





The impact of surgical task-sharing in Sierra Leone: a nationwide longitudinal observational study on surgical workforce and volume, 2012–2023

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ABSTRACT

Background A surgical task-sharing programme was initiated by the Sierra Leonean Ministry of Health in 2011 to enhance public surgical capacity and equalise access between urban and rural populations by redistributing surgical tasks within a limited healthcare workforce.

Methods This longitudinal nationwide study, involving all healthcare facilities with an operating theatre in Sierra Leone, analysed changes in volume and population rates of surgery and distribution of surgical resources before (2012), 5 (2017) and 10 years after (2023) the initiative was introduced.

Results Surgical volume rates increased from 400 to 505 procedures per 100 000 population between 2012 and 2023. The public sector became the main provider, performing 56.0% of all operations in 2023, up from 39.6% in 2012. Rural surgeries increased by 77.6% over the decade, almost two times more than in urban areas. In rural areas, there was a transition from non-specialised physicians performing 46.2% of operations in 2012, to task-shared associate clinicians performing 55.1% (95% CI 49.5% to 60.7%) in 2023, making them the main surgical provider. Nationwide caesarean section rates increased from 1.4% (2012) to 5.3% (95% CI 4.6% to 6.0%) (2023). Caesarean sections were in 2023 mostly performed in public facilities (81.3%, 95% CI 80.1.0% to 82.5%) by associate clinicians (57.6%, 95% CI 53.2% to 61.9%).

Conclusions Over the last decade, Sierra Leone has seen a shift in surgical care, with a transition from general to obstetric surgeries, from private to public institutions, and an expansion of surgical care in rural areas, with associate clinicians as the leading provider. The introduction of a nationwide surgical task-sharing initiative to strengthen the surgical workforce at district governmental hospitals in 2011 has emerged as the major contributor to the change in surgical activity and output observed in Sierra Leone over the last decade.

INTRODUCTION

Equitable access to surgical care for whole populations is essential to make progress

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Most sub-Saharan African countries and all low-income countries face severe shortages of specialist surgeons, leaving rural populations with considerable levels of unattended surgical disease burden.
- ⇒ Task-sharing with other clinician cadres has been initiated in many sub-Saharan African countries and promoted as a mitigation strategy for the specialist shortage, but without widespread acceptance.
- ⇒ Besides a prospective study from Malawi demonstrating that task-sharing nearly doubled surgical volume in eight intervention hospitals between 2013 and 2015, most studies report on mortality and morbidity outcomes of a subset of high-volume procedures such as caesarean sections, hernia repairs and male circumcisions.

WHAT THIS STUDY ADDS

- ⇒ The study tracks changes in surgical volume and human resources over a decade, enabling an impact evaluation of a task-sharing intervention embedded within broader surgical system developments in a low-income sub-Saharan country.
- ⇒ The study includes all health facilities nationwide offering surgical services within an operating theatre, enabling an evaluation of task-sharing's impact on inequity in surgical care provision between urban and rural areas.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ The study's findings suggest that task-sharing with-in surgery is an intervention that has the potential to rapidly, equitably and substantially increase surgical care for rural populations in a low-income country.

towards universal health coverage.¹ West Africa has the highest surgical burden of disease and the largest unmet need for surgical care globally.² Rural populations in particular struggle with access to safe and affordable surgical care due to the financial challenges of raising

the necessary out-of-pocket expenses and unequal access to hospitals with functioning operating theatres staffed with adequate surgical providers.^{3 4}

When the 11-year civil war ended in 2002, health infrastructure was found to be severely disrupted in the West-African, low-income country of Sierra Leone. Provision of care was substantially supported by international organisations to cover essential needs, and surgical care was no exception.⁴ 10 years after the war, in 2012, there was still a shortage of healthcare workers including surgical providers³; with one specialist surgeon or obstetrician per 100 000 population, amounting to only 5% of global recommendations.^{3 5} Essentially, less than 10% of the surgical need was addressed, and surgical activity was disproportionately distributed, with a 23-fold difference between the highest and lowest performing districts in 2012.⁴

To improve access to safe surgical care for rural populations in Sierra Leone, the Ministry of Health (MoH) and the non-profit organisation CapaCare initiated a task-sharing training programme in 2011 to rapidly build the surgical workforce at district governmental hospitals.⁶ The surgical training initiative redistributed surgical tasks from specialists and physicians to associate clinicians with surgical training and has previously been described in detail.⁶ The intention was to make better use of available human resources within a limited healthcare workforce, to enhance surgical capacity, equalise access between urban and rural populations, and bolster emergency obstetric care at first level public hospitals.⁶

To evaluate the impact of such an intervention, it is necessary to measure indicators repeatedly over time⁷; however, few low-income countries have done so for specific nationwide surgical human resource-strengthening interventions.⁸ The aim of this study was to assess the impact of the surgical task-sharing programme in Sierra Leone by examining changes in surgical volume, casemix and available human resources; and productivity between urban and rural areas, and between private and public surgical service providers, before, 5 and 10 years after the initiation of the programme.

MATERIALS AND METHODS

A nationwide, retrospective study on surgical volume and providers was conducted in Sierra Leone in 2023, 10 years after introducing a nationwide task-sharing programme. The findings were compared with two similarly conducted studies from 2012 and 2017, before and 5 years after the intervention.^{4 9} The Sierra Leonean MoH, the Norwegian University of Science and Technology and CapaCare collaborated on all three studies. We have followed the Strengthening the Reporting of Observational Studies in Epidemiology checklist to ensure comprehensive and transparent reporting.¹⁰

Identification of surgical facilities

All healthcare facilities that performed surgical procedures requiring general, regional or local anaesthesia within an operating theatre the year prior to the data collection were eligible for inclusion. A facility was excluded if staff refused to share surgical activity data, operating theatre registers were physically missing, or if written consent could not be obtained.

Facilities performing surgery in an operating theatre were identified through three steps (figure 1). First, a list of all healthcare facilities registered with the regulating body for healthcare institutions, the Medical and Dental Council of Sierra Leone, was obtained in September 2023. Second, a comparison with registries of facilities covered by previously mentioned surveys in 2012 and 2017 was made^{4 9}; and finally, we asked in the facilities visited if there were additional surgical facilities in the same district/town.

Definitions

By using Statistics Sierra Leone's definition of urban areas as any settlement of more than 2000 inhabitants, nearly all healthcare facilities offering surgical services in Sierra Leone would be considered urban. To better evaluate changes in surgical volume in a geographical context, we defined the capital region of Western Area as an urban area, and compared this with the rest of the country, further named rural areas. Western Area includes the capital Freetown and surrounding area and is the country's financial, political and cultural centre, where 16.8% (1 271 330/7 548 702) of the population resides.¹¹ Surgical provider productivity is defined as the number of surgical operations performed as the primary surgeon per week. Other definitions are presented as an online supplemental table A1.

Data collection

The methodology for the 2012 and 2017 data collection has previously been described in detail.^{4 9} Key elements of the methodology and specifics related to the 2023 data acquisition are outlined below. The 2023 data were collected between 9 October 2023 and 15 December 2023, by two medical doctors, a nursing student, a community health officer from Sierra Leone, a MSc student in global health and two fifth-year medical students from Norway.

Facility directors were interviewed regarding workforce availability using a modified version of the Lancet Commission on Global Surgery's (LCoGS) 'Hospital Assessment Tool'.¹² Additionally, procedure-related surgical data were obtained from all sources where operative procedures were logged, including the operating theatre, anaesthesia and maternity logbooks. Deidentified photographs of the logbooks were acquired for quality control and deleted on completion of the data collection. Patient details (age and sex), operation date, urgency of procedure, primary surgical provider and type of surgery were recorded for every operative procedure.

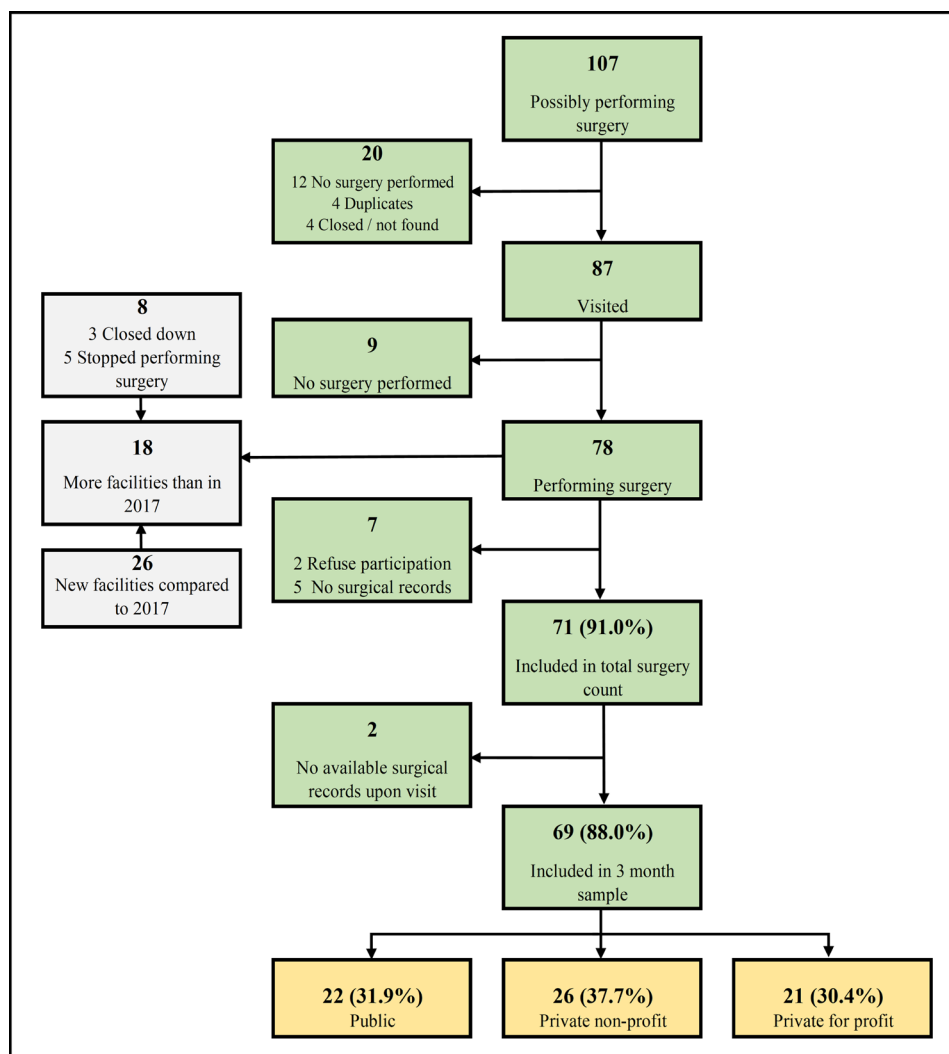


Figure 1 Identification and inclusion process of facilities performing surgeries in 2023.

We counted all surgical procedures between September 2022 and August 2023 to calculate the total annual volume of surgeries by location and type of facility. In addition, surgical casemix data were sampled for the months of October 2022, February 2023 and June 2023. We used the same selection of months as in 2017 to increase comparability, and because it considers seasonal variations and avoids peak festive periods. The 2012 study included the entire year, whereas some of the parameters for the 2017 and 2023 studies were based on the 3-month samples.

Data analysis

Data were captured, processed, analysed and compared with the existing data from 2012 and 2017 using Microsoft Excel and StataMP V.18. For 2023, both the total surgery count and the 3-month sample were used to assess the annual surgical volume. The total surgery count was used to calculate the surgical volume rate, the unmet need for surgery and the distribution of activity between facility types and urban and rural areas. The annual surgical volume by surgical provider cadres and procedure category was estimated by multiplying the 3-month sample by four and presented with 95% CIs.

For the 3 years studied, surgical volume rate and surgical workforce density were calculated using population projections from the 2004, 2015 and 2021 censuses, respectively.^{11 13 14} The unmet need for surgery was estimated by subtracting the surgical volume rate from the estimated need for surgical procedures from the Lancet Commission of Global Surgery (5000 per 100 000 population), as previously described.^{4 5 9} The caesarean section rate for 2023 was calculated using the estimated number of births in Sierra Leone in 2021 (264 000) from the World Population Prospects 2022.¹⁵ The surgical productivity was calculated by dividing the total number of surgeries performed as the primary surgeon per week by the number of full-time positions (FTPs).

Patient and public involvement

The public was involved in this study through consultations with the Deputy Chief Medical Officer (MSK) of Sierra Leone's MoH, representing national healthcare priorities. These consultations ensured the research objectives aligned with addressing surgical inequities and expanding access in rural areas. The research questions and design targeted gaps in surgical care, with MoH

input shaping the focus on task-sharing to boost surgical capacity and reduce geographical disparities. Facility-level data, collected in collaboration with healthcare providers, reflected the experiences of those accessing care, ensuring comprehensive insight into Sierra Leone's surgical system. This highlights the role of public health leadership in aligning research with population needs and strengthening healthcare delivery.

RESULTS

Surgical facilities

In total, 78 facilities were identified as performing surgery in Sierra Leone in 2023, of which 52 (66.7%) were the same as in 2017 (figure 1). Seven facilities were excluded due to refusing to participate (n=2) or missing surgical logbooks (n=5). In total, 71 (91.0%) facilities were included in the total surgery count, and 69 (88.5%) facilities were included in the 3-month sample. Of those, 22 (31.9%) were public, 26 (37.7%) private non-profit and 21 (30.4%) were private for profit. There were 43 (62.3%) facilities in rural areas. In 2023, 19 additional facilities were included compared with 2017. The number of private for-profit and non-profit facilities both

increased with eight new facilities each between 2017 and 2023.

Surgical volume

From the total count for 2023, we identified that 38 946 surgical procedures had been performed. When we estimated the annual volume of procedures from the 3-month sample, we calculated that 33 388 (95% CI 32 148 to 34 628) procedures had been performed. By using the counted figures, surgical volume in 2023 increased by 14 794 (61.3%) and 11 648 (42.7%) procedures since 2012 and 2017, respectively. These figures indicate that the surgical volume rate increased from 400 procedures per 100 000 population in 2012 to 505 procedures per 100 000 population in 2023, which corresponds to an unmet need for surgeries of 89.9%, a decrease of 2.2 percentage points since 2012.

The increase in surgical volume between 2012 and 2023 was mainly due to the 12 240 additional procedures performed in public facilities (table 1). The proportion of surgical procedures performed in the public sector increased from 39.6% in 2012, to 47.0% in 2017, and finally to 56.0% in 2023.

Table 1 Total surgical volume in 2012, 2017 and 2023 by type of facility, surgical provider and procedure category, and percentage change in surgical volume between 2012 and 2023

	Surgical volume			Percentage change
	2012*	2017†	2023 (95% CI)	2012–2023 (95% CI)
Total	24 152	27 298	38 946‡	61.3%
By type of facility				
Public	9565	12 820	21 805‡	128.0%
Private non-profit	13 050	13 652	12 109‡	–7.2%
Private for-profit	1537	1456	5032‡	227.4%
By surgical provider category				
Specialist	11 172	11 612	10 124 (8894 to 11 354)§	–9.4% (–20.4% to 1.6%)
Physician	9328	7796	7668 (6707 to 8629)§	–17.8% (–28.1% to –7.5%)
Associate clinician	1619	5484	13 680 (12 322 to 15 038)§	745.0% (661.1% to 828.9%)
Nurse	1574	716	460 (228 to 692)§	–70.8% (–85.5% to –56.0%)
Other/unknown	459	2320	1456 (985 to 1927)§	217.2% (114.5% to 319.9%)
By procedure category				
General surgery	10 989	10 752	11 336 (10 791 to 11 881)§	3.1% (–1.8% to 8.1%)
Obstetrics and gynaecology	7361	9984	16 644 (14 722 to 18 566)§	126.2% (100.0% to 152.3%)
Orthopaedic surgery	2526	2608	1828 (1635 to 2021)§	–27.6% (–35.3% to –20.0%)
Ophthalmology	2304	3752	2584 (1882 to 3286)§	12.2% (–18.3% to 42.6%)
Other	28	32	704 (569 to 839)§	2414.3% (1931.1% to 2897.5%)
Unknown	944	800	292 (241 to 343)§	–69.1% (–74.5% to –63.7%)

*Balkan *et al.*⁴

†Lindheim-Minde *et al.*⁹

‡Total surgery count.

§Estimate from 3-month sample.

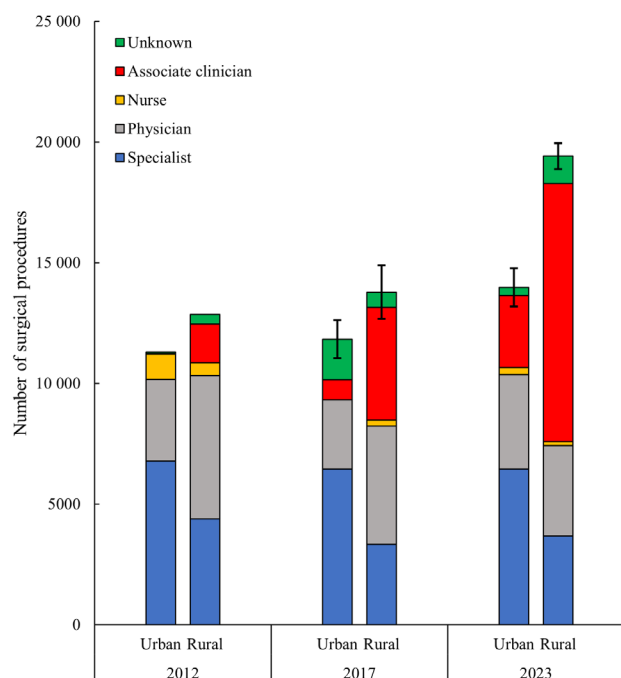


Figure 2 Comparison of surgical volume between 2012, 2017 and 2023 by provider cadre and urban/rural location.

In 2023, the largest volume of surgery (58.6%, n=22 815) was performed in rural areas; an increase of 77.6% since 2012, against an increase of 42.7% in urban areas over the same period (figure 2). Due to significantly larger population growth in rural areas (30.9% against 2.2% for urban areas) over the decade,^{11 13} the ratio between urban and rural surgeries per 100 000 population remained unchanged between 2012 and 2023 (3.4× to 3.5× in urban areas). In urban areas, specialists performed most surgeries in all three surgical assessments (60.0%, 95% CI 55.5% to 46.1%). In rural areas, however, there was a transition from physicians being the main surgical provider in 2012 and 2017, performing 46.2% and 31.0% of all operations, to associate clinicians in 2023 performing 55.1% (95% CI 49.5% to 60.7%) of all the operations.

Scope of practice

During the past decade, the largest increase in volume of surgery (126.1%) has been observed within obstetrics and gynaecology, which accounted for 49.9% (n=16 644) of the surgical volume in 2023 (figure 3). It is noteworthy that 41.8% (n=13 940) of all surgical procedures in 2023 were caesarean sections, against 20.2% and 28.2% in 2012 and 2017, respectively. The national caesarean section rate increased from 1.4% to 5.3% (95% CI 4.6% to 6.0%) of all live births between 2012 and 2023. In 2023, caesarean sections were mostly performed in public facilities (81.0%, n=11 292), by associate clinicians (57.7%, n=8043) and in rural areas (61.7%, n=8600).

The volume of general surgery has barely changed over the last decade, whereas ophthalmology and orthopaedic surgery have declined. A 27.6% decline was observed

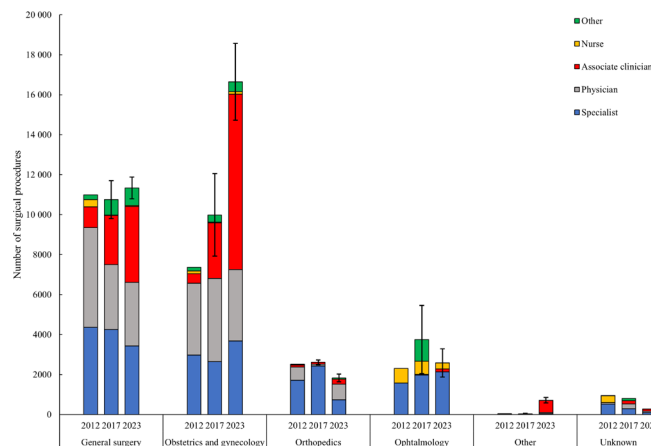


Figure 3 Comparison of surgical volume between 2012, 2017 and 2023 by surgery category and surgical provider cadre.

in orthopaedic surgery between 2012 and 2023. 73.0% (95% CI 65.3% to 80.8%) of orthopaedic surgeries were performed in private facilities. However, the proportion of orthopaedic surgeries performed in public facilities increased from 13.7% in 2012 to 27.0% (95% CI 19.2% to 34.7%) in 2023. Orthopaedic procedures were mostly performed by physicians and specialists (82.8%, 95% CI 75.3% to 90.4%) and in urban areas (68.0%, 95% CI 60.2% to 76.0%).

Surgical workforce

The total number of surgical providers increased from 164.5 FTPs in 2012 to 347.0 FTPs in 2023, which is just over double the amount in 2012 or an average annual increase of 10.1%. Most surgical providers (55.2%) worked in public facilities in 2023. The total number of specialised surgeons, anaesthetists and obstetricians (SAO) was 120.7 FTPs, which gives an SAO density of 1.6 FTP per 100 000 population in 2023. Total surgical providers' density (all cadres) increased from 2.8 to 4.2 FTPs per 100 000 population between 2012 and 2017 and further to 4.5 in 2023.

In 2023, associate clinicians performed 13 680 procedures, representing 41.0% of the total national surgical volume; that is, 745.0% more procedures than in 2012. In rural areas, associate clinicians performed 55.1% (95% CI 49.5% to 60.7%) of operations and have contributed to the majority of the growth in the volume of surgery since 2012 (figure 2). Among surgeries performed by associate clinicians, 64.2% (95% CI 56.9% to 71.4%) were obstetric procedures. Specialists had a different surgical case distribution with 36.5% (95% CI 34.5% to 38.5%) obstetric procedures, 34.0% (95% CI 31.0% to 36.9%) general surgery and 20.8% (95% CI 16.5% to 25.5%) ophthalmic surgery. For physicians, 46.7% (95% CI 40.4% to 52.9%) of surgeries were obstetric procedures, 41.2% (95% CI 34.7% to 47.7%) were general and 10.4% (95% CI 7.80% to 13.0%) were orthopaedic surgical procedures.

The proportion of surgeries performed by Sierra Leonean nationals decreased from 71.3% to 54.4%

between 2012 and 2017 but increased again to 79.0% (95% CI 78.6% to 79.6%) in 2023. In 2023, Sierra Leonean nationals accounted for 53.3% (95% CI 51.1% to 55.4%) of all procedures performed by specialists, in contrast to 86.9% (95% CI 83.9% to 89.9%) for physicians, and 100% (95% CI 100% to 100%) for associate clinicians.

Surgical productivity

Total surgical productivity was 2.2 surgical procedures per FTP per week in 2023, which is a decrease from 2012 (2.8), but an increase from 2017 (1.7) (table 2). Associate clinicians increased their productivity from 1.6 in 2017 to 2.3 in 2023, whereas the productivity of specialists decreased from 2.5 in 2017 to 2.0 in 2023. Physicians' productivity improved slightly from 2017 to 2023 (1.1 and 1.4).

Table 2 Surgical workforce and productivity between 2012, 2017 and 2023 by type of facility and surgical provider, and percentage change between 2012 and 2023

	Surgical providers			Change 2012–2023	Productivity		
	2012*	2017†	2023		2012	2017	2023
Total	164.5 (100%)	312.8 (100%)	326.0‡ (100%)	+111.0%	2.8	1.7	2.2
By type of facility							
Public	76.4 (46.4%)	154.0 (49.2%)	191.5‡ (55.2%)	+150.6%	2.4	1.6	2.2
Private non-profit	71.9 (43.7%)	92.8 (29.7%)	86.4‡ (24.9%)	+20.2%	3.5	2.8	2.7
Private for-profit	16.2 (9.9%)	66.0 (21.1%)	69.2‡ (19.9%)	+327.0%	1.8	0.4	1.4
By surgical provider							
Specialist	58.5 (35.6%)	88.9 (28.4%)	99.2§ (30.4%)	+69.5%	2.1	1.1	1.4
Physician	86.0 (52.3%)	140.3 (44.9%)	105.5§ (32.3%)	+22.6%			
Associate clinician	13.8 (8.4%)	66.1 (21.1%)	115.7§ (35.5%)	+738.2%	2.3	1.6	2.3
Nurse	6.2 (3.8%)	17.4 (5.6%)	3.75§ (1.2%)	–39.5%	4.9	0.8	2.4

*Bolkan *et al.*⁴

†Lindheim-Minde *et al.*⁹

‡Total surgery count.

§Estimate from 3-month sample.

DISCUSSION

The key findings of this study are the increase in annual surgical volume and rate of surgeries per 100 000 population from 400 to 505 over the past decade; and that this growth is due to the introduction of a new surgical cadre through task-sharing. A 2019 study from Malawi found similar effects, where the surgical volume in 16 intervention hospitals almost doubled over 3 years after the implementation of surgical task-sharing.¹⁶ Growth in surgical volume in Sierra Leone over the past decade has been mostly due to increased obstetric and gynaecological surgeries. The high proportion of obstetric surgery is in line with the rest of sub-Saharan Africa.¹⁷ It is of particular concern that the volume of general and orthopaedic surgeries has declined. The task-sharing intervention has contributed to a larger increase in surgeries performed in rural areas. However, the inequity in surgical output between urban and rural areas remains unchanged due to significantly larger population growth in rural areas over the last decade. After 2012, the country has become more surgically self-sustaining with a larger proportion of Sierra Leonean surgical providers and the public sector replacing international organisations as the main surgical service provider.

Emergency obstetric care

Maternal health has been a continuous priority for the government of Sierra Leone over the past decade, as evidenced by the provision of equipment, training a broad range of personnel, and renovating operating theatres in public facilities across the country. In parallel with an almost trebling of the national caesarean section rate between 2012 and 2023, the maternal mortality ratio almost halved from 837 per 100 000 live births in 2010 to 443 in 2020.¹⁸ The maternal mortality ratio is, however, far from the Sustainable Development Goal target of less than 140 maternal deaths per 100 000 live births in any country,¹⁹ indicating emergency obstetric services still need to be strengthened. A proxy measure for emergency obstetric services is the national caesarean section rate, where the current rate of 5.3% is less than half of the WHO's previously recommended rate of 10%–15%.²⁰

The increase in obstetric and gynaecological surgical activity, and particularly emergency caesarean sections, is likely an effect of several interventions to improve maternal healthcare over the past decade. Implementation of the Free Health Care Initiative (FHCI) for pregnant and lactating women; and children below the age of 5 years has reduced the financial barriers to seeking and reaching obstetric care.²¹ An increased proportion of deliveries has been attended by a skilled birth attendant over the last decade, rising from 53% in 2013 to 83% in 2019.²² The increase in the number of trained midwives, from fewer than 100 in 2010 to more than 1500 in 2023, has undoubtedly improved both the quantity and the quality of emergency obstetric care at all levels of the healthcare system in Sierra Leone.²³ That associate clinicians now perform more than half of all caesarean

sections in the country, and a far larger proportion of those in rural public hospitals, has expanded access to timely operative emergency obstetric care for the most vulnerable group of the population, women living in rural areas.

Inequity

The introduction of associate clinicians as surgical providers in rural areas, where this cadre now performs more than half of all operations, demonstrates the task-sharing intervention's potential to reduce inequity in access to surgical care between urban and rural areas. Undoubtedly, several other interventions have also contributed to reduced inequity between urban and rural areas over the last decade, such as the previously mentioned FHCI. The effects of introducing task-sharing are likely to be maintained, as a key feature of task-sharing to lower cadres is improved healthcare worker retention in rural areas.²⁴

Task-sharing

With associate clinicians becoming key contributors to surgical volume in Sierra Leone, there is an increased need for regular monitoring to ensure the quality of their services. Although several studies examining quality of care for this task-sharing intervention have documented similar outcomes compared with existing care delivery,^{8 25} there is a need for continuous training for knowledge and skill advancement, and further monitoring of outcomes. The new cadre needs a secure financial base and certification, as well as robust and effective regulation and systematic follow-up.²⁶ The task-sharing initiative has made Sierra Leone more self-reliant on surgical providers over the last decade.

Low surgical output and decrease in provider productivity

Despite a doubling of the surgical workforce over the last decade, surgical volume has not increased sufficiently and remains below the average of 877 annual surgeries per 100 000 population in low- and middle-income countries (LMICs), and far below the international target suggested by the LCoGS of 5000 procedures per 100 000 population per year.⁵

Barriers to increasing provider productivity in Sierra Leone have previously been studied and include patient and facility financial constraints, lack of equipment and supplies, weak regulation of providers and facilities and a small surgical workforce with little recognition.²⁷ There is a need to further strengthen the existing surgical workforce to ensure efficient use of available human resources and increase surgical output and quality of care.

The lack of growth in orthopaedic and general surgery is of particular concern. Orthopaedic surgery in Sierra Leone is centralised in a few specialised private hospitals. These cases may not be prioritised in public facilities, as they are often not life-threatening and require a well-equipped team with trained personnel and proper infrastructure as well as long-term follow-up, which public

facilities may struggle to provide. Associate clinicians are trained in basic orthopaedic procedures, but they mostly work in rural hospitals and lack the proper support system for these procedures.

The way forward

Low output of medical graduates and limited educational possibilities in Sierra Leone to become specialists in surgery and obstetrics explain the low number of Sierra Leonean specialists.²⁸ There is an urgent need for additional strategies to increase the physician and specialist surgical workforce moving forward. These include expanding specialised training programmes via the West African College of Surgeons and the Postgraduate College of Health Specialties in Sierra Leone. The recently established rural postings of medical officers and residents in surgery to regional and district hospitals are important to increase rural retention of specialist and non-specialist medical doctors. There is an urgent need for more partnerships with productive institutions, both regionally and from higher-resource settings, to significantly enhance knowledge and skills transfer within surgery and obstetrics.²⁹

Population growth in Africa is by far the most significant globally, with close to an additional billion people being projected for the coming 25 years.³⁰ The continent struggles to develop an adequate specialist surgical workforce for its current populations.⁵ In a scenario where countries succeed in replicating the scale-up of their specialist surgical workforce, like Mexico (+5.1%) and India (+2.0%) achieved between 2001 and 2014, the first low-income country would reach minimum global recommended targets of 20 surgeons, obstetricians and anaesthesiologists per 100 000 population in 2047 and 2055, respectively.³⁰ Applying India's specialist surgical workforce growth, only 10% of low-income countries will reach the target by 2100. Alternative strategies such as task-sharing are needed to address the third of the global burden of disease that requires surgical decision making, including trauma, cancer and operative emergency obstetric care.⁵

Strengths and limitations

A key strength of this study is the repeated mapping of surgical activity with an internationally acknowledged methodology.¹² This means changes in surgical volume can be tracked over time; national progress can be measured; and the impact of a capacity-building strategy embedded within broader surgical system developments can be assessed.⁷ The inclusion of all surgical healthcare facilities nationwide gives a holistic view of the role task-sharing has gained within the surgical system over the last decade. We would argue that our definition of Western Area as urban and the remaining country as rural is a strength, as there is no universally agreed definition which would have increased comparability with other countries.³¹ As Statistics Sierra Leone define urban areas

as any settlement of more than 2000 inhabitants,¹⁴ nearly all healthcare facilities offering surgical services would be in urban areas. Our operational and pragmatic approach underestimates inequity between urban and rural areas compared with other definitions, where additional urban settlements outside the capital area would have been included.

A limitation is that all three study years only included procedures performed within an operating theatre, and we suspect that many minor operations are not recorded. Furthermore, we believe the volume of surgery identified in the years studied is an under-representation of the true volume of surgical activity, as we were unable to account for procedures not captured in theatre records, nor those performed outside the identified healthcare facilities. One reason that the 3-month estimate was significantly lower than the directly counted figure in 2023, could be that one of the selected months (June) was prior to national elections, resulting in lower activity.

Logbooks were used for all three studies and are considered an accurate method to describe surgical volume.⁷ However, data collection was sometimes inconsistent, with missing or inaccessible logbooks. Productivity estimates for specialists and physicians may be underestimated, as records typically designate one main operator even when multiple professionals are involved or surgery is performed together.

CONCLUSIONS

The introduction of task-sharing in surgery and obstetrics in Sierra Leone has led to an increase in the surgical workforce, bolstered emergency obstetric care, strengthened the public sector and countered further inequity in surgical activity between urban and rural areas. These findings call attention to the effect of task-sharing as an approach to increase access to surgical care in LMICs and reduce workforce shortages. Further evaluation of long-term sustainability and effectiveness will be important in forming future healthcare strategies.

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Competing interests HAB and AJvD are unpaid board members of the non-governmental organisation CapaCare that together with the Ministry of Health in Sierra Leone are delivering the surgical task-sharing programme for associate clinicians. TA is salaried training coordinator for CapaCare in Sierra Leone and unpaid board member of CapaCare Sierra Leone. JB is country director for CapaCare in Liberia. JG was salaried training coordinator for CapaCare in Sierra Leone between 2020 and 2023. MSK is Deputy Chief Medical Officer, responsible for clinical services in Sierra Leone but have received no monetary contributions from CapaCare.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

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Ethics approval This study involves human participants. The research protocol was endorsed (ref: MMRU-SRC-07-2023) by the Scientific Research Committee of the Masanga Medical Research Unit on 18 July 2023. Subsequently, ethical approval (ref: 001/10/2023) was granted by the Sierra Leone Ethics and Scientific Review Committee. Participants gave informed consent to participate in the study before taking part.

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