanaian institution).
2. The study explicitly acknowledged a funding agency, organization, or grant number.
3. The study was published between January 2014 and March 2024. This period was chosen to capture the most recent decade of funding trends following major global health policy shifts (e.g., SDGs).

Discrepancies among the reviewers were addressed through discussion and consensus.

2.3 | Data Extraction and Thematic Analysis

A standardized data extraction form was created to gather the following details from the included studies:

1. Bibliographic details (author, year of publication).
2. Funding agency or organization details (name of funding agency/organization, grant number).

The extracted data were synthesized narratively, with a focus on identifying the key funding agencies and organizations, their research priorities, and any notable trends or patterns in the research funding landscape in Ghana. Sectoral priorities and thematic areas were categorized through a manual qualitative content analysis of the study titles, abstracts, and author-provided keywords. Discrepancies in thematic classification were resolved through consensus between reviewers.

2.4 | Quality Assessment

To evaluate the reporting quality of the included studies, we utilized the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist [11]. The STROBE checklist comprises 22 items designed to enhance the transparency and completeness of research across key sections, including the title, abstract, introduction, methods, results, discussion, and funding. This tool was used strictly to assess reporting completeness rather than to measure methodological quality or to serve as a criterion for study exclusion. All included studies (246/246, 100%) met the criterion for Funding Acknowledgement (Item 22), as this was a mandatory prerequisite for study inclusion (Table S3 and S4).

3 | Results

3.1 | Search Results

The systematic literature search identified 1073 records, of which 246 studies were deemed eligible for inclusion in the review (Figure 1 and Table S1). These studies reported on various research projects and initiatives funded in Ghana between January 2014 and March 2024.

3.2 | Trends and Patterns in Research Funding

Figure 2 provides a chronological overview of the number of funded studies in Ghana from 2014 to 2024. The data show a steady increase in the number of funded studies over the years, with a significant jump in 2018 and a peak in 2023, where 39 studies were funded. While this increase suggests growing research activity, it must be interpreted with caution. This trend likely reflects a combination of increased funding availability and the general global increase in scientific publication volume during this period. Additionally, improved adherence to journal policies requiring explicit funding statements may contribute to the higher visibility of funders in recent years. Nevertheless, the consistent presence of funded

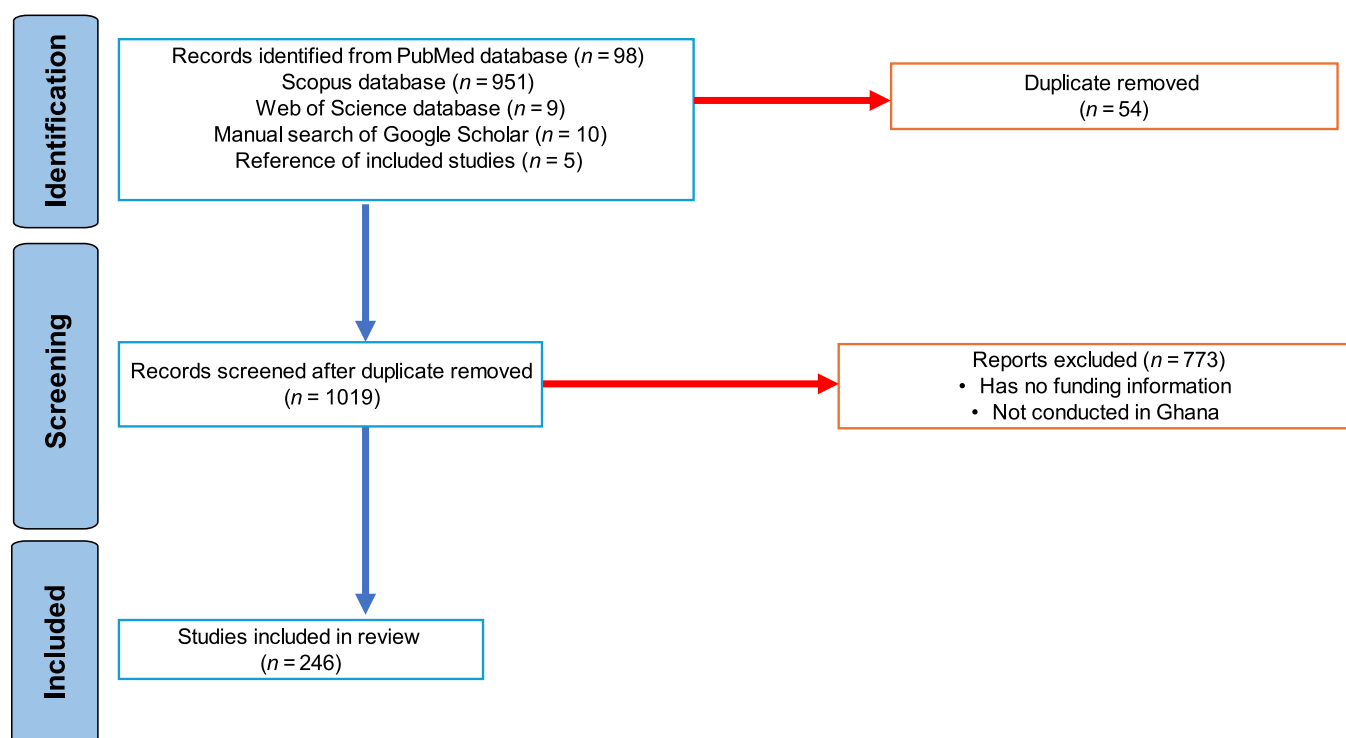


FIGURE 1 | PRISMA flow diagram showing the study selection process.

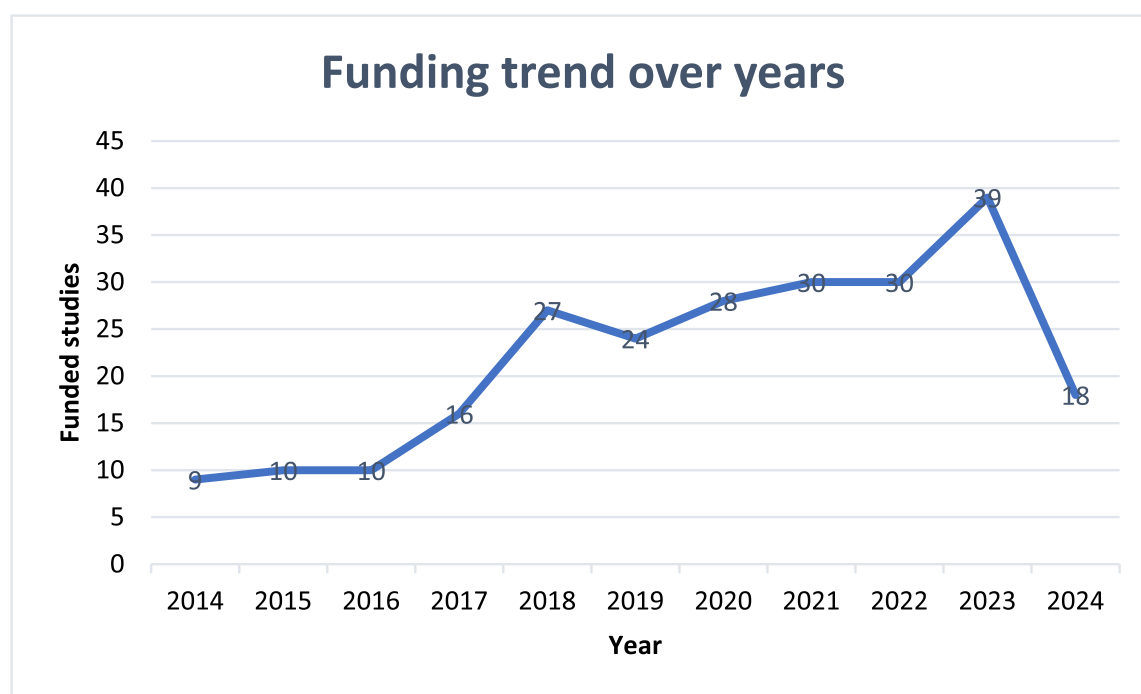


FIGURE 2 | Trends and patterns in the research funding landscape in Ghana.

outputs indicates a sustained commitment from various stakeholders to support scientific development in Ghana.

3.3 | Key Funding Agencies and Organizations

The analysis of the included studies revealed that the funding landscape is highly fragmented (Figure 3 and Table S2). Table 1

provides an overview of the key funders of research in Ghana, including their organization type, the number of studies they have funded, and the proportion of the total research output they have supported. However, the majority of the landscape consists of single-instance grants from hundreds of smaller entities. The data show that the largest funder of research in Ghana is the Bill and Melinda Gates Foundation, a philanthropic organization that has funded 16 studies, accounting for 4.4% of the total research output.

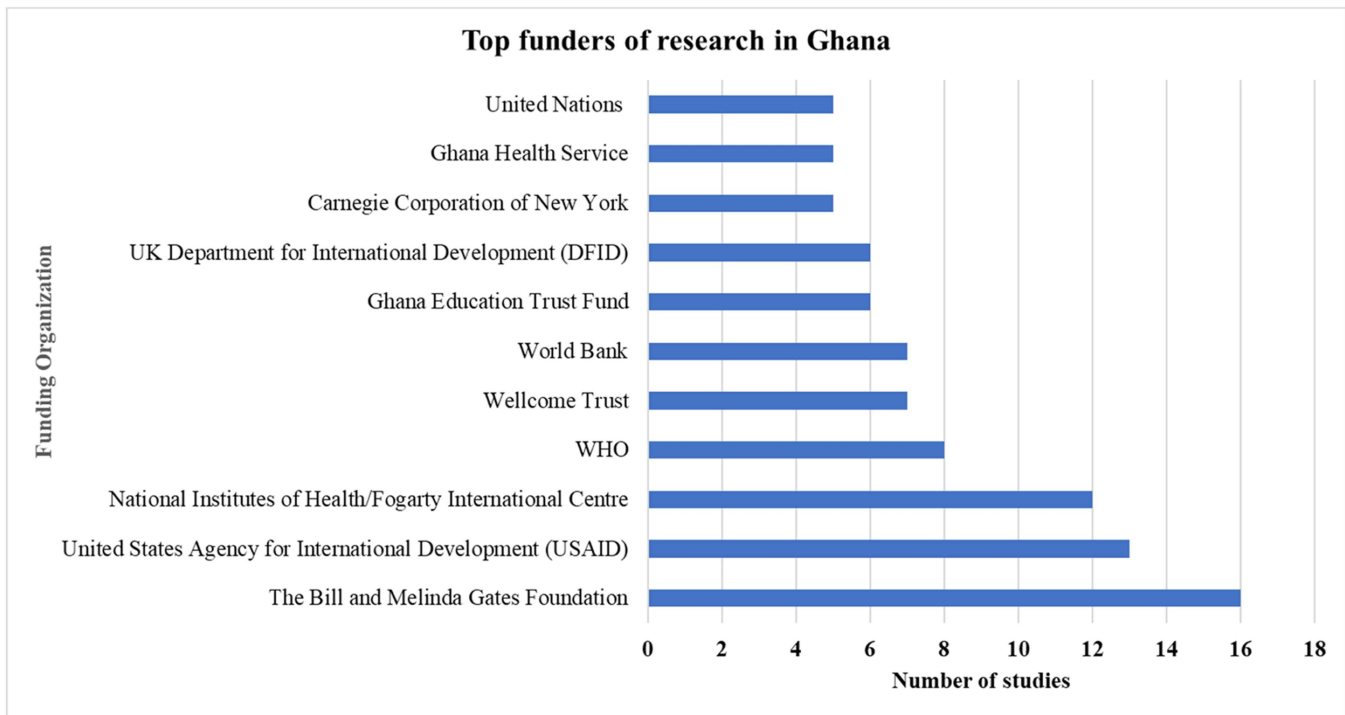


FIGURE 3 | Frequency of studies supported by major funding organizations.

TABLE 1 | Top identified funders.

Funder	Organization type	Funded studies	Proportion (%)
The Bill and Melinda Gates Foundation	Philanthropic	16	4.4
United States Agency for International Development (USAID)	International	13	3.6
National Institutes of Health/Fogarty International Centre	Governmental	12	3.3
WHO	International	8	2.2
Wellcome Trust	Philanthropic	7	1.9
World Bank	International	7	1.9
Ghana Education Trust Fund	Governmental	6	1.6
UK Department for International Development (DFID)	International	6	1.6
Carnegie Corporation of New York	Philanthropic	5	1.4
Ghana Health Service	Governmental	5	1.4
United Nations	International	5	1.4
Others/combined sources	Mixed	274	75.3

This was followed by the international organization, the United States Agency for International Development (USAID), and the governmental organization, the National Institutes of Health/Fogarty International Centre. Table 1 also includes Ghanaian governmental funding sources, such as the Ghana Education Trust (GETFund) Fund and the Ghana Health Service, which have funded six and five studies, respectively, accounting for 1.6% and 1.4% of the total research output.

3.4 | Thematic Areas and Sectoral Priorities

The research projects supported by these funding agencies and organizations spanned a diverse range of thematic areas and

sectors, with some funders focusing on health, agriculture, education, and social sciences, while others prioritize development, environment, infrastructure, and humanitarian issues (Table 2).

3.5 | Navigating the Funding Landscape for Research in Ghana

The funding landscape in Ghana presents a complex mix of opportunities and structural challenges. Table 3 presents a comprehensive overview of the funding sources that highlight the diverse landscape in Ghana, with each source offering unique advantages and challenges. Policymakers and research

TABLE 2 | Thematic areas and sectors funded.

Funder	Sectoral priorities	Thematic areas
The Bill and Melinda Gates Foundation	Health, agriculture, education, and social sciences	Training and capacity building, educational technology and innovation, and vocational and technical education
United States Agency for International Development (USAID)	Development, environment, infrastructure, and humanitarian issues	Agricultural productivity and innovation, natural resource management, climate change adaptation and mitigation, water, sanitation, and hygiene (WASH), poverty alleviation and livelihood improvement, gender equality and women's empowerment
National Institutes of Health/Fogarty International Centre	Biomedical research, education, science and technology, and public health	Communicable diseases (e.g., malaria, HIV/AIDS, and tuberculosis), noncommunicable diseases (e.g., cardiovascular diseases, and cancer), maternal and child health, nutrition and food security, mental health, and health systems and policy
WHO	Development, environment, infrastructure, and humanitarian issues	Agricultural productivity and innovation, natural resource management, climate change adaptation and mitigation, water, sanitation, and hygiene (WASH), poverty alleviation and livelihood improvement, gender equality and women's empowerment
Wellcome Trust	Health, agriculture, education, and social sciences	Training and capacity building, educational technology and innovation, and vocational and technical education
World Bank	Development, environment, infrastructure, and humanitarian issues	Agricultural productivity and innovation, natural resource management, climate change adaptation and mitigation, water, sanitation, and hygiene (WASH), poverty alleviation and livelihood improvement, gender equality and women's empowerment
Ghana Education Trust Fund	Biomedical research, education, science and technology, and public health	Communicable diseases (e.g., malaria, HIV/AIDS, and tuberculosis), noncommunicable diseases (e.g., cardiovascular diseases, and cancer), maternal and child health, nutrition and food security, mental health, and health systems and policy
UK Department for International Development (DFID)	Development, environment, infrastructure, and humanitarian issues	Agricultural productivity and innovation, natural resource management, climate change adaptation and mitigation, water, sanitation, and hygiene (WASH), poverty alleviation and livelihood improvement, gender equality and women's empowerment
Carnegie Corporation of New York	Health, agriculture, education, and social sciences	Training and capacity building, educational technology and innovation, and vocational and technical education
Ghana Health Service	Biomedical research, education, science and technology, and public health	Communicable diseases (e.g., malaria, HIV/AIDS, and tuberculosis), noncommunicable diseases (e.g., cardiovascular diseases, and cancer), maternal and child health, nutrition and food security, mental health, and health systems and policy
United Nations	Development, environment, infrastructure, and humanitarian issues	Agricultural productivity and innovation, natural resource management, climate change adaptation and mitigation, water, sanitation, and hygiene (WASH), poverty alleviation and livelihood improvement, gender equality and women's empowerment

institutions should consider these factors when developing funding strategies, fostering multistakeholder collaboration, and ensuring the alignment of research priorities with national development goals.

3.5.1 | Governmental Funding

Domestic funding, such as that from the GETFund, is theoretically ideal as it aligns closely with national priorities and

TABLE 3 | Overview of the key funding sources for research in Ghana, with their respective examples, strengths, and weaknesses.

Funding source	Examples	Strengths	Weaknesses
Government	Ghana Health Service, Ghana Education Trust Fund	Foundation for national research and alignment with national priorities	Limited funding, inconsistent release of funds, uneven allocation, and potential for political influence
International organizations	USAID, WHO, and the Bill & Melinda Gates Foundation	Significant funding, capacity building, international collaboration, and expertise	Influence on research priorities, conditions attached to funding, potential for donor dependency, and misalignment with national needs
Private sector	Pfizer, Volkswagen Foundation, Novartis	Potential for commercialization of research, increased funding, and industry expertise	Limited current involvement, need for incentives and mechanisms to encourage participation, and potential conflicts of interest
Individual researchers	Self-funding, grants	Researcher autonomy, pursuit of specific research agendas, and flexibility	Limited funding, constraints on project scope, highly competitive grant landscape, and time burden of grant writing

fosters local ownership. However, in practice, this source is often constrained by budgetary limitations and administrative delays. As noted in previous reviews of public expenditure, the inconsistent release of funds and potential for uneven allocation can hinder the continuity of long-term research projects.

3.5.2 | International Organizations

International donors (e.g., USAID, WHO) provide the bulk of high-value research support, bringing expertise and capacity-building opportunities. However, heavy reliance on these sources introduces significant risks. Chanase [12] highlights that donor-driven agendas may lead to “mission creep,” where local researchers divert attention to areas preferred by funders rather than pressing domestic needs. Furthermore, the conditions attached to external grants often limit the autonomy of local institutions.

3.5.3 | Private Sector and Industry

Currently, private sector involvement (e.g., Pfizer, Novartis) is limited compared to public sources. However, this sector holds potential for the commercialization of research and technology transfer. Strengthening industry-academia partnerships could diversify the funding pool, reducing reliance on volatile government or donor funds, provided that conflicts of interest are managed transparently.

3.5.4 | Individual and Self-Funding

A significant portion of Ghanaian research likely relies on self-funding or small internal grants, though these are often under-reported in funding acknowledgments. While this demonstrates researcher resilience, the lack of substantial financial backing limits project scope and contributes to the low productivity challenges observed in similar African academic contexts.

4 | Discussion

This scoping review presents a comprehensive analysis of the key funding agencies and organizations supporting research activities in Ghana. When contextualized within the broader sub-Saharan African landscape, Ghana's funding profile reveals distinct structural differences compared to its regional peers. While donor dependency is a shared characteristic across most low- and middle-income countries (LMICs), the composition of this support varies significantly. For instance, our review identified a heavy reliance on global philanthropic entities like the Bill & Melinda Gates Foundation. In contrast, Nigeria exhibits a more robust domestic philanthropic ecosystem, driven by high net-worth individuals and corporate foundations [13], which play a larger role in local funding than is currently observed in Ghana. While international funding is undeniably crucial for research capacity building and the advancement of knowledge in Ghana, it is essential to acknowledge the potential for donor agency influence to shape research priorities. This influence can subtly, or sometimes overtly, divert attention away from domestically relevant issues that may not align with the priorities of donor agencies [12]. The conditions frequently attached to funding, such as specific research protocols or reporting requirements, can also limit the autonomy of researchers and institutions, potentially hindering their ability to pursue research agendas that are genuinely aligned with national needs [12]. This misalignment often manifests as “mission creep,” where research agendas are shaped by the strategic interests of donors rather than the epidemiological burden of the host country [14]. A clear example of this divergence is the heavy donor emphasis on Global Health Security and specific infectious diseases (e.g., malaria, HIV, and emerging zoonoses), which align with global biosecurity interests [15–17]. In contrast, Ghana faces a rapidly rising burden of noncommunicable diseases, such as hypertension and diabetes [18, 19], which historically attract significantly less external funding than infectious diseases.

To address this, Ghana requires a strategic shift toward co-funding models where international grants are matched with

domestic commitment. Actionable steps could include the operationalization of a National Research Fund (NRF) with a statutory mandate to ring-fence tax revenue for research, reducing the volatility associated with external donor cycles. Recent analysis by Aikins et al. [20] highlights the importance of building robust local research networks in Commonwealth nations to facilitate resource acquisition and knowledge exchange. Especially given the volatility of global health funding and shifting political landscapes in major donor nations (e.g., the United States), a self-sustaining ecosystem built on strong local collaborations is essential for resilience. Our findings support this need, as fragmented funding sources currently hinder the formation of cohesive, long-term research programs.

Furthermore, regarding governmental commitment, our review identifies the presence of national funding mechanisms, such as the GETFund and the Ghana Health Service. This suggests a commitment to building domestic research capacity and aligning research priorities with Ghana's national development goals. The Ghanaian government, theoretically, plays a foundational role in funding research, providing the bedrock upon which a robust research infrastructure should be built. However, the reality is often far more nuanced, with government contributions frequently limited by budgetary constraints and competing national priorities. The inconsistent release of government subventions and delays in fee payments [21] further intensify the challenges faced by researchers, creating financial instability that affects both the quantity and quality of research projects undertaken. The inadequacy of government funding is a persistent and recurring theme throughout the analyzed studies, creating a pervasive reliance on external sources that may not always align with Ghana's specific national needs or priorities. While Ghana struggles with the consistent operationalization of the GETFund for research, Kenya has established a more formalized NRF with a statutory target of committing 2% of GDP to research and development [22, 23].

Moreover, we observed that the private sector's participation in research funding in Ghana remains relatively low, with limited evidence. Conversely, South Africa remains the regional outlier, boasting significant private sector R&D investment (approx. 40%–50% of GERD) [24], a model that Ghana has yet to successfully emulate given the minimal private sector visibility identified in our review. However, the potential for increased private sector engagement is clearly recognized, particularly in areas with potential commercial applications. The commercialization of technologies is presented as a significant potential avenue for increased private sector involvement, offering a pathway to enhance research funding and bridge the gap between academic research and industry needs [25]. Such partnerships could provide researchers with access to resources and expertise not readily available within the academic setting, while simultaneously providing industries with access to cutting-edge research findings that could inform product development and innovation. This increased involvement could lead to a more sustainable research ecosystem that is less reliant on government and international funding [26]. However, several key challenges must be addressed to unlock this potential. Fostering effective industry–academia partnerships requires careful consideration of intellectual property rights, data sharing agreements, and mutual expectations. Building trust and

transparency between researchers and industries is also essential to foster long-term partnerships. Strengthening the regulatory framework for public-private partnerships could incentivize industry engagement, particularly in the agriculture and pharmaceutical sectors, helping bridge the gap between academic research and market needs.

Individual researchers often resort to self-funding or securing grants from diverse sources to support their research endeavors. This reality reflects both the limitations of institutional funding from government and international agencies and the unwavering determination of individual researchers to pursue their research agendas despite these limitations [27]. However, reliance on self-funding inevitably limits the scope and scale of research projects that can be undertaken, creating a significant constraint on research capacity. This self-reliance highlights the resourcefulness of Ghanaian researchers and underscores the precariousness of the funding landscape for many individuals. Securing grants is a highly competitive process, presenting numerous challenges for researchers, particularly those in LMICs. The significant time investment required for grant writing, often exceeding the time spent on the actual research, represents a substantial opportunity cost for researchers. The lack of feedback on rejected applications hinders learning and improvement, while the limited opportunities for resubmission further discourage researchers from pursuing grant funding [28, 29]. The combination of limited funding opportunities and a highly competitive grant landscape presents a significant barrier to research careers, potentially contributing to a “brain drain” as researchers seek more stable and better-funded opportunities in high-income countries [30]. These challenges underscore the need for more supportive funding mechanisms and policies that prioritize the needs of researchers in LMICs.

Qualitative observation of the funded projects suggests a broad thematic overlap with Ghana's national development agendas, particularly in the sectors of health and agriculture. This thematic consistency implies that external and internal funding flows are generally directed toward sectors critical for national survival and economic growth. By prioritizing research that is closely linked to national development goals, Ghana can enhance the relevance and impact of its research ecosystem, ensuring that the knowledge and innovations generated directly contribute to the improvement of the lives of its citizens and the advancement of the country's social, economic, and environmental objectives. This alignment also reinforces the recognition that research must be embedded within a broader framework of development, where the generation and application of knowledge are inextricably linked to the pursuit of national and societal priorities [31]. Furthermore, the complexity of the funding sources identified, often involving joint acknowledgments of academic, governmental, and international bodies within single studies, suggests a research ecosystem heavily reliant on multistakeholder partnerships. This collaborative approach can enhance knowledge-sharing, capacity building, and the co-creation of context-specific solutions tailored to the unique needs and circumstances of the country [32]. By fostering these collaborative partnerships, Ghana can harness the complementary strengths of various stakeholders, creating synergies that amplify the reach and influence of its research ecosystem.

Research capacity building is paramount for the long-term sustainability and growth of research in Ghana. Several studies strongly emphasize the critical need for increased investment in training programs, modern research infrastructure, and the creation of an enabling environment conducive to high-quality research [33, 34]. Effective funding mechanisms should support individual projects and contribute to the development of a robust and self-sustaining research ecosystem. This entails fostering strong collaborations between researchers, institutions, and various stakeholders, ensuring the seamless transfer of research findings to policymakers and practitioners for effective policy implementation and impact [35]. A holistic approach to capacity building is essential to create a truly thriving research environment in Ghana. For instance, investment in modern research infrastructure, the establishment of comprehensive training programs, and the creation of enabling environments that support and encourage research are crucial for enhancing research capacity [36]. This includes fostering collaborations and partnerships between universities, research institutions, and the private sector, and creating a network of support and shared resources. Strengthening research institutions ensures that Ghana has the capacity to conduct high-quality research independently and contribute to the global body of knowledge. A well-funded and well-equipped research infrastructure is a fundamental prerequisite for a thriving research ecosystem.

5 | Limitations

This study has specific limitations. First, by using published articles as a proxy for funding, we exclude research that was funded but not published, or published without proper funding acknowledgment. This likely leads to an underestimation of government-funded or self-funded research, where strict acknowledgment policies may be less enforced than in international grants. Second, we did not normalize the increase in funded studies against the total increase in Ghanaian publications, meaning that the “growth” observed reflects absolute volume rather than a definitive increase in funding success rates. Finally, grant values (monetary amounts) were not available, preventing an analysis of the financial scale of support.

6 | Conclusion

In conclusion, Ghana's research funding landscape is a complex and dynamic system, characterized by a diverse range of funding sources, each with its own strengths and weaknesses. While international funding plays a substantial role in supporting research activities, its potential to influence research priorities and its inherent risk of creating donor dependency necessitate a strategic approach toward funding diversification and the strengthening of local research capacity. Increased government investment, coupled with effective mechanisms to attract private sector involvement, is essential for building a sustainable and locally driven research ecosystem that prioritizes national needs while simultaneously fostering productive international collaborations. This requires a multifaceted approach that addresses not only financial limitations but also

capacity gaps, institutional reforms, and the cultivation of robust partnerships among researchers, policymakers, and a wide array of stakeholders. Further in-depth research is needed to fully understand the nuanced dynamics of research funding in Ghana and to develop evidence-based strategies for achieving a more robust and self-sustaining research ecosystem that is truly responsive to the needs of the nation.

7 | Recommendations for Policy and Practice

Based on the findings of this review, we propose the following actionable recommendations to strengthen the Ghanaian research ecosystem.

1. **Operationalization of a NRF:** To mitigate the volatility associated with inconsistent government subventions, the government should accelerate the full operationalization of a statutory NRF. This fund should be ring-fenced from specific tax revenues (e.g., a percentage of VAT or extractive industry royalties) rather than relying on discretionary annual budget allocations. This would provide the stable capital required for long-term longitudinal studies that international short-term grants rarely support.
2. **Creation of a Centralized National Grant Database:** Our review highlighted the fragmentation of funding data. We recommend the establishment of a centralized digital repository for all research grants awarded in Ghana. Mandating that all research institutions and NGOs register their funded projects in this database would enhance transparency, prevent duplication of research efforts, and allow policymakers to identify funding gaps in real-time.
3. **Incentivizing Private Sector Participation:** To unlock the “untapped opportunity” of private sector funding, the government should introduce specific tax rebates or credits for companies that invest in local R&D or partner with public universities. Additionally, establishing “Innovation Clusters” where industry partners can co-locate with academic research centers could foster direct industry-academia collaboration in key sectors such as agriculture and pharmaceuticals.
4. **Dedicated Support for Early-Career Researchers (ECRs):** To combat the potential “brain drain” driven by the competitive grant landscape, specific funding streams should be reserved for ECRs. Institutions should implement internal mentorship programs that pair ECRs with senior grant-holders to improve their success rates in applying for international funding, thereby building the next generation of research leaders.

Author Contributions

Alex Odoom: conceptualization, methodology, validation, formal analysis, investigation, resources, data curation, writing – original draft, writing – review and editing, visualization. **Eric S. Donkor:** conceptualization, methodology, validation, formal analysis, investigation, resources, data curation, writing – original draft, writing – review and editing, visualization, supervision, project administration, funding acquisition. All authors have read and approved the final version of the manuscript.

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The authors have nothing to report.

Disclosure

The lead author Eric S. Donkor affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Ethics Statement

The authors have nothing to report.

Consent

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data supporting the findings of this study are available in the Supporting Material of this article. Eric S. Donkor had full access to all data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

Supporting Table S1: Studies and funding agency(s).