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Financing of Surgery and Anaesthesia in Sub-Saharan Africa: A Scoping Review

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-051617
Article Type:	Original research
Date Submitted by the Author:	25-Mar-2021
Complete List of Authors:	Ifeanyichi, Martilord; Radboudumc, Department for Health Evidence Aune, Ellis; Radboudumc, Department for Health Evidence Shrime, Mark; Royal College of Surgeons in Ireland, Department of Global Health and Social Medicine; Harvard Medical School, Department of Global Health and Social Medicine Gajewski, Jakub ; Royal College of Surgeons in Ireland Pittalis, Chiara ; Royal College of Surgeons in Ireland, Department of Epidemiology and Public Health Medicine Kachimba, John; University of Zambia University Teaching Hospital, Department of Surgery Borgstein, Eric; University of Malawi Brugha, Ruairi; Royal College of Surgeons in Ireland, Department of Epidemiology and Public Health Medicine Baltussen, Rob; Radboudumc, Department for Health Evidence Bijlmakers, Leon; Radboudumc, Department for Health Evidence
Keywords:	Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, HEALTH ECONOMICS, SURGERY, PUBLIC HEALTH

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4 Review
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44 **Word Count: 4,301**
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ABSTRACT

Objective: This study aimed to conduct a situational analysis and provide a collation of current knowledge on financing of surgical and anaesthesia care across sub-Saharan Africa (SSA).

Setting: Surgery and anaesthesia services across all levels of care - primary, secondary and tertiary.

Design: We performed a scoping review of scientific databases (PubMed, EMBASE, Global Health and African Index Medicus), grey literature, and websites of development organisations. Screening and data extraction were conducted by two independent reviewers and abstracted data were summarized using thematic narrative synthesis per the financing domains: mobilization, pooling and purchasing.

Results: The search resulted in 5533 unique articles among which 149 met the inclusion criteria: 132 were related to mobilization, 17 to pooling, and 5 to purchasing. Neglect of surgery in national health priorities is widespread in SSA and no report was found on national level surgical expenditures or budgetary allocations. Financial protection mechanisms are weak or non-existent; poor patients often forego care or face financial catastrophes in seeking care, even in the context of universal public financing (free care) initiatives.

Conclusion: Financing of surgical and anaesthesia care in SSA is as poor as it is under-investigated, calling for increased national prioritisation and tracking of surgical funding. Improving availability, accessibility, and affordability of surgical and anaesthesia care require comprehensive and inclusive policy formulations.

KEY WORDS: Global Surgery; Sub-Saharan Africa; Health Financing; Universal Health Care; Health Accounts

Strengths and Limitations of this Study

- This study was conducted based on standard guidelines, including Arksey and O'Malley (2005), Levac et al (2010), the Joanna Briggs Institute (2020), and PRISMA Statement and its extension for scoping reviews.
- It benefited from a comprehensive published and grey literature search strategy designed with the support of institutional bibliographers.
- The use of two independent reviewers and an arbiter ensured meticulousity while minimising biases in the review process.
- It thoroughly examines the situation and the current knowledge on the financing of surgery and anaesthesia in sub-Saharan Africa.
- Findings from one country may not represent the situation in other countries in the region.

INTRODUCTION

Over 70% of the world population lack access to safe, timely and affordable surgical, obstetric and anaesthesia (SOA) care, with an estimated nine out of ten people affected in sub-Saharan Africa (SSA).¹ The Lancet Commission on Global Surgery (LCGS) has set a timeline of 2030 for 80% of the global population to have access to SOA care,² and as a strategy, it also recommended that low- and middle-income countries (LMICs) develop National Surgical, Obstetrics, and Anaesthesia Plans (NSOAPs), structured into five domains: service delivery, infrastructure, workforce, information management, and financing.² The financing system is critical to the achievement of universal access to surgical care, as it directly affects availability, accessibility and affordability of services.

Health financing is the “function of a health system concerned with the mobilization, accumulation and allocation of money to cover the health needs of the people, individually and collectively, in the health system”.³ Three cardinal but interrelated functions of health financing are distinguished: revenue collection, resource pooling, and purchasing.³ Resource mobilization refers to the ways in which revenues are raised and collected, including government budgetary allocations (from taxes), health insurance premiums, out-of-pocket payments (OOP) and donor funding. The pooling function refers to the mechanisms of accumulation of prepaid funds on behalf of populations in order to address financial challenges at the point of service delivery. Pooling delinks expected health expenditures from patients’ ability to pay,⁴ and ideally protects people from catastrophic or impoverishing expenditure while accessing health services. The most common pooling mechanisms are government tax revenues pooling for health and health insurance schemes. The purchasing function refers to the payment systems for health goods and services provided.

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5 To improve surgical financing, the LCGS recommended that national governments undertake
6 the following: cover basic surgical care within Universal Health Coverage (UHC); pool risks
7 in a single pool and reduce payments at point of service; track financial flows for surgery
8 through national health accounts; and use value-based purchasing with risk-pooled funds.
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10 Further, as progress assessment indicators, they proposed that surgical expenditure be reported
11 as a percentage of GDP and as a percentage of annual health care expenditure; and that out-of-
12 pocket payments on surgery, and catastrophic and impoverishing expenditure on surgery be
13 monitored. It is noteworthy that catastrophic and impoverishing expenditures on surgery have
14 been included in the World Bank World Development Indicators (WDI).⁵
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28 Since the LCGS report in 2015, five SSA countries have launched and are implementing their
29 NSOAPs: Rwanda, Zambia, Tanzania, Nigeria and Madagascar.⁶ Dozens of other SSA
30 countries are either in the process of or have committed to the development of NSOAPs.
31 Development of health policies require baseline analyses.⁷ In the development of the Tanzania
32 NSOAP, evidence from a systematic literature review by Nyberger et al guided a stakeholder
33 discussion to directly inform the NSOAP priorities.⁸ In the financing domain however, the
34 review found only limited evidence – highlighting a paucity of research on the financing of
35 surgery, especially at country levels. A collation of evidence from different countries may be
36 beneficial to national health policy makers, and as more countries develop and adopt NSOAPs,
37 there is a need for more evidence to guide these investments towards improving SOA care in
38 sub-Saharan Africa.
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56 This study aimed therefore to answer the following question: *What is known about financing*
57 *of surgery and anaesthesia in SSA?* We conducted a scoping review with the following
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3 objectives for each financing domain: (i) Describe the current status; (ii) Synopsise the
4 available evidence; (iii) Produce a database of all studies related to the subject; (iv) Highlight
5 the current challenges and explore the policy options ; and (v) Identify research gaps and guide
6 future research efforts.
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14 **METHODS**

15 **Framework**

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21 The approach was based on Arksey and O'Malley⁹ who provided the first methodological
22 framework for conducting scoping reviews, supplemented with the recommendations of Levac
23 et al¹⁰ and the Joanna Briggs Institute (JBI).¹¹
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31 **Search Strategy and Data Sources**

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33 The search query was designed based on three search blocks - "surgery and anaesthesia",
34 "health financing", and "sub-Saharan Africa" - with the assistance of institution bibliographers.
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36 The primary query was built on PubMed, in an iterative fashion, using a list of already
37 identified relevant articles. The final PubMed query was adapted and applied to all the other
38 databases. The full search string is included in Supplemental material 1 (S1).
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47 We searched four bibliographic databases without any language restrictions: Global Health on
48 22nd July 2020, and PubMed, Embase, and African Index Medicus on July 24th. Searches were
49 restricted to articles published between January 2010 and July 2020, to capture a fairly current
50 situation, while covering approximately five years before and after the LCGS report.
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52 Conference proceedings, dissertations, and animal studies were excluded. Additionally, we
53 performed snowballing by hand-searching for further possibly relevant articles cited in the
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3 identified articles. A grey literature search was conducted on Google, and websites of WHO,
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5 World Bank, and USAID were also manually searched.
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10 **Screening Process and Management**

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14 All search results were first imported into EndNote X9 for deduplication, and then exported to
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16 Rayyan,¹² a web and mobile app designed for systematic reviews, for title and abstract
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18 screening. The initial screening was performed independently by authors MI and EA. In case
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20 of discrepancy, MI and EA reviewed the abstract together, and if no agreement could be
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22 reached, author LB was consulted to make the final decision. In the second round, full texts of
23
24 included articles were reviewed independently and discussed by authors MI and EA, and LB
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26 was again consulted in case of irresolvable discrepancies. French articles were handled solely
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28 by author LB who possesses a full professional proficiency in French Language.
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36 The Population, Concept, and Context (PCC) framework described by the JBI¹¹ was used to
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38 define the inclusion/exclusion criteria, which are included in Table 1. Relevance criteria were
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40 applied in a hierarchical fashion: each article was assessed firstly on whether or not it pertained
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42 to SSA, then whether or not it pertained to surgery, and lastly whether it covered financing of
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44 surgery. All available sources were included.
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49 Table 1: Inclusion and Exclusion Criteria

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	Inclusion Criteria	Exclusion Criteria
Population	<ul style="list-style-type: none"> • General population • Major surgery patients 	<ul style="list-style-type: none"> • Non-surgery patients

	<ul style="list-style-type: none"> • Operative and non-operative surgery patients • Healthcare providers • Health policy makers • Agencies or organisations Involved in surgery financing 	<ul style="list-style-type: none"> • Medical gynaecological patients • Medical obstetric patients • Patients with minor procedures such as male circumcision, post-abortion care (e.g. manual vacuum aspiration)
<p>Concept</p>	<ul style="list-style-type: none"> • Financing of surgical care including user fees, tax funding, health insurance, donor funds • Universal health coverage • Equity in surgery care access • Impoverishing and catastrophic expenditures • Economics of surgery 	<ul style="list-style-type: none"> • Costing studies (without financing data) • Cost-effectiveness studies (without financing data) • Studies focusing on the epidemiological or clinical aspects of surgeries

Context	<ul style="list-style-type: none"> • Primary, secondary and tertiary hospital care • Sub-Saharan Africa • Global surgery studies broadly (including SSA) 	<ul style="list-style-type: none"> • Non-hospital primary health facilities (dispensaries, health posts, health centres) • Studies focusing on high-income countries only • Studies focusing on LMICs outside SSA
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Data Extraction, Analysis and Synthesis

Data extraction and charting was performed using a customized form in Excel 2020 based on the JBI guidelines.¹¹ Sub-themes that emerged were noted and coded against the relevant financing function domains. Descriptive statistics were computed for the article characteristics. A narrative synthesis was employed in summarising the results of the research question, maintaining the three financing domains as the overarching themes. Results are presented as per PRISMA Statement¹³ and its extension for scoping reviews (See Supplemental material 2[S2]).¹⁴

Patient and Public Involvement

Patients or the public were not involved in the design, conduct, or reporting, or dissemination plans of our research.

RESULTS

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3 Following deduplication, our search resulted in 5533 unique articles. Text and abstract
4 screening produced 229 articles, of which 149 met the inclusion criteria following full text
5 reading (Figure 1). Most (132) were in English and nine were in French. Two-third of the
6 articles were published between 2015 and 2020. In terms of geographical spread, the studies
7 covered 28 countries: Nigeria had the highest number of articles (34), followed by Uganda (15)
8 and Kenya (14). Eight articles were non-specific while several articles cut across more than
9 one country. Details are presented in Supplemental material 3 (S3).

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20 The majority of articles focused on specific surgical conditions or subspecialties (N=121;
21 81%), while 28 were non-specific or dealt with surgical systems generally. Obstetrics (mostly
22 Caesarean sections) had the highest number of articles (39), followed by ophthalmology (24;
23 mostly cataract procedures), and oncology (17). The breakdown of the articles per specialty is
24 presented in Figure 2.

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32 The majority of the articles were empirical (N=138; 92%); ten were opinion/editorial papers,
33 while one was a technical brief. The empirical articles included 70 quantitative studies (81%),
34 12 qualitative studies, 11 mixed-methods studies, and three systematic reviews. Most of the
35 quantitative articles were descriptive (N=81; 72%); 12 were analytical (cohort or case-control);
36 five were modelling studies; and 14 were quasi-experimental (including four interrupted time
37 series analyses, two propensity score matching analyses, two difference-in-difference analyses,
38 and six uncontrolled before-and-after studies).

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49 The bulk of the articles related to the pooling and risk protection function of health financing
50 (N=132; 89%); 17 related to financial resource mobilization (11%), and five to purchasing
51 (3%). Some of the articles related to more than one domain. In the next sections, we present a
52 thematic narrative of the data extracted from the various articles.
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3 Figure 1: PRISMA flowchart of the search process
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9 Figure 2: Breakdown of the selected articles by surgical specialties
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15 **(I) Resource Mobilisation and Budgetary Allocations to Surgery.**

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18 Seventeen articles explored the resource mobilization for or allocations to surgery. No report
19 of national or sub-national level budgetary allocations or actual expenditures on surgery was
20 found. There was evidence of poor prioritization of surgery in government plans and UHC
21 programmes in SSA generally: in a systematic review of National Health Strategic Plans
22 (NHSPs) of 48 SSA countries by Citron et al (2016), 19% of NHSPs had no mention of surgery
23 or surgical conditions, and 63% had five or fewer mentions of surgery. Compared to HIV and
24 malaria that had 3772 mentions across all the plans, surgery had only 376 mentions. While
25 33% of policies had no surgical targets, all had measurable targets for HIV and TB control.¹⁵
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37 Seven articles had data on revenue sources for surgery at the hospital level, with out-of-pocket
38 payments (OOP),¹⁶⁻¹⁹ government support,²⁰ and donor funds^{19 20} identified as the biggest
39 sources of the operational funds. In Ekenze and others' systematic review of studies published
40 between January 2007 and November 2016 that reported the specific funding of paediatric
41 surgeries in SSA, OOP was the predominant source of funding (91.4%), followed by NGO
42 funding (60%).¹⁹
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51 Regarding hospital expenditure on surgery, four studies were relevant.^{16 20-22} In a retrospective
52 cross-sectional study of the human and financial constraints to essential surgery at eight district
53 hospitals (DHs) in Tanzania, Uganda, Mozambique, the DHs spent 7-14% of their operational
54 funds on surgery, representing an annual per capita expenditure of US\$ 0.05 to 0.14.²¹ The bulk
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3 of this expenditure (3-8% of total operational cost) was attributed to obstetrics alone.
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5 Comparable proportions (16-17%) were also reported at two DHs in Malawi.
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9 Several approaches to increasing the funding of surgery were recommended in the articles. In
10 the review by Ekenze et al, the main suggestions were increased funding by national
11 governments and by international organisations (85.7%), the establishment or improvement of
12 health insurance schemes (60%) and the sustained use of charities and medical missions
13 (42.9%).¹⁹ Several papers in our review emphasized public-private partnerships,^{23 24} as well as
14 scale-up of health insurance coverage.²⁵⁻²⁷ Rather than attempting to reinvent the wheel in the
15 face of structural and economic constraints, Frimpong called on national governments to tweak
16 and leverage on the existing market models to scale-up local production of surgical
17 consumables, for example by replacing non-profitable tyre production with gloves and boots
18 production, or production of cotton wool and gauze alongside or in place of cloth.²⁸
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32 Reddy et al (2020) advocated moving beyond the traditional funding sources.²⁹ They suggested
33 innovative financing instruments that have been applied in other global health initiatives, such
34 as voluntary solidarity levy (as in Unitaid), voluntary contributions (PRODUCT[RED]),
35 performance-based instruments (GAVI), and securities and bonds (International Finance
36 Facility for Immunisation [IFFI] and The Children's Investment Fund Foundation [CIFF])
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44 **(II) Pooling/Risk Protection**

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47 A total of 132 articles provided evidence related to pooling functions and financial protection.
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49 Eight subthemes emerged. Some themes portrayed dysfunctionality of the financial protection
50 systems and their implications for patients: financial barriers to access of care, transport cost
51 barriers, OOP and catastrophic/impooverishing expenditure, payment coping mechanisms, and
52 low willingness to pay. Others explored commonly available financial protection interventions:
53 universal public financing, and health insurance. Other studies evaluated how best to
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3 simultaneously achieve health benefits, financial protection, equity and efficiency in surgical
4 care delivery. Several articles cut across multiple themes. The eight thematic clusters and
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7 selected illustrative studies are presented below:
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10 *1. Financial barriers to accessing surgical care*

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13 The 55 articles in this cluster investigated patient reported obstacles or challenges to surgical
14 care and reported “costs” or “lack of finances” as a major reason for not seeking³⁰ and for not
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obtaining surgical care (following recommendation);^{31 32} and as a reason for experiencing
delays in accessing,^{24 33} or dropping out of the surgical continuum of care.^{34 35} In a population-
based survey to assess the surgical burden of diseases in Uganda, 66% of the people living with
treatable surgical conditions cited cost as the reason for not seeking care.³⁰ A systematic review
of barriers to cataract surgeries in Africa cautioned against face value interpretation of such
findings, as “costs” are sometimes convenient masks for factors than inability to pay, such as
unwillingness to pay and complex family decision-making dynamics.³⁶

35 *2. Transport cost barrier*

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Closely related to the above financial access barriers, 12 articles highlighted the particular
challenges presented by transport costs to accessing surgical care, even in situations where
medical treatments are provided free of charge. In interviews and focus group discussions with
64 patients living with lymphatic filariasis in Ahanta West District of Ghana, 64% cited indirect
costs (transport and loss of wages) as the most prohibitive factor to seeking care, despite the
cost of surgery being covered under the National Health Insurance Scheme (NHIS).³⁷

53 *3. Out-of-Pocket, and Catastrophic and Impoverishing Expenditures*

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Twenty-six publications explored OOP and catastrophic or impoverishing expenditure
incidences and reported high rates. In a study that modelled global country-level comparison
of the financial burden of surgery, the risk of financial hardship from surgery was highest in

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3 SSA, with up to 90% of patients facing the risks of catastrophes and up to 100% risk
4 impoverishments.³⁸ Despite that health services are provided free of charge at public facilities
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6 in Malawi, 90-97% of hernia patients still suffered catastrophic expenditure.³⁹
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10 *4. Patient Coping Mechanisms and Economic Consequences of Out-of-Pocket Payments*

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13 Twelve articles provided insights into how households of surgical patients mobilise resources
14 for OOPs as well as the adjustments they make in their daily lives to cope with the impact.
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16 Despite the free obstetric care policy in Malawi, 31% of the women who received such care
17 borrowed money, 24% sold assets, 17% used their savings, while others got help from family
18 members abroad (17%) or their local social network (12%).⁴⁰ Reported compromises in every
19 day spending in the face of catastrophic surgical expenditure included decreases in food
20 consumption,^{40 41} withdrawal of wards/children from school,^{40 42} even as some households
21 remained in debts several years after the surgery.^{40 41}
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33 *5. Willingness To Pay (WTP)*

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35 Three articles investigated the willingness of surgical patients to pay for services. Even though
36 most patients were willing to pay “something”, their WTP was usually lower than the actual
37 cost of getting the surgery.^{43 44} In a hospital-based survey of patients who had received free
38 surgery in Malawi, participants expressed willingness to pay a median of US\$3, which was
39 substantially lower than US\$60, the estimated combined cost of screening, transport, feeding,
40 accommodation, medicines and surgery.⁴⁴ Studies showed that WTP for surgical services
41 increases remarkably with counselling on the benefit⁴⁵ and actual cost of the surgery,³⁶ and
42 increased trust in providers.³⁶
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54 *6. Universal Public Financing (UPF) or Free Services*

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57 In a bid to protect patients from financial hazards, governments in SSA have often abolished
58 user fees in public hospitals, either for all or certain categories of care. Twenty-three articles
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3 evaluated the implementation or the effects of such measures on service utilization and/or
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5 financial protection.
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8 Free maternal and under-five care in Sierra-Leone was associated with a five-fold increase in
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10 the volume of paediatric surgeries in the 20 months after its introduction compared to 20
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12 months before at a public tertiary hospital; above-five surgeries increased by only 17%⁴⁶.
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14 Perhaps partly reflecting differences in methodologies, conflicting reports were obtained on
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16 the effects of fee removal on Caesarian section rates, with various studies reporting nil impact,
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18 ^{47 48} increases,⁴⁹ and (possibly supplier-induced) excessive CS rates.⁵⁰
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23 Several papers reported significant financial hazards despite the free care policies, due to
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25 informal direct medical costs, indirect medical costs (particularly transportation), or both.
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27 Patients often encountered informal direct medical OOPs due to frequent drug stockouts,
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29 equipment breakdowns, unofficial fees,^{42 49 51-53} or outright bribery of health workers to
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31 “facilitate” access to so-called free care.^{49 50 54 55}
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35 The failure of UPF programmes across SSA to provide adequate financial protection has had
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37 adverse implications for equitable access to care, as evidenced in six studies. Pro-rich inequities
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39 were documented in use of CS several years after introduction of free obstetric care policies in
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41 Ghana,^{56 57} Mali,^{58 59} and Benin.⁵⁹
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45 Valuable insights were gained into the challenges confronting successful implementation of
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47 UPF policies. Poor funding and delayed or incomplete hospital reimbursements were
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49 commonly reported,^{52 60} as was poor supervision and accountability mechanisms,^{60 61} lack of
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51 clarity on policy provisions e.g. which items or services ought to be paid for,^{54 61} poor
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53 specification and targeting of beneficiaries,⁵⁰ demotivation of hospital workers due to declines
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55 in hospital finances,⁵² and resistance among health professionals manifesting as “rent-seeking”
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57 and corrupt practices to augment sagging personal incomes.^{50 54 60}
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7. Health Insurance

Twenty-three articles provided insights into health insurance coverage and the degree of protection it provides for surgery patients in SSA. Health insurance coverage rates among cross-sections of emergency surgery patients studied were generally poor: about 3% in Nigeria,⁶² 6% in Mali,⁶³ 8% in Tanzania,⁶⁴ 17% in Madagascar,⁶⁵ and 23% in Kenya.⁶⁶ Coverage rates stood out in Ghana (67%), courtesy of NHIF,⁶⁷ and Rwanda (98%) with its Community Health Insurance Fund (CHIF).⁶⁸ Instructively, higher rates were reported among elective surgery patients – 45% in Nigeria⁶⁹ and Tanzania,⁷⁰ and 90% in Kenya⁷¹ – indicating a disproportionately higher uptake of elective services by the insured who are mostly the better off, at the expense of the poor.^{69 70} This review found evidence of some level of financial protection from health insurance. For instance, in a study among surgical patients admitted over a period of eight months at a teaching hospital in Ghana, 58-87% of insured patients faced catastrophic expenditure, compared to 83-98% among the uninsured. The insured spent an average of 39% of their annual income on seeking surgical care compared to 61% of the uninsured.⁷² Like the UPF programmes however, concerns of inequities remain.⁷³

Various studies reported specific challenges associated with national health insurance schemes in SSA. In Nigeria for instance, NHIS is considered as bureaucratic and elitist, covering only civil servants and people of higher social status.^{25 69} Beneficiaries have also reported lack of clarity about what services are covered or not, as well as confusion about payment and reimbursements mechanisms.²⁵ From the provider perspective, there have been worries about NHIS reimbursement rates being lower than the actual service costs, forcing some private providers to exit the programme, as well as delays in reimbursements which affect running of the facility.^{69 74} Another major and common challenge recorded was shallowness of benefit coverages. Even though the insured had lower chances of catastrophic expenditure, a large proportion of them still suffered catastrophes,⁷² and still employed “extreme” payment coping

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3 strategies.⁴¹ Although poor awareness of NHIF was noted as an issue in SSA, studies indicate
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5 patient education and sensitization again make a huge difference.⁷⁵
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8 *8. Financial protection, equity and efficiency*

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11 An extended cost-effectiveness analysis by Shrima et al (2016) evaluated the health, financial
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13 and equity impacts of nine common NGO and government strategies towards improving access
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15 to surgery in Uganda. It showed that only mobile surgical programmes and policies that
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17 simultaneously address surgical service scale-up (providers), out-of-pocket expenditure for
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19 surgery, and (the often ignored) transport cost, can provide health and financial benefits,
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21 equitably and efficiently.⁷⁶ A similar study in Ethiopia arrived at the same conclusion.⁷⁷
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26 **(III) Purchasing/Provider Payment**

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29 Five articles had findings related to the purchasing function of health financing. Surgery
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31 providers in public institutions in SSA are generally salaried workers,^{78 79} but poor
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33 remuneration is widespread. In a multi-centre survey of 41 paediatric surgeons across 11
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35 Francophone countries in SSA, the average salary in 2008 was just about 450 Euros per month
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37 (ranging from 120 to 1400 Euros).⁷⁹
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42 Two studies explored the effect of payments mechanisms on hospital operations. A before-and-
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44 after study in Burkina Faso showed that both government and household expenditure on CS
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46 increased after the free delivery policy changed from retrospective fee-for-service payment to
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48 prospective fee-for-service payment.⁸⁰ The other study showed that the introduction of
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50 performance-based financing at DHs in Rwanda was associated with an increase in the number
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52 of CS from 60 to 140 per quarter over a five-year period.⁸¹
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55 **DISCUSSION**

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3 Today, domestic resource mobilization for surgery in SSA is grossly deficient due to the double
4 jeopardy of an overall constrained fiscal space for health and poor political prioritisation of
5 surgery. Using Shiffman and Smith's analysis framework for assessing global health priorities,
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8 Frimpong-Boateng (2019) attributed the neglect to "the failure to communicate a clear policy
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10 need using powerful ideas that take advantage of the political contexts of the times".²⁸ There
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13 is clearly a need for champions, including practitioners, scholars, public servants, and
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15 professional societies who would leverage political affiliations and use empirical evidence to
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17 project surgery into political consciousness at different levels, as has been witnessed in the few
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19 countries that have adopted NSOAPs.^{6 82 83}
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24 Another direct consequence of the national level neglect of surgery in SSA is the literature
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26 lacuna on surgical allocations and expenditures, as revealed in this review, contrary to the
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28 LCGS recommendations. In a further search for possible insights, we reviewed five SSA
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30 NSOAPs that were accessible via Google (Ethiopia, Nigeria, Rwanda, Tanzania, and Zambia)
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32 and found that none had any data related to national financial allocations to surgery or actual
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34 expenditures, while only the Nigeria and Rwanda NSOAPs had information on hospital
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36 allocations to surgery. This finding is neither new nor limited to SSA: Meara et al (2015)
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38 reviewed 958 national health accounts published between 1996 and 2010 in LIMCs and
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40 reported that only Georgia and Kyrgyzstan routinely reported expenditures on surgery;² and a
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42 2015 systematic review of UHC programmes in LIMCs showed surgeries were systematically
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44 excluded from national UHC packages.⁸⁴ This limited evidence shows the lack of substantial
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46 progress, five years after the LCGS recommendations, suggesting minimal scholarly interest
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48 in the subject. The upward trend recorded in the volume of studies from 2015 is nonetheless
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50 welcome and should be sustained and intensified.
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57 Poor pooling functions across SSA mean that access to surgical care still correlates strongly
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59 with socioeconomic status, resulting, among the poor, in disinclination to seek care,
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3 catastrophic expenditures for those who dare to seek care, disruptions in care stream, and
4 consequential inequities in health outcomes affecting especially the poor. The successes
5 recorded with CHIF in Rwanda⁸⁵ and NHIF in Ghana⁸⁶ might serve as examples to be built
6 upon by other countries. Meanwhile, as laudable as health insurance and UPF interventions
7 are, the most important message from this study is that just removing or subsidizing user fees
8 is not enough. Aside from the associated technical complexities that must be addressed,
9 numerous other non-medical cost elements hampering universal access to surgical care remain,
10 including transport, food, accommodation, and loss of earnings. As such, even if all the direct
11 medical costs were covered at the national or facility level, some patients would remain simply
12 too poor to obtain even “free” surgical care.⁸⁷ The particular contexts of low-income countries
13 ought to be understood and addressed appropriately using more comprehensive policy designs.

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29 This study reveals important priorities for future research. First, there is need to explore the
30 current national level mobilization and allocation patterns and track the available resources
31 throughout the system to inform best policy directions.⁷ Second, numerous studies have
32 established the vulnerabilities faced by the poor due to inadequacies in protection measures,
33 but few have explored optimal financial protection strategies given the socioeconomic realities
34 in SSA.^{76 88} More evidence in this regard will aid contextualised policy formulation. Further,
35 the literature is particularly scanty on the purchasing aspects of surgical services: a deeper
36 understanding of interactions between hospital reimbursement patterns and personnel
37 remuneration systems on one hand and surgical service delivery on the other hand will
38 engender value-based purchasing mechanisms and ensure maximization of surgical output with
39 the limited available resources.² Lastly, as national and subnational governments in SSA
40 continue to pursue free obstetric care policies, the literature remains divided on their exact
41 impacts on CS rates. More rigorous studies are recommended to resolve the conflicts and
42 explore the factors that may account for different outcomes in different countries.

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3 Wide variations found in approaches to the estimation of catastrophic expenditures across the
4 articles call for a special note. Health expenses are described as “catastrophic” if they exceed
5 a certain threshold proportion of household income/expenditure or capacity to pay,⁸⁹ but lack
6 of unanimity remains in the thresholds applied.^{40 89} In addition, cost elements considered in the
7 calculations also differed, with some covering only direct medical cost,^{38 62} others including
8 direct non-medical costs,^{27 65} and still others extending to indirect costs.^{39 51 90} Moreover,
9 definitions of direct and indirect costs were inconsistent. Given the cardinal position this metric
10 has assumed in financial protection analyses, uniformity in approaches is particularly
11 imperative, and to achieve this, we advocate adherence to the definition and methodology
12 adopted by the WHO and the World Bank for indicator 3.8.2 of the Sustainable Development
13 Goals (SDGs) which monitors the financial protection dimension of universal health
14 coverage.^{91 92}

34 **Conclusion**

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37 This study has provided a situational analysis of financing of surgery and anaesthesia in SSA
38 while summarising the current knowledge on the subject. The resources available for surgery
39 are limited due in part to the neglect of surgery in national priorities, making it difficult for
40 hospitals to provide the full package of surgical services. Surgery services are unaffordable for
41 the great majority of populations, resulting in financial catastrophes and/ or impoverishments.
42 Findings in this review could guide national policy makers in SSA, especially those
43 implementing or developing NSOAPs, in adopting more comprehensive and inclusive
44 measures to enhance access to SOA services, while steering research towards critical
45 unanswered questions.

58 **Author Contributions**

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3 MI and LB conceived the study. MI, EA and LB designed the study, conducted the search and
4 analysed the data. MI and EA drafted the first manuscript. All authors contributed to data
5 interpretation, and critically reviewed and edited the first draft. All authors read and approved
6 the final manuscript. LB supervised the study.
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13 **Acknowledgements**

14
15 We are grateful to Dr Henk Broekhuizen (Department of Social Sciences, Wageningen
16 University) for his help in the conceptualization of the study. The authors also wish to
17 appreciate information specialists Elmie Peters and Dr On Ying Chan of Radboud University
18 Medical Library, and Paul Murphy of Royal College of Surgeons in Ireland (RCSI) Library,
19 for their technical assistance in the development and execution of the literature search strategy;
20 and Jos Peters of Radboud University Medical Library who assisted in the acquisition of the
21 full texts of the articles.
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34 **Competing Interests**

35
36 The authors declare no competing interests
37

38 **Funding**

39
40 This work was supported by European Commission's Horizon 2020 Framework Programme,
41 under grant agreement no: 733391, as part of the Scaling up Safe Surgery for District and Rural
42 Populations in Africa (SURG-Africa) project.
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47 **Ethical Approval**

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49 Not Applicable
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52 **Data Availability Statement**

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54 Extra data is available by emailing author MI (Martilord.ifeanyichi@radboudumc.nl)
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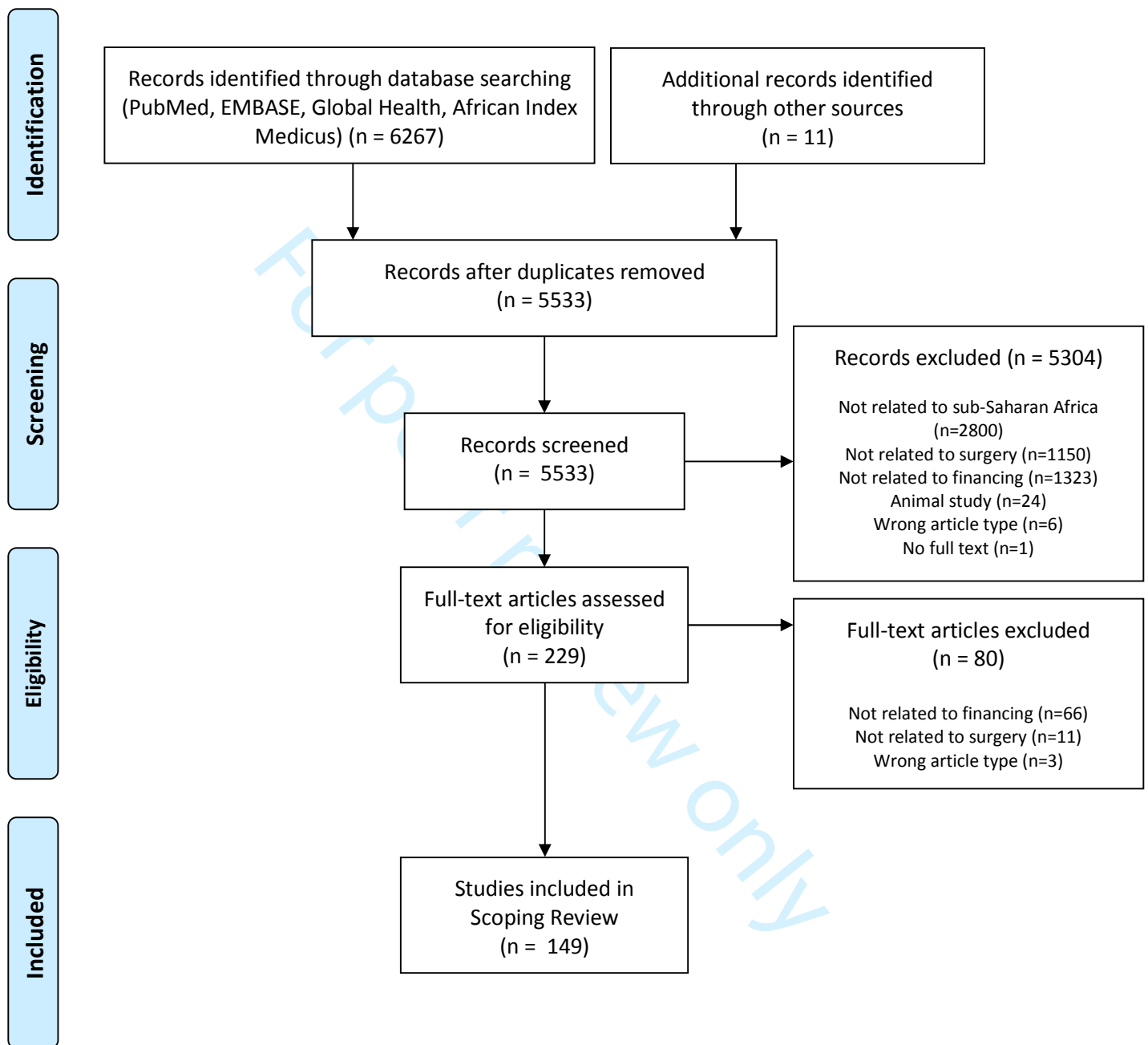
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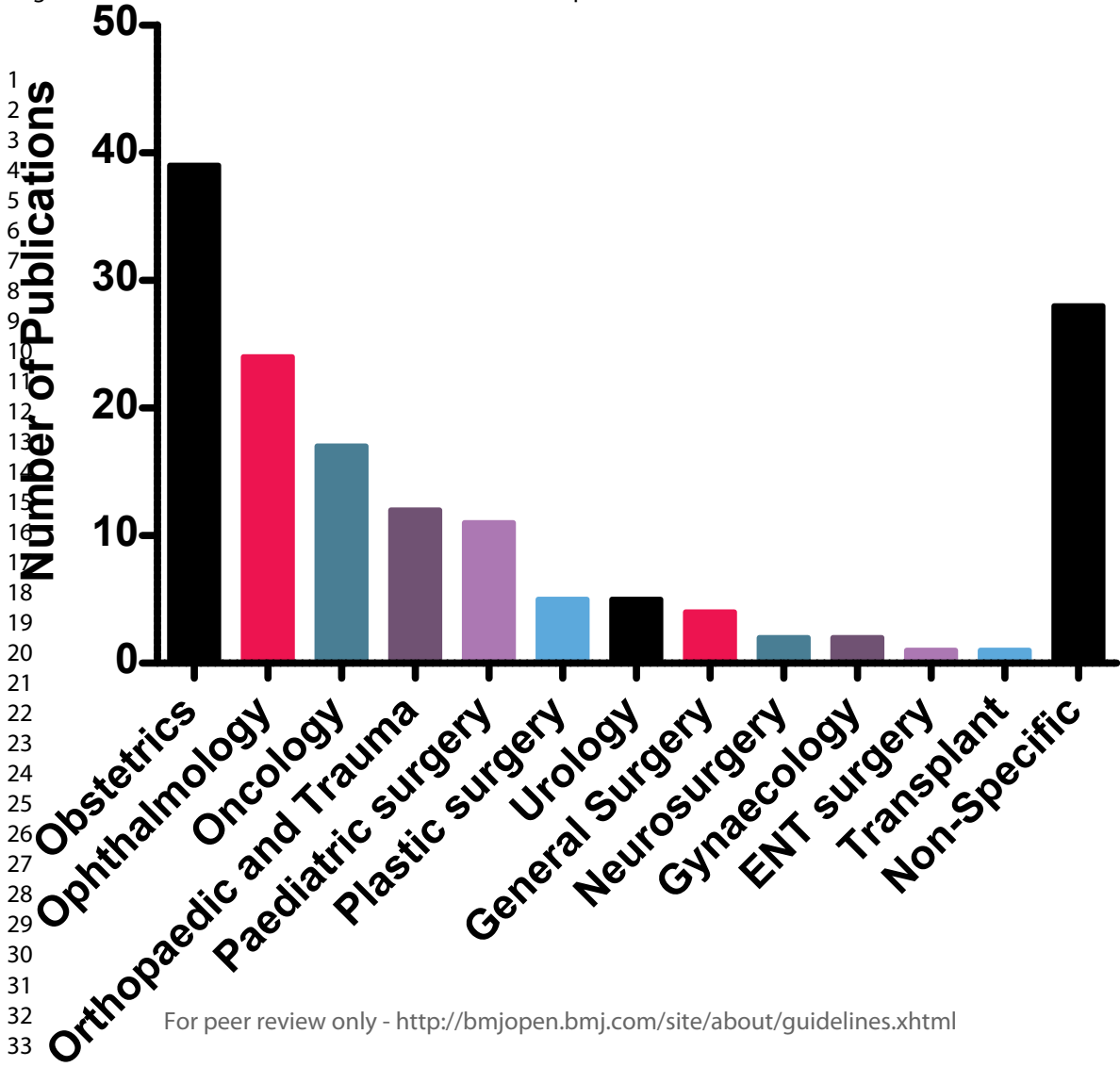
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3 **S1: Search Query**
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5 **1. PUBMED**
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<p>7 ("Surgical Procedures, Operative"[Mesh] OR "surgery"[subheading] OR anaesthe*[tiab] OR 8 anesthe*[tiab] OR anaesthesia[Mesh] OR "Specialties, Surgical"[Mesh] OR surger*[tiab] OR 9 surgical[tiab]) AND ("Healthcare Financing"[Mesh] OR "Health Policy"[mesh] OR Universal 10 Health Insurance[Mesh] OR "Health Planning"[Mesh] OR "Health Expenditures"[Mesh] OR 11 Expenditure*[tiab] OR "Insurance, Health"[Mesh] OR Health Services/Economics[Mesh] OR 12 Economics[Mesh:NoExp] OR Fund raising[Mesh] OR Health Care Costs[Mesh] OR Fees 13 and Charges[mesh] OR "Financing, Personal"[Mesh] OR budgets[mesh] OR Health 14 Services Accessibility/Economics[Mesh] OR health priorit*[tiab] OR Financ*[tiab] OR 15 Revenue*[tiab] OR Charities/economics[mesh] OR "Universal Health Care"[tiab] OR 16 Universal Health Coverage[tiab] OR "National Health Accounts"[tiab] OR payment*[tiab] OR 17 Budget allocation*[tiab] OR Health Insurance[tiab]) AND ("Africa South of the Sahara"[Mesh] 18 OR Africa*[tiab] OR Cameroon*[tiab] OR Central African Republic*[tiab] OR Congo*[tiab] 19 OR Chad*[tiab] OR Democratic Republic of the Congo*[tiab] OR Equatorial Guinea*[tiab] 20 OR Gabon*[tiab] OR Sao Tome and Principe*[tiab] OR Burundi*[tiab] OR Madagasca*[tiab] 21 OR Comoros*[tiab] OR Mauriti*[tiab] OR Eritrea*[tiab] OR Ethiopia*[tiab] OR Kenya*[tiab] 22 OR Rwanda*[tiab] OR Somalia*[tiab] OR South Sudan*[tiab] OR Sudan*[tiab] OR 23 Tanzania*[tiab] OR Uganda*[tiab] OR Angola*[tiab] OR Botswana*[tiab] OR Lesotho*[tiab] 24 OR Malawi*[tiab] OR Mozambi*[tiab] OR Namibia*[tiab] OR South Africa*[tiab] OR 25 Swaziland*[tiab] OR Zambia*[tiab] OR Zimbabwe*[tiab] OR Benin*[tiab] OR Burkina 26 Faso*[tiab] OR Cabo Verde*[tiab] OR Cote d'Ivoire*[tiab] OR Gambia*[tiab] OR Ghana*[tiab] 27 OR Guinea*[tiab] OR Guinea-Bissau*[tiab] OR Liberia*[tiab] OR Mali*[tiab] OR 28 Mauritania*[tiab] OR Niger*[tiab] OR Nigeria*[tiab] OR Senegal*[tiab] OR Sierra Leone*[tiab] 29 OR Togo*[tiab] OR Eswatini*[tiab] OR Seychelles*[tiab] OR sub-Saharan*[tiab]) 30 31 32 33 34 35 36 37 38 39 Filters: from 2010 – 2020 40 41</p>	<p>2,849</p>
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42
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44 **2. EMBASE**
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<p>46 (exp surgery/ OR surgery.fs. OR exp obstetric operation/ OR exp anaesthesia/ OR 47 surger*.ti,ab,kw. OR surgical.ti,ab,kw. OR anaesthe*.ti,ab,kw. OR anesthe*.ti,ab,kw.) AND 48 (exp Health Care Cost/ OR Economics/ OR Universal Health Insurance/ OR exp Health 49 Insurance/ OR exp Fee/ OR budget/ OR Funding/ OR value-based purchasing/ OR 50 Universal Health Care/ OR Health Care Planning/ OR Social Welfare/ OR health 51 priorit*.ti,ab,kw. OR Health Care Policy/ OR Financ*.ti,ab,kw. OR Universal Health 52 Care.ti,ab,kw OR Universal Health Coverage.ti,ab,kw. OR budget allocation*.ti,ab,kw. OR 53 54 55 56 57 58 59</p>	<p>3,661</p>
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payment*.ti,ab,kw. OR Health Insurance.ti,ab,kw. OR National Health Account*.ti,ab,kw. OR Revenue*.ti,ab,kw. OR expenditure*.ti,ab,kw.) AND (exp "Africa south of the Sahara"/ OR Cameroon*.ti,ab,kw. OR Central African Republic*.ti,ab,kw. OR Congo*.ti,ab,kw. OR Chad*.ti,ab,kw. OR Democratic Republic of the Congo*.ti,ab,kw. OR Equatorial Guinea*.ti,ab,kw. OR Gabon*.ti,ab,kw. OR "Sao Tome and Principe*".ti,ab,kw. OR Burundi*.ti,ab,kw. OR Madagasca*.ti,ab,kw. OR Comoros*.ti,ab,kw. OR Mauriti*.ti,ab,kw. OR Eritrea*.ti,ab,kw. OR Ethiopia*.ti,ab,kw. OR Kenya*.ti,ab,kw. OR Rwanda*.ti,ab,kw. OR Somalia*.ti,ab,kw. OR South Sudan*.ti,ab,kw. OR Sudan*.ti,ab,kw. OR Tanzania*.ti,ab,kw. OR Uganda*.ti,ab,kw. OR Angola*.ti,ab,kw. OR Botswana*.ti,ab,kw. OR Lesotho*.ti,ab,kw. OR Malawi*.ti,ab,kw. OR Mozambi*.ti,ab,kw. OR Namibia*.ti,ab,kw. OR South Africa*.ti,ab,kw. OR Swaziland*.ti,ab,kw. OR Zambia*.ti,ab,kw. OR Zimbabwe*.ti,ab,kw. OR Benin*.ti,ab,kw. OR Burkina Faso*.ti,ab,kw. OR Cabo Verde*.ti,ab,kw. OR Cote d'Ivoire*.ti,ab,kw. OR Gambia*.ti,ab,kw. OR Ghana*.ti,ab,kw. OR Guinea*.ti,ab,kw. OR Guinea-Bissau*.ti,ab,kw. OR Liberia*.ti,ab,kw. OR Mali*.ti,ab,kw. OR Mauritania*.ti,ab,kw. OR Niger*.ti,ab,kw. OR Nigeria*.ti,ab,kw. OR Senegal*.ti,ab,kw. OR Sierra Leone*.ti,ab,kw. OR Togo*.ti,ab,kw. OR Eswatini*.ti,ab,kw. OR Seychelles*.ti,ab,kw. OR sub-Saharan*.ti,ab,kw. OR Africa*.ti,ab,kw.)

Filters: from 2010 – 2020

3. Global Health Database

("Surgical Procedures" or "surgery" or anaesthesia or anesthesia or anaesthesia or surger* or surgical).mp. AND ("Healthcare Financing" or "Health Policy" or "Universal Health Insurance" or "Health Planning" or "Health Expenditures" or Expenditure* or "Health Insurance" or "Health Services" or "health economics" or Economics or "Fund raising" or "Health Care Costs" or "Fees and Charges" OR Financing" or budgets or "Health Services Accessibility" or "health priorit*" or Financ* or Revenue* or Charities or "Universal Health Care" or "Universal Health Coverage" or "National Health Accounts" or payment* or Budget allocation* or "Health Insurance").mp. AND ("Africa South of the Sahara" or Africa* or Cameroon* or "Central African Republic*" or Congo* or Chad* or "Democratic Republic of the Congo*" or "Equatorial Guinea*" or Gabon* or "Sao Tome and Principe*" or Burundi* or Madagascar* or Comoros* or Mauriti* or Eritrea* or Ethiopia* or Kenya* or

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Rwanda* or Somalia* or South Sudan* or Sudan* or Tanzania* or Uganda* or Angola* or Botswana* or Lesotho* or Malawi* or Mozambique* or Namibia* or "South Africa*" or Swaziland* or Zambia* or Zimbabwe* or Benin* or "Burkina Faso*" or Cabo Verde* or "Cote d'Ivoire*" or Gambia* or Ghana* or Guinea* or Guinea-Bissau* or Liberia* or Mali* or Mauritania* or Niger* or Nigeria* or Senegal* or Sierra Leone* or Togo* or eswatini* or Seychelles* or sub-Saharan*).mp.

Filters: from 2010 – 2020

For peer review only

S2: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	5-6
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	6
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Not Applicable
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6-7
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	7
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	7
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	7-9
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	9
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	9
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Not Applicable
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	9



SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	10-11
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	10-11
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not Applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	11-18
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	11-18
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	18-21
Limitations	20	Discuss the limitations of the scoping review process.	21
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	21
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	22

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* ;169:467–473. doi: 10.7326/M18-0850



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S3: Breakdown of Included Articles by Countries of Focus

Country	Number of Related Publications
Benin	9
Botswana	1
Burkina Faso	6
Cameroon	9
DRC	6
Ethiopia	8
Gabon	2
Ghana	13
Guinea	3
Kenya	14
Madagascar	5
Malawi	5
Mali	8
Mauritania	1
Mozambique	2
Namibia	2
Nigeria	34
Rwanda	5
Senegal	3
Sierra Leone	4
South Africa	3
Sudan	2
Tanzania	11
Togo	2
Uganda	15
Zambia	2
Zimbabwe	2
Non-Specific	8

BMJ Open

Financing of Surgery and Anaesthesia in Sub-Saharan Africa: A Scoping Review

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-051617.R1
Article Type:	Original research
Date Submitted by the Author:	07-Sep-2021
Complete List of Authors:	Ifeanyichi, Martilord; Radboudumc, Department for Health Evidence Aune, Ellis; Radboudumc, Department for Health Evidence Shrime, Mark; Royal College of Surgeons in Ireland, Institute of Global Surgery; Harvard Medical School, Department of Global Health and Social Medicine Gajewski, Jakub ; Royal College of Surgeons in Ireland, Institute of Global Surgery Pittalis, Chiara ; Royal College of Surgeons in Ireland, Department of Public Health and Epidemiology Kachimba, John; University of Zambia University Teaching Hospital, Department of Surgery Borgstein, Eric; University of Malawi Brugha, Ruairi; Royal College of Surgeons in Ireland, Department of Public Health and Epidemiology Baltussen, Rob; Radboudumc, Department for Health Evidence Bijlmakers, Leon; Radboudumc, Department for Health Evidence
Primary Subject Heading:	Global health
Secondary Subject Heading:	Health economics, Health policy, Surgery
Keywords:	Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, HEALTH ECONOMICS, SURGERY, PUBLIC HEALTH, ANAESTHETICS

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3 1 **Title of Manuscript:** Financing of Surgery and Anaesthesia in Sub-Saharan Africa: A Scoping
4 2 Review
5

6 3
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3 1 **ABSTRACT**
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5 2 **Objective:** This study aimed to provide an overview of current knowledge on financing of
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7 3 surgical and anaesthesia care across sub-Saharan Africa (SSA).
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10 4 **Setting:** Surgery and anaesthesia services across all levels of care - primary, secondary and
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12 5 tertiary.
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15 6 **Design:** We performed a scoping review of scientific databases (PubMed, EMBASE, Global
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17 7 Health and African Index Medicus), grey literature, and websites of development
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19 8 organisations. Screening and data extraction were conducted by two independent reviewers and
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21 9 abstracted data were summarized using thematic narrative synthesis per the financing domains:
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23 10 mobilization, pooling and purchasing.
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28 11 **Results:** The search resulted in 5533 unique articles among which 149 met the inclusion
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30 12 criteria: 132 were related to mobilization, 17 to pooling, and 5 to purchasing. Neglect of surgery
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32 13 in national health priorities is widespread in SSA and no report was found on national level
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34 14 surgical expenditures or budgetary allocations. Financial protection mechanisms are weak or
35
36 15 non-existent; poor patients often forego care or face financial catastrophes in seeking care, even
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38 16 in the context of universal public financing (free care) initiatives.
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42 17 **Conclusion:** Financing of surgical and anaesthesia care in SSA is as poor as it is under-
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44 18 investigated, calling for increased national prioritisation and tracking of surgical funding.
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46 19 Improving availability, accessibility, and affordability of surgical and anaesthesia care require
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48 20 comprehensive and inclusive policy formulations.
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52 21 **KEY WORDS:** Global Surgery; Sub-Saharan Africa; Health Financing; Universal Health
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54 22 Care; Health Accounts
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1 **Strengths and Limitations of this Study**

- 2 • This study was conducted based on standard guidelines, including Arksey and
3 O'Malley (2005), Levac et al (2010), the Joanna Briggs Institute (2020), and
4 PRISMA Statement and its extension for scoping reviews.
- 5 • It benefited from a comprehensive published and grey literature search strategy
6 designed with the support of institutional bibliographers.
- 7 • The use of two independent reviewers and an arbiter ensured meticulousity while
8 minimising biases in the review process.
- 9 • It thoroughly examines the situation and the current knowledge on the financing of
10 surgery and anaesthesia in sub-Saharan Africa.
- 11 • Findings from one country may not represent the situation or be applicable in other
12 countries in the region.

1 INTRODUCTION

2 Over 70% of the world population lack access to safe, timely and affordable surgical, obstetric
3 and anaesthesia (SOA) care, with an estimated nine out of ten people affected in sub-Saharan
4 Africa (SSA).¹ The Lancet Commission on Global Surgery (LCGS) has set a timeline of 2030
5 for 80% of the global population to have access to SOA care,² and as a strategy, it also
6 recommended that low- and middle-income countries (LMICs) develop National Surgical,
7 Obstetrics, and Anaesthesia Plans (NSOAPs), structured into five domains: service delivery,
8 infrastructure, workforce, information management, and financing.² The financing system is
9 critical to the achievement of universal access to surgical care, as it directly affects availability,
10 accessibility and affordability of services.

11
12 Health financing is the “function of a health system concerned with the mobilization,
13 accumulation and allocation of money to cover the health needs of the people, individually and
14 collectively, in the health system”.³ Three cardinal but interrelated functions of health financing
15 are distinguished: revenue collection, resource pooling, and purchasing.³ Resource
16 mobilization refers to the ways in which revenues are raised and collected, including
17 government budgetary allocations (from taxes), health insurance premiums, out-of-pocket
18 payments (OOP) and donor funding. The pooling function refers to the mechanisms of
19 accumulation of prepaid funds on behalf of populations in order to address financial challenges
20 at the point of service delivery. Pooling delinks expected health expenditures from patients’
21 ability to pay,⁴ and ideally protects people from catastrophic or impoverishing expenditure
22 while accessing health services. The most common pooling mechanisms are government tax
23 revenues pooling for health and health insurance schemes. The purchasing function refers to
24 the payment systems for health goods and services provided.

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To improve surgical financing, the LCGS recommended that national governments undertake the following: cover basic surgical care within Universal Health Coverage (UHC); pool risks in a single pool and reduce payments at point of service; track financial flows for surgery through national health accounts; and use value-based purchasing with risk-pooled funds. Further, as progress assessment indicators, they proposed that surgical expenditure be reported as a percentage of GDP and as a percentage of annual health care expenditure; and that out-of-pocket payments on surgery, and catastrophic and impoverishing expenditure on surgery be monitored. It is noteworthy that catastrophic and impoverishing expenditures on surgery have been included in the World Bank World Development Indicators (WDI).⁵

Since the LCGS report in 2015, five SSA countries have launched and are implementing their NSOAPs: Rwanda, Zambia, Tanzania, Nigeria and Madagascar.⁶ Dozens of other SSA countries are either in the process of or have committed to the development of NSOAPs. Development of health policies require baseline analyses.⁷ In the development of the Tanzania NSOAP, a situational analysis conducted by Nyberger et al using a systematic review of literature guided a stakeholder discussion to directly inform the NSOAP priorities.⁸ In the financing domain however, the review found only limited evidence – highlighting a paucity of research on the financing of surgery, especially at country levels. A collation of evidence from different countries may be beneficial to national health policy makers, and as more countries develop and adopt NSOAPs, there is a need for more evidence to guide these investments towards improving SOA care in sub-Saharan Africa.

1 This study aimed therefore to provide a general overview of the evidence on financing of
2 surgery in SSA, produce a database of all studies related to the subject, and identify research
3 gaps to guide future research efforts.

4 5 **METHODS**

6 7 **Framework**

8 Given the aim of the study, a scoping review was adopted. “A scoping review or scoping study
9 is a form of knowledge synthesis that addresses an exploratory research question aimed at
10 mapping key concepts, types of evidence, and gaps in research related to a defined area or field
11 by systematically searching, selecting, and synthesizing existing knowledge”.⁹ Beyond
12 mapping evidence, scoping reviews are particularly useful for summarizing and disseminating
13 research findings to policy makers, practitioners and consumers who might otherwise be unable
14 to engage in such tasks themselves due to time and resource constraints.¹⁰

15
16 This study followed the five-step approach described by Arksey and O’Malley¹⁰ who provided
17 the first methodological framework for conducting scoping reviews: (i) Identifying the research
18 question; (ii) Identifying relevant studies; (iii) Study selection; (iv) Charting the data; (v)
19 Collating, summarising and reporting results. This was supplemented with the
20 recommendations of Levac et al¹¹ and the Joanna Briggs Institute (JBI).¹²

21 22 **Research Question**

23 Broadly, this study was underpinned by the question: *What is known from the existing literature*
24 *about financing of surgery and anaesthesia in SSA?*

25 Specific sub-questions that guided the study are:

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3 1 Regarding financing of surgery and anaesthesia in SSA -
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5 2 i. What is the situation?
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7 3 ii. What mechanisms (if any) mobilise, pool and allocate resources for services?
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9 4 iii. What strategies have been trialled to improve access?
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11 5 iv. What has been the progress since the 2015 publication of the LCGS?
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13 6 v. What specific challenges are identified?
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15 7 vi. What policy options are recommended for improvement?
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9 **Search Strategy and Data Sources**

10 The search query was designed based on three search blocks - “surgery and anaesthesia”,
11 ”health financing”, and “sub-Saharan Africa” - with the assistance of institution bibliographers.

12 The primary query was built on PubMed, in an iterative fashion, using a list of already
13 identified relevant articles. The final PubMed query was adapted and applied to all the other
14 databases. The full search string is included in Supplemental material 1 (S1).
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17 We searched four bibliographic databases without any language restrictions: Global Health on
18 22nd July 2020, and PubMed, Embase, and African Index Medicus on July 24th. Searches were
19 restricted to articles published between January 2010 and July 2020, to capture a fairly current
20 situation, while covering approximately five years before and after the LCGS report.
21 Conference proceedings, dissertations, and animal studies were excluded. Additionally, we
22 performed snowballing by hand-searching for further possibly relevant articles cited in the
23 identified articles. A grey literature search was conducted on Google, and websites of WHO,
24 World Bank, and USAID were also manually searched.
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25 **Screening Process and Management**

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5 2 All search results were first imported into EndNote X9 for deduplication, and then exported to
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8 3 Rayyan,¹³ a web and mobile app designed for systematic reviews, for title and abstract
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10
11 4 screening. The initial screening was performed independently by authors MI and EA. In case
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13 5 of discrepancy, MI and EA reviewed the abstract together, and if no agreement could be
14
15 6 reached, author LB was consulted to make the final decision. In the second round, full texts of
16
17 7 included articles were reviewed independently and discussed by authors MI and EA, and LB
18
19 8 was again consulted in case of irresolvable discrepancies. French articles were handled solely
20
21 9 by author LB who possesses a full professional proficiency in French Language.
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26 11 The Population, Concept, and Context (PCC) framework described by the JBI¹² was used to
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28 12 define the inclusion/exclusion criteria, which are included in Table 1. Relevance criteria were
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30 13 applied in a hierarchical fashion: each article was assessed firstly on whether or not it pertained
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32 14 to SSA, then whether or not it pertained to surgery, and lastly whether it covered financing of
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34 15 surgery. All available sources were included.
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41 Table 1: Inclusion and Exclusion Criteria
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	Inclusion Criteria	Exclusion Criteria
Population	<ul style="list-style-type: none"> • General population • Major surgery patients • Operative and non-operative surgery patients • Healthcare providers • Health policy makers • Agencies or organisations involved in surgery financing 	<ul style="list-style-type: none"> • Non-surgery patients • Medical gynaecological patients • Medical obstetric patients • Patients with minor procedures such as male circumcision, post-abortion

		care (e.g. manual vacuum aspiration)
Concept	<ul style="list-style-type: none"> • Financing of surgical care including user fees, tax funding, health insurance, donor funds • Universal health coverage • Equity in surgery care access • Impoverishing and catastrophic expenditures • Economics of surgery 	<ul style="list-style-type: none"> • Costing studies (without financing data) • Cost-effectiveness studies (without financing data) • Studies focusing on the epidemiological or clinical aspects of surgeries
Context	<ul style="list-style-type: none"> • Primary, secondary and tertiary hospital care • Sub-Saharan Africa • Global surgery studies broadly (including SSA) 	<ul style="list-style-type: none"> • Non-hospital primary health facilities (dispensaries, health posts, health centres) • Studies focusing on high-income countries only • Studies focusing on LMICs outside SSA

2 Data Charting and Analysis

Data charting (ie extraction) was performed using a customized form in Excel 2020 based on the JBI guidelines.¹² All empirical evidence related to any of the functions of health financing was extracted; maintaining an approach broad enough to include even evidence related to the absence of these functions and their implications for surgery delivery and access. In addition, non-empirical but unique or sufficiently compelling (as adjudged by the two independent researchers) insights on challenges or policy options for surgical financing were also extracted. In doing these, a bottom up thematic analysis was employed¹⁴: emerging themes were

1 identified and coded within the functional domains. This was subsequently followed by axial
2 coding ie linking conceptually related themes together. Descriptive statistics were computed
3 for the article characteristics.

4 **Summarisation and Reporting of Results**

5 A narrative synthesis was employed in summarising the results of the research question,
6 maintaining the three financing domains as the overarching themes. Results are presented as
7 per PRISMA Statement ¹⁵ and its extension for scoping reviews (See Supplemental material
8 2[S2]).¹⁶

9 **Patient and Public Involvement**

10 Patients or the public were not involved in the design, conduct, or reporting, or dissemination
11 plans of our research.

12 **RESULTS**

13 Following deduplication, our search resulted in 5533 unique articles. Text and abstract
14 screening produced 229 articles, of which 149 met the inclusion criteria following full text
15 reading (Figure 1). Most (132) were in English and nine were in French. Two-third of the
16 articles were published between 2015 and 2020. In terms of geographical spread, the studies
17 covered 28 countries: Nigeria had the highest number of articles (34), followed by Uganda (15)
18 and Kenya (14). Eight articles were non-specific while several articles cut across more than
19 one country. Details are presented in Supplemental material 3 (S3).

20 The majority of articles focused on specific surgical conditions or subspecialties (N=121;
21 81%), while 28 were non-specific or dealt with surgical systems generally. Obstetrics (mostly
22 Caesarean sections) had the highest number of articles (39), followed by ophthalmology (24;

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2
3 1 mostly cataract procedures), and oncology (17). The breakdown of the articles per specialty is
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5 2 presented in Figure 2.

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8 3 The majority of the articles were empirical (N=138; 92%); ten were opinion/editorial papers,
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10 4 while one was a technical brief. The empirical articles included 112 quantitative studies (81%),
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12 5 12 qualitative studies, 11 mixed-methods studies, and three systematic reviews. Most of the
13
14 6 quantitative articles were descriptive (N=81; 72%); 12 were analytical (cohort or case-control);
15
16 7 five were modelling studies; and 14 were quasi-experimental (including four interrupted time
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18 8 series analyses, two propensity score matching analyses, two difference-in-difference analyses,
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20 9 and six uncontrolled before-and-after studies).

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25 10 The bulk of the articles related to the pooling and risk protection function of health financing
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27 11 (N=132; 89%); 17 related to financial resource mobilization (11%), and five to purchasing
28
29 12 (3%). Some of the articles related to more than one domain. In the next sections, we present a
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31 13 thematic narrative of the data extracted from the various articles.

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38 15 Figure 1: PRISMA flowchart of the search process

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44 17 Figure 2: Breakdown of the selected articles by surgical specialties

45 46 47 18 48 49 50 19 **(I) Resource Mobilisation and Budgetary Allocations to Surgery.**

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53 20 Seventeen articles explored the resource mobilization for or allocations to surgery. No report
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55 21 of national or sub-national level budgetary allocations or actual expenditures on surgery was
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57 22 found. There was evidence of poor prioritization of surgery in government plans and UHC
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59 23 programmes in SSA generally: in a systematic review of National Health Strategic Plans

1 (NHSPs) of 48 SSA countries by Citron et al (2016), 19% of NHSPs had no mention of surgery
2 or surgical conditions, and 63% had five or fewer mentions of surgery. Compared to HIV and
3 malaria that had 3772 mentions across all the plans, surgery had only 376 mentions. While
4 33% of policies had no surgical targets, all had measurable targets for HIV and TB control.¹⁷
5
6 Seven articles had data on revenue sources for surgery at the hospital level, with out-of-pocket
7 payments (OOP),¹⁸⁻²¹ government support,²² and donor funds^{21 22} identified as the biggest
8 sources of the operational funds. In Ekenze and others' systematic review of studies published
9 between January 2007 and November 2016 that reported the specific funding of paediatric
10 surgeries in SSA, OOP was the predominant source of funding (91.4%), followed by NGO
11 funding (60%).²¹
12
13 Regarding hospital expenditure on surgery, four studies were relevant.^{18 22-24} In a retrospective
14 cross-sectional study of the human and financial constraints to essential surgery at eight district
15 hospitals (DHs) in Tanzania, Uganda, Mozambique, the DHs spent 7-14% of their operational
16 funds on surgery, representing an annual per capita expenditure of US\$ 0.05 to 0.14.²³ The bulk
17 of this expenditure (3-8% of total operational cost) was attributed to obstetrics alone.
18 Comparable proportions (16-17%) were also reported at two DHs in Malawi.
19
20 Several approaches to increasing the funding of surgery were recommended in the articles. In
21 the review by Ekenze et al, the main suggestions were increased funding by national
22 governments and by international organisations (85.7%), the establishment or improvement of
23 health insurance schemes (60%) and the sustained use of charities and medical missions
24 (42.9%).²¹ Several papers in our review emphasized public-private partnerships,^{25 26} as well as
scale-up of health insurance coverage.²⁷⁻²⁹ Rather than attempting to reinvent the wheel in the
face of structural and economic constraints, Frimpong called on national governments to tweak
and leverage on the existing market models to scale-up local production of surgical

1 consumables, for example by replacing non-profitable tyre production with gloves and boots
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1 consumables, for example by replacing non-profitable tyre production with gloves and boots
2 production, or production of cotton wool and gauze alongside or in place of cloth.³⁰

3 Reddy et al (2020) advocated moving beyond the traditional funding sources.³¹ They suggested
4 innovative financing instruments that have been applied in other global health initiatives, such
5 as voluntary solidarity levy (as in Unitaid), voluntary contributions (PRODUCT[RED]),
6 performance-based instruments (GAVI), and securities and bonds (International Finance
7 Facility for Immunisation [IFFI] and The Children's Investment Fund Foundation [CIFF])

8 **(II) Pooling/Risk Protection**

9 A total of 132 articles provided evidence related to pooling functions and financial protection.
10 Eight subthemes emerged. Some themes portrayed dysfunctionality of the financial protection
11 systems and their implications for patients: financial barriers to access of care, transport cost
12 barriers, OOP and catastrophic/impooverishing expenditure, payment coping mechanisms, and
13 low willingness to pay. Others explored commonly available financial protection interventions:
14 universal public financing, and health insurance. Other studies evaluated how best to
15 simultaneously achieve health benefits, financial protection, equity and efficiency in surgical
16 care delivery. Several articles cut across multiple themes. The eight thematic clusters and
17 selected illustrative studies are presented below:

18 *1. Financial barriers to accessing surgical care*

19 The 55 articles in this cluster investigated patient reported obstacles or challenges to surgical
20 care and reported "costs" or "lack of finances" as a major reason for not seeking³² and for not
21 obtaining surgical care (following recommendation);^{33 34} and as a reason for experiencing
22 delays in accessing,^{26 35} or dropping out of the surgical continuum of care.^{36 37} In a population-
23 based survey to assess the surgical burden of diseases in Uganda, 66% of the people living with
24 treatable surgical conditions cited cost as the reason for not seeking care.³² A systematic review

1 of barriers to cataract surgeries in Africa cautioned against face value interpretation of such
2 findings, as “costs” are sometimes convenient masks for factors other than inability to pay,
3 such as unwillingness to pay and complex family decision-making dynamics.³⁸

4 *2. Transport cost barrier*

5 Closely related to the above financial access barriers, 12 articles highlighted the particular
6 challenges presented by transport costs to accessing surgical care, even in situations where
7 medical treatments are provided free of charge. In interviews and focus group discussions with
8 64 patients living with lymphatic filariasis in Ahanta West District of Ghana, 64% cited indirect
9 costs (transport and loss of wages) as the most prohibitive factor to seeking care, despite the
10 cost of surgery being covered under the National Health Insurance Scheme (NHIS).³⁹

11 *3. Out-of-Pocket, and Catastrophic and Impoverishing Expenditures*

12 Twenty-six publications explored OOP and catastrophic or impoverishing expenditure
13 incidences and reported high rates. In a study that modelled global country-level comparison
14 of the financial burden of surgery, the risk of financial hardship from surgery was highest in
15 SSA, with up to 90% of patients facing the risks of catastrophes and up to 100% risk
16 impoverishments.⁴⁰ Despite that health services are provided free of charge at public facilities
17 in Malawi, 90-97% of hernia patients still suffered catastrophic expenditure.⁴¹

18 *4. Patient Coping Mechanisms and Economic Consequences of Out-of-Pocket Payments*

19 Twelve articles provided insights into how households of surgical patients mobilise resources
20 for OOPs as well as the adjustments they make in their daily lives to cope with the impact.
21 Despite the free obstetric care policy in Malawi, 31% of the women who received such care
22 borrowed money, 24% sold assets, 17% used their savings, while others got help from family
23 members abroad (17%) or their local social network (12%).⁴² Reported compromises in every
24 day spending in the face of catastrophic surgical expenditure included decreases in food

1 consumption,^{42 43} withdrawal of wards/children from school,^{42 44} even as some households
2 remained in debts several years after the surgery.^{42 43}

3 *5. Willingness To Pay (WTP)*

4 Three articles investigated the willingness of surgical patients to pay for services. Even though
5 most patients were willing to pay “something”, their WTP was usually lower than the actual
6 cost of getting the surgery.^{45 46} In a hospital-based survey of patients who had received free
7 surgery in Malawi, participants expressed willingness to pay a median of US\$3, which was
8 substantially lower than US\$60, the estimated combined cost of screening, transport, feeding,
9 accommodation, medicines and surgery.⁴⁶ Studies showed that WTP for surgical services
10 increases remarkably with counselling on the benefit⁴⁷ and actual cost of the surgery,³⁸ and
11 increased trust in providers.³⁸

12 *6. Universal Public Financing (UPF) or Free Services*

13 In a bid to protect patients from financial hazards, governments in SSA have often abolished
14 user fees in public hospitals, either for all or certain categories of care. Twenty-three articles
15 evaluated the implementation or the effects of such measures on service utilization and/or
16 financial protection.

17 Free maternal and under-five care in Sierra-Leone was associated with a five-fold increase in
18 the volume of paediatric surgeries in the 20 months after its introduction compared to 20
19 months before at a public tertiary hospital; above-five surgeries increased by only 17%⁴⁸.
20 Perhaps partly reflecting differences in methodologies, conflicting reports were obtained on
21 the effects of fee removal on Caesarian section rates, with various studies reporting nil impact,
22 ^{49 50} increases,⁵¹ and (possibly supplier-induced) excessive CS rates.⁵²

23 Several papers reported significant financial hazards despite the free care policies, due to
24 informal direct medical costs, indirect medical costs (particularly transportation), or both.

1 Patients often encountered informal direct medical OOPs due to frequent drug stockouts,
2 equipment breakdowns, unofficial fees,^{44 51 53-55} or outright bribery of health workers to
3 “facilitate” access to so-called free care.^{51 52 56 57}

4 The failure of UPF programmes across SSA to provide adequate financial protection has had
5 adverse implications for equitable access to care, as evidenced in six studies. Pro-rich inequities
6 were documented in use of CS several years after introduction of free obstetric care policies in
7 Ghana,^{58 59} Mali,^{60 61} and Benin.⁶¹

8 Valuable insights were gained into the challenges confronting successful implementation of
9 UPF policies. Poor funding and delayed or incomplete hospital reimbursements were
10 commonly reported,^{54 62} as was poor supervision and accountability mechanisms,^{62 63} lack of
11 clarity on policy provisions e.g. which items or services ought to be paid for,^{56 63} poor
12 specification and targeting of beneficiaries,⁵² demotivation of hospital workers due to declines
13 in hospital finances,⁵⁴ and resistance among health professionals manifesting as “rent-seeking”
14 and corrupt practices to augment sagging personal incomes.^{52 56 62}

15 *7. Health Insurance*

16 Twenty-three articles provided insights into health insurance coverage and the degree of
17 protection it provides for surgery patients in SSA. Health insurance coverage rates among
18 cross-sections of emergency surgery patients studied were generally poor: about 3% in
19 Nigeria,⁶⁴ 6% in Mali,⁶⁵ 8% in Tanzania,⁶⁶ 17% in Madagascar,⁶⁷ and 23% in Kenya.⁶⁸
20 Coverage rates stood out in Ghana (67%), courtesy of National Health Insurance Fund
21 (NHIF),⁶⁹ and Rwanda (98%) with its Community Health Insurance Fund (CHIF).⁷⁰
22 Instructively, higher rates were reported among elective surgery patients – 45% in Nigeria⁷¹
23 and Tanzania,⁷² and 90% in Kenya⁷³ – indicating a disproportionately higher uptake of elective
24 services by the insured who are mostly the better off, at the expense of the poor.^{71 72} This review

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3 1 found evidence of some level of financial protection from health insurance. For instance, in a
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5 2 study among surgical patients admitted over a period of eight months at a teaching hospital in
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7 3 Ghana, 58-87% of insured patients faced catastrophic expenditure, compared to 83-98% among
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9 4 the uninsured. The insured spent an average of 39% of their annual income on seeking surgical
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11 5 care compared to 61% of the uninsured.⁷⁴ Like the UPF programmes however, concerns of
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13 6 inequities remain.⁷⁵
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18 7 Various studies reported specific challenges associated with national health insurance schemes
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20 8 in SSA. In Nigeria for instance, NHIS is considered as bureaucratic and elitist, covering only
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22 9 civil servants and people of higher social status.^{27 71} Beneficiaries have also reported lack of
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24 10 clarity about what services are covered or not, as well as confusion about payment and
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26 11 reimbursements mechanisms.²⁷ From the provider perspective, there have been worries about
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28 12 NHIS reimbursement rates being lower than the actual service costs, forcing some private
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30 13 providers to exit the programme, as well as delays in reimbursements which affect running of
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32 14 the facility.^{71 76} Another major and common challenge recorded was shallowness of benefit
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34 15 coverages. Even though the insured had lower chances of catastrophic expenditure, a large
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36 16 proportion of them still suffered catastrophes,⁷⁴ and still employed “extreme” payment coping
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38 17 strategies.⁴³ Although poor awareness of NHIF was noted as an issue in SSA, studies indicate
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40 18 patient education and sensitization again make a huge difference.⁷⁷
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46 19 *8. Balancing financial protection, equity and efficiency*

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49 20 An extended cost-effectiveness analysis by Shrimme et al (2016) evaluated the health, financial
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51 21 and equity impacts of nine common NGO and government strategies towards improving access
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53 22 to surgery in Uganda. It showed that only mobile surgical programmes and policies that
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55 23 simultaneously address surgical service scale-up (providers), out-of-pocket expenditure for
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57 24 surgery, and (the often ignored) transport cost, can provide health and financial benefits,
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1 equitably and efficiently, simultaneously.⁷⁸ A similar study in Ethiopia arrived at the same
2 conclusion.⁷⁹

3 **(III) Purchasing/Provider Payment**

4 Five articles had findings related to the purchasing function of health financing. Surgery
5 providers in public institutions in SSA are generally salaried workers,^{80 81} but poor
6 remuneration is widespread. In a multi-centre survey of 41 paediatric surgeons across 11
7 Francophone countries in SSA, the average salary in 2008 was just about 450 Euros per month
8 (ranging from 120 to 1400 Euros).⁸¹

9 Two studies explored the effect of payments mechanisms on hospital operations. A before-and-
10 after study in Burkina Faso showed that both government and household expenditure on CS
11 increased after the free delivery policy changed from retrospective fee-for-service payment to
12 prospective fee-for-service payment.⁸² The other study showed that the introduction of
13 performance-based financing at DHs in Rwanda was associated with an increase in the number
14 of CS from 60 to 140 per quarter over a five-year period.⁸³

15 **DISCUSSION**

16 Today, domestic resource mobilization for surgery in SSA is grossly deficient due to the double
17 jeopardy of an overall constrained fiscal space for health and poor political prioritisation of
18 surgery. Using Shiffman and Smith's analysis framework for assessing global health priorities,
19 Frimpong-Boateng (2019) attributed the neglect to "the failure to communicate a clear policy
20 need using powerful ideas that take advantage of the political contexts of the times".³⁰ There
21 is clearly a need for champions, including practitioners, scholars, public servants, and
22 professional societies who would leverage political affiliations and use empirical evidence to
23 project surgery into political consciousness at different levels, as has been witnessed in the few
24 countries that have adopted NSOAPs.^{6 84 85}

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3 1 Another direct consequence of the national level neglect of surgery in SSA is the literature
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5 2 lacuna on surgical allocations and expenditures, as revealed in this review, contrary to the
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7 3 LCGS recommendations. In a further search for possible insights, we reviewed five SSA
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9 4 NSOAPs that were accessible via Google (Ethiopia, Nigeria, Rwanda, Tanzania, and Zambia)
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11 5 and found that none had any data related to national financial allocations to surgery or actual
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13 6 expenditures, while only the Nigeria and Rwanda NSOAPs had information on hospital
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15 7 allocations to surgery. This finding is neither new nor limited to SSA: Meara et al (2015)
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17 8 reviewed 958 national health accounts published between 1996 and 2010 in LIMCs and
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19 9 reported that only Georgia and Kyrgyzstan routinely reported expenditures on surgery;² and a
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21 10 2015 systematic review of UHC programmes in LIMCs showed surgeries were systematically
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23 11 excluded from national UHC packages.⁸⁶ This limited evidence shows the lack of substantial
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25 12 progress, five years after the LCGS recommendations, suggesting minimal scholarly interest
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27 13 in the subject. The upward trend recorded in the volume of studies from 2015 is nonetheless
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29 14 welcome and should be sustained and intensified.

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36 15 Poor pooling functions across SSA mean that access to surgical care still correlates strongly
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38 16 with socioeconomic status, resulting, among the poor, in disinclination to seek care,
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40 17 catastrophic expenditures for those who dare to seek care, disruptions in care stream, and
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42 18 consequential inequities in health outcomes affecting especially the poor. The successes
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44 19 recorded with CHIF in Rwanda⁸⁷ and NHIF in Ghana⁸⁸ might serve as examples to be built
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46 20 upon by other countries. Meanwhile, as laudable as health insurance and UPF interventions
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48 21 are, the most important message from this study is that just removing or subsidizing user fees
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50 22 is not enough. Aside from the associated technical complexities that must be addressed,
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52 23 numerous other non-medical cost elements hampering universal access to surgical care remain,
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54 24 including transport, food, accommodation, and loss of earnings. As such, even if all the direct
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56 25 medical costs were covered at the national or facility level, some patients would remain simply
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1 too poor to obtain even “free” surgical care.⁸⁹ The particular contexts of low-income countries
2 ought to be understood and addressed appropriately using more comprehensive policy designs.
3 This study reveals important priorities for future research. First, there is need to explore the
4 current national level mobilization and allocation patterns and track the available resources
5 throughout the system to inform best policy directions.⁷ Second, numerous studies have
6 established the vulnerabilities faced by the poor due to inadequacies in protection measures,
7 but few have explored optimal financial protection strategies given the socioeconomic realities
8 in SSA.^{78 90} More evidence in this regard will aid contextualised policy formulation. Further,
9 the literature is particularly scanty on the purchasing aspects of surgical services: a deeper
10 understanding of interactions between hospital reimbursement patterns and personnel
11 remuneration systems on one hand and surgical service delivery on the other hand will
12 engender value-based purchasing mechanisms and ensure maximization of surgical output with
13 the limited available resources.² Lastly, as national and subnational governments in SSA
14 continue to pursue free obstetric care policies, the literature remains divided on their exact
15 impacts on CS rates. More rigorous studies are recommended to resolve the conflicts and
16 explore the factors that may account for different outcomes in different countries.

17 Wide variations found in approaches to the estimation of catastrophic expenditures across the
18 articles call for a special note. Health expenses are described as “catastrophic” if they exceed
19 a certain threshold proportion of household income/expenditure or capacity to pay,⁹¹ but lack
20 of unanimity remains in the thresholds applied.^{42 91} In addition, cost elements considered in the
21 calculations also differed, with some covering only direct medical cost,^{40 64} others including
22 direct non-medical costs,^{29 67} and still others extending to indirect costs.^{41 53 92} Moreover,
23 definitions of direct and indirect costs were inconsistent. Given the cardinal position this metric
24 has assumed in financial protection analyses, uniformity in approaches is particularly
25 imperative, and to achieve this, we advocate adherence to the definition and methodology

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3 1 adopted by the WHO and the World Bank for indicator 3.8.2 of the Sustainable Development
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5 2 Goals (SDGs) which monitors the financial protection dimension of universal health
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7 coverage.^{93 94}
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10 4 **Limitations**

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14 5 The first limitation of this study is that associated with scoping reviews generally, which is that
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16 6 they often do not evaluate the quality of the evidence presented, thus putting the results at high
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18 7 risk of bias and diminishing the possibilities of drawing definitive conclusions therefrom.
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20 8 Further, while our study aimed to collate findings from different countries for the consumption
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22 9 of policymakers and stakeholders in individual countries, it is not clear to what extent findings
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24 10 or policy lessons from one country could be applicable in another country. Overall, however,
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26 11 we think that the use of two parallel reviewers and an arbiter, in line with best practices,
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28 12 improved the quality of the work, and that the work nonetheless provides some useful insights
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30 13 for policymakers across SSA.
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35 14 **Conclusion**

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38 15 This study has provided a situational analysis of financing of surgery and anaesthesia in SSA
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40 16 while summarising the current knowledge on the subject. The resources available for surgery
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42 17 are limited due in part to the neglect of surgery in national priorities, making it difficult for
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44 18 hospitals to provide the full package of surgical services. Surgery services are unaffordable for
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46 19 the great majority of populations, resulting in financial catastrophes and/ or impoverishments.
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48 20 Findings in this review could guide national policy makers in SSA, especially those
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50 21 implementing or developing NSOAPs, in adopting more comprehensive and inclusive
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52 22 measures to enhance access to SOA services, while steering research towards critical
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54 23 unanswered questions.
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59 24 **Author Contributions**

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3 1 MI conceived the study. MI, EA and LB designed the study, conducted the search and analysed
4
5 2 the data. MI and EA drafted the first manuscript. MI, EA, MS, JG, CP, JK, EB, RB, RB, LB
6
7 3 contributed to data interpretation, and critically reviewed and edited the first draft. MI, EA,
8
9 4 MS, JG, CP, JK, EB, RB, RB, LB read and approved the final manuscript. LB supervised the
10
11 5 study.
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15 6 **Acknowledgements**

17 7 We are grateful to Dr Henk Broekhuizen (Department of Social Sciences, Wageningen
18
19 8 University) for his help in the conceptualization of the study. The authors also wish to
20
21 9 appreciate information specialists Elmie Peters and Dr On Ying Chan of Radboud University
22
23 10 Medical Library, and Paul Murphy of Royal College of Surgeons in Ireland (RCSI) Library,
24
25 11 for their technical assistance in the development and execution of the literature search strategy;
26
27 12 and Jos Peters of Radboud University Medical Library who assisted in the acquisition of the
28
29 13 full texts of the articles.
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36 15 **Competing Interests**

37
38 16 The authors declare no competing interests
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41 17 **Funding**

42 18 This work was supported by European Commission's Horizon 2020 Framework Programme,
43
44 19 under grant agreement no: 733391, as part of the Scaling up Safe Surgery for District and Rural
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46 20 Populations in Africa (SURG-Africa) project.
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49 22 **Ethical Approval**

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51 23 Not Applicable
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54 25 **Data Availability Statement**

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56 26 Extra data is available by emailing author MI (Martilord.ifeanyichi@radboudumc.nl)
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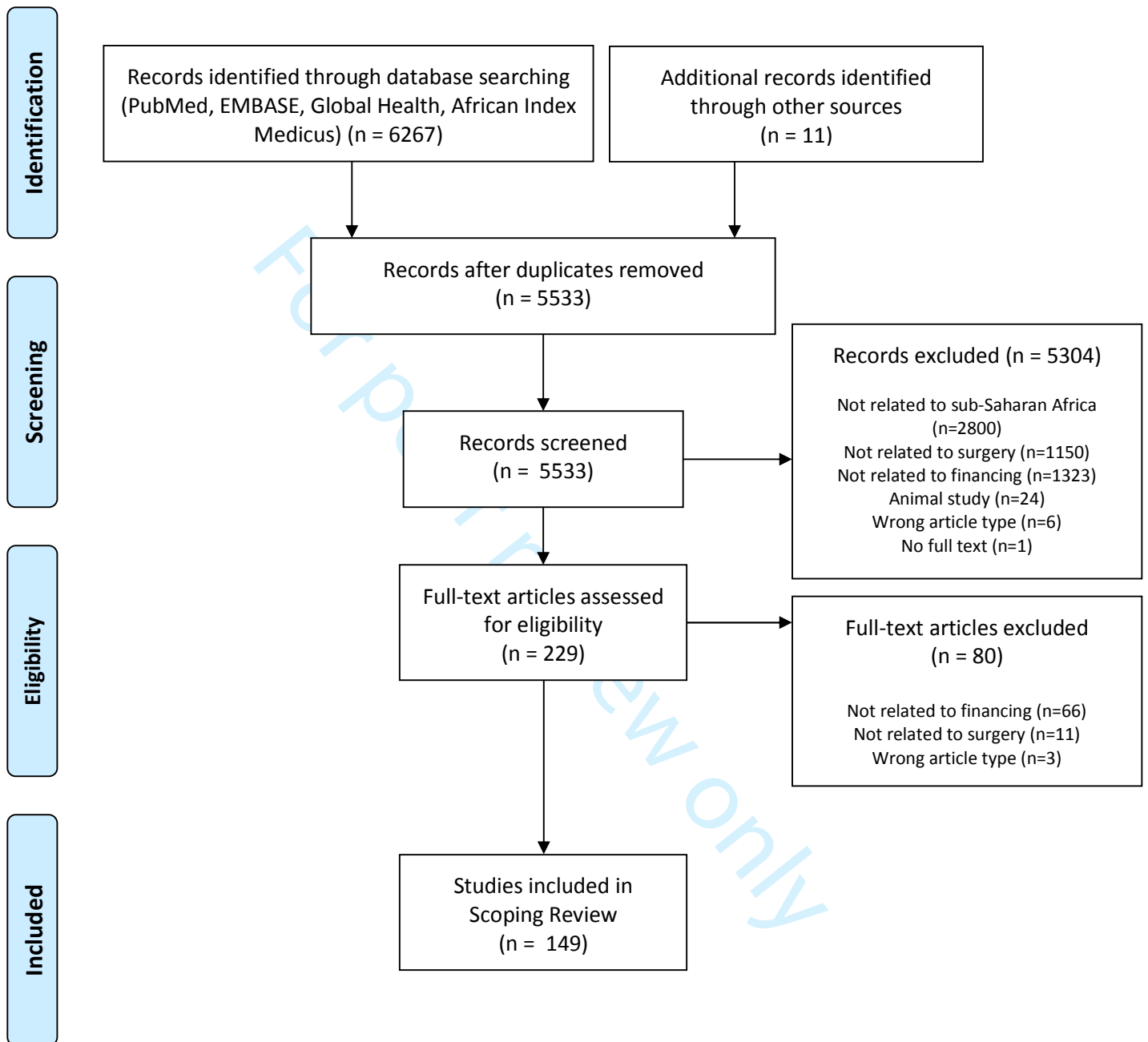
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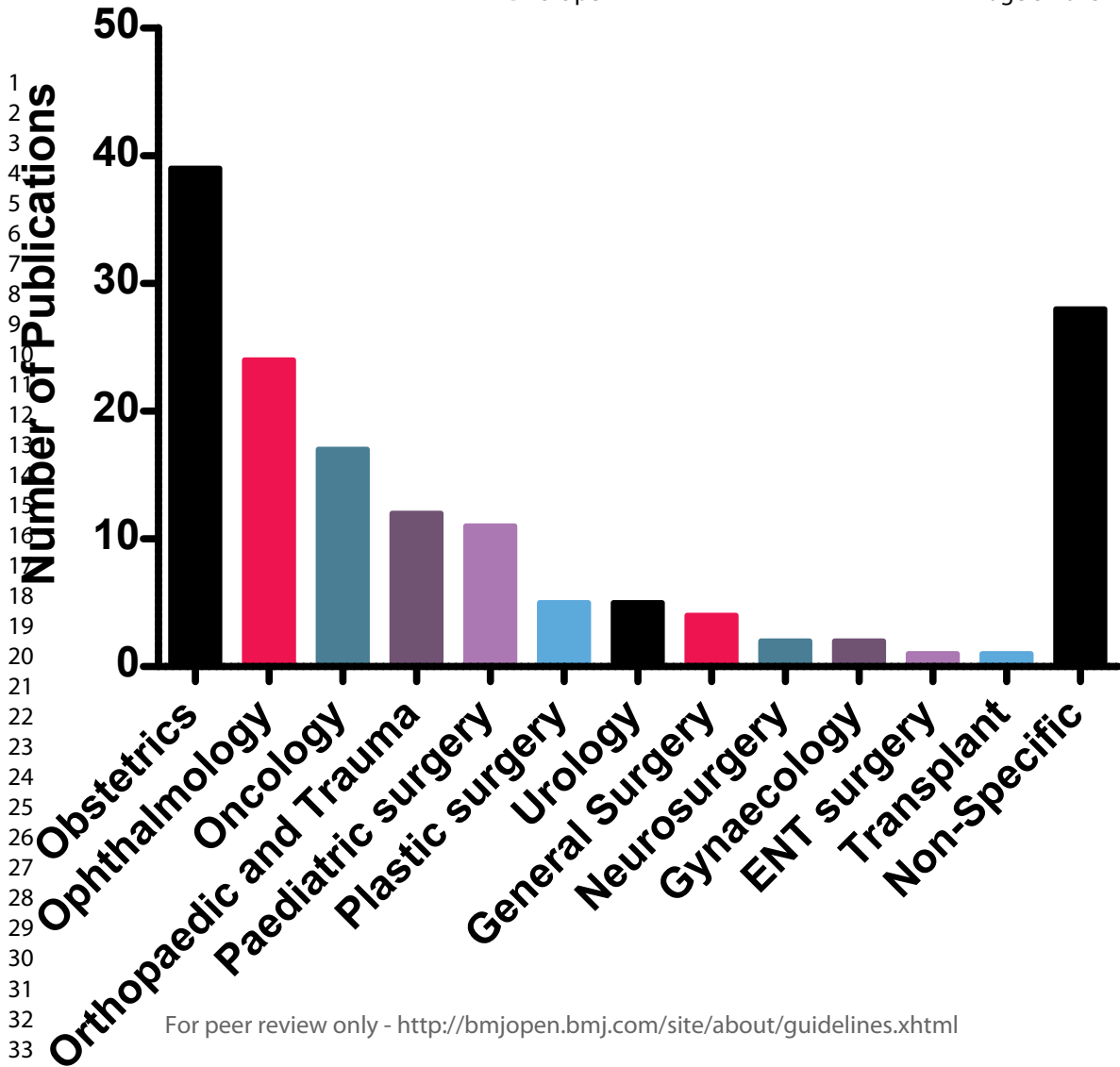
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3 **S1: Search Query**
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5 **1. PUBMED**
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	<p>7 ("Surgical Procedures, Operative"[Mesh] OR "surgery"[subheading] OR anaesthe*[tiab] OR 8 anesthe*[tiab] OR anaesthesia[Mesh] OR "Specialties, Surgical"[Mesh] OR surger*[tiab] OR 9 surgical[tiab]) AND ("Healthcare Financing"[Mesh] OR "Health Policy"[mesh] OR Universal 10 Health Insurance[Mesh] OR "Health Planning"[Mesh] OR "Health Expenditures"[Mesh] OR 11 Expenditure*[tiab] OR "Insurance, Health"[Mesh] OR Health Services/Economics[Mesh] OR 12 Economics[Mesh:NoExp] OR Fund raising[Mesh] OR Health Care Costs[Mesh] OR Fees 13 and Charges[mesh] OR "Financing, Personal"[Mesh] OR budgets[mesh] OR Health 14 Services Accessibility/Economics[Mesh] OR health priorit*[tiab] OR Financ*[tiab] OR 15 Revenue*[tiab] OR Charities/economics[mesh] OR "Universal Health Care"[tiab] OR 16 Universal Health Coverage[tiab] OR "National Health Accounts"[tiab] OR payment*[tiab] OR 17 Budget allocation*[tiab] OR Health Insurance[tiab]) AND ("Africa South of the Sahara"[Mesh] 18 OR Africa*[tiab] OR Cameroon*[tiab] OR Central African Republic*[tiab] OR Congo*[tiab] 19 OR Chad*[tiab] OR Democratic Republic of the Congo*[tiab] OR Equatorial Guinea*[tiab] 20 OR Gabon*[tiab] OR Sao Tome and Principe*[tiab] OR Burundi*[tiab] OR Madagasca*[tiab] 21 OR Comoros*[tiab] OR Mauriti*[tiab] OR Eritrea*[tiab] OR Ethiopia*[tiab] OR Kenya*[tiab] 22 OR Rwanda*[tiab] OR Somalia*[tiab] OR South Sudan*[tiab] OR Sudan*[tiab] OR 23 Tanzania*[tiab] OR Uganda*[tiab] OR Angola*[tiab] OR Botswana*[tiab] OR Lesotho*[tiab] 24 OR Malawi*[tiab] OR Mozambi*[tiab] OR Namibia*[tiab] OR South Africa*[tiab] OR 25 Swaziland*[tiab] OR Zambia*[tiab] OR Zimbabwe*[tiab] OR Benin*[tiab] OR Burkina 26 Faso*[tiab] OR Cabo Verde*[tiab] OR Cote d'Ivoire*[tiab] OR Gambia*[tiab] OR Ghana*[tiab] 27 OR Guinea*[tiab] OR Guinea-Bissau*[tiab] OR Liberia*[tiab] OR Mali*[tiab] OR 28 Mauritania*[tiab] OR Niger*[tiab] OR Nigeria*[tiab] OR Senegal*[tiab] OR Sierra Leone*[tiab] 29 OR Togo*[tiab] OR Eswatini*[tiab] OR Seychelles*[tiab] OR sub-Saharan*[tiab]) 30 31 32 33 34 35 36 37 38</p> <p>39 Filters: from 2010 – 2020 40 41 42 43</p>	<p>2,849</p>
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44 **2. EMBASE**
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	<p>46 (exp surgery/ OR surgery.fs. OR exp obstetric operation/ OR exp anaesthesia/ OR 47 surger*.ti,ab,kw. OR surgical.ti,ab,kw. OR anaesthe*.ti,ab,kw. OR anesthe*.ti,ab,kw.) AND 48 (exp Health Care Cost/ OR Economics/ OR Universal Health Insurance/ OR exp Health 49 Insurance/ OR exp Fee/ OR budget/ OR Funding/ OR value-based purchasing/ OR 50 Universal Health Care/ OR Health Care Planning/ OR Social Welfare/ OR health 51 priorit*.ti,ab,kw. OR Health Care Policy/ OR Financ*.ti,ab,kw. OR Universal Health 52 Care.ti,ab,kw OR Universal Health Coverage.ti,ab,kw. OR budget allocation*.ti,ab,kw. OR 53 54 55 56 57 58 59</p>	<p>3,661</p>
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payment*.ti,ab,kw. OR Health Insurance.ti,ab,kw. OR National Health Account*.ti,ab,kw. OR Revenue*.ti,ab,kw. OR expenditure*.ti,ab,kw.) AND (exp "Africa south of the Sahara"/ OR Cameroon*.ti,ab,kw. OR Central African Republic*.ti,ab,kw. OR Congo*.ti,ab,kw. OR Chad*.ti,ab,kw. OR Democratic Republic of the Congo*.ti,ab,kw. OR Equatorial Guinea*.ti,ab,kw. OR Gabon*.ti,ab,kw. OR "Sao Tome and Principe*".ti,ab,kw. OR Burundi*.ti,ab,kw. OR Madagasca*.ti,ab,kw. OR Comoros*.ti,ab,kw. OR Mauriti*.ti,ab,kw. OR Eritrea*.ti,ab,kw. OR Ethiopia*.ti,ab,kw. OR Kenya*.ti,ab,kw. OR Rwanda*.ti,ab,kw. OR Somalia*.ti,ab,kw. OR South Sudan*.ti,ab,kw. OR Sudan*.ti,ab,kw. OR Tanzania*.ti,ab,kw. OR Uganda*.ti,ab,kw. OR Angola*.ti,ab,kw. OR Botswana*.ti,ab,kw. OR Lesotho*.ti,ab,kw. OR Malawi*.ti,ab,kw. OR Mozambi*.ti,ab,kw. OR Namibia*.ti,ab,kw. OR South Africa*.ti,ab,kw. OR Swaziland*.ti,ab,kw. OR Zambia*.ti,ab,kw. OR Zimbabwe*.ti,ab,kw. OR Benin*.ti,ab,kw. OR Burkina Faso*.ti,ab,kw. OR Cabo Verde*.ti,ab,kw. OR Cote d'Ivoire*.ti,ab,kw. OR Gambia*.ti,ab,kw. OR Ghana*.ti,ab,kw. OR Guinea*.ti,ab,kw. OR Guinea-Bissau*.ti,ab,kw. OR Liberia*.ti,ab,kw. OR Mali*.ti,ab,kw. OR Mauritania*.ti,ab,kw. OR Niger*.ti,ab,kw. OR Nigeria*.ti,ab,kw. OR Senegal*.ti,ab,kw. OR Sierra Leone*.ti,ab,kw. OR Togo*.ti,ab,kw. OR Eswatini*.ti,ab,kw. OR Seychelles*.ti,ab,kw. OR sub-Saharan*.ti,ab,kw. OR Africa*.ti,ab,kw.)

Filters: from 2010 – 2020

3. Global Health Database

("Surgical Procedures" or "surgery" or anaesthesia or anesthesia or anaesthesia or surger* or surgical).mp. AND ("Healthcare Financing" or "Health Policy" or "Universal Health Insurance" or "Health Planning" or "Health Expenditures" or Expenditure* or "Health Insurance" or "Health Services" or "health economics" or Economics or "Fund raising" or "Health Care Costs" or "Fees and Charges" OR Financing" or budgets or "Health Services Accessibility" or "health priorit*" or Financ* or Revenue* or Charities or "Universal Health Care" or "Universal Health Coverage" or "National Health Accounts" or payment* or Budget allocation* or "Health Insurance").mp. AND ("Africa South of the Sahara" or Africa* or Cameroon* or "Central African Republic*" or Congo* or Chad* or "Democratic Republic of the Congo*" or "Equatorial Guinea*" or Gabon* or "Sao Tome and Principe*" or Burundi* or Madagascar* or Comoros* or Mauriti* or Eritrea* or Ethiopia* or Kenya* or

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Rwanda* or Somalia* or South Sudan* or Sudan* or Tanzania* or Uganda* or Angola* or Botswana* or Lesotho* or Malawi* or Mozambique* or Namibia* or "South Africa*" or Swaziland* or Zambia* or Zimbabwe* or Benin* or "Burkina Faso*" or Cabo Verde* or "Cote d'Ivoire*" or Gambia* or Ghana* or Guinea* or Guinea-Bissau* or Liberia* or Mali* or Mauritania* or Niger* or Nigeria* or Senegal* or Sierra Leone* or Togo* or eswatini* or Seychelles* or sub-Saharan*).mp.

Filters: from 2010 – 2020

For peer review only

S2: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	5-6
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	7-8
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Not Applicable
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	8-11
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	8
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	8
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	8-11
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	11
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	11
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Not Applicable
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	11



SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	12-13
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	12-13
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not Applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	13-20
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	13-20
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	20-22
Limitations	20	Discuss the limitations of the scoping review process.	22-23
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	23
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	24

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* ;169:467–473. doi: 10.7326/M18-0850



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S3: Breakdown of Included Articles by Countries of Focus

Country	Number of Related Publications
Benin	9
Botswana	1
Burkina Faso	6
Cameroon	9
DRC	6
Ethiopia	8
Gabon	2
Ghana	13
Guinea	3
Kenya	14
Madagascar	5
Malawi	5
Mali	8
Mauritania	1
Mozambique	2
Namibia	2
Nigeria	34
Rwanda	5
Senegal	3
Sierra Leone	4
South Africa	3
Sudan	2
Tanzania	11
Togo	2
Uganda	15
Zambia	2
Zimbabwe	2
Non-Specific	8