Kids Operating Room

GLOBAL REPORT

The Unmet Need of Children’s Surgery in 2022
CONTENTS

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Chair’s Foreword

Global Children’s Surgery: The Current Situation

The Epidemiological Transition
Surgical Services
Children’s Access to Surgery
Inequality in Accessing Surgical Care
Health Systems Strengthening
The Importance of the Health Workforce

Children’s Surgery in Sub-Saharan Africa: Data Insights

Surgical Wait Times in Sub-Saharan Africa
Analysis in Zambia
Specialist Equipment
Anaesthetic Resource

Health Systems Strengthening: The Solution

Installing Dedicated Paediatric Operating Rooms

Analysis in Abuja
An Increase in Elective Operations
More Complex and Safe Surgeries
Nationwide Economic Benefit

Global Partnerships

Training Local Surgeons
Goma, Democratic Republic of the Congo

A Call for Action

References
More than $22 billion is spent every year in health aid yet, according to the World Health Organization, at least half of the world’s population lacks access to essential health services.

Long before the COVID-19 pandemic exposed persistent inequalities in health, we knew Global Health as a movement was broken.

Despite emergency care being among the most cost-effective public health interventions, surgical disease has been neglected, by global health interventions, which for decades have focused on communicable diseases and short-term medical missions.

Surgical treatment requires a systems approach and is a prerequisite for the full attainment of Universal Health Coverage (UHC) and other health related objectives.

Through universal access to safe, timely and affordable surgery, we could avoid preventable death and disability for millions and promote economic growth. However, due to lack of awareness, lack of political will and lack of financial support, surgical care is not systematically addressed in most local and global health programmes.

A genuine transformation in global health is crucial.

People in resource-limited settings face serious constraints due to a lack of skilled healthcare providers, deficient infrastructure, disproportionate out-of-pocket healthcare costs, and the non-prioritisation of surgical care within national health plans. Yet, the wider problem of fragile health systems, which need to be strengthened to remove these barriers to care, are systematically ignored by the largest funders of global health aid.

To meet present and foreseeable burdens, strengthening health systems has become an imperative. Since surgical care is the backbone for the treatment of many non-communicable diseases, it improves the response capacity and resilience of the entire healthcare system. Therefore, urgent investment in human and physical resources for surgical and anaesthesia care is needed.

In addition to better investment, surgical care systems need to have the attention of global health actors worldwide and be on the political negotiating tables. This attention, however, needs to go beyond rhetoric and embrace a true and synchronised global response including funding commitment.

Kids Operating Room envision a time when health cooperation is not needed. We’re strongly committed to health systems strengthening and capacity building. All children around the world should have access to the timely, lifesaving care they deserve. Sadly, this report shows we remain a long way away from equitable access to safe surgery for children. Something we can and must all do more to address.

Garreth Wood, Chair
Surgery has recently gained recognition as a critical component of Universal Health Coverage (UHC) and health systems strengthening (HSS)\textsuperscript{6,10}. In 2015, the World Health Organization (WHO) adopted the resolution WHA68.15, “Strengthening emergency and essential surgical care and anaesthesia as a component of Universal Health Coverage”\textsuperscript{11}. The resolution was unanimously approved and came alongside the formal report from The Lancet Commission on Global Surgery, which estimated that 143 million additional surgical procedures are needed annually in LMICs and recommended a ‘National surgical, obstetric and anaesthesia plans (NSOAP)’ framework to be used to improve surgical care\textsuperscript{5}. We estimate that an additional 54 million children’s surgical procedures are needed annually.

Despite the increasing acknowledgment, there is a lack of research and analysis of how LMICs are including access to emergency and essential surgical services in their national health plans. Likewise, there is an absence of external financial commitment to support this implementation.

While Infectious diseases receive 40% of global health funding, NCDs receive less than 2%. Health systems in LMICs suffer from low resources, low numbers of specialist trained staff, poor funding, and lack of specialist equipment\textsuperscript{12,13}. This is no different when the focus is moved to paediatric surgery.

In addition to country-specific sociocultural, economic and structural elements, all of these factors influence children’s access to safe surgery. The paediatric surgical workforce density (PSWD) in LMICs shows the investment needed to strengthen the surgical systems in these countries.
Children’s Access to Surgery

Vaccination and public health programmes have made a significant impact on childhood diseases, resulting in global childhood mortality decreasing by 61% since 1990. This reduction would have been more prominent however, if non-communicable childhood disease hadn’t been neglected over the years. Congenital anomalies cause a substantial burden of global children’s morbidity and mortality in LMICs2, as well as conditions requiring general surgery and injuries from road traffic collisions4. In 2017, the estimated number of children without access to surgical care globally was 1.7 billion5. Using 2020 population estimates6, and the assumption that access to surgical care for children has not increased significantly since then, we estimate that this number has increased by 50 million to be at least 1.75 billion.

Inequality in Accessing Surgical Care

Access to healthcare is not equal across the world. Children living in LMICs have much lower rates of access to the services they need than those in HICs. No matter where they are born, children must be given access healthcare in an affordable and timely way if they are to have the opportunity to reach their full potential in life.1

Lack of provision for paediatric surgery is a major part of the healthcare access problem in LMICs. Where there are surgical care systems in place, adults often take priority which leads to long wait times and delayed treatment for children. In the areas where surgical care systems are lacking, children are dying unnecessary deaths or, at best, are all-too-often left to live with a surgically treatable and debilitating condition.

When we talk about the 1.75 billion children globally who do not have access to surgical care, we must discuss the inequality in the proportion of children from LMICs counting towards this figure.

Using the latest population estimates and considering children between 0-18 years old, there are 1.6 billion children living in LMICs1. A study from the Lancet Global Health showed that the proportion of the population from LMICs who do not have access to surgical care is 95%, which means that there are 1.5 billion children in LMICs who are not currently able to access surgical care when they need it. LMICs are home to 61.5% of the world’s children but account for 87% of those who do not have access to safe, affordable surgery. This inequality needs to change.

Increasing surgical access for children contributes to many of the 17 Sustainable Development Goals (SDGs), such as, poverty eradication, health, education, gender equity, economic growth, reduced inequality and global partnerships.

Health Systems Strengthening

While the global health community is aware of the central role of surgical and anaesthesia care in achieving resilient health systems, Surgery and anaesthesia are at the heart of every health system since they require resilient engagement with primary care and emergency and pre-hospital services as well as cross-cutting services including pathology, blood banks, rehabilitation and nursing, among others8,14.

The COVID-19 pandemic and its devastating consequences have exposed an imperious need for strong health systems. While the global health community is aware of the central role of surgical care systems in creating resilience, a convincing declaration of substantial funding is needed.
The Importance of the Health Workforce

The health workforce is the backbone of a health system and is directly correlated with positive health outcomes. Workforce availability is an important indicator of the strength of a health system. Low technical and operational human resource for health is not a new phenomenon and has been reported in several studies.

The WHO estimates a shortfall of 18 million health workers by 2030, mostly in low and low-middle income countries and the third SDG highlights the need to “substantially increase health financing and the recruitment, development, training and retention of the health workforce on developing countries”. Global disparities and shortages in the supply of healthcare workers has been highlighted since 2006, when the World Health Report Working Together for Health portrayed the health workforce shortage as a global crisis. Sub-Saharan Africa is an example of uneven distribution of health-care personnel: according to the WHO in 2010, the subcontinent carried 24% of the global burden of disease in 11% of the world’s population but having a little as 3% of the world’s health workers.

There are on average 0.03 paediatric surgeons per 100,000 children in low-income countries. This is one specialist surgeon for over 3 million children.

However, in high-income countries there is one specialist paediatric surgeon for every 47,000 children.

The WHO’s 2020 Health Workforce Support and Safeguards List comprises 47 countries that face the most pressing health workforce challenges; 33 are African countries that are experiencing critical shortage of human resources for health with around 0.8 physicians, nurses and midwives per 1,000 of the population. To improve health outcomes and to support an effective healthcare delivery system, the minimum acceptable density threshold of physicians, nurses and midwives is 2.3/1,000.

The increasing international migration of health workers from low- and middle-income countries to high-income countries has exacerbated health workforce shortfalls as well as inadequate remuneration and inadequate health system infrastructure. On the other hand, the delivery of surgical care is highly dependent on the availability and retention of a trained and specialised workforce, including anaesthesia, obstetrics and trauma.

85% of children in Africa will require some kind of surgical care by age 15.

Specialist paediatric surgeons are needed for treatment of complex paediatric problems, including congenital anomalies, trauma, abdominal emergencies and tumours. Thus, the paediatric surgical workforce density is an important indicator of access to comprehensive paediatric care as well as correlating with survival of complex paediatric surgical problems. In many LMIC settings, there is a lack of workforce and health system infrastructure to respond to the needs for children’s surgery and, consequently, children’s surgical care is often provided by adult general surgeons or not at all.

The health workforce is a critical building block for strong health systems and as the WHO affirmed a decade ago: there’s ‘no health without a workforce’. Investment in the training and education of health workers is a worldwide challenge and no health-related goal, nor Universal Health Coverage, will be achieved without a considerable injection of resources into the training of healthcare professionals.

Kids Operating Room, with partners including Smile Train, are leading an investment in the development of new surgeons and anaesthesia providers for children in low-resource settings. While ambitious and acting as an effective pilot project, significant external funding is required to equip local surgeons with the right skills to care for their own nation’s children.
We have a team of local data collectors based in each hospital collecting key demographic, clinical, and socio-economic data from the use of the Operating Rooms. Our data collectors help us to understand the influencing factors surrounding paediatric surgery in our partner countries and to develop this global database for important collaborative research.

Data collection and research by partners in low-and middle-income countries is a key aspect of strengthening health systems. Quality monitoring of paediatric surgery allows for refined Operating Room design, planning for future development and identification of potential preventative public health measures - for example an Operating Room seeing high numbers of burns can help inform public health measures in that community.

A survey conducted by KidsOR/UCSF in 2021 has highlighted the need for increased surgical capacity by showing the maximum time that children are waiting for a selection of conditions. Pre-visited sites included in this graph were due a KidsOR installation in 2021, where dedicated Operating Rooms with specialized equipment will work towards alleviating these wait times. We will gather post-installation wait time data for comparative analysis in late 2022.

**Surgical Wait Times in Sub-Saharan Africa**

A survey conducted by KidsOR/UCSF in 2021 has highlighted the need for increased surgical capacity by showing the maximum time that children are waiting for a selection of conditions. Pre-visited sites included in this graph were due a KidsOR installation in 2021, where dedicated Operating Rooms with specialized equipment will work towards alleviating these wait times. We will gather post-installation wait time data for comparative analysis in late 2022.

**Fig. 1: Surgical wait times for specified children's surgical conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Maximum Wait Time (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns Hidalgo</td>
<td>10</td>
</tr>
<tr>
<td>Stoma Closure</td>
<td>8</td>
</tr>
<tr>
<td>Hernia</td>
<td>6</td>
</tr>
<tr>
<td>Hypospadias</td>
<td>4</td>
</tr>
<tr>
<td>Cleft</td>
<td>2</td>
</tr>
<tr>
<td>Hydrocephalus</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**DATA INSIGHTS**

Our collaborative research effort with institutions and individual hospital research teams means that we are working together to improve paediatric surgical services on a global scale.

**SOCIOECONOMIC**

Vital data highlighting patient family expenditure, which is often lacking in LMIC research.

**ANAESTHETICS**

Collecting important data on the anaesthetist present, type of anaesthesia used, and clinical outcomes.

**DEMOGRAPHIC**

Understanding key variables such as the age and sex of the child, as well as the region they have travelled from.

**SURGICAL**

Recording the child’s diagnosis, procedure performed, the specialism of the surgeon and trainee presence.
**Analysis in Zambia**

In an analysis of 1,843 pre-installation paediatric surgical cases over 38 months (July 2018 to September 2021) at one of our partner hospitals in Zambia, 19% of operations went ahead with missing necessary surgical equipment and 40% were missing necessary anaesthetic equipment.

When asked to highlight all the different types of resources missing during these operations, monitors and equipment were most often missing during surgeries, with 91% listing equipment and 34% listing monitors.

The missing surgical equipment was specified to show the need at this specific site. Diathermy and laparoscopic equipment were frequently listed as necessary but missing, as well as surgical excision instruments, endoscopic equipment, needle holders and hernia ring forceps.

**Specialist Equipment**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Missing Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diathermy Equipment</td>
<td>91%</td>
</tr>
<tr>
<td>Laparoscopic Equipment</td>
<td>2%</td>
</tr>
<tr>
<td>Endoscopic Equipment</td>
<td>6%</td>
</tr>
<tr>
<td>Needle Holder</td>
<td>4%</td>
</tr>
<tr>
<td>Hernia Rings</td>
<td>2%</td>
</tr>
<tr>
<td>Excision Set</td>
<td>1%</td>
</tr>
<tr>
<td>Infusion Pump</td>
<td>1%</td>
</tr>
<tr>
<td>Appropriate Retractors</td>
<td>1%</td>
</tr>
<tr>
<td>Mayo Stand</td>
<td>1%</td>
</tr>
</tbody>
</table>

Fig. 3: Types of surgical equipment most frequently listed as needed but missing in the 354 operations lacking necessary resources.

**Anaesthetic Resource**

The type of resource missing was specified for the 747 operations that occurred before KidsOR installation lacking the anaesthetic resources necessary for safe surgery.

This highlights the concerning need for basic anaesthetic monitoring equipment in low-resource hospital settings.

The most frequent diagnoses of the children who underwent surgery at this site were hydrocephalus, inguinal or scrotal hernia, umbilical or epigastric hernia, Wilms Tumour, Spina Bifida, and intestinal atresia.

**Fig. 4: Type of resource unavailable in the 747 operations that were lacking necessary anaesthetic resources.**

- Medication: 8%
- Equipment: 91%
- Fluid: 2%
- Blood: 1%
- Monitors: 34%
- Other: 2%
Kakuma Refugee Camp: A Case Study

According to UNHCR estimates, 26.4 million people in the world are refugees and almost half are children. In Kenya, an ‘open-door’ asylum policy means that two of the world’s largest refugee camps are found there; Kakuma and Kalobeyei and Dadaab. Kakuma refugee camp has a population of 196,666 as of 2020, which has surpassed the capacity of the camp by 58,000. More than half of the refugees at Kakuma camp are children.

Access to healthcare for refugees is difficult and they experience many challenges, some of which are shared by the local populations and others that are unique to the refugee situation. UNHCR statistics highlight that 86% of refugees are hosted in developing countries where there are already issues with inadequate health systems.

Refugee populations living in camps instead of cities do have a greater chance of receiving healthcare because of the organised humanitarian assistance provided. For example, the International Rescue manages a General Hospital in Kakuma that provides health services. However, despite the great efforts of the local team, data from the refugees themselves show limited access with low numbers of clinics and long wait times leading to inadequate care.

At Kakuma, children requiring corrective or emergency procedures were referred to Bethany Kids of Kjabe Hospital, which are more than 600km away. This, coupled with over half of the population being under the age of 18, adds to the evident need for paediatric surgical facilities at this site. In June 2020, KidsOR installed the first ever dedicated paediatric Operating Room in a refugee camp, at the ICR General Hospital at Kakuma.

Alongside key partners UNHCR, IRC and with funding from the Biltema Foundation, the dedicated Operating Room will also scale the paediatric surgical care in Kakuma through the training of junior doctors.

One of the first patients to receive a life-changing operation was Jibril Hussein Imidi, who was born with a hernia. “When Jibril was a baby, breastfeeding was a problem. I took him to the hospital, and he was prescribed medicine, but when I asked about surgery, I was told to wait until he turned four years old. But when he turned four, we were asked to wait longer.”

“We had so many challenges before he was operated on. We could not go a week without him falling sick. The hospital became our home; we spent less time at home and more time at the hospital.”

However, with the KidsOR Operating Room now fully functional Jibril was able to get the help that he required. His mother explains: “The surgery has helped so much. He is now back at school and doing so well.”

THE SOLUTION
DEDICATED PAEDIATRIC OPERATING ROOMS

Analysis in Abuja

The National Hospital is situated in Abuja, the capital of Nigeria and the 8th most populous city in the country. This facility is a public national referral hospital that accepts patients from all over the country and beyond. The hospital has a 400-bed capacity, with specialist services including paediatric surgery. The paediatric surgical service is overseen by Drs. Igoche and Anyanwu and Prof. Ameh.

An Increase in Elective Operations

The interrupted time series analysis (ITSA) shows the trend of paediatric surgical cases per month pre-installation compared to post-installation as well as any immediate change at the installation month which was August 2019. The total surgical volume saw a significant and immediate increase after installation. When looking specifically at elective operations, as seen in Figure 5, the case volume saw a significant immediate increase after installation and a significant positive change between pre- and post-surgical volume trend.

More Complex and Safe Surgeries

ITSA was also done looking at the surgical volume of patients of ASA class 2 and above (ASA classification describes the level of fitness of patients before surgery, with class 2 and above referring to patients with increasing systemic disease) as well as the surgical volume of neonatal patients.

There was a significant immediate increase in ASA class >2 after installation, as well as a significant immediate increase and positive change between pre- and post-installation neonatal surgical volume. The increase in volume of more complicated and risk-associated cases post-installation correlates with the provision of specialist paediatric and neonatal surgical and anaesthetic equipment as well as dedicated rooms to schedule higher volumes of elective patients.

Even though higher risk patients received surgical care, the mortality rate did not increase post-install, showing the quality of safe surgery by the surgical team. This data illustrates how the surgical team have the specialist skills for these complex surgeries but are held back by lack of infrastructure and necessary equipment.

**Fig. 5: Interrupted Time Series Analysis (ITSA) analysis of elective and emergent surgical volume, pre and post-installation of the KidsOR-funded dedicated Operating Rooms.**

**Elective:**  
- **Actual**  
- **Predicted**

**Emergency:**  
- **Actual**  
- **Predicted**
The economic benefit accrued each year from children’s surgical capacity created by KidsOR installation. The projected figure for end of year 2021 is shown.

**Nationwide Economic Benefit**

Surgery for children not only has an impact on the population’s health but has a great benefit to the country’s economy.

When a child has a lifesaving operation, or an operation that takes away years of disability in their life, that allows the child to stay in school and grow up to contribute to their nation’s economy. This economic benefit has been calculated to further show the impact of this intervention.

Our data so far shows an average economic benefit of USD $31,097 per operation in a KidsOR Operating Room to the country in which the hospitals are situated. This is an average figure as the economic benefit of an operation depends on a few factors, such as the severity of the surgical condition requiring treatment, the number of years the child will then contribute to the economy as a healthy person, and the average life expectancy in the child’s country of residence.

This vast economic impact in LMICs shows that increasing paediatric surgical capacity not only improves the health of the population but strengthens the country’s economy. This allows for continued growth and development of all systems in the country.
The increasing number of global health initiatives has changed the landscape and architecture of health financing in low- and middle-income countries. While endeavouring to fill the gaps of countries’ health care, poor alignment and harmonisation of partnerships has led to a fragmentation that weakens the effectiveness of health programmes and threatens the public health system. Effective coordination amongst health actors is key for the attainment of the health-related Sustainable Development Goals, including Universal Health Coverage.

Aware of the lack of paediatric surgeons in Africa, KidsOR is committed to fund the training of 120 surgeons across Sub-Saharan Africa by 2030, of which 40 are in partnership with Smile Train. The West African College of Surgeons (WACS) and the College of Surgeons of East, Central and Southern Africa (COSECSA) are the partners delivering the training. A specialised health workforce is vital for robust and resilient health systems. However, the education and training of health workers is chronically under-funded as denounced by the WHO. Further investment in training the local workforce is urgently needed as it is the only way to achieve the SDG health targets in a sustainable way.

We talked with Dr Raphael Mwita, a SmileTrain-KidsOR collab scholar, who gave us an insight into his COSECSA training so far:

“What I loved the most about the training is the competence-based training system that is conducted with COSECSA as it is centred on structural topics that defines knowledge, professional behaviours and core clinical procedures. Some challenges which I wish could be taken care of are that hands on training and experience with laparoscopic surgery is needed as we lack a well-equipped set up for laparoscopic practicing simulators. A standout moment for me was when I was able to build up high performing team in theatre, especially on reducing turnover time. In the past, medical attendants were feeling inferior until when I emphasize teamwork.”

Dr Alicia Massenga, who was part of the KidsOR scholarship programme.

“A dedicated room for children allows health workers to work in a good and secure environment.”

At our partner site in Bethesda Hospital in Goma, we discussed the impact of the dedicated paediatric Operating Room with Dr Joseaphat Paluku Katswere, who is a surgeon at the hospital.

“What are some of the challenges you have experienced in delivering quality of care to patients?”

The main challenge was the lack of some specific materials and/or equipment for specific procedures. The other challenge is that we don’t have health insurance at the hospital hence most children will be asked to pay for services. Given the context of our region, with recurrent conflicts families/children will have to send their little money to access health services, the money is never enough most times.

Why is having a dedicated paediatric Operating Room important?

The burden of surgical condition is high. A dedicated room for children allows health workers to work in a good and secure environment. Also, with this kind of a room, children are relaxed and in a good mood before and after operation.

Which are the common surgeries you perform on children at your hospital? Do you have a case you have recently performed that has stuck with you?

Common surgeries are cleft, trauma, burns, and other congenital anomalies. The first case that touched my heart was an 11-year-old girl who was brought in with a burst abdomen following a traffic road accident. Her intestines were all out. She was admitted in theatre for a surgical operation. Her intestines were put back in the abdominal cavity, then a Bogota bag (a sterile plastic bag that can be used for closure of abdominal wounds) was put to protect the organs given that the abdominal wall had to be left open for some days. Three days later she was readmitted in theatre, lavage was done, and closure of the abdominal wall was done. On the fifth post-operative day, the dressing was changed, and the surgical site was clean. The patient was discharged on the eighth day.
87% of children who cannot access surgical care globally are from LMICs.

The longest recorded patient travel time is 5 days.

In a kids or facility 9 out of 10 have surgical and anaesthetic trainees.

200 km average distance travelled to access surgery.

African countries have a critical shortage of health workers.

510,000 years of disability averted in 2021.

USD $31,097 economic benefit per operation.

86% of refugees are hosted in countries with inadequate health systems.

The Journey

The data we collect on travel time and distance illustrates the lack of hospitals with dedicated paediatric Operating Rooms in LMICs. The more hospitals we partner with, and the greater the children’s surgical capacity created in low-resource settings, the more these figures will decrease.
# A CALL FOR ACTION

The global burden of disease has changed in the last 40 years, but funding hasn’t kept pace.

Children around the world are suffering as a result yet the world’s major funding nations and organisations still prefer to focus on diseases when, instead, they need to start seeing what the people who need care.

If we have learned anything from the global pandemic it must be that health is a global activity in which we are all engaged. We cannot accept a system where billions of dollars are spent each year only for LMIC health systems to be so weak they remain entirely dependent on external support. Indeed, so weak they present a risk to us all.

Focusing on vertical, disease-specific issues is unsustainable and the failure to provide health for all is a financial planning catastrophe. We need to reshape global health by focusing on health system strengthening.

Training local surgeons and investing in high-quality surgical infrastructure strengthens healthcare systems. As we have shown in this report, it allows nations to start moving towards independent delivery of care for their children. It proves that aid in not an inevitability. It lets local doctors see the patient, not the disease, and provide the full care they need.

Without change the international community will be perpetuating a situation where the poor rely on the rich and, worse, the poorest will be prevented from ever accessing the care they need to achieve their potential. Children will continue to die preventable deaths while funders celebrate successes focused only on their own disease-specific metrics.

Globally, children are dying at an astonishing rate because they can’t access the safe surgery they need. These are preventable deaths and every dollar moved into surgery creates stronger health systems, moving children closer to a time when achieving their potential is to be fully expected, not simply dreamed about.

## REFERENCES
