

OUT OF POCKET AND CATASTROPHIC HEALTH EXPENDITURES OF FAMILIES FROM SEEKING PEDIATRIC SURGICAL CARE IN A TERTIARY HOSPITAL IN TANZANIA

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ABBREVIATIONS:

CHE	Catastrophic Health Expenditure
HIC	High Income Country
LCoGS	Lancet Commission on Global Surgery
LMIC	Low- and middle-income countries
MNH	Muhimbili National Hospital
NSOAP	National Surgical Obstetrics and Anaesthesia Plan
OOPE	Out of Pocket Expenditure
PPP	Purchasing Power Parity
SDG	Sustainable Development Goal
UBC	University of British Columbia
UHC	Universal Health Coverage
WHO	The World Health Organization

ABSTRACT

Introduction:

Approximately 1.8 billion of children, majority being from low- and middle- income countries, lack access to safe and affordable surgical care. There is limited data on financial implication to families from seeking and receiving surgical care for their children. We aimed to assess the burden and factors associated with catastrophic health expenditures (CHE) and the risk of impoverishment among families of children receiving surgery in Tanzania.

Methodology

This was a retrospective study. Demographics, clinical and financial data were collected from parents or caregivers of children undergoing surgery. CHE and the risk of impoverishment was calculated using the formula by *Shrime et al.* We used descriptive statistics, and compared the studies using chi-square and multivariate logistic regression analysis considering statistically significant results at $p < 0.05$. CHE and risk of impoverishment was the primary and secondary outcomes respectively.

Results

The median total OOPE was US\$ 66.3 (IQR: US\$ 21.1 – US\$181.2). The median OOPE from medical and nonmedical costs were \$ 0 (IQR: US\$ 0 – US\$65.5) and US\$6.0 (IQR: US\$0.9 - US\$21.4) respectively. The prevalence of families at risk of CHE was 46.1% (71/154). Marital status ($p < 0.001$), health insurance ($p=0.02$), electricity ($p=0.01$), referral status ($p=0.001$) use of private car to the referral center ($p=0.04$) and public transport (0.02) were found to be predictors of outcomes.

Conclusion and Discussion

Seeking children surgical care is may push families into the risk of CHE and impoverishment resulting from OOPE. In addition to existing strategies, bringing care closer to the patient may be an effective intervention and may protect families from CHE and reduce risk of impoverishment.

INTRODUCTION AND BACKGROUND

Of the 5 billion people lacking access to safe, affordable, and timely surgical care, approximately 1.8 billion are children (1–3). Majority of these are from low- and middle-income countries (LMICs) (3). Nearly 50% of the population in LMICs is under the age of 25 years compared to 30% in high-income countries (HIC) (4). An estimated 40% – 85% of children in these countries will require surgery by the age of 15-year-old (4–6). The Lancet Commission on Global Surgery (LCoGS) and the universal goals calls for financial risk protection in seeking health and surgical care. However, this has not been realized with nearly 81 million people worldwide are facing catastrophic health expenditure (CHE) and 50% are at risk of CHE when they seek or receive surgical care (7). A significant number of these people, 48 million, are due to nonmedical costs, and 33 million are from payment of surgery and anaesthesia care (7). The burden of CHE for surgery is the highest in LMICs and most heavily on poor people. Protection from financial hardship is a key component of universal health coverage and a key indicator of a strong healthcare system used by World Health Organization (WHO), the World Bank and the LCoGS (3,8–10). The need for evidence and interventions to ensure children surgery is safe and affordable is evident (4).

Countries continue to design strategies and models for financial risk protection, one being increasing health insurance coverage. Despite the use of health insurance, out-of-pocket expenditure (OOPE) continue to creates barriers to accessing and utilizing healthcare. In Tanzania, our previous study noted that 75% of children undergoing elective surgery had health insurance (11). This coverage was significantly higher compared to both adult population (45.5%) and Tanzania's general population (32% in 2019) (11–13). However, there was no evidence that health insurance protected families from high OOPE (11). Similarly, a multicounty study in Tanzania showed 22.2% of households' had healthcare spending exceeding 25% of their non-food expenditures (14). About 76.8% of Tanzanian are living below the poverty line (US\$3.20 per day) (9), with an estimated 65.8% and 85.5% at risk of CHE and impoverishing expenditure respectively, from seeking surgical care (3,15). There is limited evidences on financial implications of children surgical care in Tanzania (2). Understanding financial and access factors for children's surgery is highly needed for policy direction and prioritization of this group (16,17). We therefore aimed at

determining the burden of risk of CHE and impoverishment, and their associated factors among families of children receiving surgery at Muhimbili National Hospital (MNH).

METHODOLOGY

Study design

This was a ***cross-sectional retrospective study*** done at MNH using data of children who received surgery from 2019 to 2022.

Study area

MNH is a National Referral Hospital, Research Center and University Teaching Hospital with 1,500 bed facility, attending 1,000 to 1,200 outpatients per day and admitting 1,000 to 1,200 inpatients per week (18). This hospital is located in Tanzania, a country in East Africa with 61.7 million people. More than a half the population is young people below 17 years old (19). Tanzania's rural population accounts for over 70% of the country's population where paediatric surgery is not well developed. This is due to limited health facilities and no permanent pediatric surgical, medical, or anesthesia workforce. Hence, MNH handles both complex and simple children surgical conditions referred from various health facilities in the country. The most common surgical conditions managed at MNH includes anorectal malformations, Hirschsprung's disease, Pediatric tumors and common emergency conditions (laparotomies, for peritonitis intestinal obstruction, hernias, and trauma).



Figure 1. The map of Tanzania showing where the study will take place

Data Collection

Anonymous data of patient in a specified duration were obtained from the secure REDCap database hosted at MNH. This was data collected for a different study which did not focus on CHE (11). We extracted: 1) *Sociodemographic data*: Age of parent/caregiver and patients, parents' level of education, referrals to MNH, family size, zones of residence; 2) *Clinical data*: surgical condition, type of surgery, admission status, referrals status, 3) *Financial data*: ownership of durable assets, household use for food, medical and nonmedical costs incurred at both referring and tertiary centre, insurance ownership, and perception of family's current financial situation and residence. OOPE data were collected in Tanzanian Shillings (TZS) and converted to US\$ dollars during analysis using the 1st February 2023 rate of 1 US\$ = 2332 TZS.

Inclusion and Exclusion

All patients who had financial data on medical and nonmedical related costs were included. Although this is surgical care to children, families are generally the one affected by financial implications as they seek this care for their children. We excluded those who did not have financial data reported at any of the care pathway.

Analysis

Retrospective cohort analysis of data was conducted using IBM SPSS software version 26. OOPE was defined as expenditures of surgical care borne directly by parents/caregivers where insurance did not cover, including self-medication and other expenditures. This was calculated by adding all costs incurred by the patient's family on their journey to receiving surgical care. These costs were grouped as medical and non-medical related costs. WHO considers health expenditure to be catastrophic when OOP health expenditures exceed 40% of household's capacity to pay subsistence expenditures (i.e., available income after fixing basic needs). For this study we used the definition of CHE as *"a household expenditure for hospitalization exceeding 10% of the total annual household income"*(20). The sample characteristics; sociodemographic, clinical and financial data were described using median and interquartile range (IQR) for continuous data, and percentages or frequencies for categorical data. The risk CHE was the primary outcome and risk of impoverishment as a secondary outcome. These were both obtained by using a formula by Shrima *et al.*, that uses OOPE for medical and non-medical comparing with the average annual income of Tanzania and its GINI coefficient (21–23). The GINI Coefficient is a statistical measurement of income inequality and economic concentration of a country. It measures income or wealth distribution among individuals relative to the entire country's population, ranging from 0 to 1. The value of 0 represent perfect equality and 1 perfect inequality, but it does not show the country's overall income. This means a low-income and high-income country can exhibit the same GINI coefficient since it only indicates wealth distribution, not income level (24). We used the Tanzania's GINI as 0.405, and comparing the expenses with the annual income as US\$1,140 of a Tanzanian (25). This formula was used since we did not have household incomes. Individual variables are input in the formula to generate the risk of impoverishment and CHE as proportions. The risk of impoverishment was calculated at population living at US\$1.25 PPP/d and US\$2 PPP/d and was compared with the other factors (demographic, socioeconomic and clinical). Comparisons was made using chi-square and multivariate regression analysis to identify variables that strongly influence the primary outcome. Statistically significant result were considered at < 0.05 .

ETHICAL CONSIDERATIONS:

This study received ethical approval from MNH. No patient consent was required for this secondary analysis. A permission was received from the MNH to use data which was part of the previous project on access to pediatric surgical care at this institution (IRB No: MNH/IRB/2019/036). Ethical clearance was also obtained from the University of British Columbia (UBC). All data used was anonymous and stored in a secure REDCap database accessible to researchers only.

RESULTS:

Population and Clinical characteristics

A total of 154 children with a median age of 36 months (Range: 1 – 132 months) were included. Of these, 64.3% (99/154) were males and 34.4% (53/154) were females and 1.3% (2/154) had ambiguous genitalia. Anorectal malformations were the most common diagnosis constituting 24.7%. In terms of health seeking for the surgical condition, 58.2% (85/146) children had a history of being to other hospitals for treatment prior to coming to MNH. 59.1% (91/154) were treated as outpatients and 40.9%(63/154) were treated as inpatients. Majority were from the coastal zone (109, 70.8%), where MNH is located. Statistically significant results were found referral status ($p=0.001$) and using private car/transport to the referring hospital ($p < 0.001$) with the risk of CHE. Insurance coverage was 75.3% (116/154) but there were no statistically significant results with the risk of CHE ($p=0.14$). Self-referral was 22.1%(34/154), while Hospital referral were 77.9% (120/154) (Table 1)

Table 1: **Patient Demographics and their CHE**

Variables		CHE < 10% n (%)	CHE > 10%	P-value
Sex	Male	47 (61.8)	47 (66.2)	0.58*
	Female	27 (35.5%)	24 (33.8)	
	Ambiguous genitalia	2 (2.6)	0 (0)	
Diagnosis	HD	19 (25.0)	19 (26.8)	0.61*
	Urogenital anomalies	14 (18.4)	7 (9.9)	
	Appendicitis	17 (22.4)	14 (19.7)	
	Hernia	1 (1.3)	5 (7)	
	Biliary atresia	7 (9.2)	12 (16.9)	
	Duodenal stenosis	2 (2.6)	1 (1.4)	
	Abdominal injuries	2 (2.6)	3 (4.2)	
	Nephroblastoma	1 (1.3)	1 (1.4)	

	Lipoma	4 (5.3)	4 (5.6)	
	Hypersplenism	4 (5.3)	1 (1.4)	
	Intussusception	3 (3.9)	3 (4.2)	
	Unknown	2 (2.6)	1 (1.4)	
Insurance Coverage	Insurance	23 (30.4)	14 (19.7)	0.14
	No insurance	53 (69.7)	57 (80.3)	
Type of Surgery	Elective	70 (92.1)	66 (93.0)	0.84
	Emergency	6 (7.9)	5 (7.0)	
Admission Status	Inpatient	26 (34.2)	34 (47.9)	0.09
	Outpatient	50 (65.8)	37 (52.1)	
Referral status	Hospital referral	51 (67.1)	64 (90.1)	0.001
	Self-referral	25 (32.9)	7 (9.9)	
Hospital visited before MNH	3 and more	8 (11.4)	14 (20.3%)	0.17
	2 or less	62 (88.6%)	55 (79.8%)	
Mode of transport to referring hospital	Walking	4 (5.3)	1 (2.4)	0.37*
	Using bicycle	1 (1.3)	0 (0)	1*
	Using motorcycle	6 (7.9)	6 (8.5)	0.9
	Using private car	2 (2.6)	13 (18.3)	< 0.001
	Using public transport	37 (48.7)	42 (59.2)	0.20
	Ambulance	1 (1.3)	0 (0)	1*
	Other	4 (5.3)	2 (2.8)	0.45
Mode of transport to tertiary hospital	Walking	0 (0)	1 (1.4)	0.48*
	Using bicycle	-	-	-
	Motorcycle	-	-	-
	Private car	5 (6.6)	7 (9.9)	0.47
	Using public transport	57 (75)	51 (71.8)	0.66
	Ambulance	10 (13.2)	13 (18.3)	0.39
	Other	3 (3.9)	1 (1.4)	0.62*

*Fishers' Exact Test

Caregiver demographics

Majority of the babies' parents or caregiver were aged 30-34 (40, 26,0%), private employees or self-employed (98, 63.6%), had primary education (63, 40,9%), married or cohabiting (126, 81.8%) and perceived their socioeconomic status as "*having enough money for food and clothes only*" (54, 35.1%). Having electricity, and zones of residence was significantly associated with CHE with *p*-value of 0.02 and 0.03 respectively. Majority from both self-referral and hospital referral had previously visited at least one other hospitals before coming to MNH. The mode of transport to the referring hospital: Walking (5, 4,1%), Bicycle (1, 0,8%), Motorcycle (12, 9,9%), Private Car (15, 12,4%), Public car (82, 67,8%), Ambulance (1, 0,8%), Other (7, 5,8%). The

mode of transport to MNH: Walking (1, 0,7%), Bicycle (0, 0,0%), Motorcycle (0, 0,0%), Private Car (12, 7,8%), Public car (114, 74,5%), Ambulance (23, 15,0%), Other (5, 3,3%) (Table 2)

Table 2: Care givers demographics correlated with CHE

Variable		CHE < 10%	CHE > 10%	P
Age groups	15-19	0 (0)	3 (4.3)	0.06*
	20-24	9 (11.8)	7 (10.0)	
	25-29	21 (27.6)	16 (22.9)	
	30-34	17 (22.4)	23 (32.9)	
	35-39	12 (15.8)	16 (22.9)	
	40-44	13 (17.1)	3 (4.3)	
	>45	4 (5.3)	2 (2.9)	
Income perception	Enough money for food	22 (28.9)	23 (32.4)	0.98
	Enough money for food and clothes only	27 (35.5)	24 (33.4)	
	Enough money for food, clothes & can save a bit, but not enough to buy expensive goods	25 (32.9)	22 (31.0)	
	Afford to buy certain expensive goods	2 (2.6)	2 (2.8)	
Level of Education	No education	5 (6.6)	6 (7.0)	0.93*
	Primary	34 (44.7)	28 (39.4)	
	Secondary	25 (32.9)	27 (38.0)	
	Higher education	12 (15.8)	11 (15.5)	
Marital Status	Single	12 (15.8)	5 (7)	0.23*
	Married/cohabiting	60 (78.9)	60 (84.5)	
	Widowed/Separated	4 (5.3)	6 (8.5)	
Occupation	Homemaker	12 (15.8)	15 (21.1)	0.45*
	Private employee	47 (61.8)	47 (66.2)	
	Public employee	14 (18.4)	8 (11.3)	
	Unemployed	3 (3.9)	1 (1.4)	
Assets owned	Land	47 (61.8)	44 (62.0)	0.99
	House	45 (59.2)	42 (59.2)	0.10
	Rear animals	23 (30.3)	22 (31.0)	0.92
	Own Bank Account	32 (42.1)	23 (32.4)	0.22
	Electricity	62 (81.6)	46 (64.8)	0.02
	Bicycle	14 (18.4)	18 (25.4)	0.31
	Motorcycle	19 (25.0)	12 (16.9)	0.23
	Motorcycle ownership	32	21.2	0.99
Zones	Central	3 (3.9)	2 (2.8)	0.03*
	Lake	8 (10.5)	7 (9.9)	
	Northern	6 (7.9)	0 (0)	

	Southern Highlands	4 (5.4)	2 (4.1)	
	Coastal	46 (60.5)	58 (81.7)	
	Zanzibar	2 (2.6)	0 (0)	
	Southern	7 (9.2)	2 (2.8)	
Family Size	< 5 family members	36	31	0.17*
	5 or more family members	40	30	
Number of dependents	< 5 dependents	63	58	0.81*
	5 or more dependents	13	13	

Financial status:

The prevalence of people at risk of CHE was 46.1% (71/154). The median risk of impoverishment of 24% (IQR=22.9% - 28%) at US\$ PPP 1.25 and 40.8 (IQR: 39.8% - 44.4%) at US\$ PPP 2. These resulted from a median total OOPE of US\$ 66.3 (IQR: US\$ 21.1 – US\$181.2). The median of medical and nonmedical related costs were US\$ 0 (IQR: US\$ 0 – US\$65.5) and \$6.0 (IQR: US\$0.9 - US\$21.4) respectively. Assets owned: house (92, 63,9%), Rear animals (48, 33,3%), Bank account (59, 41,0%), Electricity Radio Television (114, 79,2%), Bicycle (35, 24,3%), Motorcycle/Car (32, 22,2%). Significant results were: Marital status ($p < 0.001$), insurance status ($p=0.02$), electricity ($p=0.01$), referral status ($p=0.001$) use of private car to the referral center ($p=0.04$) and public transport (0.02) were found to be predictors of outcomes (Table 3).

Table 3: Multivariate logistic regression model evaluating clinical predictors of catastrophic healthcare expenditure (CHE)

Variable	OR (95% Confidence Interval)	P- value
Sex	1.58 (0.60 - 4.162)	0.36
Admission status	0.60 (0.19 - 1.88)	0.38
Occupation	1.37 (0.68 - 2.75)	0.38
Level of education	1.98 (0.947 - 4.15)	0.07
Caregiver age group	0.836 (0.50 - 1.40)	0.50
Marital status	8.391 (2.26 - 31.22)	<0.001
Family size	1.30 (0.826 - 2.04)	0.26
Number dependents	0.61 (0.32 - 1.15)	0.12
Insurance Status	4.63 (1.31 - 16.38)	0.02
Type of surgery	1.56 (0.22 - 10.92)	0.65
Income perception	2.25 (0.96 - 5.27)	0.06
Land ownership	3.10 (0.57 - 16.85)	0.19
House ownership	0.53 (0.11 - 2.63)	0.44

Animal Rearing	1.34 (0.37 - 4.89)	0.66
Own Bank Account	1.18 (0.32 - 4.43)	0.80
Electricity at home	0.15 (0.03 - 0.68)	0.01
Bicycle	2.48 (0.63 - 9.83)	0.20
Motorcycle ownership	0.78 (0.18 - 3.32)	0.73
Hospital stay	1.21 (0.43 - 3.35)	0.72
Referral status	15.82 (3.19 - 78.48)	0.001
Zones of residence	1.35 (0.90 - 2.03)	0.15
Diagnosis analyzed	0.93 (0.78 - 1.12)	0.44
Hospital visits before MNH	1.04 (0.64 - 1.69)	0.89
Time to seeking care	1.00 (1.0 - 1.01)	0.55
Walking to referring center	1.97 (0.09 - 42.50)	0.66
Using Motorcycle to referring center	0.12 (0.01 - 1.27)	0.08
Private car to referring center	0.06 (0.00 - 0.83)	0.04
Public transport to referring center	0.13 (0.03 - 0.70)	0.02
Walking to MNH	1.297E-8 ^a	1.00
Private car to MNH	5.73E-10 ^a	1.00
Public Transport to MNH	1.94E-9 ^a	1.00
Ambulance to MNH	8.68E-10 ^a	1.00
Hospital visited before MNH	4.60 (0.87 - 24.33)	0.07

These are multivariable odds ratios, adjusted for all of the other variables

DISCUSSION AND CONCLUSIONS

Nearly 30% of the global burden of disease is surgical, and nearly 25% of individuals who undergo surgery each year face financial hardship because of its cost (26). Thus the LCoGS called for systems and health-financing mechanisms to ensure that no patient faces financial catastrophe from surgery by 2030. The global commitment to enhance financial protection of populations requires concerted efforts to address the main drivers of CHE in all settings and for all population groups. This includes designing financial protection programs that prioritize populations with the greatest economic burden, and address contextual challenges. Countries are now working on designing national health financing policies that cover those at greatest risk of financial hardship. These programs need to be implemented alongside broader poverty alleviation efforts for greatest gains in mitigating the household-level economic burden (27). This study wanted to understand whether spending on children surgery can lead to impoverishing expenditure and/or catastrophic expenditures. We noted that 46.1% of the families are at risk of CHE, which is comparable to the global estimates of 43.9% (23).

Parent or caregiver factors such as marital status ($p < 0.001$), and patient or surgical care related factors such as health insurance ($p=0.02$), referral status ($p=0.001$), electricity ownership ($p=0.01$), and using private car ($p=0.04$) and public transport (0.02) to travel to referral center were found to be predictors of outcomes. Other variables shown no significant differences when compared with the risk of CHE and risk of impoverishment. Majority of people in the elective surgery group had insurance than those in the emergency surgery group. Having health insurance or other permanent assets did not protect families from CHE and the risk of impoverishment. In our population, 16.9% (26/154) had visited more than 3 hospitals in their pathway to MNH. Even with non-significant results with the risk of CHE, most of patient may have opted for health insurance when they have gone through several hospitals and already started to face financial difficulties.

The Sustainable Developmental Goals (SDG) declaration has influenced reforms in health financing towards Universal Health Coverage (UHC), ensuring health for all. The effects of these efforts include seeking various approaches for health financing such as reduced fragmentations, pursuance of strategic purchasing methods, expanding coverage with a focus on; population coverage, financial coverage and number of services paid through pool funds (28). Children are key and need specific efforts and interventions. In Tanzania, children surgery is provided in a few hospitals, majority are in urban centres leaving behind the rural settings where nearly 70% of the population reside. As per the Tanzania referral procedure, patients from health post, dispensary and health centre are referred directly to the district hospital. District hospitals refer patients to regional hospitals which can then refer them to the national or specialised hospitals like MNH(29). An ideal referral system to reach a centre capable of providing paediatric surgery is complicated and may cause delays. In addition to the number of hospitals visited before reaching MNH, our study has noted other factors such as referral status, and the use of private car and public transport to travel to the hospital as predictors of risk of CHE. Bringing care near to the patient maybe an effective intervention in addition to the continued efforts to improve health insurance coverage.

We have noted that seeking children surgery can lead to significant financial implications to families. In our population the median OOPE was US\$ 66.3 which is

very high considering the majority of parents (63.6%) having no formal jobs. The median risk of impoverishing expenditure at US\$1.25 and 2 PPP/day was 24.0% and 40.8% respectively. The cost of surgery is both a barrier to seeking and receiving timely surgical care and a major factor in the decision not to seek care at all. This can lead to a vicious cycle of poverty especially among children who are the future of our globe. Limited children surgery infrastructure and workforce have been noted to be the main barriers for hospitals to provide children surgery (11).

Achieving 100% of the population with financial protection against CHE from OOP surgical and anaesthesia care payments in LMICs needs extra efforts (3). It also needs a keen consideration of special groups such as children who the majority, prone to causing CHE and have limited interventions to address the situation (30). The risk of impoverishment may lead to poor health seeking behavior, due to unaffordable services hence implicate on patient outcomes. Parents have to travel long distances to seek surgical care for their children as the limited capacity is in urban centres (11,31). Some may opt for traditional healers which apart from safety to patient, it even worsens OOPE (32).

Information from this study will add data to the ongoing efforts in Tanzania to improve surgical care guided by the implementation of NSOAPs (15). It will also add information to the global and regional efforts by contributing to the LCoGS global surgery financial indicators data to guide global health policy planning and implementation at national level (1). The global efforts towards achieving UHC and SDG target 3.8.2 highlights *“ensuring financial risk protection to decrease the proportion of the population with a large household expenditure on health, as a share of total household expenditure or income”*. Hence an in-depth understanding of financial data is important and will facilitate access to care, financial protection and promote UHC. This will not be possible if pediatric surgical care is not given the required attention, making it financially accessible to this large group (33). In order to effectively finance for health two key dimensions are needed; more finance and better finance. This means, increasing financing is not enough but the quality of finance is crucial to delivering Health for All. This process needs enough data and from all populations.

LIMITATIONS AND CONCLUSION

This study has several limitations, one being a retrospective design, we were not able to collect the total family income collected instead we used the country GINI and average country level income. We were able to highlight the predictors of risk of financial catastrophes but not the model to establish a causal relationship. Future studies should focus on prospective design to understand the risks at various income levels. In conclusion, we have noted that families may significantly be pushed to poverty as they seek pediatric surgical care, which requires to travel long distances. This leads to massive medical and nonmedical costs. We therefore call for countries and region to implement various financing mechanism to help with the contribution that is already done using health insurances.

REFERENCES:

1. Mullapudi B, Grabski D, Ameh E, Ozgediz D, Thangarajah H, Kling K, et al. Estimates of number of children and adolescents without access to surgical care. Bull World Health Organ. 2019 Apr 1;97(4):254–8.

2. Grabski D, Ameh E, Ozgediz D, Oldham K, Abantanga FA, Abdelmalak M, et al. Optimal Resources for Children's Surgical Care: Executive Summary. *World J Surg*. 2019 Apr 1;43(4):978–80.
3. Meara JG, Leather AJM, Hagander L, Alkire BC, Alonso N, Ameh EA, et al. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *The Lancet*. 2015 Aug;386(9993):569–624.
4. Ullrich SJ, Tamanna N, Aziz TT, Philipo GS, Banu T, Ameh EA, et al. Financing Pediatric Surgery: A Provider's Perspective from the Global Initiative for Children's Surgery. *World J Surg*. 2022 May 1;46(5):1220–34.
5. Pilkington M, Situma M, Winthrop A, Poenaru D. Quantifying delays and self-identified barriers to timely access to pediatric surgery at Mbarara Regional Referral Hospital, Uganda. *Journal of Pediatric Surgery*. 2018 May;53(5):1073–9.
6. Bickler SW, Telfer ML, Sanno-Duanda B. Need for Paediatric Surgery Care in an Urban Area of the Gambia. *Trop Doct*. 2003 Apr 1;33(2):91–4.
7. Shrimme MG, Dare AJ, Alkire BC, O'Neill K, Meara JG. Catastrophic expenditure to pay for surgery worldwide: a modelling study. *The Lancet Global Health*. 2015 Apr 27;3:S38–44.
8. Monitoring Progress towards Universal Health Coverage at Country and Global Levels | PLOS Medicine [Internet]. [cited 2022 Nov 4]. Available from: <https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001731>
9. Wagstaff A, Eozenou P, Neelsen S, Smits MF. Introducing the World Bank's 2018 Health Equity and Financial Protection Indicators database. *The Lancet Global Health*. 2019 Jan 1;7(1):e22–3.
10. Jamison DT, Alwan A, Mock CN, Nugent R, Watkins D, Adeyi O, et al. Universal health coverage and intersectoral action for health: key messages from Disease Control Priorities, 3rd edition. *The Lancet*. 2018 Mar 17;391(10125):1108–20.
11. Philipo GS, Bokhary ZM, Bayyo NL, Bandyopadhyay S, Pueschel MG, Bakari RA, et al. A Journey Undertaken by Families to Access General Surgical Care for their Children at Muhimbili National Hospital, Tanzania; Prospective Observational Cohort Study. *World J Surg* [Internet]. 2022 Apr 12 [cited 2022 Apr 12]; Available from: <https://doi.org/10.1007/s00268-022-06530-z>
12. Rajaguru PP, Jusabani MA, Massawe H, Temu R, Sheth NP. Understanding surgical care delivery in Sub-Saharan Africa: a cross-sectional analysis of surgical volume, operations, and financing at a tertiary referral hospital in rural Tanzania. *Global Health Research and Policy*. 2019 Oct 26;4(1):30.
13. Embrey M, Mbwasi R, Shekalaghe E, Liana J, Kimatta S, Ignace G, et al. National Health Insurance Fund's relationship to retail drug outlets: a Tanzania case study. *Journal of Pharmaceutical Policy and Practice*. 2021 Feb 17;14(1):21.

14. Ssewanyana S, Kasirye I. Estimating Catastrophic Health Expenditures from Household Surveys: Evidence from Living Standard Measurement Surveys (LSMS)-Integrated Surveys on Agriculture (ISA) from Sub-Saharan Africa. *Appl Health Econ Health Policy*. 2020 Dec 1;18(6):781–8.
15. NATIONAL SURGICAL, OBSTETRIC AND ANAESTHESIA PLAN (NSOAP)2018 – 2025 [Internet]. THE UNITED REPUBLIC OF TANZANIA MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER, ELDERLY AND CHILDREN; 2018. Available from: https://static1.squarespace.com/static/56b8ed53b6aa60903fe8e7f5/t/5e578792fe7516041e38d68b/1582794655754/3_Tanzania+NSOAP.pdf
16. Ozgediz D, Langer M, Kisa P, Poenaru D. Pediatric surgery as an essential component of global child health. *Seminars in Pediatric Surgery*. 2016 Feb 1;25(1):3–9.
17. Baynes C, Diadhiou M, Lusiola G, O’Connell K, Dieng T. Understanding the financial burden of incomplete abortion: An analysis of the out-of-pocket expenditure on postabortion care in eight public-sector health care facilities in Dakar, Senegal. *Global Public Health*. 2022 Sep 2;17(9):2206–21.
18. Muhimbili National Hospital [Internet]. [cited 2023 Apr 20]. Available from: <https://www.mnh.or.tz/index.php>
19. World Population Prospects - Population Division - United Nations [Internet]. [cited 2022 Nov 6]. Available from: <https://population.un.org/wpp/>
20. Devadasan N, Criel B, Van Damme W, Ranson K, Van der Stuyft P. Indian community health insurance schemes provide partial protection against catastrophic health expenditure. *BMC Health Serv Res*. 2007 Mar 15;7:43.
21. Naidu P, Ataguba JE, Shrima M, Alkire BC, Chu KM. Surgical Catastrophic Health Expenditure and Risk Factors for Out-of-Pocket Expenditure at a South African Public Sector Hospital. *World J Surg*. 2022 Apr 1;46(4):769–75.
22. Shrima MG. Calculating Catastrophic and Impoverishing Expenditure [Internet]. [cited 2022 Nov 29]. Available from: https://shrima.shinyapps.io/catexp_shiny/
23. Shrima MG, Dare A, Alkire BC, Meara JG. A global country-level comparison of the financial burden of surgery. *British Journal of Surgery*. 2016 Oct 1;103(11):1453–61.
24. Kyara VC, Rahman MM, Khanam R. Is Tanzania’s economic growth leaving the poor behind? A nonlinear autoregressive distributed lag assessment. Chenavaz RY, editor. *PLoS ONE*. 2022 Jul 8;17(7):e0270036.
25. Gini Coefficient by Country 2023 [Internet]. Wisevoter. [cited 2023 Feb 12]. Available from: <https://wisevoter.com/country-rankings/gini-coefficient-by-country/>

26. Shrimme MG, Bickler SW, Alkire BC, Mock C. Global burden of surgical disease: an estimation from the provider perspective. *The Lancet Global Health*. 2015 Apr;3:S8–9.
27. Essue BM, Laba TL, Knaul F, Chu A, Minh HV, Nguyen TKP, et al. Economic Burden of Chronic Ill Health and Injuries for Households in Low- and Middle-Income Countries. In: *Disease Control Priorities, Third Edition (Volume 9): Improving Health and Reducing Poverty* [Internet]. The World Bank; 2017 [cited 2023 Apr 8]. p. 121–43. (Disease Control Priorities). Available from: https://elibrary.worldbank.org/doi/full/10.1596/978-1-4648-0527-1_ch6
28. Odoch WD, Senkubuge F, Hongoro C. How has sustainable development goals declaration influenced health financing reforms for universal health coverage at the country level? A scoping review of literature. *Globalization and Health*. 2021 Apr 23;17(1):50.
29. Understanding barriers to implementing referral procedures in the rural and semi-urban district hospitals in Tanzania: Experiences of healthcare providers working in maternity units | *PLOS ONE* [Internet]. [cited 2023 Apr 20]. Available from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0255475>
30. Gyedu A, Goodman SK, Katz M, Quansah R, Stewart BT, Donkor P, et al. National health insurance and surgical care for injured people, Ghana. *Bull World Health Organ*. 2020 Dec 1;98(12):869–77.
31. O'Flynn E, Andrew J, Hutch A, Kelly C, Jani P, Kakande I, et al. The Specialist Surgeon Workforce in East, Central and Southern Africa: A Situation Analysis. *World J Surg*. 2016 Nov;40(11):2620–7.
32. Brinda EM, Andrés RA, Enemark U. Correlates of out-of-pocket and catastrophic health expenditures in Tanzania: results from a national household survey. *BMC International Health and Human Rights*. 2014 Mar 5;14(1):5.
33. Barasa EW, Ayieko P, Cleary S, English M. Out-of-pocket costs for paediatric admissions in district hospitals in Kenya. *Tropical Medicine and International Health*. 2012 Aug;17(8):958–61.