

The State of Surgical Research in Sub-Saharan Africa: An Urgent Call for Surgical Research Trainers

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Background: Surgery in low- and middle-income countries (LMICs) is poorly developed because of years of neglect. Sustained research on global surgery led to its recognition as an indivisible and indispensable part of primary healthcare in 2015. However, this has had little visible effect on surgical ecosystems within LMICs, especially in sub-Saharan Africa (SSA). SSA surgical research systems strengthening, which includes skills transfer, with local priority setting driving the research agenda, is needed to propel global surgery into the future.

Methods: The authors performed a literature review of the state of surgical research within SSA and also report the initial efforts of two research training nonprofits to empower young African surgeons with research skills.

Results: Surgical research in SSA is disadvantaged even before it is birthed, facing monumental challenges at every stage of development, from research agenda determination to funding, study execution, and publication. Compared with a global output of 17.49 publications per 100,000 population, SSA produces 0.9 ($P < 0.0001$). The Surgeons in Humanitarian Alliance for Reconstructive, Research, and Education and Enabling Africa Clinical Health Research programs are involved in the longitudinal research mentorship of surgical residents within SSA; the improved quality of research and successful publications by participants suggest nascent steps in growing young surgical scientists.

Conclusions: In the absence of an existing surgical research infrastructure within LMICs, global surgery research trainers should link up and collaborate to help develop a surgical research community that will provide the local data required to help transform the SSA surgical ecosystem. (*Plast Reconstr Surg Glob Open* 2024; 12:e5903; doi: 10.1097/GOX.0000000000005903; Published online 14 June 2024.)

INTRODUCTION

The year 2015 is etched into the history of surgery because of three landmark publications that freed surgery

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from the stranglehold of the 1978 Alma Ata Declaration and led to a complete transformation of global perspectives on the place of surgery within the public health arena.¹⁻³ These publications were the products of focused and sustained research; they provided the impetus for political commitments to improve surgical capacity in low- and middle-income countries (LMICs) as part of their drive toward universal health coverage.^{4,5} This impact lends credence to the fact that research produces data that drives policy.⁶⁻⁹ These three publications also established the blueprint and metrics for surgical scale-up, as well as a springboard for the improvement of the various surgical disciplines.^{8,10-12}

THE ALMA ATA DECLARATION AND THE TRAJECTORY OF SURGERY

For the global surgical community, the main lesson from the period of "systematic neglect of surgery,"¹³ between 1978 and 2015, is that if surgical data had been available to contribute to the fashioning of the Alma Ata Declaration, the face of global surgery would be different

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today. The Alma Ata Declaration, signed in September 1978 at a conference jointly convened by the World Health Organization and the United Nations International Children’s Emergency Fund, focused on primary health care as the key to achieving an acceptable level of health throughout the world.¹⁴ To accommodate surgery within the current dispensation, primary health has had to be redefined.¹⁵

Global surgery advocates appreciate the complexity of the surgical ecosystem and the resources required to establish quality surgical care. Nevertheless, the continued association of the provision of surgical services with the tag “tertiary care,” roundly robs surgery of the invaluable “primary healthcare” label and the potential political mileage that could lead to government investment in surgery as a “basic community health” need. Only when surgery is viewed as an indivisible and indispensable component of primary healthcare¹⁶ will it truly find its appropriate positioning within LMIC healthcare systems. Surgery would then have the opportunity to thrive against decades-old misconceptions of the cost–benefits of surgical interventions that continue to hamper the adoption of surgery within LMICs.¹⁷ The fragmented nature of the global surgery community and the fact that it will likely take more than data to impact policy development within LMICs are additional obstacles to the realization of the tenets of the global surgery.^{14,17,18} Africa, with 17% of the global population, disproportionately bears 25% of the global burden of disease; this burden is managed by 3% of the global healthcare workers. Sub-Saharan Africa (SSA) produces less than 1% of the global research output.¹⁹ Between 1996 and 2022, SSA contributed 0.7% of the global surgical publications as reported by the Scimago Journal & Country Rank (<https://www.scimagojr.com/countryrank.php?category=2746&area=2700>). Accessed February 1, 2024.). This unacceptably low surgical research output from SSA calls for action (Table 1 and Fig. 1).

Further, the global average number of surgical publications per 100,000 population was 17.49 in the period between 1996 and 2022, SSA had an average of 0.9 publications per 100,000 population ($P < 0.0001$); North America led with 77.26 publications per 100,000 population. All

Takeaways

Question: What is the current state of surgical research in sub-Saharan Africa?

Findings: Surgical research in sub-Saharan Africa faces monumental challenges at every stage of development, from research agenda determination, to funding, study execution, and publication.

Meaning: Surgical research is the next frontier in global surgery: global surgery research trainers should link up and collaborate to help create a surgical research ecosystem of repute.

the differences between the number of surgical publications per population from the different regions compared with SSA were statistically significant ($P < 0.0001$; Table 1).

OBSTACLES TO SURGICAL RESEARCH

Despite the aforementioned obstacles, the next horizon for global surgery evolution is research. Surgical research in SSA is disadvantaged even before it is birthed, facing monumental challenges at every stage of development, from research agenda determination to funding, study execution, and publication.^{20–26} Indeed, a Kenyan court found an international funding agency guilty of systematic discrimination against a group of local researchers.²⁷ Some of the identified challenges facing African scientists include personal (lack of time, lack of incentives, lack of knowledge and skills, etc), institutional (career progression for research scientists, heavy workload), infrastructural (laboratories, equipment, etc), financial (research funds and personal remuneration), and educational (medical curricula and allied health professions), as well as a poor alignment of research activity with the government’s needs and priorities because of an over-reliance on external funding.^{21,27,28} The lack of a budgeted fee for open access (or even some subscription-based journals), and inability to access “pay-for-view” articles makes it difficult to craft quality articles for publication.²⁹ Bias by the international publishing community is another obstacle facing

Table 1. No. Surgical Publications per Geographical Region between 1996 and 2022

Region	Total Population of Region*	Surgical Publications 1996–2022 (%)†	Country Leading Region with Publications (%)	Publications per 100,000 Population	<i>P</i> ‡
Europe	741,904,860	531,152 (35.47)	United Kingdom (18.2)	71.59	<0.0001
North America	608,132,768	469,822 (31.37)	USA (91)	77.26	<0.0001
Asia	4,772,005,412	307,949 (20.56)	Japan (36.8)	6.45	<0.0001
Middle East	493,279,469	53,285 (5.95)	Turkey (52.8)	10.80	<0.0001
Latin America	668,590,900	35,303 (3.56)	Brazil (54.6)	5.28	<0.0001
Pacific	52,581,372	35,303 (2.36)	Australia (87.1)	67.14	<0.0001
Sub-Saharan Africa	1,226,641,550	10,991 (0.73)	South Africa (39.5)	0.90	—
Total	8,563,136,331	1,497,584 (100)		17.49	<0.0001

Global total population, global total surgical publications (1996–2022) are indicated in bold. The average global publications per 100,000 population, and the difference (*P* value) when compared to the publications from Africa, are also in bold.

*Worldometer—real-time world statistics (worldometers.info); World Population Prospects—Population Division—United Nations (<https://population.un.org/wpp/>); World Bank Group—International Development, Poverty, and Sustainability; and World Population by Country 2024 (Live) (worldpopulationreview.com); Accessed February 2, 2024).

†<https://www.scimagojr.com/countryrank.php?category=2746&area=2700>. Accessed February 1, 2024.

‡Difference in number of publications per 100,000 per region (with Sub-Saharan Africa as the reference).

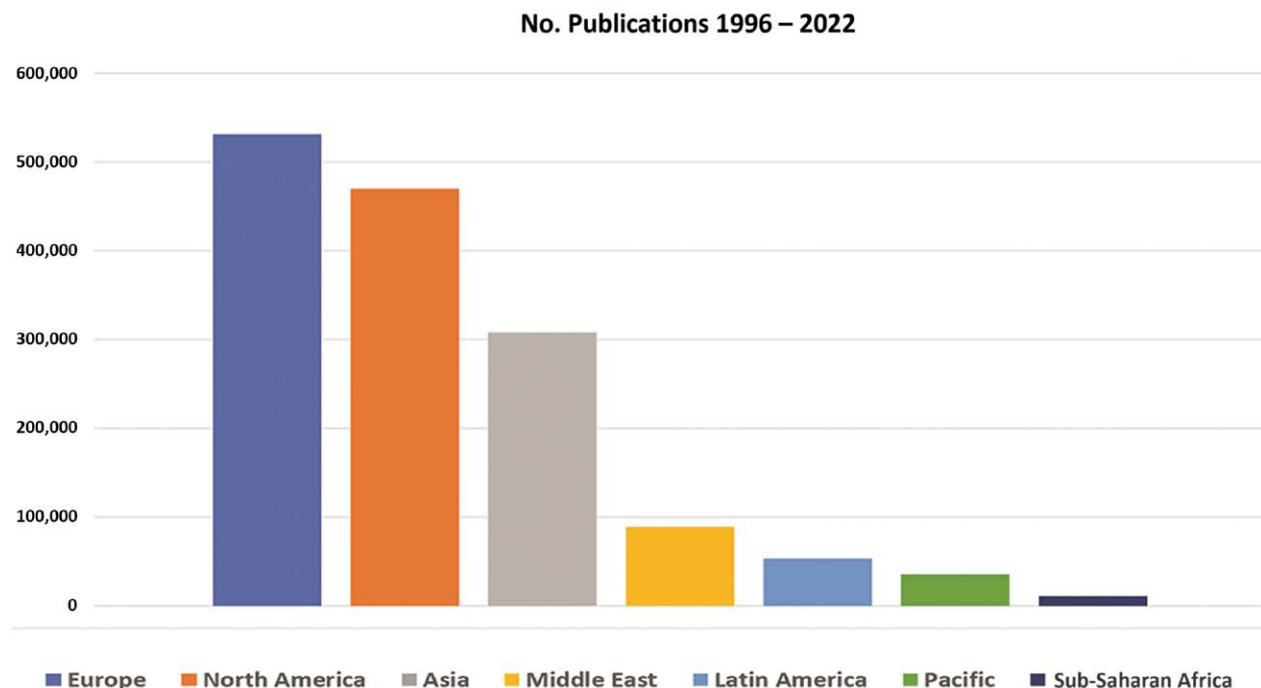


Fig. 1. No. surgical publications per geographical region (1996–2022). Data from SCImago, (n.d.). SJR — SCImago Journal & Country Rank [<https://www.scimagojr.com/countryrank.php>]. Retrieved February 1, 2024, from <http://www.scimagojr.com>.

the generation of new knowledge from within SSA. Less than 10% of all biomedical journals from SSA are indexed in international research databases, greatly impeding the dissemination of SSA research findings.^{22,23,30} There is little intrinsic incentivization within the current surgical ecosystem in SSA for the production of quality surgical research. Competing needs (especially high clinical workloads), a near-complete lack of prioritization at every level of governance, and a lack of resources and skills make surgical research unattractive and frequently unattainable.

THE MISSING LINK

Health services research in surgery is the missing link in the race by governments in LMICs and the global surgery community towards surgical scale-up. In the absence of local granular data, policy decisions have no foundation and are bound to waste resources and eventually fail.⁵ Strategic data reporting from the surgical ecosystems, on the other hand, provide real-world data that lead to the formulation of effective policies, which upon implementation, produce discernible system changes. The authors posit that, although it will take time to develop skilled research champions for surgical data collection and reporting within SSA, and even more time for data to be adopted and translated into policy and finally implemented, “a journey of a thousand miles begins with a single step.”³¹ The global surgery train left the station in 2015 with publication of the *Lancet* report on global surgery; we are called now to provide fuel to see it dock by the year 2030. A large portion of this fuel is the growth in surgical capacity through the production of local surgeons empowered with appropriate research skills.³²

With a poorly developed local research infrastructure, which has for years focused on externally funded communicable diseases (eg, tuberculosis, malaria, and HIV)¹³ SSA is inadequately prepared for surgical research.³³ Surgeons in Africa have not been involved in research initiatives and are therefore poorly prepared for this responsibility. While appreciating the obstacles reported in the literature that stand in the way of surgical research in SSA, as well as the excellent solutions proposed,³⁴ we believe that the scarcity of surgical research skills (and the need to develop a research culture within the SSA surgical community) is the largest barrier to overcome, but also offers the best solution. The time is ripe for the development of Afrocentric research, addressing the most urgent needs in SSA, as identified by local experts. International collaboration and scientific mobility stimulate the quality of scientific output of nations and enhance innovation; therefore, it remains pivotal to the growth of surgical research in SSA.³⁵ We must remain cognizant of the fact that asymmetric research training and funding, determined largely by funders from high-income countries (HICs), focused heavily on communicable diseases,^{9,36} has contributed a lot to the current poor state of the surgical research, and therefore, the surgical ecosystem in SSA. When funding for surgery is available, it has often been at cross-purposes with local needs.¹⁷ As with global surgery, vertical interactions with little local input³⁷ are no longer tenable within the new global health dispensation, and a new paradigm is needed.³⁸ Strengthening surgical research systems must include skill transfer, with local priority setting driving the research agenda.⁶ Plastic surgical research in Africa is limited, contributing a dismal 4.6% of global plastic surgical

research between 2015 and 2021.³⁹ Plastic surgery has contributed a number of important “firsts” in surgery,⁴⁰ and can address a sizeable proportion of the global burden of surgical disease.⁴¹ Strengthening research skills amongst the SSA surgical fraternity will help provide data delineating the extent of actual disease amenable to plastic surgery, and thereby provide guidance in formulation of strategies to combat this burden of disease.

The goal of global surgical research in SSA is to develop a critical mass of surgical workers with research skills. In recognition of this need, multiple tiny efforts have been made across the subcontinent. The authors included a report on the initial efforts of two nonprofit research training organizations to empower young African surgeons with research skills.

NONPROFIT SURGICAL RESEARCH ORGANIZATIONS

The authors belong to two different nonprofit research training organizations that have been involved in teaching research skills to SSA surgical residents after recognizing the need to invest in the development of surgical research skills among future surgeons.

The Surgeons in Humanitarian Alliance for Reconstructive, Research and Education (SHARE; <https://www.thepsf.org/programs/surgeons-in-humanitarian-alliance-for-reconstruction-research-and-education>) is a program of the Plastic Surgery Foundation (PSF), which enhances collaboration to improve care and surgical capacity in regions with limited numbers of plastic surgeons but a high incidence of conditions requiring plastic surgery. The program, launched in 2021, is tailored to local learners through three core components: global fellows, educators, and researchers. SHARE global researchers receive mentorship from established PSF researchers, as well as access to existing PSF research resources. SHARE targets plastic surgery residents and early career plastic surgeons. Currently, the majority of SHARE fellows are from SSA. SHARE global researchers complete a 2-year research curriculum that provides guidance on study design, research methods, ethics, data analysis, and article preparation. They are also provided with individual research mentors who help shape and support their research proposals. SHARE fellows are eligible to receive grant funding from the PSF, free access to the *Plastic and Reconstructive Surgery* journal, and free publication of their papers in the *Plastic and Reconstructive Surgery—Global Open* journal.

Enabling Africa Clinical Health (EACH) Research (<https://enabling-africa-research.com/>) is a research nonprofit registered in Kenya that runs virtual and in-person basic research methodology courses to enhance the quality of academic theses for university surgery residents and research and article writing skills for residents in the College of Surgery of East, Central, and Southern Africa (COSECSA). The program engages participants through the journey from research question development to publication; university trainees are encouraged to turn their theses into manuscripts with appropriate support. EACH Research plans to spread its reach to include surgical trainees in the West African College of Surgery.

Both EACH Research and SHARE recognize the power of synergy and collaborate on several fronts to deliver on a shared goal: growing a skilled surgical researcher community. During the 2023 annual meeting of the American Society of Plastic Surgeons, the authors participated in the “Forged on the Continent: SHARE and Plastic Surgery Training in Africa” panel, in which one of the presentations, “Training Africa’s surgical researchers today: taking on the challenge,” stimulated interest in a broader understanding of the state of surgical research in SSA among panel members. The authors performed a literature review of the current state of surgical research in Africa to understand and better strategize research capacity-strengthening initiatives within SSA.

RESEARCH, DEVELOPMENT, AND WEALTH

While the notion that it takes wealthy economies to produce high-quality research has been espoused,^{42,43} it must be questioned, because some evidence suggests that there is a difference in research and development among wealthy nations.³⁵ Allik et al hypothesized that additional ingredients of scientific wealth include high levels of good governance, human development, and education.³⁵ Nevertheless, in a review of surgery research publications in SSA, Uthman et al found that volume of publications was directly associated with the country’s gross domestic product (GDP).^{24,44} Furthermore, it has been estimated that the generation of new knowledge accounts for up to 30% of the GDP of a country, which, when combined with the potential annual GDP increase of 2% with surgical scale-up, should create a sufficient appeal for LMIC governments to invest in surgical research.^{44,45} Further, the estimated loss of up to US\$12.3 trillion between 2015 and 2030 by LMICs if surgery is not scaled up should similarly awaken the LMIC political class to the need for investment in surgery and surgical research.⁴⁵ Unfortunately, the opposite is true. The progress of surgery within many LMICs has stagnated, and for many decades, has been largely dependent on humanitarianism from HICs.³⁷ The results of years of neglect are self-evident: 95% of Africans do not have access to affordable surgery.⁴⁵

Although international collaboration is a powerful stimulant for the quality of scientific output,⁴⁶ removing the collaborative research veil from African publications lays bare Africa’s scientific research drought; there are very few independent African scientists working in Africa. HIC authors dominate both first and last authors, even within the global surgery environment.^{8,21} Further, the large majority of both collaborative and independent scientific research conducted in Africa is nonsurgical. Adedokun et al reviewed genomic epidemiologic publications from SSA between 2004 and 2013; less than one-tenth of them were related to noncommunicable diseases, and less than half of the first authors were affiliated with an African institution.⁴⁷ In addition, the dissemination and broad access to Afrocentric surgical research output is hampered by a lack of the core skeletal support system available to HIC research: SSA does not have a citation indexing directory, and journals from this region are severely underrepresented in standard international databases.³⁰ A recent review of research from Africa found that only 560 journals

were included in the major international biomedical databases; of these, 279 (50%) covered clinical medicine within which surgery was one of more than 10 disciplines, making SSA surgical research “literarily” invisible!²²

Access to scientific literature is a critical component of the education and training of surgical trainees to foster the adoption of evidence-based practice (EBP) and enhance quality patient care.²⁸ However, the evidence must have contextual relevance to impact local practices. Because most of the evidence available for the management of patient care is generated outside SSA, healthcare workers are often forced to adapt HIC-generated EBPs to local realities, often leading to nonstandardized care provision practices based on available resources. The adaptation of evidence garnered in different contexts in the care of a patient may lead to poor outcomes when applied in different environments. Locally generated EBP is replicable, leading to predictable patient outcomes. Therefore, locally generated surgical data are urgently required to improve surgical patient care in SSA.

The systematic generation, collection, analysis, and dissemination of surgical data within resource-constrained environments may, therefore, be in the immediate, a higher priority than the performance of the surgery itself. The data needed to drive political will, and therefore policy for surgical scale-up for most LMICs must be generated locally.^{6,8} Granular surgical data will be derived from healthcare institutions in the vast domains of diverse LMICs, from community hospitals with surgical capability to national referral healthcare institutions. Surgical research is the next horizon in the evolution of global surgery. Acceptance of this realization means that surgical training must run hand-in-hand with research training; the production line must present a competent surgeon with research skills. As the SSA surgical workforce grows both numerically and in diversity (specialties), the need for crafting systems to empower these surgeons with research capabilities is growing. As a result of an increase in the number of training programs within SSA, the number of surgical specialists trained and retained is steadily growing. While brain drain is real, the proportion of surgeons choosing to work locally is much higher.^{32,48} The training of surgeons within their communities is critical for their retention within LMICs. A larger surgical workforce creates the opportunity for the development of a research culture, and a larger researcher workforce, as surgical needs are gradually met and clinical workloads become more predictable. Unfortunately, because there has not been an intentional systematic policy to develop and grow surgical research infrastructure to support the small surgical researcher community in SSA, members of the global surgery research community must develop programs to meet this need. Because these efforts are nascent, it is possible for the global surgery research community to come together and harness their strengths to avoid duplication of efforts and a waste of resources.

RESEARCH TRAINING METRICS

There is currently no evidence-based methodology for providing surgical clinical research training, and the

metrics of the efficacy of a given method could be determined in a variety of ways, although the most visible is the research output or the quality of research produced by the trainees.²⁹ Although the number and quality of publications provide an excellent measure of research output, measuring the quality of university theses is more difficult. However, the transformation of theses into peer-reviewed publications offers a much easier output to measure.

The SHARE program has had a total of 46 global fellows in two cohorts (15 in 2021/2022 and 31 in 2023/2024). All global researchers in SHARE were paired with mentors during the 18-month curriculum. Each researcher has the opportunity to submit a grant proposal that they think through and refine during the training. In the first cohort, six such grants were awarded, with an output of four published manuscripts, and more in the pipeline. These publications are an important contribution to the SSA plastic surgery knowledge base and limited publications from this subcontinent.³⁹ Of the 552 plastic surgery publications from Africa in a recent review, only 97 (17.6%) were from SSA, and of these, South Africa had a robust contribution of 41%.³⁹

The EACH Research program has had a total of 179 trainees registered for five cohorts, two in 2021 and two in 2022; only 4% finished the course and proceeded to publications. The progress of university residents is difficult to track, with a number exiting the research program for a variety of reasons, including discouragement by academic supervisors’ preference for different research topics or designs. Nevertheless, an increasing number of residents and young consultants are publishing papers from their thesis.

Plastic surgery trainees in the two programs (SHARE and EACH Research) are encouraged to engage with each other. Although the SHARE program is guided by the needs identified by the trainees, the EACH Research program is focused on developing basic research methodology skills, with a longitudinal follow-up to publication. Both engage trainees in translating the skills gained from publications. As the number of collaborators increases, the metrics of successful training are likely to evolve.

CONCLUSIONS

Surgical research is the next frontier of global surgery. Investment in LMIC surgical research and innovation will help develop a surgical research community and a research culture, with the benefits of local development of EBPs that will enhance the quality of healthcare provision, with a positive effect on the overall economy. In the absence of an existing surgical research infrastructure, global surgery research trainers should link up and collaborate to help create a surgical research ecosystem that will, in turn, provide local granular data needed for the transformation of the SSA surgical ecosystem.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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