



# BMJ Open Barriers to increase surgical productivity in Sierra Leone: a qualitative study

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## ABSTRACT

**Objective** To explore factors influencing surgical provider productivity and identify barriers against and opportunities to increase individual surgical productivity in Sierra Leone, in order to explain the observed increase in unmet surgical need from 92.2% to 92.7% and the decrease in surgical productivity to 1.7 surgical procedures per provider per week between 2012 and 2017.

**Design and methods** This explanatory qualitative study consisted of in-depth interviews about factors influencing surgical productivity in Sierra Leone. Interviews were analysed with a thematic network analysis and used to develop a conceptual framework.

**Participants and setting** 21 surgical providers and hospital managers working in 12 public and private non-profit hospitals in all regions in Sierra Leone.

**Results** Surgical providers in Sierra Leone experience a broad range of factors within and outside the health system that influence their productivity. The main barriers involve both patient and facility financial constraints, lack of equipment and supplies, weak regulation of providers and facilities and a small surgical workforce, which experiences a lack of recognition. Initiation of a Free Health Care Initiative for obstetric and paediatric care, collaborations with partners or non-governmental organisations, and increased training opportunities for highly motivated surgical providers are identified as opportunities to increase productivity.

**Discussion** Broader nationwide health system strengthening is required to facilitate an increase in surgical productivity and meet surgical needs in Sierra Leone. Development of a national strategy for surgery, obstetrics and anaesthesia, including methods to reduce financial barriers for patients, improve supply-mechanisms and expand training opportunities for new and established surgical providers can increase surgical capacity. Establishment of legal frameworks and appropriate remuneration are crucial for sustainability and retention of surgical health workers.

## INTRODUCTION

The need to increase the volume and quality of surgical, obstetric and anaesthesia care, especially in low-income and middle-income countries (LMICs), has been widely recognised, as globally five billion people still lack access to safe and affordable surgical

## Strengths and limitations of this study

- This explanatory qualitative study uses the observed changes from a nationwide surgical activity mapping to guide the research questions. It, therefore, provides an in-depth understanding of the observed changes, such as the decrease in surgical productivity despite an increase in surgical workforce and the shift from general surgery towards obstetric surgery.
- The broad range of surgical facilities in all regions, both public and private non-profit, and purposive sampling of participants provide a comprehensive overview of the barriers and opportunities that influence surgical productivity in Sierra Leone.
- The study is intentionally limited to the perspective of hospital managers and surgical providers.
- Our findings are supported by research elsewhere, but some of the results might be context-specific to Sierra Leone.

care.<sup>1-4</sup> Sierra Leone has implemented several strategies to improve surgical and obstetric care in the previous decade. This included an expansion of the surgical workforce through strengthening of medical education and the training of associate clinicians through a surgical task-sharing initiative that started in 2011.<sup>5-6</sup> A health finance protection scheme for pregnant women and children below five (the Free Healthcare Initiative (FHCI)), was introduced in 2010 and has improved access to maternal healthcare, including obstetric surgeries.<sup>7-8</sup> In addition, partnerships to strengthen the health system after the Ebola outbreak facilitated the import of qualified regional West-African health workers.<sup>9</sup>

To evaluate the implications of the implemented strategies, a comparative analysis of the surgical volume and surgical workforce in 2012 and 2017 was performed.<sup>10</sup> Surgical volume is defined as the annual number of surgical procedures per 100 000 population. Over just 5 years, Sierra Leone experienced a growth in operative procedures, and an almost doubling of the surgical workforce,

**Table 1** Levels of surgical care in Sierra Leone compared with global surgery targets

	Sierra Leone 2012*	Sierra Leone 2017*	Target Lancet Commission on Global Surgery† (2030)
Volume of surgical procedures per 100 000 population	400	372	5000
No of surgical, anaesthetic and obstetric specialist physicians per 100 000 population	0.97‡	1.18‡	20–40
Surgical productivity (no of surgical procedures per week per full-time surgical position)	2.8	1.7	N/A

\*Lindheim-Minde *et al*, *Surgery*, 2021,<sup>10</sup>

†Lancet Commission on global surgery,<sup>1</sup>

‡Excluding anaesthetic specialists.

N/A, not available.

including the birth of a new cadre of non-specialist surgical providers. However, due to a simultaneous but even stronger population growth, the volume of surgical procedures performed per 100 000 population decreased from 400 to 372 surgical procedures between 2012 and 2017. The increased volume of surgical providers without the same growth in surgical interventions, led to the observation of a substantial decrease in surgical provider productivity (defined as the number of surgical procedures per week per full-time surgical provider position) from 2.8 to 1.7.

The shortcomings to reduce the unmet operative need of still more than 90% are concerning and contributes to increased morbidity and premature mortality (table 1). Also, the decrease in surgical provider productivity raises concern for quality, as reductions in surgical providers operative volumes are associated with inferior outcomes and higher complication rates.<sup>11 12</sup> Whereas the volume of general surgery remained similar between 2012 and 2017, the volume of caesarean sections (CS) increased remarkably.<sup>10</sup>

The repeated mapping of nationwide annual operative activity and surgical workforce in 2012 and 2017 in a low-resource setting is unique and provides an opportunity to evaluate possible effects of health systems interventions initiated in this period that aim to improve surgical care delivery. This study aims to gain insight in the factors that influence surgical capacity in Sierra Leone by exploring the challenges of surgical health workers as well as their explanations for the rapid decrease in surgical productivity and the difference in the increase between general surgery and obstetric surgery. An improved understanding of the reasons behind the observed changes in operative activity can help guide future interventions to increase surgical volume, productivity and quality.

## METHODS

### Study design

This explanatory qualitative study explores factors influencing surgical service delivery and surgical provider

operative productivity in Sierra Leone from a health worker perspective. This methodology allowed an open and deep exploration of factors health workers perceive influence surgical activities, as well as seeking explanations for the decline in surgical productivity observed between 2012 and 2017. An emergent design was used, where the process of data collection and analysis occurred simultaneously.<sup>13</sup>

### Setting and participants

Sierra Leone is positioned 182 out of the 189 countries on the Human Development Index ranking.<sup>14</sup> More than half of the population lives under the poverty line, with large and increasing inequality.<sup>15 16</sup> In 2018, 7% of national budget was allocated to health, and 45% of total health expenditures were patients out-of-pocket spending.<sup>17 18</sup> Sierra Leone has a three-tier health system with peripheral health units (PHU's) at the primary care level, district hospitals, which function as first level referral centres for surgical care, at the secondary level and regional hospitals for specialty and referral services.<sup>19</sup> In 2017, approximately half of the 54 hospitals were public facilities.<sup>20</sup> The health system in Sierra Leone, including the health workforce, has suffered from the civil war between 1991 and 2002 and the Ebola epidemic in 2014–2016.<sup>21 22</sup> Many of the health facilities lack adequate infrastructure and resources.<sup>20</sup>

According to a recent nationwide study, 60 health facilities performed comprehensive surgery in 2012 and 2017.<sup>10</sup> Surgical activity increased from 24 152 to 27 928 annual surgical procedures over this period, mainly due to a 62% increase in CS performed. Meanwhile, the surgical workforce expanded from 164.5 to 312.8 full-time positions and surgical productivity decreased from 2.8 to 1.7 surgeries per week per surgical provider. The percentage of surgeries performed at public facilities and by associate clinicians increased.

### Sampling strategy

In each of the five geographical regions we identified healthcare facilities with the highest and lowest surgical

volumes per provider, and facilities with a vast change in surgical productivity between 2012 and 2017. These were purposefully selected for this study. We considered health workers in these facilities more likely to offer valuable insights in the factors influencing surgical productivity. Twenty-one participants from 12 health facilities were included for interviews until saturation was reached (table 2). Hospital managers and surgical providers were interviewed as they have extensive insights in the different factors influencing surgical volumes and productivity. They were selected for the in-depth interviews based on the facility where they worked, their availability and willingness to participate. All but one hospital managers also worked as surgical provider. The average interview duration was 40 min. No incentives were provided to study participants.

### Data collection and analysis

Individual, semistructured interviews were conducted in person between August and October 2019 with use of an interview guide (online supplemental material) based on the Lancet Commission on Global Surgery (LCoGS) Surgical Assessment Tool for qualitative interviews.<sup>23</sup> Interviews covered a range of issues, including time spent performing surgery, how participants perceived surgical productivity, registration of surgeries in hospital records, changes concerning surgical care over the past decade, job satisfaction, barriers and enablers for surgical productivity, and what is needed to improve surgical care and surgical productivity in Sierra Leone. Furthermore, we provided the participants the results of the comparative surgical mapping in 2012 and 2017,<sup>10</sup> including the decrease in surgical productivity and the relative increase of obstetric surgery, and asked them to reflect on these findings in relation to their own experiences. The interview guide was piloted with a Sierra Leonean surgical provider and adjusted accordingly to ensure understanding, relevance and adjust to cultural norms and phraseology.

Interviews were performed by a Dutch MD in Global Health and Tropical Medicine (JB) with working experience in Sierra Leone and other LMICs, and two Sierra Leonean surgically trained associate clinicians, also called Surgical Community Health Officers (SACHOs) (PM, TS). The SACHOs received training prior to the data collection and were accompanied until confident to conduct the interviews independently. The variety in interviewers was anticipated to balance interviewer effects, facilitating rich data collection and establishing cultural integrity. The selected facilities were randomly assigned to each of the interviewers. During visits to the selected health facilities, field notes were taken to encompass data obtained from informal conversations with other surgical health workers such as anaesthesia providers, midwives, operating theatre staff, nurses and other surgical providers and observations made in the facilities. Interviews were in English and were recorded and transcribed verbatim (JB) using f4transkript software

V.7.<sup>24</sup> The transcripts were transferred to NVivo V.12 to analyse the information using a thematic network analysis with an inductive approach to recognise meaningful patterns.<sup>25</sup> Transcripts were coded by JB and a selection of interviews by another research team member as well, after which codes and themes were compared and discussed among the team. Preliminary results were discussed at a global surgery symposium in Sierra Leone in order to distribute findings and collect feedback on the credibility from the public.

### Patient and public involvement

Patients and public were not involved in the design and conduct of this research, as it focused on the perspective of hospital managers and surgical providers.

## RESULTS

The thematic analysis identified six themes that participants used to explain the low surgical productivity, namely governance, financing, human resources, resources (equipment and supplies), quality of care and access. With these themes a conceptual framework was developed to display, categorise and connect the themes and subcategories (figure 1). While almost all participants recognised an increase in surgical volume and a shift from general surgery to obstetric surgery over the past years, only half of the participants recognised the decrease in surgical productivity.

### Governance and leadership

Seventeen of the 21 participants mentioned political decision making to strongly influence surgical service delivery at the facility level. They considered collaborations between the government or health facilities with partners such as donors or non-governmental organisations (NGOs) as beneficial. Although a few participants expressed concerns about donor-dependency and advocated for more self-reliance, most described collaboration with partners as a valuable method to receive financial assistance, increase human capital, offer training, improve the hospital infrastructure (buildings, water and electricity supply) and provide supplies. Examples of policies that positively influenced surgical volumes were all related to initiatives instituted to improve access to obstetric health services, such as the introduction of the FHCI in 2010 and the establishment of the National Emergency Medical Service (NEMS) ambulance system in 2018. The NEMS provides free prehospital transport, and is mostly used for obstetric and paediatric patients.<sup>26</sup> Alongside with obstetric training for health workers, these initiatives have resulted in improved access to obstetric care and obstetric surgeries. No such examples were mentioned for general surgery.

So that has created very big impact in meeting some of the unmet surgical needs, especially this free health care is a focus. (...) And we even have the referral system that has been strengthened, we have

Table 2 Characteristics of participants and facilities

Participant no	Facility no	Function	Cadre	Gender	Nationality	Region	Sector	Setting	Facility performance	Median monthly surgical productivity in facility in 2017	Interviewer	Duration of interview (minutes)
1	2	Hospital manager	N/A	M	Sierra Leone	WA	Public	Urban	Low	1.5	PI	22
2	1	Hospital manager	Specialist	M	Sierra Leone	WA	Public	Urban	Change: decrease	2.0	PI	43
3	1	Surgical provider	STP student	M	Sierra Leone	WA	Public	Urban	Change: decrease	2.0	PI	46
4	3	Hospital manager	Physician	M	Sierra Leone	NW	Public	Rural	Low	4.0	PI	34
5	3	Surgical provider	SACHO	M	Sierra Leone	NW	Public	Rural	Low	4.0	PI	26
6	4	Hospital manager	Specialist	M	Sierra Leone	EP	Public	Urban	Low	3.0	PI +RA1	38
7	4	Surgical provider	SACHO	M	Sierra Leone	EP	Public	Urban	Low	3.0	RA1 +PI	37
8	5	Hospital manager	Physician	M	Sierra Leone	SP	Public	Urban	High	12.5	PI	30
9	5	Surgical provider	SACHO	F	Sierra Leone	SP	Public	Urban	High	12.5	PI	40
10	6	Hospital manager	Physician	M	Sierra Leone	NP	Public	Urban	Change: decrease	9.0	PI +RA2	53
11	6	Surgical provider	SACHO	M	Sierra Leone	NP	Public	Urban	Change: decrease	9.0	RA2 +PI	40
12	7	Hospital manager	Physician	M	Sierra Leone	EP	Public	Urban	High	18.0	PI	36
13	7	Surgical provider	Specialist	M	Foreign	EP	Public	Urban	High	18.0	RA2	36
14	8	Surgical provider	Physician	F	Foreign	NP	NGO	Rural	High	13.0	PI	27
15	9	Surgical provider	SACHO	M	Sierra Leone	SP	NGO	Rural	Change: decrease	11.0	RA1 +PI	40
16	2	Surgical provider	Specialist	M	Sierra Leone	WA	Public	Urban	Low	1.5	PI	44
17	10	Hospital manager	Physician	M	Sierra Leone	WA	NGO	Urban	High	11.0	PI	80*

Continued

Table 2 Continued

Participant no	Facility no	Function	Cadre	Gender	Nationality	Region	Sector	Setting	Facility performance	Median monthly surgical productivity in facility in 2017	Interviewer	Duration of interview (minutes)
18	11	Hospital manager	Physician	M	Sierra Leone	NW	Public	Rural	High	14.4	PI	66†
19	11	Surgical provider	Physician	M	Sierra Leone	NW	Public	Rural	High	14.4	PI	66†
20	12	Hospital manager	Physician	M	Sierra Leone	EP	NGO	Rural	Change: decrease	13.3	RA1	25
21	12	Surgical provider	SACHO	M	Sierra Leone	EP	NGO	Rural	Change: decrease	13.3	RA1	30

\*25 min of the interview not recorded.

†Interviewed simultaneously (participant request).

EP, Eastern Province; F, female; M, male; N/A, not available; NGO, non-governmental organisations; NP, Northern Province; NW, North Western Province; PI, primary investigator; RA1, research assistant 1; RA2, research assistant 2; SACHO, Surgical Clinical Health Officer; SP, Southern Province; STP, surgical task-sharing programme; WA, Western Area.

the ambulance system, so all those patients that have been dying in the community, they are brought into the facility and we manage them. Because the government and other partners have stepped up with a lot of programmes, a lot of education and plenty other things. (ID7, SACHO, public)

Insufficient regulation of both surgical facilities and providers by the government stimulates the use of traditional healers or informal, unlicensed clinics, according to several participants. Almost half the participants called for improved regulation to address the informal sector and unlawful activities.

We have a lot of mushroom clinics (...) we receive a lot of moribund cases from these clinics. They are not covered by doctors, neither SACHOs, neither CHOs. Some of them just have experience saying 'Ok, I have worked in the hospital as a porter, now I know how to give injections'. The people will start calling you a doctor, you pose like a doctor, you open a clinic. They have trust in you, because community people tend to have trust in their community fellows. (ID10, physician, public)

The informal sector is described to exist both within regular health facilities by healthcare providers and outside official facilities, where services are offered by unqualified providers. Participants described that financial incentives exist not to record surgical activities in hospital logbooks, which again lead to under-registration of surgical activity in registered facilities.

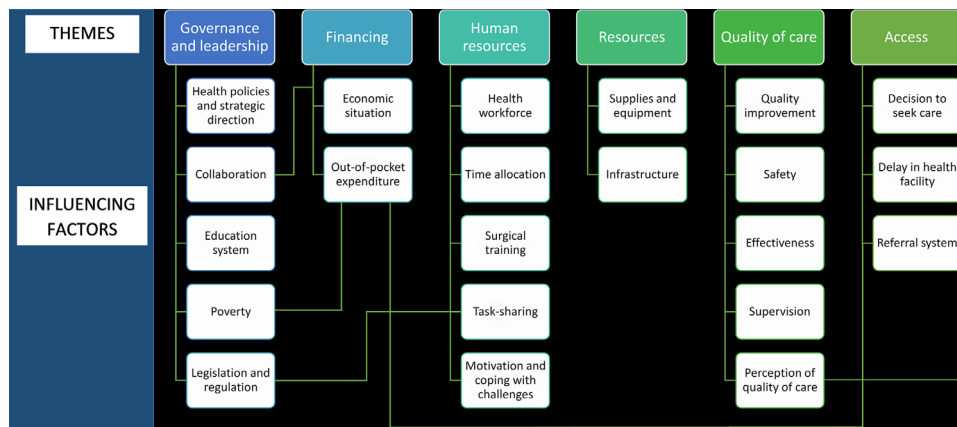
So most times, I don't think they [the surgeries] have been logged in. Because if it has been logged in, something has to go to the hospital. If it's not logged in, you give the hospital nothing. It [the payment] goes back elsewhere, it goes back to you that has done the surgery. (ID18, physician, public)

Though leadership at facility level and the involvement of employees in decision-making were considered important factors to increase efficiency and surgical productivity, currently several management positions are occupied by physicians without previous management experience and limited clinical experience.

For my finance [manager], all he observes is that money is coming from the outpatient department, money is coming from the maternity, but money coming from the theatre is very small. (ID17, physician, private-non-profit)

### Financing

All participants described financial barriers for surgery, both at patients demand side and hospitals provision side. According to participants, the deteriorating economic situation in Sierra Leone and inflation have negatively affected the budget of the health sector, health facilities and individuals, while simultaneously costs of living



**Figure 1** Conceptual framework of the themes and factors influencing surgical productivity. The conceptual framework displays factors influencing surgical productivity based on thematic analysis of participants' responses. Strong connections between factors are connected with lines. The themes and factors displayed play a role at different levels of the health system: the National and environmental level, health facility level and community level.

increased. As healthcare in Sierra Leone is largely paid for out-of-pocket and a large proportion of the population is living in poverty, financial barriers lead to delayed presentation at facilities, and often only after severe complications arise.

The poverty, out-of-pocket expenditure has escalated. And people cannot afford, so some people they go home, because of lack of resources to pay the bills. (ID16, specialist, public)

Whereas patients covered under the FHCI are supposed to get free healthcare, this often poses financial pressure on facilities when the required supplies from the government are insufficient. Not infrequently, these costs are passed on to the patient, thereby decreasing (financial) access to surgical care. Participants experienced that facilities increased surgical activity when offering services at a subsidised price, and that the rise in obstetric surgery is mainly due to the implementation of the FHCI. Several participants suggested that incorporation of emergency surgical care in the FHCI could increase access to surgical care, whereas one suggested the implementation of a health insurance system as a means to reduce out-of-pocket expenditure for patients.

### Human resources

Ninety-five per cent of participants emphasised that the current surgical workforce is too small and unequally distributed, leading to high workloads. Other obligations, such as administrative tasks, meetings and non-surgical care limit the time that can be allocated to surgery and reduce surgical productivity. Hospitals often have too few physicians, and several of them had additional duties such as the medical superintendent role. Inadequate numbers of other health workers, such as anaesthetists and nurses further restrict surgical volumes.

The medical superintendent, he seldomly comes to theatre, although he is doing surgery very well. He is overwhelmed with his administrative work, and most

of the times he has to attend meetings, doing other activities. (ID11, SACHO, public)

Participants explained that shortage of surgical specialists results from the limited educational capacity in the country. Lack of opportunities for specialisation result in emigration of physicians for further education. Financial barriers limit the number of health workers considering additional education. Establishing sufficient capacity to deliver quality education within Sierra Leone would provide the opportunity for health workers to contribute to the health system during their training, and at the same time increase health worker retention.

For non-specialists, who form the largest proportion of surgical providers, short trainings to improve anaesthetic, surgical, obstetric and postoperative management skills were considered beneficial. Some physicians described a lack of confidence in performing surgery due to limited surgical training options. Physicians and associate clinicians both describe that surgical task-sharing provided mutual benefits in terms of learning, sharing the workload and increasing trust in surgery by the community, especially in rural areas. Two participants critically reflected on the role of associate clinicians, sharing concerns about their practices beyond their qualifications and responsibilities.

We see community health officers, I mean, doing surgeries very, very well, (...) you can actually see the difference between you and the CHO, despite that you are a doctor. I think that is one of the reasons that gave me the instinct that, even though I am a medical doctor, actually I needed to go and improve myself. (ID4, physician, public)

Factors that motivate surgical providers include feeling useful and respected, maintaining knowledge and skills, financial motivation and conditions of service, involvement in decision making and being part of a team. Most participants will go a long way to be able to perform

surgery when there is a need, for example, by buying supplies themselves, donating blood, and continuing work despite long hours. Demotivating factors include high workload, challenging living conditions, and experiencing a lack of both financial and non-financial rewards. Some qualified health workers are unpaid volunteers for several years before being absorbed on the government payroll, leading to practices to generate informal income. For others, such as the SACHO's, it takes time before the salary is adapted to the new skills and job description. The lack of accreditation and recognition by the government, together with the lack of career development options for surgical providers are among the most important demotivating factors.

All my time is for surgeries. Even to see my family is a problem. (...) Because my dream was to save people's life and I am doing my level-best to do this. But sometimes when you are frustrated, you feel demotivated and you feel that [what] you are doing is just enslaving yourself. (ID15, SACHO, private-non-profit)

### Resources

All participants experienced deficiencies in supplies, equipment and infrastructure which, together with lack of manpower, limit the surgical capacity. Mostly mentioned were lack of drugs, consumables such as sutures and catheters, blood provision, and surgical equipment, both in quantity and quality. A stable supply of electricity and water was not available in most facilities. Other aspects limiting surgical volume were the number of beds, the capacity of operating theatres and postoperative care in the wards. The high volume of obstetric surgeries sometimes puts a strain on surgical services, resulting in elective general surgeries being postponed because emergency obstetric cases are prioritised. On the other hand, experience with obstetric surgery increased the confidence to perform general surgical procedures for some participants.

Because the demand is so high in obstetric surgery, you will see somebody who is a general surgeon will end up doing only caesarean sections. (ID17, physician, private-non-profit)

### Quality of care

According to participants, quality and safety of surgical care improved over the past 5–10 years. Several examples were given of improved infection prevention measures, reduced postoperative mortality and complications, improved surgical skills, use of protocols, better triage and availability of diagnostic tools enabling early diagnosis and treatment. Participants describe that due to improved quality, trust of patients in surgery has increased.

Once the coordination is there, you have good results, patients will have confidence and more patients will come in. (ID17, physician, private-non-profit)

Participants underline the importance of surgical and obstetric skills training for strengthening the surgical system. Supervision is considered essential to guarantee quality during training and enforces surgical providers to develop a critical attitude, incorporate evidence-based practice and deliver high-quality care. In some facilities supervision is challenging, especially for physicians without additional surgical training, who have the responsibility to supervise associate clinicians and students.

When you as a junior doctor are doing something (...) you don't have anybody to correct you. (ID10, physician, public)

### Access

Patients' poor access to surgery was perceived as one of the key barriers against increasing surgical productivity. This includes numerous factors such as aforementioned financial barriers, as well as cultural habits and poor awareness of surgical problems and its treatment options.

Sometimes, you know, the people fear the surgery. [At] the time they come to accept the surgery, they have to consult all the family, maybe they have to go first to the traditional healers, and come back. The culture, it can be one of the biggest barriers. (ID13, specialist, public)

Poor roads and transportation decrease access to hospitals that offer surgical services. According to participants the referral system from PHU's to hospitals has advanced with the development of an ambulance system. Most facilities see a substantial increase in referred obstetric patients as a result. With the improved surgical expertise in district hospitals, most participants described that referrals from district hospitals to regional and tertiary hospitals for common emergency surgical conditions have decreased.

### DISCUSSION

This qualitative study brings together experiences from hospital managers and surgical providers in a low-resource setting, filling a knowledge gap by identifying the barriers they experience to increase the surgical volume and surgical productivity. The key findings, summarised in the conceptual framework, illustrate how surgical providers in Sierra Leone are limited by factors across and beyond the health system. These findings add to the evidence of similar cross-cutting barriers to surgical care from other LMIC's that describe barriers such as poverty, workforce shortages and staff motivation, and scarcities of supplies and infrastructure.<sup>27–30</sup> Previous studies in Sierra Leone reported on community barriers, such as poverty, cultural beliefs and quality of care.<sup>31–34</sup> A recent study from Sierra Leone's capital Freetown focused on the importance of staff recognition.<sup>35</sup> Increasing surgical volume and surgical productivity are important to lessen the burden of unmet surgical need, but also to prepare for the expected



additional surgical demand due to population growth and a future increase in non-communicable diseases.<sup>36 37</sup>

The explanatory accounts from this study improve our understanding of why the surgical productivity in Sierra Leone has remained low despite an increase in surgical providers. As the study provides a cross-section of barriers affecting surgery throughout the country, the differences in perceived barriers between settings can provide guidance in targeting and implementing health policies. The variety in barriers could explain why half of the participants did not perceive a decrease in surgical productivity. In rural areas, participants described high workload, limited supervision and difficult living circumstances, while health facilities in urban settings often were overcrowded. Both settings suffer from limited supplies, equipment, infrastructure and workforce, especially in public facilities. Private non-profit facilities and public facilities collaborating with NGOs benefit from increased supplies, and are commonly able to offer surgery for a reduced price.

### Barriers to increasing surgical productivity

The main barriers identified against increasing surgical productivity include poverty and financial barriers, deficiencies in surgical supplies, equipment, drugs and blood provision, and lack of proper regulation of surgical facilities. These findings are supported by a recent study of trauma and wound care in Sierra Leone, describing supply-side and demand-side factors in accessing care.<sup>38</sup> The lack of basic infrastructure and surgical equipment in healthcare facilities in Sierra Leone was already identified a decade ago and reaffirmed in 2017.<sup>20 39</sup> Studies in other LMIC's, such as Tanzania, Malawi and Zambia, also found that shortages of supplies, equipment and lack of space hampered an increase of surgical volume, and caused high cancellation rates of surgery.<sup>40-42</sup> Similar lessons can be learnt from non-surgical programmes, such as HIV and tuberculosis, where already a decade ago it was found that the success and scale-up of a programme is strongly correlated with the strength of a health system and vice-versa.<sup>43 44</sup> Across the different health systems strengthening interventions, governance and leadership plays an important role due to its coordinating function.<sup>45</sup> To develop a sustainable surgical system, policy-makers and health systems developers need to address these issues, as they are outside the scope of influence of surgical providers.

Over the past decades the health agenda in Sierra Leone has largely focused on infectious diseases and maternal health, influenced by domestic and international actors.<sup>46-48</sup> Development of a national surgical, obstetric and anaesthesia plan (NSOAP) and surgical health policies could promote engagement to achieve surgical objectives.<sup>17 49</sup> Although the development of a NSOAP in Sierra Leone was initiated in 2016, until today it has not been finalised.<sup>17</sup> The lessons learnt from establishing maternal health infrastructure, information systems and policies

could be used to enhance development of the system for general surgery.<sup>50</sup>

Correspondingly, the high out-of-pocket expenditure for surgical care currently poses a large burden on individuals.<sup>31-35</sup> Subsidising healthcare through the FHCI has been effective in improving access to obstetric and surgical care for pregnant women and children,<sup>8 51 52</sup> despite the fact that subsidised care under the FHCI in reality is not always free.<sup>53</sup> Although the additional obstetric surgeries further increase the workload of an already overloaded surgical system, the overall CS rate in Sierra Leone remains low at 4% of live births, indicating that access to obstetric care continues to be a challenge.<sup>54 55</sup> In, for example, Ghana and Rwanda, health insurance effectively increased the use of health services for obstetric and surgical causes, while reducing the risk of catastrophic health expenditure.<sup>56 57</sup> Although the Sierra Leone Social Health Insurance Scheme was launched in 2018, until now this is not operational.<sup>47 58</sup>

### Workforce performance

Currently, there is still an immense health worker shortage in Sierra Leone, due to low output of medical graduates, lack of postgraduation training opportunities and challenges with staff retention.<sup>59-63</sup> Motivation among surgical providers in Sierra Leone is high, but numerous factors hinder their productivity. Over the past decade Sierra Leone introduced a surgical task-sharing programme, expanded capacity of medical training and established in-country postgraduate surgical training.<sup>64</sup> However, for the next decades the capacity of medical institutions in Sierra Leone is not sufficient to train the required number of physicians and specialists.<sup>5 39 65</sup> Our results indicate that task-sharing is widely accepted among surgical providers and the community in Sierra Leone. We found that the absence of a legal framework, lack of official recognition and accreditation, inexact defined responsibilities and poor employment conditions were important demotivating factors for associate clinicians in Sierra Leone, as also described in other sub-Saharan countries.<sup>66-69</sup> According to a recent review of surgical task-sharing in sub-Saharan Africa, other barriers to surgical task-sharing involved a perceived reduction in surgical skills and outcomes, poor continuous professional development and lack of supervision.<sup>68</sup> Whereas task-sharing has proven its worth in providing safe surgical care in Sierra Leone, and associate clinicians currently perform almost 20% of surgical procedures,<sup>70 71</sup> so far it has not led to the required increase in surgical volume.

Therefore, next to increasing the number of surgical providers, we recommend strengthening the existing surgical workforce. Increasing productivity of current surgical providers can provide a fast and low-cost solution to increase surgical volume.<sup>5</sup> A continuous professional development programme for the different cadres of surgical providers can support surgical health workers to increase productivity e.g. with short surgical courses, surgical coaching and supervision with audit



and feedback.<sup>72–74</sup> Adequate training and supervision of students enrolled in the task-sharing programme and just graduated physicians to provide them with the necessary skills and confidence is needed, as they often feel not well equipped to perform surgeries. To bolster health worker retention in rural areas, it is important to improve working and living conditions, for example, access to healthcare and education of their own family.<sup>63 73</sup>

### Quality

As not all surgical procedures are registered, or performed in formal clinics, actual access to surgical care might be higher than anticipated. Currently, the private sector includes a heterogeneous mix of private and informal facilities and providers. Increased stewardship and accountability for health facilities and providers by the government, including accreditation and licensing, can help regulate the surgical system.<sup>75 76</sup> Good quality, affordable surgical treatment needs to be available in order for regulation to be effective in reducing the demand for unqualified, low quality providers.<sup>75 77</sup> Improving the availability of resources, drugs and surgical equipment has mutual effects on surgical productivity, accessibility and quality of care. A higher perceived quality of care will consequently increase the acceptability of and demand for surgery.<sup>32 78</sup> Although participants described improvements in quality of surgical care, a study by Willott *et al* in Freetown found significant discrepancies between how patients and healthcare providers perceived quality of care and the provider–patient relationship.<sup>35</sup> Further research at the community level could give valuable insights to where individuals get their surgical care, and what the surgical ecosystem in Sierra Leone looks like. As it is essential to safeguard safety and quality of surgery when aiming to increase the surgical volume and surgical productivity, we recommend further research on quality of care through assessment of surgical indications, complications and referrals, to strengthen these claims.

### Strengths and limitations

The variety of facilities and participants, spread over all regions of Sierra Leone and including both the public and private non-profit sector, allowed a broad understanding of the research topic. Private for-profit facilities were excluded, because they accounted for only 5.2% of all surgeries performed nationwide.<sup>10</sup> Furthermore, the research was limited to the provider side, and did not include community accounts. Although interviews were the main source of information, it was supported by observations in the facilities and informal conversations with other staff at the facilities to improve understanding and interpretation of the interviews. In addition, nationality, cultural differences and personal experiences of the primary investigator might have influenced data collection and interpretation, even

though we tried to limit this influence by including a variety in interviewers and frequent discussions with the research team, who all had worked in Sierra Leone for prolonged time.

Through the interviews with surgical providers, we realised that actual surgical volume and surgical productivity are probably higher than the results of the surgical mapping suggested, because of the influence of under-registration of surgical procedures and informal practices. This could explain why participants did not recognise the decrease in surgical productivity from subjective experience. Further research into the influence of the private sector, including informal practice for surgical procedures, dual practice and under-reporting is needed to determine the scale and the effects of this data gap.

### CONCLUSION

The weak health system contributes to a fragile surgical system in Sierra Leone resulting in a low and decreasing surgical productivity. Surgical provider performance is negatively influenced by factors across the whole health system, such as a lack of resources and financial barriers. The successful increase in obstetric surgery illustrates what can be accomplished with focused interventions. Strengthening of the whole health system will be required to meet all surgical needs, including efforts to develop national strategies for surgery, obstetrics and anaesthesia, to strengthen infrastructure and supply management and to reduce financial barriers in accessing surgical care. Surgical productivity can be enhanced by increasing surgical training and continuous professional development for surgical providers to increase their surgical skills and confidence and use their full potential. Together with implementation of a regulatory framework, with tangible recognition in terms of fair remuneration and career development options for surgical providers, these efforts can have a large impact in increasing access to surgical care in Sierra Leone. While expanding surgical capacity, the quality of care needs to be guarded.

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the programme coordinator, and PM and TS are graduates of the surgical training programme.

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