

**Systematic Review**

# Funding paediatric surgery procedures in sub-Saharan Africa

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## Abstract

### Background

In sub-Saharan Africa, there is a growing awareness of the burden of paediatric surgical diseases. This has highlighted the large discrepancy between the capacity to treat and the ability to afford treatment, and the effect of this problem on access to care. This review focuses on the sources and challenges of funding paediatric surgical procedures in sub-Saharan Africa.

### Methods

We undertook a search for studies published between January 2007 and November 2016 that reported the specific funding of paediatric surgical procedures and were conducted in sub-Saharan Africa. Abstract screening, full-text review and data abstraction were completed and resulting data were analysed using Statistical Package for Social Sciences (SPSS) software.

### Results

Thirty-five studies met our inclusion criteria and were reviewed. The countries that were predominantly emphasized in the publications reviewed were Nigeria, South Africa, Kenya, Ghana and Uganda. The paediatric surgical procedures involved general paediatric surgery/urology, cardiac surgery, neurosurgery, oncology, plastics, ophthalmology, orthopaedics and otorhinolaryngology. The mean cost of these procedures ranged from 60 to 21,140 United States Dollars (USD). The source of funding for these procedures was mostly out-of-pocket payments (OOPs) by the patient's family in 32 studies, (91.4%) and medical mission/non-governmental organizations (NGOs) in 21 (60%) studies. This pattern did not differ appreciably between the articles published in the initial and latter 5 years of the study period, although there was a trend towards a reduction in OOP funding. Improvements in healthcare funding by individual countries supported by international organizations and charities were the predominant suggested solutions to challenges in funding.

### Conclusion

While considering the potential limitations created by diversity in study design, the reviewed publications indicate that funding for paediatric surgical procedures in sub-Saharan Africa is mostly by OOPs made by families of the patients. This may result in limited access to some procedures. Coordinated efforts, and collaboration between individual countries and international agencies, may help to reduce OOP funding and thus improve access to critical procedures.

### Key Words

Healthcare financing; paediatric surgery; challenges; sub-Saharan Africa

## Introduction

The past decade has witnessed an increased awareness of the burden of paediatric surgery in developing countries<sup>1,2</sup>. Such burden is further exacerbated by late presentation for care, concomitant malnutrition, a large cache of patients with conditions that have not received surgery with extensive chronic surgical disability, advanced disease on presentation requiring more complex procedures, and an increased likelihood of postoperative complications<sup>1-5</sup>. As a result, the scale of the burden of disease due to paediatric surgical conditions in sub-Saharan Africa (SSA) may be enormous. Although there have been significant advances in the management of these disorders with excellent outcome for most of the cases in more developed regions<sup>6,7</sup>, studies have shown that there is substantial lack of access to surgical care for these disorders in SSA<sup>4,5,8</sup>. This lack of access may be due to the lack of appropriate facilities and trained professionals, or the large discrepancy between the capacity to treat and the ability to afford treatment. The latter is reported to be a major challenge to tackling the huge paediatric surgical burden in SSA<sup>8,9</sup>. This is exacerbated by the lack of focused

intervention by individual countries and their institutions<sup>10</sup> and has prompted the initiation of programmes by a number of non-governmental agencies and international and local charitable organizations to improve funding and access to treatment for these children<sup>11</sup>. Despite these efforts, solutions are limited and sustainability is sadly lacking<sup>8,12</sup>.

A detailed investigation of the sources of funding for paediatric surgery procedures in SSA may provide significant insight into potential options with which to achieve a more universal and sustainable improvement in funding and possibly lead to improvements in access to care. In this systematic review, we evaluated publications providing data on the funding of paediatric surgery in SSA over the last 10 years. We specifically focused on the sources of funding and possible solutions to challenges with regards to the future funding of paediatric surgical procedures.

## Materials and methods

We followed the guidelines described by the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement<sup>13</sup> and conducted a systematic review of literature relating to healthcare funding for paediatric

**Table 1. The distribution of publications selected for analysis and the countries emphasized in these studies**

<i>Authors</i>	<i>Article type</i>	<i>Year</i>	<i>Country emphasized</i>	<i>Key aspect of study</i>
Poenaru <sup>1</sup>	Review	2016	Kenya	Burden of disease and funding
Evans et al. <sup>14</sup>	Prospective	2014	Kenya, Malawi	Burden and cost of cataract surgery
Adetayo et al. <sup>15</sup>	Survey	2012	Cameroon, Ghana, Kenya, Malawi, Mozambique Nigeria, Liberia, Sierra Leone, South Africa Uganda, Zambia, Zimbabwe	Challenges of managing cleft
Muir et al. <sup>9</sup>	Review	2016	Kenya, Uganda	Challenges of managing hydrocephalus
Ekenze et al. <sup>5</sup>	Review	2016	Botswana, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Nigeria, South Africa, Tanzania, Zambia	Burden of disease and challenges
Poenaru et al. <sup>16</sup>	Review	2010	Malawi, South Africa	Challenges of management
Kushner et al. <sup>17</sup>	Letter to Editor	2012	Sierra Leone	Effect of free health services
Poenaru <sup>18</sup>	Review	2013	Cameroon, Ghana, Kenya, Malawi, Mozambique Nigeria, Liberia, Sierra Leone, South Africa Uganda, Zambia, Zimbabwe	Effect of Smile Train
Chao et al. <sup>19</sup>	Retrospective	2014	Liberia	Burden of surgical disease
Ekenze et al. <sup>20</sup>	Retrospective	2010	Nigeria	Burden of disease and challenges
Salvador et al. <sup>21</sup>	Retrospective	2015	Mozambique	Burden of disease and challenges
Edwin et al. <sup>22</sup>	Retrospective	2016	Ghana	Burden and challenges of cardiac surgery
Okoye et al. <sup>23</sup>	Retrospective	2015	Nigeria	Effect of cost reduction
Lala et al. <sup>24</sup>	Letter to Editor	2014	South Africa	Burden and challenge of liver surgery
Emejulu et al. <sup>25</sup>	Prospective	2014	Nigeria	Burden and challenge of neurosurgery
Aremu et al. <sup>26</sup>	Case report	2013	Nigeria	Delayed diagnosis from inability to pay
Wu et al. <sup>4</sup>	Retrospective	2013	Kenya	Burden of disease
Shillcutt et al. <sup>27</sup>	Prospective	2010	Ghana	Cost effectiveness of groin hernia surgery

surgery in SSA. To identify all possible sources of literature on healthcare funding for paediatric surgery in SSA, we carried out searches of PubMed, African Index Medicus and African Journal Online (AJOL) using the following search details: (“Economics” OR “Funding”) AND (“Paediatric “ AND “Surgery” OR “Paediatric surgery”) AND (“Africa”). Only articles published between January 2007 and November

2016 from SSA were considered. Article titles, abstracts, and reference lists were also screened for relevance. Each of the identified articles was then evaluated in full to identify all papers reporting healthcare funding for paediatric surgery in SSA. Papers were included if they were based on studies of SSA and reported the funding of specific paediatric surgical procedures, including the sources of funding and the potential

**Table 2. Paediatric surgery specialties in the 35 reviewed publications, as categorized by country**

Countries	Specialities							
	General paediatric surgery	Plastic surgery	Cardiac/thoracic surgery	Neurosurgery	Oncology	Ophthalmology	Orthopaedic	Otorhinolaryngology
Botswana	1							
Cameroon		2	1	1				
Cote d'Ivoire	1							
Ethiopia	1							
Ghana	3	2	1				1	
Kenya	3	2		1	1	1	1	
Liberia	1	2				1	1	1
Malawi	2	2		1		1		
Mozambique		2		1				
Nigeria	3	2	3	2	6	1	2	2
Sierra Leone	1	2						
South Africa	4	2	2		1			
Tanzania	1							
Uganda		2	1	1				
Zambia	1	2		1		1		
Zimbabwe		2	1	1				

solutions to funding challenges. The surgeries involved were not limited to procedures performed by paediatric general surgeons, but included all surgical procedures carried out in children. We excluded publications that did not contain data relating to specific funding sources for surgical procedures, and studies that dealt with cost analysis without emphasizing access in relation to the cost and funding of the procedures. No articles were excluded for being published in a language other than English. Articles published in other languages were translated to English using online translation resources.

The evidence obtained was reviewed and evaluated by the authors. First, we excluded duplications. Then, we used a data extraction sheet to collect a range of information from each of the selected publications, including type, span, year, key aspects and country emphasized in the study, surgical procedures, funding sources, funding trends, challenges to funding and suggestions to address the challenges created by the lack of funding.

## Data analysis

We used Statistical Package for Social Sciences (SPSS 15.0 version, SPSS Inc, Chicago, IL) software for data entry and analysis. Results are expressed as percentages or as means. Because complete data sets were not available for all parameters, we used descriptive percentages to represent the proportion of parameters for which a specific data point was available.

## Results

### Search results

The initial database search for healthcare funding for paediatric surgery in SSA yielded 401 publications. After screening these publications, 35 articles were evaluated in full. The algorithm for the selection of the publications is shown

in Figure 1. Of these 35 studies, 22 (62.9%) were published in the last 5 years of the study period (January 2012–November 2016), and 13 (37.1%) were published in the first 5 years (January 2007–December 2011). Of the 35 studies reviewed (Table 1), 14 (40%) were retrospective<sup>19–23,34–38,41,43,44, 7</sup> (20%) were prospective<sup>14,25,27,29,30,33,39</sup>, 9 (25.7%)<sup>1,5,9,16,18,31,32,40,42</sup>, 2 (5.7%) were survey<sup>15,28</sup>, 2 (5.7%) were letters to an editor<sup>17,24</sup> and one (2.9%) was a case report<sup>26</sup>. The SSA countries emphasized in the studies were Nigeria (14), South Africa (9), Kenya (8), Ghana (6), Malawi (5), Uganda (4), Zambia (4), Cameroon (3), Liberia (3), Sierra Leone (3), Mozambique (3) and Zimbabwe (3). Others were Botswana (1), Cote d'Ivoire (1), Ethiopia (1) and Tanzania (1).

### Paediatric surgical procedures

The surgical procedures covered in the reviewed publications involved general paediatric surgery/paediatric urology (n=13), oncology (n=10), cardiac/thoracic surgery (n=9), neurosurgery (n=8), plastic surgery (n=6), orthopaedics (n=5), ophthalmology (n=5) and otorhinolaryngology (n=4). Table 2 shows the distribution of specialties indicated for the various countries.

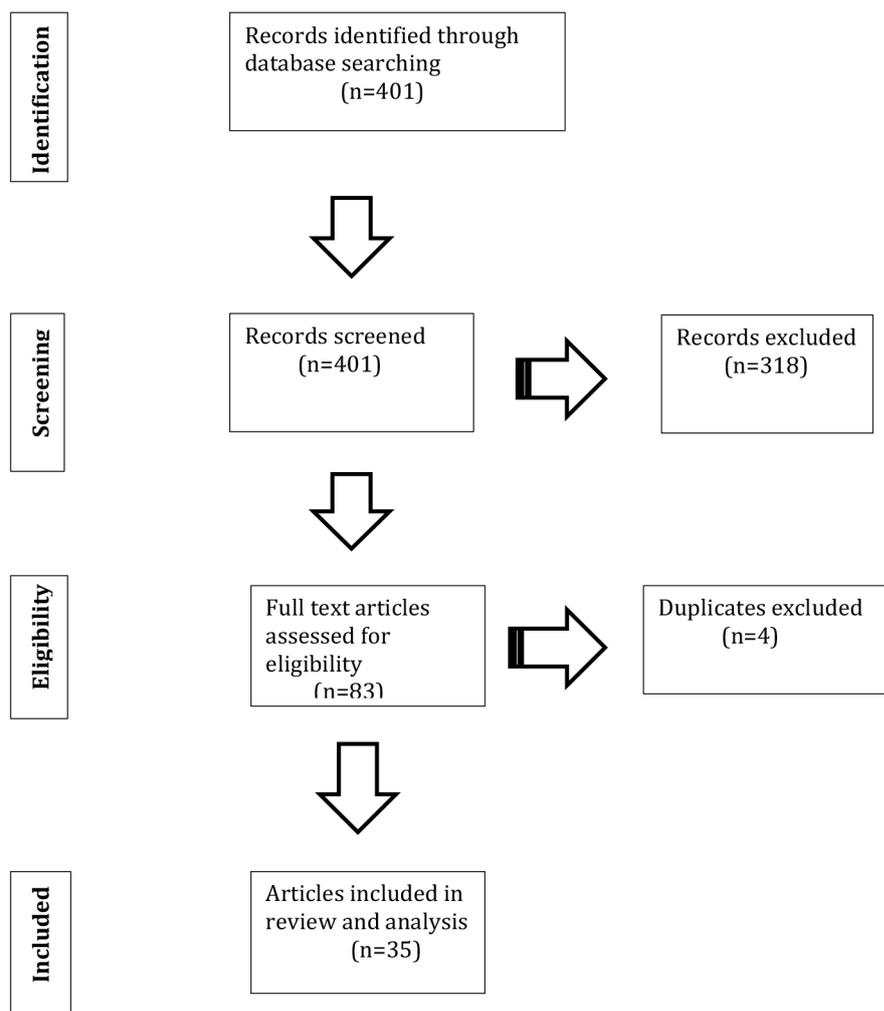
### Funding for procedures

All 35 studies specified the sources of funding for the surgical procedures mentioned. However, only 9 (25.7%) indicated the exact cost of the surgical procedures described<sup>4,14,19,23,27–29,33,39</sup>. The mean cost of the procedures, as indicated, ranged from 60 USD for paediatric hernia or cataracts to 21,140 USD for cardiac surgery. The reported sources of funding for such procedures was predominantly by out of pocket (OOP) payments made by the parents/guardians in 32 (91.4%) of the publications, medical missions and non-governmental organizations (NGOs) in 21 publications (60%), health

**Table 3. A comparison of the main sources of funding for surgical procedures between articles published during the last 5 years of the study period and those published during the first 5 years**

Source of funding	1997–2006 (n=13)	2007–2016 (n=22)
Out-of-pocket	13/13 (100%)	19/22 (86.4%)
NGOs <sup>a</sup> /medical missions	7/13 (53.8%)	14/22 (63.6%)
Health insurance	1/13 (7.7%)	4/22 (18.2%)
Direct government funding	0	3/22 (13.6%)

<sup>a</sup>NGOs, Non-governmental organizations



**Figure 1. An algorithm showing how studies were selected for analysis (modified from the PRISMA flowchart).**

insurance in 5 publications (14.3%) and direct government funding in 3 publications (8.6%). Comparison of the major sources of funding for surgical procedures between the articles published in the last 5 years of the study period and those published in the first 5 years showed a trend towards a reduction in OOP funding (Table 3). All publications indicated limitations in access to surgical procedures due to funding challenges.

### ***Suggested solutions to funding challenges***

The publications reviewed all featured one or more suggestions to improve funding. The main suggestions were improvements in funding efforts provided by the governments of individual countries and by international bodies in 30 publications (85.7%), the establishment or

improvement of health insurance schemes in 21 publications (60%) and the sustained use of charities and medical missions in 15 publications (42.9%).

### **Discussion**

This study revealed an increase in the number of publications relating to the funding of paediatric surgery in SSA over recent years. This may represent an offshoot of increased medical and paediatric surgical literature over recent years, or this may reflect an increasing interest in global surgery and access to paediatric surgery care in developing countries. Remarkably, literature relating to funding for paediatric surgery in high income countries (HICs) has been scant over the past decade; most studies have focused on patients with a low income and incomplete insurance<sup>45–48</sup>. This may

be related to improved access and coordinated funding protocols for paediatric surgery in these countries. Despite the increased number of publications on this theme in our particular setting, a substantial proportion of those reviewed for this study were descriptive or retrospective<sup>4,19–23,34–38,41,43,44</sup> in nature and were devoid of specific analysis; this limited the information such publications could yield. Nevertheless, the publications reviewed during our analysis offered some insight into paediatric surgery procedures and funding sources, the perceived challenges to funding and offered some suggestions to address such challenges.

The reviewed literature indicated that a wide array of procedures was undertaken in SSA and that these procedures involved a variety of specialties. A substantial proportion of the surgical procedures undertaken in children, and reported in the global literature, were covered. However the more modern approaches to some of these procedures, such as laparoscopy, robotic and transplantation surgeries were not emphasized by the literature reviewed, probably because such procedures were not routinely undertaken in this particular setting and were therefore not reported. A series of studies showed that a considerable proportion of funding for these procedures originated from OOP payments by parents/guardian of the affected children<sup>5,9,16,19,20,22,25,26,30,34,44</sup>. Previous studies have shown that OOP payments have the potential to undermine the core objectives of health care systems, including those relating to equitable financing, equal access and improved population health<sup>45,46,49,50</sup>. Even when considering the limitations imposed by the reviewed literature, deficits in healthcare were clearly evident in our present analysis. The consequences of reduced access in our particular setting may range from delayed treatment with associated complications<sup>1,5,20</sup> to the accumulation of a large cache of patients who suffer from conditions that have not undergone surgery with a consequential burden created by chronic surgical disability<sup>1–5,51</sup>. Although similar circumstances have been reported in other developing countries<sup>2,3,10,46,49,52,53</sup>, there is evidence that OOP payments are also made in HICs<sup>47,48</sup>, although this occurs in a significantly reduced proportion and occurs predominantly for patients on low incomes and/or with incomplete insurance. The reason for the predominance of OOP payments for procedures in our particular setting could not be conclusively deduced from studies we reviewed, although some of the studies<sup>1,5,9,16,19,20,22,25,26,30,34</sup> indicated a lack of effective health insurance schemes and inadequate government healthcare funding in the affected countries as being key contributing factors. The latter may be traced to the very low total expenditure on health as a percentage of gross domestic products in SSA (2.5%) compared to over 10% in HICs<sup>54</sup>. This deficiency might be addressed by targeted efforts to increase the percentage of the gross domestic product spent on health in this setting. Our study also revealed that funding from charities and medical missions plays an important supportive role in funding paediatric surgery procedures in SSA. While this practice is known to play a beneficial role in the short term, there are concerns related to the long-term benefits and sustainability<sup>11,55</sup>. It is also pertinent to note that despite the benefit of such humanitarian efforts, it is possible that these practices may lull the affected countries into a false sense of improved healthcare delivery, thus reducing their commitment towards improving healthcare spending.

However, certain measures might be required to reduce these inequities, expand financial protection and promote adequate

paediatric surgical access. Although the substantial diversity of the study designs included in our present review might make it difficult to offer strong recommendations, the cited studies do highlight some measures which could be used to improve funding for paediatric surgery procedures. The suggested measures emphasize considerable effort should be made by individual countries in order to reduce the proportion of total health expenditure by OOP payments<sup>1,4,5,9,20,22,25,31,41,44</sup>. This may be achievable by increasing government expenditure on health and by establishing effective health insurance schemes with a broader coverage of benefits. Another option for the affected countries is the example of Sierra Leone, where the government introduced free healthcare for pregnant women, new mothers, and children younger than 5 years<sup>17</sup>. This practice had a substantial effect on access to paediatric care and surgery while also helping to avoid severe disability and death. However, there is a need for caution as there might be challenges with sustainability; furthermore, the reproducibility of this technique in more populated low- to middle-income countries (LMICs) might be difficult. There are similar challenges of limited coverage and sustainability associated with the heavy reliance on charities and medical missions; this prompted some previous reports to recommend this method of funding as adjunct to the efforts of individual countries<sup>1,11,12</sup>. Finally, there have been several other events in global surgery, which have sought to achieve health equity for all people who require surgical care, with a special emphasis on underserved populations and populations in crisis, including the World Health Assembly resolution on ‘Strengthening emergency and essential surgical care and anaesthesia as a component of universal health coverage’ in 2015<sup>56</sup>, The Lancet Commission on Global Surgery<sup>57</sup> and The Amsterdam Declaration on Essential Surgical Care<sup>58</sup>. It is anticipated that such international efforts may provide a suitable framework to create long-term solutions to the funding challenges experienced by paediatric surgery in SSA and other LMICs<sup>59</sup>.

### Study limitations

This study was limited by its retrospective nature and the diversity of designs featured among the studies included in our review. This resulted in some missing data with regards to the types of funding and funding challenges, and therefore precluded a more detailed analysis. Another limitation of our study was that the literature search only targeted papers that included ‘developing countries’ or ‘Africa’. Consequently, studies would have been excluded if they did not use these specific terms.

### Conclusion

The published literature relating to the funding of paediatric surgery in SSA indicate that a wide variety of paediatric surgery procedures are undertaken in this region, and involve a range of specialties. Although limited by the evident diversity in study design, and incomplete datasets, the reviewed literature highlights that a substantial proportion of these procedures are funded by OOP payments by parents and guardians and that this may limit access to care for some procedures. The challenges to funding may be addressed by improved spending on healthcare by individual countries, enhanced health insurance programmes and augmentation in the funding options provided by charities and medical missions. International efforts, via global surgery programmes, may provide suitable a framework with which to create long-term solutions.

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