

## Neglected Diseases

# The “Other” Neglected Diseases in Global Public Health: Surgical Conditions in Sub-Saharan Africa

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Currently in sub-Saharan Africa, most patients with surgical problems that are routinely treatable in high-income countries never reach a health facility, or are treated at a facility with inadequate human or physical resources. These conditions lead to premature death or physical disability with a significant economic burden. Meanwhile, the last decade has seen the emergence of numerous “neglected tropical disease” (NTD) initiatives in global public health. As surgeons working with clinicians in sub-Saharan Africa, the momentum for NTDs causes us to ask: Shouldn’t surgical conditions also be considered “neglected”?

This article compares NTDs and surgical conditions in sub-Saharan Africa, considering their estimated burden and the cost-effectiveness of treatment, the scope of these conditions and associated global health disparities, and the effect of donor priorities on provision of surgical services. Lessons from NTD initiatives are analyzed among possible solutions to improving access to surgical services in sub-Saharan Africa.

## Burden and Cost-Effectiveness

Variably defined [1,2], NTDs are primarily parasitic and bacterial infectious diseases—excluding the “big three” infections (HIV, tuberculosis, and malaria)—that affect the world’s rural poor in low-income countries (LICs) and can be cheaply addressed [1,2]. Despite their significant, primarily chronic disease burden, they are sidelined as “other diseases” in the Millennium Development Goals.

Even with limited data, conservative estimates suggest that surgical conditions account for 11% of the total global burden of disease and 25 million disability-adjusted life years (DALYs) in Africa, the region with the highest concentration of surgical DALYs (38/1,000 population) [3]. Meanwhile, NTDs account for 1.3% of the global burden of disease and 20 million DALYs globally, mainly in Africa [1,4]. Despite a greater burden of disease, surgical conditions (except emergency obstetric care) are also not included in the Millennium Development Goals.

Recent cost-effectiveness studies (Table 1) show that basic surgical care compares favorably (US\$11–US\$33/DALY averted) with traditional public health interventions such as vaccinations (US\$5/DALY averted) [5–7]. Basic surgical services are more cost-effective than antiretroviral therapy (US\$300–US\$500/DALY averted), even assuming low-cost production, high HIV prevalence, and high compliance [6].

The Neglected Diseases section focuses attention either on a specific disease or describes a novel strategy for approaching neglected health issues in general.

## Summary Points

- Surgical conditions are similar to NTDs in that they disproportionately affect the world’s rural poor in low-income countries, and can be cheaply addressed.
- Injuries represent the largest portion of surgical disease burden in Africa, followed by obstetric complications, malignancies, congenital anomalies, and perinatal conditions.
- The development of human resources for surgical services and perioperative care has been neglected, and innovative strategies addressing clinician migration and capacity-building are needed.
- Surgical delivery efforts can learn lessons from NTD initiatives, including increasing access through donation programs, nonprofit ventures, and advocacy, and developing incentives to produce and make available essential equipment and supplies in poor countries.
- The impact of vertical (primarily infectious) disease-specific donor programs on health systems, including surgical services, must be evaluated, and access to essential surgical care must be recognized as a basic human right by the global public health community.

Similar to essential surgery, integrated treatment programs for NTDs are quite cost-effective, at US\$2–US\$9/DALY averted. [1].

The cost estimates for surgery include the minimum human resources, infrastructure, and supplies necessary to provide surgical care at a first-level referral facility—the district hospital. The relative cost-effectiveness of surgical

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**Abbreviations:** DALY, disability-adjusted life year; LIC, low-income country; NTD, neglected tropical disease

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**Table 1.** Estimated Cost-Effectiveness of Health Interventions

Intervention	Cost-Effectiveness
Rapid-impact package for NTDs	US\$2–US\$9/DALY averted [1]
Measles vaccination	US\$5/DALY averted [6]
Basic surgical services	US\$11–US\$33/DALY averted [5,7]
Antiretroviral therapy for HIV	US\$300–US\$500/DALY averted [6]

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care has been surprising to some. However, for clinicians struggling to provide surgical services in sub-Saharan Africa, the potential public health impact of surgical care is no surprise, as many medical conditions can be treated cheaply and effectively by a basic surgical procedure.

### The Scope of Surgical Conditions in Sub-Saharan Africa

Injuries account for the greatest burden of surgical disease worldwide (63 million DALYs) and in Africa (10 million DALYs), and are followed by obstetric complications (4 million DALYs in Africa), malignancies, congenital anomalies, and perinatal conditions (approximately 2 million DALYs each in Africa). As with NTDs, the burden of disease from injuries is disproportionately borne in LICs, where 90% of injury deaths occur. In men aged 15–44, the predominant economically active segment of the population, only HIV takes more lives than road traffic crashes, and for every death, dozens are left with temporary or permanent disabilities [8,9]. High-income countries experience 1.7 deaths/10,000 vehicles compared to more than 50/10,000 vehicles in Africa [10]. In African children over five, injuries claim more lives than HIV, tuberculosis, and malaria combined [11]. Only one third of injured patients in Africa reach a health facility—and greatly delayed presentation is the rule rather than the exception [12].

Along with injuries, obstetrical emergencies also exact a significant health toll in Africa. Provision of emergency obstetric care has been highlighted as a Millennium Development Goal, with the United Nations calling for a 75% reduction in maternal mortality from 1990 to 2015. This goal would have required an annual 5.5% reduction, but actual rates have been less than 1% [13]. Maternal mortality ratios show the greatest gap between rich and poor countries of all basic health indicators, with 99% of maternal deaths occurring in LICs—primarily in Africa and South Asia.

Despite the existence of specialized “fistula hospitals” in Ethiopia and Nigeria, over 2 million women in Africa are living with an untreated obstetric fistula [14,15]. This consequence of poor access to basic emergency surgery subsequently requires more resource-intensive surgery. The same is true for many patients disabled from delayed fracture care, contractures and skin cancers from untreated burns (especially in children), and chronic wounds from soft-tissue infections treatable at an earlier stage. Like NTDs, many untreated surgical conditions such as obstetric fistulae are terribly stigmatizing. Many surgically treatable cancers such as cervical, breast, and colon cancer also present at late, untreatable stages or require complex, morbid, palliative operations—a reminder that early detection and treatment of malignancies must link primary and surgical care. In some LICs, cervical cancer kills more women than AIDS [16]. Prospective studies in Africa have also shown that 85% of children will require surgical care by age 15; yet surgical

services for children remain poorly developed in most countries [17,18].

### Human Resources and Surgery

The shortage of physicians and nurses in Africa has been well-documented: Africa bears nearly 25% of the global burden of disease with only 2% of the global health workforce [19]. The neglect of training institutions as well as the “brain drain” of physicians and other health personnel to rich countries contributes to this imbalance. Policies to counteract the brain drain by limiting recruitment of nurses have been initiated; in addition, capacity-building of academic institutions has also been successful in retaining national health care workers in some countries [20,21].

Meanwhile, human resources for surgery have been neglected [22]. Africa has approximately 1% of the number of surgeons of the United States, but the exact count is unknown [23]. The training of non-physician providers in emergency obstetric care in countries such as Malawi, Mozambique, and Tanzania has begun to close this gap with equal safety, lower cost, and better retention than training physicians alone [24]. The expansion of training for these cadres to other essential surgical procedures should be considered. Likewise, the global anesthesia workforce has not been adequately recognized. In most African countries, anesthesia is provided by non-physicians who require greater support and supervision [25,26].

### Donor Priorities and Essential Surgical Services

Many LICs have a double burden of infectious and noncommunicable diseases. Proponents of vertical infectious disease initiatives maintain that these programs will strengthen health systems overall. From a clinical perspective, however, there may be a widening gap between generous infectious disease programs supported by major donor organizations and basic essential health services. For example, of the 111 donor-supported health projects in Uganda totaling nearly US\$300 million over the last two years, only two have partially supported regional hospital services [27]. US\$85/DALY is spent on HIV research compared to only US\$0.50/DALY for injury research [28].

Just a few steps across from the poorly equipped casualty ward at the national hospital in Uganda, where injured patients arrive without prehospital care, is the generously funded Infectious Disease Institute. While the postgraduate surgical training program struggles to recruit surgeons, surveys confirm that medical students are drawn instead to the research and income opportunities in infectious disease (Figure 1) [29]. Many of these students take nonclinical research positions, depleting the workforce available for patient care. These potential secondary effects of current donor priorities on essential health services must be more comprehensively evaluated.

As mentioned previously, surgery can be a cost-effective prevention strategy—this concept is now being recognized by the public health community currently focusing on the potential impact of male circumcision on HIV in saving millions of lives [30]. Yet, while the US National Institutes of Health spends US\$600 million annually on research for an HIV vaccine that might never be developed, funding to scale up access to this prospectively proven intervention remains elusive. [31].



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**Figure 1. Surgical Training in Sub-Saharan Africa**

Senior house officer Dr. Gorretti Ibalata of the Department of Surgery at Makerere University in Kampala, Uganda, teaching intern Dr. Serufusa Sekidde during an operation. Generally, however, more medical students are drawn to careers in infectious diseases and public health than to surgery. (Photo: Doruk Ozgediz)

Improved surgical services can strengthen health systems overall. Like NTD initiatives, surgical services intersect with many programs such as maternal health, child health, noncommunicable diseases, and HIV. For example, despite the fact that many patients with HIV present with a surgical problem such as an enlarged lymph node, a tumor, or a soft-tissue infection, and others develop complications that require surgery (such as extrapulmonary tuberculosis), there has been very little effort made to link HIV programs with surgical services. Even NTDs such as schistosomiasis, filariasis, and Buruli ulcer themselves can have profound surgical complications. For instance, the early excision of Buruli nodules by primary providers in rural areas, with antibiotic therapy, prevents the development of large disabling ulcers and illustrates the preventative potential of basic surgical interventions [32].

### NTD Initiatives: Other Lessons for Surgery in Africa

NTD initiatives have emphasized the lack of investment in research and drug development, partially due to poor incentives and market failures in the pharmaceutical industry [33]. As a result of these failures, drug development for NTDs has stalled while “blockbuster” drugs have been developed for diseases that preferentially affect high-income countries. Similarly, “blockbuster” devices and technologies have been developed for surgical conditions in high-income countries, led by advances in laparoscopy, arthroscopy, and other techniques.

Meanwhile, the lack of basic surgical supplies and equipment limits the delivery of surgical services in Africa (Figure 2). Similar to treatments for NTDs, there have been insufficient incentives for industry to ensure their availability. NTD programs have approached this same problem through a range of programs including drug donation, public–private partnerships, and the establishment of nonprofit pharmaceutical companies [1,2].

Similar approaches could reduce the price of essential life-saving surgical supplies or encourage development

of “generic formulations” that can be locally produced. Currently, in most parts of Africa, essential surgical supplies are imported. Existing surgical supply donation programs have been primarily led by humanitarian groups and are difficult to sustain—private–public partnerships as developed for NTDs could be an innovative solution. These partnerships could develop mass-produced “generic” surgical toolkits using locally adapted guidelines of the World Health Organization’s Emergency and Essential Surgical Care Project [34].

Aravind Eye Hospital, in Madurai, India, provides an example of ingenuity in delivery of low-cost essential surgical care. By combining assembly-line efficiency, passionate leadership, and community sponsorship, the hospital has managed to deliver cataract surgery to millions of blind Indians, and this model is being exported globally [35]. Similarly, the Tilganga Eye Center of Kathmandu, Nepal, has revolutionized cataract treatment in LICs by developing, prospectively studying, and championing new surgical techniques and the manufacturing of inexpensive but high-quality intraocular lenses [36].

Technologic innovation may also overcome the isolation of rural health personnel providing surgical care in LICs. For example, infectious disease programs—even in conflict settings—have linked cellular networks to geographic information systems (GIS) and personal data assistants (PDAs) [37,38]. Similar programs could enable surgical surveillance, supply maintenance, and consultation for complex surgical cases. Some pilot surgical telemedicine programs have already served these functions, but bandwidth and cost remain concerns [39,40].

Overall, NTDs can be treated at the first level of most health systems, while surgical services require a more complex complement of infrastructure and human resources, and may also require a more systems-based approach. For example, trauma systems can reduce medically preventable deaths from injuries by 50%, but most countries in Africa have no organized trauma system [41]. Trauma training programs



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**Figure 2. Basic Surgical Supplies and Equipment**

To improve access to care for surgical conditions in Africa, what is needed is not always “high-tech”—on the contrary, it is just reliable provision of the “bare bones” with basic life-saving instruments, equipment, and supplies. (Photo: Dr. Jacqueline Mabweijano, Head of Casualty Unit, Mulago Hospital, Kampala, Uganda)

for prehospital and hospital personnel have been effective in Uganda and other LICs [42,43]. In Ghana, the training of lay first-responders such as commercial truck drivers in basic trauma care has proven to be an effective low-cost alternative to a more expensive ambulance system. In conflict zones, the training of local villagers in first aid has reduced mortality from landmine injuries [44]. Creatively building on existing informal networks of care in these resource-constrained settings holds great promise in reducing the disease burden due to injuries. NTD initiatives have also been successful in integrating disease treatments through “rapid-impact” interventions; the horizontal approach to improving surgical services as a whole at specific levels of the health system is similarly encouraging [1,45].

## Conclusion

Surgical conditions share a number of characteristics with NTDs. Both account for a significant disease burden, disproportionately borne in Africa, and are relatively cost-effective to treat. Nonetheless, both have been neglected as priority health interventions. The burden of injuries and obstetric complications are particularly significant. Surgical care, which depends on adequately trained personnel and infrastructure, may be more difficult to deliver than medical treatments for NTDs. Nonetheless, lessons from NTD initiatives may improve access to surgical care through donation programs, nonprofit ventures, advocacy, and development of incentives to reduce the price and improve the availability of essential equipment and supplies. Perhaps most importantly, proponents for NTDs cite the basic human right to health and the potential for poverty reduction achievable through these programs [46]. This human right to health includes access to essential surgical care. Patients with untreated surgical conditions, as well as the local clinicians struggling to care for them, must gain greater recognition by the global public health community. ■

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