Part 4: Advocating for safe surgery

Surgery result in better population health, and is key to ensuring the delivery of many of the SDGs. The following goals would be positively affected by upscaling surgery through the strategies discussed in this book. SDG target 3.1.1 of reducing maternal deaths to <70 per 100 000 live births and decreasing neonatal deaths to 12 deaths per 1000 live births (SDG target 3.2.1) require surgery.[1] Maternal and neonatal mortality will decrease by increasing access to caesarean section, until we reach the safe inflection point of 19 caesarean sections per 100 live births.[2] This is the target for access to caesarean section deliveries. Africa is currently running at about 5 caesarean sections per 100 live births. A caesarean section rate <7.2 per 100 live births, is associated with a maternal mortality of 463maternal deaths per 100 000 live births and a neonatal mortality of 30 neonatal deaths per 1000 live births. Providing 19 caesarean sections per 100 000 live births, results in a fall in maternal mortality to 36 maternal deaths per 100 000 live births and neonatal mortality to 7 deaths per 1000 live births.[2] This equates to a potential 12 fold reduction in maternal mortality, and 5 fold reduction in neonatal mortality. While simply increasing access to caesarean sections would not ensure mortality figures within the SDG targets, the associated systems requirements to increase the ability to deliver more caesarean sections will certainly contribute to improving maternal and neonatal outcomes.

SDG 3.2 is to reduce preventable deaths in children <5 years, and neonatal mortality. We know that neonates born in Africa have a mortality at least double that of high-income countries following caesarean section,[3] and increasing access to caesarean sections will decrease maternal mortality.[2] Children having surgery in Africa have a 11 fold higher mortality than HICs.[4] Currently anaesthesiologists and surgeons working in Africa, consider nearly half of the operating rooms unsafe for neonatal surgery and 1/3 unsafe for surgery in children until 1 years old.[4] There is an enormous opportunity to improve child health in Africa with adequate surgical provision.

SDG 3.3 aims to reduce the incidence of human immunodeficiency virus (HIV) infection, tuberculosis, malaria, hepatitis B and neglected tropical diseases.[1] Circumcision, a simple procedure, is associated with HIV prevention. Yet, it is associated with mortality in Africa through surgical sepsis, where sterile surgical conditions are unavailable. Safe surgery will decrease HIV infection through safe circumcision. SDG 3.4.1 aims to reduce premature mortality from cardiovascular disease, cancer, diabetes or chronic respiratory disease by one-third by 2030.[1] Safe surgery will contribute at least a 1/3 to the management of these diseases to ensure comprehensive medical care.[5] Target 3.6 aims to halve the number of deaths from road traffic injuries by 2030. Target 3.8.1 is to achieve universal health coverage of essential health services, including reproductive, maternal, newborn and child health, infectious diseases, non-communicable diseases, and service capacity and access, among the general and the most disadvantaged populations.[1] Surgery is needed to support and achieve these goals.

Target 3C aims to increase health financing and the recruitment, development, training and retention of the health workforce in low- and middle-income countries.[1] We have also shown how a small increment in a health budget, in the context of a comprehensive NSOAP can provide a substantial change to the delivery of a surgical service.[6] We also need to rethink education to enable an increase in the quality of surgical care we can deliver, while also retaining surgical providers.

Gender inequality deprives women and girls of basic rights; preventable maternal mortality and morbidity, with a target of gender equality by 2030 (SDG 5).[1] Women in vulnerable populations face gender-specific barriers in accessing healthcare as well as the burden of many sex-specific conditions, including gynaecological disease and the vast majority of breast pathology.[7] These diseases commonly affect women in the prime of life and, as such, have substantial societal consequences due to the complex effects on their children and families, not to mention the economic impact.[7] We have shown through the work of ASOS and ISOS, that women living in Africa have double the odds of severe postoperative complications following elective non-obstetric, non-gynaecological surgery compared to international incidences.[8] The gender inequality in surgical care is larger in Africa than the rest of the world, and this needs to be urgently addressed. This may extend to the critical care environment where the data from COVID-19 admissions in Africa, suggested that men possibly had access to critical care, and once in critical care received more care than women.[9]

SDG 8 aims to promote inclusive and sustainable economic growth, employment and decent work for all.[1] The aim of SDG 9 is to build a resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation.[1] Goals 8 and 9 are not achievable without a healthy population. Delivery of essential surgery will increase the quality of life of about a 1/3 of the population.[5] SDG 17.18 calls for capacity-building support to increase the availability of high-quality, timely and reliable data. The surgical indicators as a benchmark for countries; however, mechanisms to ensure accurate reporting from the facility level to the ministries of health to WHO and the World Bank Group are necessary.[1] This would allow benchmarking and monitoring of progress with surgical delivery. This brings us full circle to why we need NSOAPs.

These are solid arguments for why we need to advocate for NSOAPs and the adequate surgical provision. However, even ensuring a functional surgical health system in one country or region will be severely compromised if adjoining countries cannot provide adequate health care. This is because diseases do not follow political boundaries, and people in need will overcome any country borders to survive. Therefore, we need regional strategies to solve health problems. For example, mosquitos happily cross-country borders and so does malaria. A regional strategy was adopted to address this, with the Malaria Elimination Eight Initiative (E8 programme) in sub-Saharan Africa. If Botswana can eradicate malaria and Zambia can't, then it is futile, as the mosquitos will continue to cross national borders. An example of how patients in need migrate is well demonstrated by how the Western Cape province in South Africa is being required to provide care for increasing numbers of patients migrating from the Eastern Cape, which has a public healthcare service which is on the verge of collapse. It is for these reasons that we need a regional strategy for surgical health in Africa.

Advocacy

'Change requires more than righteous anger. It requires a program, and it requires organizing.' Barak Obama

To drive for the changes we need to deliver safe surgery requires advocacy.

We have seen how indicators were an important catalyst to improving maternal outcomes. The success of tracking indicators in maternal health and obstetrics is evident, with the associated

falling maternal mortality. Now we need to monitor and document surgical outcomes so that we can understand what is needed to ensure universal health care.

Surgery has had four landmark global health advocacy victories. At the 68th World Health Assembly held in May 2015, the World Health Assembly (WHA) passed the WHA resolution 68.15 titled; 'Strengthening emergency and essential surgical care and anaesthesia as a component of universal health coverage' which established surgery as a cornerstone of universal health care.[10] This had been a long time coming. There was a growing appreciation that to provide universal healthcare, the surgical component of diseases needed to be adequately addressed. Importantly, there was an awareness that provision of the resources and infrastructure needed to provide surgery, also contribute to establishing an enabling healthcare environment to provide other healthcare.[11] What is truly mindboggling is that it took us until 2015 to recognise that surgery is essential for universal health care. Where had we been for so long?

The upshot of this was the second victory, where WHA resolution 70.22 was passed in 2017, where WHO member states agreed to report the sustainable development goals (SDGs) every two years.[12] This included the perioperative (at and around the time of surgery) mortality rate into the 100 core health indicators, and the other five indicators of surgical care as categories in the 100 core health indicators.[13] At last there was a global agreement to track surgical outcomes. The World Bank health indicators include workforce, volume of surgery, and financial protection indicators (Emi Suzuki, personal communication). Unfortunately, the access to surgery and perioperative mortality rate indicators are currently not included as the data is not readily accessible. This is concerning, as the perioperative mortality rate is the only quality indicator of surgery, and as it is not readily available, it is not reported in the World Bank 100 indicators. It has been agreed that perioperative mortality rate is globally important, but by not being reported, it may send the message to the public that it is not an important metric. I would prefer that it was shown on the list (to demonstrate its importance), and then followed by a field showing that the data is 'not available'. This will flag the importance of the indicator, and need to ensure that we find ways of making it available.

The third global advocacy success was achieved at the opening address at the 72nd World Health Assembly by Richard Horton in 2019. As the editor-in-chief of the Lancet, the pre-eminent global public health journal, he had canvassed the global community on Twitter, on which top global health concerns he should be communicate to the country leaders at the opening of the assembly. He presented five global health priorities, of which one was safe surgery for all. The international community had spoken and were calling for global attention to surgical health.

Finally, in 2023 the WHA committed to a new resolution 76.2; 'Integrated Emergency, Critical and Operative care for universal health coverage and protection from health emergencies,' also known as the ECO resolution. This resolution states that emergency, critical and operative care is integral to a comprehensive primary health care. This is a huge step forward at an international level recognising that universal healthcare is impossible, without emergency, critical and operative care, and as such should be considered as part of primary care.

The international advocacy work which had been led by John Meara, Emmanuel Makasa and others has paid off with these three four victories for surgical health and advocacy. John Meara is a head of plastic surgery at Boston Children's Hospital and Professor of Global Surgery, and the founder and Director Emeritus of the Program in Global Surgery and Social Change in the

Department of Surgery at Harvard Medical School. He is a softly spoken, surgeon (unusual for surgeons) with a baby face, who has led the advocacy for safe surgery, particularly through his role as Co-Chair for the Lancet Commission on Global Surgery. Identifying the need for global monitoring of perioperative mortality was a major success, providing a platform to document the progress to universal health care coverage. If only this had been delivered as promised though. Shortly before the Covid-19 pandemic, Emmanuel Makasa lamented to me; 'The WHA resolution (*68.15*) was agreed by many, but it has been supported by few'. A study conducted in 2016 of the 215 countries on the World Bank's list, the most commonly reported indicator was "Specialist surgical workforce density" (71 countries, 33%), yet "Access to timely essential surgery" was reported by only 33 countries (15%), and "Perioperative mortality rate" by 29 countries (13%).[14] Essentially we have little idea of the quality of surgical care in seven of every 8 countries in the world. Therefore, we cannot track surgical outcomes in nearly 90% of countries globally, making it difficult to develop the impetus needed to improve the quality of surgical care. To mimic the influential work of Florence Nightingale, Andrew Topping, the Cape Town 'Flying Squad', the CEMD and others, it is imperative that we push to track surgical outcomes in every country. Currently, we have important surgical indicators as part of the core health indicators dataset, but the compliance with reporting is unacceptably low, and there appears to be no teeth to make this happen. We must change the current non-compliance for tracking surgical outcomes through advocacy or surgical health (and by extension population health) will remain poor.

Financing health

How we spend money on health

My father was a difficult man. Intellectually sharp but with a personality and life spent swimming upstream. He would argue and keep pushing back. He couldn't see the point of doctors. We thought we cost him an unreasonable amount of money. '*Bloody money grabbers*.' He was resilient, and as strong as an ox. An arteriopath from a life of heavy smoking. He had coronary artery disease, aortic disease and carotid disease. He had successful coronary artery bypass surgery when I was at university studying medicine. A ruptured aortic aneurysm, with an expected mortality of 20 to 50% when I was a qualified anaesthesiologist. I was in San Francisco at the time. I spoke to my mother as he was being wheeled into the operating theatre and explained the poor prognosis. However, as always, he was home within a few days, ready to complain about doctors when I arrived back from the United States. '*They charge a fortune and I feel awful!*' he moaned. He did look awful to be honest, which is not surprising considering that he had just survived a life-threatening surgical emergency, and clearly bled a torrential amount. He was as white as a sheet. A few years later, he went on to have a transient ischaemic attack (a little stroke that resolves fortunately) and underwent a carotid stent to prevent it happening again. Again, I thought he would complicate with a stroke, but he flew through. He was living proof of the benefits of surgery. Three big operations, with no complications. Amazing really. His life was a good 20 to 25 years longer than it should have been, due to successful surgery. He was mentally sharp to the end. But he never liked doctors, and would have a go at me at every opportunity. Until his death, I battled to persuade him of the value of medicine and surgery. He could not accept what health care cost, but he was never out of pocket. I think that if he read this chapter now, he may have changed his tune. But he wouldn't have capitulated easily. He certainly would have worked me over with some challenging arguments. I hope that had he read this, he would have focused his anger on the system and governments, and how poorly organised the funding of healthcare is, rather than his usual position of targeting the healthcare providers such as myself. I hope too, that this chapter makes you unhappy and indignant with the status quo of the funding of surgical care currently provided by the governments, non-governmental organisations (NGOs) and others.

Here is a refresher from what you have read. Maternal mortality numbers suggest that a mother dies every 1¾ minutes, 24 hours a day, 365 days a year.[15] The number of people in Africa who cannot access safe and affordable surgical care in Africa is approximately a billion, out of a population of a little over a billion.[11] At least a 1/3 of all diseases have a need for surgical care. And universal health care cannot be achieved without surgical care.

So, what do we need to do to rectify this? It is estimated that to provide global 'Universal Health Care' will cost about a $1 trillion per annum. The WHO defines 'universal health coverage' as 'access to needed essential health services, without financial hardship.' Universal coverage is comprehensive. It includes the full range of care from health promotion and prevention, to treatment, rehabilitation and palliative care.[16] To achieve universal health coverage, health financing requires about $100 per capita to achieve an essential package of 218 interventions, and $50 per head for a basic package of 108 "highest priority interventions".[17 18]

The cost be to provide 80% coverage for essential universal health coverage across these 21 essential universal health packages for safe maternal and newborn health would require $2.70 per capita in low-income countries and $3.70 in low- and middle-income countries.[19] This is

an increase in the current expenditure of $1.60 and $2.10 per capita respectively.[19] So for an additional $2 per capita per annum, we can achieve 80% coverage for SDG goals for maternal and newborn health, at an incremental cost of $1.2 billion in low-income countries and $5.6 billion in low- and middle-income countries.[19]

What about all surgeries? The per capita cost for providing 80% essential health coverage for surgery is $5.10 in low-income countries and $7.40 in low- and middle-income countries.[19] However, here the incremental cost is relatively more than what is required for maternal and newborn health (approximately 3 times more), due to the current low expenditure on surgery. It is $4.4 billion for surgery, but $17 billion for maternal and newborn health.[19] The total cost for the surgical component of universal essential health coverage remains a modest $350 billion dollars for low-income countries and low- and middle-income countries.[19] Globally, $1 trillion would provide sufficient financing to provide essential universal health coverage for all.[17] The discrepancy between the funding required for maternal and neonatal health, compared to surgical health shows the current disparity in health expenditure between these two health categories, where maternal and newborn care receives three times as much financial attention compared to surgery.

$1 trillion may sound like a lot of money. But it is not. In fact, it is an 1/8 of what is currently spent on health globally. In 2018, the global health expenditure was $8.3 trillion dollars.[20] The proportional contribution was 60.7% as government health spending, 20.6% as prepaid private spending, 18.5% as out-of-pocket spending, and 0.5% as donor financing.[21] Why can we not provide universal health coverage, when we are spending eight times the amount needed? There are two fundamental problems. The first is that the distribution of expenditure is unequal across countries, and the second is that the distribution of expenditure is inappropriate across disease categories.

Let's look at the healthcare expenditure across countries. Countries with less resources, have less to spend on health. The 2016 estimates are that upper-middle income countries spent on average $130 per capita, while lower-middle income countries spend less than half that amount, at $58 dollars per capita.[17] Less than 10% of the spending of low-income countries is on surgical services.[19]

Considering that only a $100 is needed to provide the 'essential package', estimates are that of the 49 of low-middle countries, only nine (18%) can afford the 218 interventions. If one considers, the more affordable $50 basic package of the 'highest priority interventions', a further 16 countries (33%) can afford the 108 interventions basic package, but disturbingly 24 countries (49%) cannot even afford the basic package. In low income countries, the average government spend is $9 per head,[17] less than 20% of the amount required to provide a basic package of health for the 'highest priority interventions'. The contributions to health funding outside of government spending are associated with a country's World Bank income group classification.[21] Development assistance for health (donor funding) is dominant in low-income countries (28% of 2017 health spending), out-of-pocket spending is dominant in lower-middle-income countries (55.0% in 2017), and prepaid private spending dominant in high-income countries (86.0% in 2017).[11] In resource poor environments, approximately 60% of funding is government health spending, nearly the entire remainder is made up by personal expenditure (39%), through prepaid private spending, and out of pocket spending,[21] and the remaining 0.5% is donor-based funding.[11]

Although, the donor contribution sounds like a small amount, the role and importance of donor funding cannot be underestimated. It contributed $40 billion in 2017,[22] or 4% of the pack needed to achieve universal health coverage at $1 trillion. Donors are crucial to ensuring that the most basic package for universal health coverage could theoretically be achieved, considering that 49% of middle-income countries, and all low-income countries currently cannot deliver this package. As personal financing of health is near impossible in low-income countries and low- and middle-income countries, the importance of donor funding can be seen in the estimated proportional donor contribution to total health care expenditure in 2018 which was 30% for low-income countries, and 10% for low- and middle-income countries.[20] The total global health expenditure per HDI category is the following: approximately $40 for low-income countries, $115 for low- middle-income countries, $446 for upper-middle-income countries and $3313 for high-income countries.[20] There are three important points. Firstly, in lower-middle income countries and low-income countries, donors are an important component to delivery of health care. Secondly despite the contribution of donors, low-income countries are currently unable to provide universal health coverage. Based on the current estimates, low-income countries need an additional $60 dollars per capita to provide universal health coverage. In 2019, the population of the 32 low -income countries was approximately 650 million people,[23] meaning that an additional $39 billion dollars will be needed to achieve universal health coverage, or $6,5 billion for the 'basic package'. The third concerning observation is that despite the theoretically sufficient combined funding for middle-income countries, these countries cannot provide universal healthcare coverage. This observation speaks to the fact that the total spend is not aligned with where the money should be spent on health to meet the health requirements of the population. That is, the allocations of funds for health are inappropriately distributed across disease categories.

Funding allocations by donors provides an insight into priorities. Global funding in 2017 in the 135 low- and middle-income countries was the following: HIV/AIDS received $20 billion, tuberculosis received approximately $11 billion, and malaria $5 billion.[21] In 2019, donor global health financing was approximately $41 billion dollars, with the largest chunk going to Africa ($13 billion).[21] HIV ($9.5 billion), malaria ($2.3 billion) and tuberculosis ($1.7 billion) received 1/3 of the entire donor health care funding. It is not that these are unnecessary allocations, but that there are large disease gaps in financing health, and until these are addressed, we will never achieve universal health coverage. Essentially, the funding of health is not appropriately allocated to disease categories nor is it following the changing proportional disease burden of the population. The funding priority areas appear to be informed retrospectively, as opposed to prospectively. More people die within 30 days of surgery every year (over 4 million), than HIV, malaria and tuberculosis combined (approximately 3 million).[24] Only ischaemic heart disease and stroke have a higher burden of mortality than surgery.

Surgery is in a terrible position when being considered for funding. Its biggest problem is that it does not have a category (or silo) for funding. Surgery must siphon money from other pots, to make ends meet. The 'surgical allocation' of funding, has to be scraped out of the small 'sector wide approaches' and 'health systems strengthening' allocations (total donor allocations of $5 to 6 billion), after scrapping with all other disease categories competing for a slice of the financial pie.[21]

Currently, there is zero signal that this trend in funding allocation is going to change any time soon to align with need. The trends in donor health expenditure are not encouraging for future support to address these disease gaps for universal health coverage. Between 2010 and 2019,

child and newborn health expenditure has increased by 77%, reproductive and maternal health by 26%, and other infectious diseases by 63%. Yet, 'sector wide approaches' and 'health system strengthening' (the area surgery may get a little funding) has instead decreased by 2%.[21]

The recent history of mortality and funding

Donor funding is important for improving health, especially in low resource environments. Donor funders may provide a financial bridge to universal health coverage in low-income and low-middle-income countries, but their priorities are inconsistent with need and so in the foreseeable future they will not help address this problem. It is possible to track donor funding against global deaths, using mortality data[22] and donor funding data.[21] In 1990, there were 43 million deaths, and donor funding contributed about $132 per death (Table 9).

Table 9. Deaths and donor expenditure per death in 1990

Cause of death	Proportion of deaths	Number of deaths	Billions of dollars	Dollars per death
Infectious diseases	15,45%	6654090	0,61	92
Maternal and child health	16,19%	6969692	2,58	370
Non-communicable	60,42%	26016982	0,13	5
Injuries	7,94%	3418364	2,4	702
Total		43059128	5,72	132

By 2019, the deaths had risen to 56 million (although I can only account for 54 million deaths when trying to link these deaths to donor funding), and the donor funding had increased to $658 dollars per death, a fourfold increase from 1990 (Table 10). The CPI inflation index would suggest that $1 in 1990 is now equivalent to $2, so the relative donor contribution to health has just over doubled between 1990 and 2019.

Table 10. Deaths and donor expenditure per death in 2017 (and funding from 2019 reports)

Cause of death	Proportion of deaths	Number of deaths	Billions of dollars	Dollars per death
Infectious diseases	10,67%	5731008	16,3	2844
Maternal and child health	7,54%	4048733	13,3	3285
Non-communicable	75,27%	40417218	0,73	18
Injuries	6,52%	3501115	5	1428
Total	1	53698074	35,33	658

However, the really distressing finding is the relative difference in the number of donor dollars spent per death between disease categories. Non-communicable deaths have received only $18 dollars per death in 2019, compared to infectious diseases and maternal and child health, which received approximately $3000 per death, or nearly 170 times more funding per death. Yet, in 1990, the proportional difference in funding per death was less than half that, at 74 times difference between donor funding for noncommunicable diseases compared to infectious diseases and maternal and child health. Yet, this is totally inconsistent with the changing proportional contribution to mortality: non-communicable diseases continue to contribute a bigger and bigger proportion to global mortality, while the proportional allocation of donor funding is becoming less and less (Table 11).

Table 11. Proportional change in mortality and donor funding between 1990 and 2019

Cause of death	Proportional increase in deaths	Proportional increase in expenditure
Infectious diseases	-13,87%	2672,13%
Maternal and child health	-41,91%	515,50%
Non-communicable	55,35%	561,54%
Injuries	2,42%	208,33%

This is the current state of the donor financing of health. Firstly, funding is skewed towards specific disease categories, predominated by infectious diseases. Yet the trend associated with mortality is predominated by the rise of non-communicable disease deaths. The rise in non-communicable diseases is also reflected in surgical patients in low-resource environments. In Africa, 42% of patients have surgery for non-communicable disease, 27% for caesarean delivery, 18% for trauma, and then the remaining 13% for infection.[25] Secondly, the allocation of donor funding continues to increase in the diseases areas where mortality is actually decreasing proportionately. Thirdly, surgery has a large role to play in global health equity. However, as funding is silo'ed, and there is no surgical silo, surgical funding will remain under-represented in less resourced environments.

What would be an equitable donor allocation for surgery? Well, if more deaths follow surgery than HIV/TB, malaria and tuberculosis combined,[24] which received more than $13.9 billion in donor funding in 2017, or 34% of global funding expenditure on health, then a reasonable starting point would be at least an equivalent amount for surgery. Surgical outcomes are not going to improve until there is an increase in funding allocation. This is borne out by the striking positive association between donor funding and mortality between 1990 and 2019. Increasing funding was associated with a decrease in mortality, while lesser funding was associated with less impact on mortality. In fact, the inequity between disease categories and funding will continue to diverge if we do not act now. Based on the projected global burden of disease and mortality data for 2030, we see that mortality associated with infectious diseases and maternal and child health will continue to fall to 2030, while deaths following injuries will remain constant, and deaths following non-communicable diseases will continue to increase (Table 12). [26 27 28]

Table 12. Proportional contributions to global mortality

Disease categories	GBD 1990	WHO 2016	WHO 2030
Infectious diseases	15,45%	15,66%	12,10%
Maternal and child health	16,19%	4,52%	2,72%
Non-communicable	60,42%	71,22%	77,01%
Injuries	7,94%	8,59%	8,17%

GBD Global Burden of Disease; WHO World Health Organisation

What is important to note are the future trends in mortality. Importantly, non-communicable diseases will exceed the combined burden of communicable, maternal, neonatal, and nutritional diseases as the leading cause of mortality in sub-Saharan Africa by 2030.[29] There is a sombre warning related to these disease trends as it is predicted that future expenditure in the management of non-communicable diseases will outstrip the budget allocations in African countries that are unprepared, as current resources are being directed away from the management of non-communicable diseases, instead of towards them.[30] The upshot of this, is that there is a lack of health systems preparedness to respond to the changing need of disease

priorities. An appropriate response to these disease trends demands prioritisation of surgical health financing.

For the poorest billion people, non-communicable diseases and injuries (NCDI) account for more than a 1/3 of the burden of disease, and exceed HIV, tuberculosis and maternal mortality combined.[31] The need for surgical interventions are even more important in these low resource environments, with the poor access to surgery, and the relative absence of some specialised surgical services in these environments, further compromising health equity. Deaths from non-communicable diseases and injuries exceed 800 000 per annum in those younger than 40 years in the poorest billion. It is estimated that investing in cost-effective and equitable treatment for non-communicable diseases and injuries, would save 4.6 million lives between 2020 and 2030.[31]

However, when you look at the interventions necessary for the poorest billion based on cost-effectiveness and health equity (defined by priority to the poor, to women, to those with the least lifetime health, and to those with severely disabling conditions),[31] the role of surgical delivery is strikingly obvious, as surgical interventions are represented in over 50% of the necessary interventions. There are 27 interventions in the highest effectiveness category, and a further 19 either in the high or highest cost-effectiveness and equity categories.[31] 23 of the 46 (50%) interventions are surgical interventions, and 14 of the 27 highest effectiveness interventions (52%) are surgical.[32] It appears that surgery may have a proportionally bigger role to play in these low resource environments, than in high resource environments, approaching 50%, compared to the global 30% proportional contribution.

In summary, surgery is not expensive, where it runs at about 10% of the costs for essential health, but it provides about 30% of the healthcare needed at a population level, and this may approach as much as 50% for the poorest billion. Furthermore, the ability to provide surgery strengthens healthcare systems. The resilient systems in managing the global COVID-19 pandemic leveraged the resources of surgical systems; anaesthesiologists, ventilators, and the ability to provide safe airway management for example. Surgical systems enable other disciplines needed for healthcare. Poor surgical systems, also mean that the presentation and treatment of diseases is late, and this compromises patient survival.[25 33] Surgery is a cross cutting discipline within the healthcare sector. Strengthening surgery strengthens health systems.[34] To provide access to safe surgery, requires a systems and infrastructure change. Increasing access to emergency surgery, also increases access to other emergencies.[34] Improving access to emergency surgery, increases medical, maternal and paediatric emergency management too. Similarly, improving access to elective surgery results in an increased network across disciplines, as managing a number of these surgical diseases require multidisciplinary care.[34] Health systems strengthening is key to determining access to universal health care. The need for strengthening health systems is proportionally larger in low resource and vulnerable environments. The projected increase needed in health spending across low- and middle-income countries for health systems strengthening to achieve SDG 3 goals by 2030 would increase the mean share of GDP expenditure to 7·5% from the current mean of 5·6%, a 33% increase healthcare expenditure.[35]

The same can be said for critical care in low resource environments. Critical care resources are limited in Africa. Two important reasons are a lack of recognition of the value of critical care to the whole health system and inadequate funding for these services. Critical care services strengthen the whole hospital (and health) system, and there is value in money spent to deliver critical care. However, the perception is that critical care is an expensive resource for low-

resource health systems. This is not true, as basic critical care is a core component necessary for the provision of universal health coverage. At least 16 of the 46 essential interventions for universal health coverage are likely to require some critical care support to ensure safe provision (i.e. repair of cleft lip and cleft palate, surgical treatment of early stage colorectal cancer, definitive surgical management of orthopaedic injuries, management of acute critical limb ischemia with amputation, percutaneous coronary intervention for acute myocardial infarction, medical management of acute, decompensated heart failure, bowel obstruction, bowel perforations, colostomy, hernia repairs including emergency surgery, shunts for hydrocephalus, trauma thoracoscopy, trauma laparotomy, trauma-related amputations, and treatment of congenital endocrine or metabolic disorders).[31]

The cost of providing surgical health

Thirty percent of global health requirements have a surgical component.[5 36] There are several approaches to reach this conclusion. A simple approach is the frequency of operations per admission to hospital according to global burden of disease categories.[11 36] Approximately 1/3 of all hospital admissions are for surgery. 23.9% of communicable diseases, maternal, neonatal and nutritional disorder admissions require surgery, 33.9% of non-communicable diseases require surgery and 34.6% of injuries require surgery.[36] Categories with a surgical need exceeding a 1/3 of all admissions include maternal disorders, transport injuries, unintentional injuries excluding transport, digestive tract, neoplasms, and musculoskeletal conditions.[36] Of the surgical conditions requiring surgery in Africa, the commonest indication for surgery is non-communicable disease (42%), then caesarean section (27%), trauma (18%) and acute infection (13%).[25]

Funding should be aligned with the predicted burden of disease and the associated mortality. We need to rethink healthcare funding. Silo'ing funding according to disease categories alone is inappropriate, as it leads to underfunding of 'cross-cutting' care such as surgery, which does not have a silo. If one is to improve global health, then one either needs to break down these disease silos,[37] or each disease 'silo' needs to ring-fence a budget for the proportional component of care which requires surgery. If we moved away from 'silo' budgeting, then here are two suggested 'back of the envelope' approaches to the re-allocation of funding. For those with more financial skills, they can flesh out the real numbers, but this is a start. We could re-allocate funding to burden of disease (not rocket science). Based on mortality, the budget for surgery should be 133% of that allocated to HIV, malaria and tuberculosis, as there are four deaths following surgery compared to every three deaths following HIV, malaria and tuberculosis combined.[24] An alternative approach is to base funding on surgery's contribution to health. If we assume that approximately 30% of hospital care requires surgery,[36] then approximately 30% of hospital budgets should be appropriately allocated to surgery delivery. Although some funding may be considered already allocated to surgery, as surgery is important for managing all categories of health, the reality is that little of this funding reaches surgical healthcare delivery, certainly not in the order of 30%. In reality, about 30% of population health is dependent on surgical care, and this rises in low resource environments,[5] and therefore a country health budget should have 30% of the budget earmarked for surgical services.

If a universal health package costs about $100 per person per year,[17] and surgery contributes between 30%[36] and 50%[31] of this package, it then requires between $30 and $50 per capita per year, or 8 to 14 cents per person per day. Tanzania recently costed the increase in funding needed to provide safe and affordable surgery. This scale up would only require an additional ½ cent per capita per day, or $2 per person per year.[6] At full coverage, the DCP3 essential

universal health coverage package costs about US$84 per capita annually in low-income countries and US$120 per capita in lower-middle-income countries. The NCDI poverty package costs about 62% (US$52 per capita) of the essential universal health coverage costs in low -income countries and 70% (US$84 per capita) in low- and low-middle-income countries.[31] Accepting that surgical conditions account for approximately 50% of the interventions,[31] we can assume that surgical needs for NCDI cost about US$28 per capita for low -income countries and about US$42 per capita for low- and low-middle-income countries, which is 33% and 23% of the total package.

Therefore, an appropriate strategy may be to ensure a surgical silo with a proportion of the total health budget of approximately 30% based on these assumptions, and within each disease category budget, there should be ring-fenced proportion for surgical care. So possibly, a third of non-communicable and injuries should be ring-fenced for surgical treatment and surgical strengthening, and possibly less for infections. There are tools now to customise a health package, according to various surgical needs (https://dcp-uw.shinyapps.io/dcp-cm/),[38] and resource requirements.[19] We can literally design our own health care package. We can also calculate the cost of a establishing and running an operating theatre.[39]

To ensure that surgery is allocated the appropriate budget for population health, we need to do the following. Firstly, we need to explicitly track health care expenditure on surgical care for health provision. Thanks to the WHO, we can now track global financing of health,[40] but we still cannot track surgical expenditure as all the spending summaries remain within disease categories; and surgery is not represented. This is the deal breaker; "In low-income countries, infectious diseases accounted for half of overall health spending, while in middle income countries, they accounted for one-third. Non-communicable diseases accounted for about 30% of health spending in middle-income countries and about 13% in low-income countries."[20] Reproductive health had the same share of health spending in low-income countries and iddle-income countries (12%-13%), as did injuries, at 4%.[20] Until we track surgical expenditure, we will not be able to track the proportional expenditure on surgery in each of these categories.

However even if we can improve on the appropriate allocation of funds to support universal health coverage, we need to ensure accountability for financial spending for this to work. We also have address the problem of Africa being the region with the least efficient health spending amongst low- and middle-income countries.[41] We have to institute mechanisms to ensure that the allocated funds are used as intended. Simple reallocation of an appropriate budget will not ensure surgical health for all until we address the '*unused fiscal space for health across African countries, [the] disproportionate spending on tertiary care to the detriment of primary care, procurement, inappropriate workforce distribution and motivation (financial and non-financial), medical errors, and corruption*' which have been identified as driving these inefficiencies.[41]

We need various strategies to address this financial threat to health equity. This requires lobbying citizens, civil society, governments, and donors. First and foremost, as citizens, our role is to ensure that our governments are accountable. This is important, as governments are spending less on health. "Average government spending on health in low-income countries was only $9 per capita in 2018, about 1.2% of GDP, and the priority given to health has been declining between 2000 and 2018."[20] So priority one, is to stop the decrease in government spending on health. Secondly, we must ensure that funding allocations are appropriate to disease areas of need. Thirdly, we must document and record the allocation to surgical care. We know people want this; especially following the call for safe and affordable surgery by

Richard Horton at the WHA opening address. It is appropriate to advocate for documentation of expenditure on the 'cross-cutting' disciplines and categories contributing to population health, as the dialogue of health priorities is shifting from individual diseases to broad categories of health which encompass many different diseases; planetary health, women's rights and sexual and reproductive health and rights for all, and safe and affordable surgery. Health is a whole government issue and not just a department of health issue.

While we must demand that our governments deliver safe surgery, as citizens we must ensure that we play our part in guaranteeing a better life for all. We must pay our taxes, and then hold our governments accountable for the appropriate spending of our money. This includes addressing corruption, and the inappropriate allocation of funds. The role of citizens in high-income countries is to ensure that the priorities for donor health care spending are proportionately representative of need when money is allocated to global health. We should also demand that governments donate more money to foreign aid, as less the 1% of the gross national income is currently allocated to foreign aid almost across the board.[42] The exception is Norway which runs at about 8%. How is that possible?

The alternative of the current push for tax cuts in high-income countries adversely affects life expectancy in both the home nation, and in low-resource nations.[43] A sad example is from the UK. Funds were squeezed due to BREXIT and COVID-19 which will decrease UK life expectancy as less funds will be available for health. Sadly, this has simultaneously led to a cut in international spending by the National Institute of Health Research (NIHR). Tax cuts in high-income countries have important negative implications for global health spending.

In low- and middle-income countries, those citizens who willingly pay taxes, must trust that the government will spend their money appropriately. This is a challenge in low- and middle-income countries where corruption is rife, setting up an inevitable vicious cycle, where corruption and syphoning of funds leads to less tax payment, resulting in less government funds to provide funds for healthcare.

To improve the quality of surgical care, the workforce needs to be scaled, training should reach a minimum standard of care, and adequate resources are required to practice care according to acceptable training standards. To this end, appropriate funding for surgical care is needed to provide the resources and strengthen the healthcare system, to provide the surgical care needed for the 30% coverage of population health.

We understand the problem of insufficient surgical health, the politics of delivering this care, and the global policies around surgical health. We now need to leverage the resolutions of WHA 68.15 and 76.2, and the global call delivered by Richard Horton to the WHA. Clinicians must work hand in hand with governments and policy makers to realise the ambition of safe surgery and anaesthesia for all in Africa. Clinicians need to help deliver improved health outcomes through quality surgical care, otherwise the politicians will never support the changes required to make surgery safer.

Political leverage

Making politicians accountable

Politicians work in voting cycles, and as such longer-term projects seem to always be relegated to the back burner, because the short-term win necessary for the voters at the next election will always trump, the more important longer-term requirements to create a stable environment for the population. These longer-term goals will consume funds and not be easily visible to most of the voting public before the next election. The classic global example of this principle was when Cape Town almost had the infamy of becoming the first city in the world to run out of water, which became locally known as 'Day Zero'. The reality is that the signs that Cape Town had a potential water problem had been there for ages. Engineers had alerted the government to the problem decades in advance of that almost disastrous day. However, in the world of politics it had been relegated to the lower priorities for future leaders to address. There were always more important immediate issues to address to secure votes for the next election.

This is the challenge facing the scaling up the resources needed for surgery. To achieve the scale up needed requires finance and time, and the results are unlikely to be visible within the sort time span of a single political term. So high visibility projects are the rage, such as building one big hospital, while the more important responsibility of a NSOAP which would resource the existing hospitals with the equipment and human capital to provide effective and safe care are ignored. We know that we need this longer-term view of surgical scale up,[11] and we know how to do it using the national NSOAP process and implementation plans, to make surgery safe and affordable in a country.

So, how do we get politicians and policy makers to look further down the road, beyond the next election? We, as individuals and communities must lobby governments to deliver universal healthcare which includes safe and affordable surgery, just as the HIV communities, advocates and activists have shown us in the early days of the HIV pandemic.

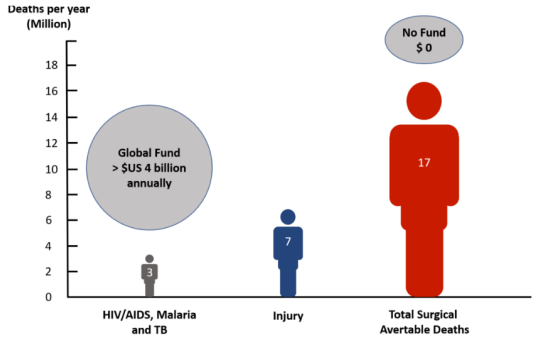
Citizens and civil society can exert enormous pressure for change in health. One need look no further than HIV and the role that normal citizens played in transforming HIV care. The inability to access antiretroviral therapy led to funding through advocacy by the Treatment Action Campaign (TAC). The strength of this movement was that it was characterised by multiple small actions of many people. There are many stories. A colleague from George, in the Western Cape was a Provincial co-ordinator for the TAC, and later helped establish the Médecins Sans Frontières (MSF) antiretroviral distribution centre in Khayelitsha. He spent his Saturdays teaching the public about HIV in small workshops. There was a tremendous commitment to creating a public awareness about HIV, its treatment, and everyone's rights to accessing treatment. This educational foundation led to the success of the HIV movement. Similarly, it is only through education that citizens and civil society can rise and demand the social accountability necessary from governments to deliver safer surgery for all. It is hoped that this book will provide some of the knowledge needed to do this.

Early HIV advocacy has shown us how a common social and human rights issue can create a passionate community with a common purpose. The evidence for antiretroviral efficacy was so strong that individuals were willing to give up their time to ensure everyone knew. This was a human right for which they were all passionate and committed. The TAC ultimately was the coalition that evolved from the anger of the injustice of a lack of access to treatment that individuals felt.

The outstanding success of the HIV campaign is evident by the funding that poured into HIV, and 30 years later continues to fund HIV research and care. The current disparity between the success of HIV advocacy, and the limited advocacy for safe surgical care is well summarised

in figure 9 from the Global Surgery Foundation (https://www.globalsurgeryfoundation.org/why), illustrating the relationship between HIV and surgical funding, and the global deaths per year.

Figure 9. Global funding of HIV, TB and malaria, injuries, and surgery



We should feel indignant that in 2024, with the overwhelming evidence supporting the need for adequate surgical services to support global health, that we should have a funding picture as shown here. While funding for HIV, TB and malaria is important, the population health burden associated with insufficient and unsafe surgery should lead to an outcry. Clearly, the importance of surgery for population health is not understood by the public at large. It is time for us as citizens to rise and challenge the current status quo and advocate for safer surgery and anaesthesia.

Indeed, the challenge to ensure that governments respond to provide safe surgery for all, should theoretically be easier, than it was for the TAC and HIV advocacy to ensure antiretroviral therapy for all. The TAC faced an environment where there was no global resolution supporting antiretroviral therapy. In contrast, with the WHA 68.15 resolution, most countries have already agreed to the ensure safe and affordable surgery for all.[10] Our challenge is to hold our governments accountable to this resolution.

In many countries in Africa, the delivery of healthcare for the population is far from optimal. This is only too evident by the behaviour of the political elite. Based on the fantastic work by Sir Michael Marmot, we know that improved social circumstance is associated with improved health and better healthcare outcomes.[44] However, in healthcare systems as challenged as those in Africa, even the social advantage of the political elite cannot always ensure adequate healthcare in their own country. Essentially, there are healthcare requirements which are not even accessible to the socially advantaged in Africa, such as the political elite. Due to the limited resources for healthcare in low-income countries and middle-income countries, the country itself has barriers to the delivery of quality health care independent of social circumstance. The only way to overcome these barriers are to flee to a country which can provide the necessary care. If there is no hospital, no operating room, no surgeon, then it doesn't matter how wealthy you are, it just won't happen. Many of Africa's leaders have fled to other countries in times of health care need. It is not uncommon for African leaders to die in foreign hospitals, such as leaders from Malawi, Gabon, Togo, Nigeria and Tanzania all have before. Sadly these heads of state would "*prefer to pour taxpayers' money into overseas medical facilities rather than spending it on improving health care at home*".[45] Their actions are an admission of the inadequacy of the medical resources and healthcare their own governments are providing for their population at home. The impact of seeking care outside of Africa, has a further negative impact on health at home. It was estimated that in 2016, Africans spent $6

billion on medical tourism outside of Africa.[46] There will remain little impetus to improve the quality of care at home, if this behaviour of the political elite is tolerated. Indeed it was estimated in 2017 that the bill for treating Ugandan government officials overseas could fund the building of 10 new hospitals per annum.[46]

Funding healthcare in any African country (and for that matter any LIC or MIC) will be a challenge, particularly, as the tax revenue to GDP ratio is so low. While most European countries have a ratio in excess of 30%, most African countries are below 20%.[47] Low resource countries therefore need to embrace the potential solutions offered in this book, and similarly the public need to hold politicians accountable, and ensure that public funds are not siphoned off through corruption and state capture which has hold South Africa ransom recently.

What we need is a public intolerance of the inability to provide safe surgical care for all. We need to honour WHA resolution 68.15. No one is safe, until everyone is safe. As citizens, and civil society, we need to demand this. But this will not happen, until everyone is educated about the surgery that they are entitled to, why they should receive it, and what they are currently offered. Only then will we create an intolerance for the current state of surgical care in Africa, and agitate for change.

The surgical community has previously failed in its advocacy campaign.[48] The power of leaders in the global surgery community was weak due to fragmented ideas, resulting in an inability to publicly position the problem of safe surgery and anaesthesia. Within the political contexts, the surgical community did not capitalise on the political opportunities such as the health development goals. The data on the burden of surgical disease and the messaging to the public was poor.[48] This should not be the case anymore. There is now a wealth of knowledge which shows the position and place of surgery in health, and its impact on society. Now is the time for us to realise the delivery of safe and affordable surgery for all, as it is clear it is needed for global health priorities, and research exists to support it as a necessary and cost-effective component of health.[48]

How to communicate surgical need with politicians

Politicians don't like us presenting problems. Especially, especially when we know that governments have many problems to deal with. What we need to do is present solutions. Rifat Atun, Professor of Global Health Systems at Harvard University says, *'For every problem, bring three solutions.*' This must be our strategy. This book provides the kernels for these solutions. We now need to present these potential solutions to governments to make surgery safe and affordable for all.

So how do we communicate this strategy and these solutions for safe surgery and anaesthesia effectively to influence politicians?[49] Jeremy Shiffman provides a structure for communicating priorities with politicians based on four categories; 'actor power' (which is the strength of the individuals and organisations), the ideas, the political context and characteristics of the issue.[49] I will show you how to use this strategy to influence politicians to improve surgical care.

'Actor power' has provided a policy cohesion at a global level to provide safe surgery and anaesthesia for all, with the WHA 68.15 and WHA 76.2 resolutions. We have 'champions' for the cause through people such as John Meara from Harvard, Emmanuel Makasa from Zambia who led the first NSOAP, Salome Maswime who is Head of Global Surgery in Cape Town, and others. They are respected global voices. We have guiding institutions, who are leading

the initiative such as the Global Surgery Foundation, the Global Surgery Department at Harvard, the World Federation of the Societies of Anaesthesiologists (WFSA), the NIHR Unit for Global Surgery and the NIHR Global Group for Perioperative and Critical Care, amongst others. They pretty much speak with the same voice, and so the agreement on what is needed for safe surgery is consistent globally.

Although, the global health community has flagged surgery as a global priority as presented by Richard Horton to the WHA, where we are currently failing from an 'actor power' perspective is civil society mobilisation. Citizens and communities must tell the story. We must speak and advocate just as the communities stepped up to respond to HIV to ensure health for all.

When we consider the 'ideas', we have agreed on the internal framework necessary to deliver safe surgery, as documented in the NSOAP process. Where we are currently failing is the presentation of the external framework underpinning the need for safe surgical provision. We need to provide a clear message of the proportional contribution of surgery to population health, and the unacceptable adverse outcomes and disparity in the quality of surgical care across low-resource environments. We need to communicate the cost saving of providing adequate surgical care.

There are reasons to believe that the political context is receptive to providing safe surgery. Governments have signed WHA 68.15, providing the policy needed to support surgery. This resolution demands the reporting of national surgical indicators. These indicators provide the information necessary to document our response to surgical provision, and the quality of the surgical care. We must demand the delivery of these indicators.

Tracking the surgical indicators, and most importantly, the perioperative mortality rate has the potential to influence politicians. Just like we have tracked maternal mortality, and shone a light on its successes and failures, we can do the same with surgery. We know that the burden of mortality associated with surgery is important, exceeding that of TB, HIV and malaria combined.[24] We have data on effective surgical procedures, which will impact on global health, from the poorest billion,[31] to more broadly across all health systems.[19] We are armed to present the case for safe surgery and anaesthesia.

You may retort, that you are but one person. How can you possibly make a difference? Well simple. If you have but one opportunity, make it count. This is my strategy to maximising a single opportunity. If you can present each of these problems as solutions as a simple elevator pitch in 30 seconds, I believe that you will be on the way to successfully advocating for change. This is my favourite framework for creating a simple 30 second elevator pitch narrative.[50] Practice this; 'We have a '*real and important problem*' of …, but we have '*added substantially to what we know*' through…. We have a '*pragmatic*' solution of… for an '*outcome that matters*' which is …. Here is an '*intervention that is 'value for money"* because … and this is an '*intervention that matters*' because … The '*data are available and verifiable*' at…'

How does this sound? 'We have a '*real and important problem*' of deaths following surgery being twice the global average in Africa.[25] We have '*added substantially to what we know*' through local data which shows that too few patients receive surgery, that surgical providers are limited and patients are dying unnecessarily postoperatively on the surgical ward. Instituting a local NSOAP would be a '*pragmatic*' government solution. A '*pragmatic'* solution on the ward would be to increase postoperative surveillance to identify the patients who complicate early, which may prevent a complication progressing to death. These

interventions would impact on an '*outcome that matters*': death. They would ensure less lives are lost, mothers are saved, and people can work. We know that these interventions are *'value for money',* especially as it will ensure that children have parents, and adults will be able to work and contribute to the economy. These '*data are available and verifiable*'.'

In conclusion, if we want to improve surgical health and thereby population health, we need to do three things. We must get patients who require surgery into the operating room. We are losing lots of lives, and the economic impact of untreated surgical disease is crippling. The second issue is that the quality of surgery in low resource environments is poor. This is multifactorial, and in several circumstances, it is the current state of the health system which is a major contributor to this excess mortality. Finally, even if a patient has surgery in a low-resource environment, we should still do everything possible to provide excellent care. There are local strategies that we can provide to support quality surgical care. We need to build these interventions and processes into care provided on the ground in the surgical environment.

1. Roa L, Jumbam DT, Makasa E, et al. Global surgery and the sustainable development goals. *Br J Surg* 2019;106(2):e44-e52. doi: 10.1002/bjs.11044 [published Online First: 2019/01/09]
2. Molina G, Weiser TG, Lipsitz SR, et al. Relationship Between Cesarean Delivery Rate and Maternal and Neonatal Mortality. *JAMA* 2015;314(21):2263-70. doi: 10.1001/jama.2015.15553
3. Bishop D, Dyer RA, Maswime S, et al. Maternal and neonatal outcomes after caesarean delivery in the African Surgical Outcomes Study: a 7-day prospective observational cohort study. *Lancet Glob Health* 2019;7(4):e513-e22. doi: 10.1016/S2214-109X(19)30036-1 [published Online First: 2019/03/19]
4. Torborg A, Meyer H, Elfiky M, et al. Outcomes after Surgery for Children in Africa a Fourteen-Day Prospective Observational Cohort Study (ASOS-Paeds). *Lancet* 2023:under review.
5. Shrime MG, Bickler SW, Alkire BC, et al. Global burden of surgical disease: an estimation from the provider perspective. *Lancet Glob Health* 2015;3 Suppl 2:S8-9. doi: 10.1016/s2214-109x(14)70384-5 [published Online First: 2015/05/01]
6. Citron I, Jumbam D, Dahm J, et al. Towards equitable surgical systems: development and outcomes of a national surgical, obstetric and anaesthesia plan in Tanzania. *BMJ global health* 2019;4(2):e001282. doi: 10.1136/bmjgh-2018-001282 [published Online First: 2019/05/30]
7. Langer A, Meleis A, Knaul FM, et al. Women and Health: the key for sustainable development. *The Lancet* 2015;386(9999):1165-210. doi: 10.1016/S0140-6736(15)60497-4
8. Paterson A, Maswime S, Hardy A, et al. Postoperative outcomes associated with surgical care for women in Africa: an international risk-adjusted analysis of prospective observational cohorts. *BJA Open* 2022;4 doi: 10.1016/j.bjao.2022.100100
9. Biccard BM, Gopalan PD, Miller M, et al. Patient care and clinical outcomes for patients with COVID-19 infection admitted to African high-care or intensive care units (ACCCOS): a multicentre, prospective, observational cohort study. *The Lancet* 2021;397(10288):1885-94. doi: 10.1016/S0140-6736(21)00441-4
10. WHA. Strengthening emergency and essential surgical care and anaesthesia as a component of universal health coverage. WHA68.15 ed, 2015.
11. Meara JG, Leather AJ, Hagander L, et al. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Lancet* 2015;386(9993):569-

624. doi: 10.1016/S0140-6736(15)60160-X [published Online First: 2015/05/01]
12. UNITAR. National Surgical, Obstetric and Anaesthesia Planning Manual. In: 2020, ed. Geneva: United Nations Institute for Training and Research, 2020.
13. Global Reference List of 100 Core Health Indicators, 2015: Metadata Geneva: WHO; 2015 [cited 2021 1 March]. Available from: https://www.who.int/healthinfo/indicators/2015/metadata/en/.
14. Kamali P, Marks I, Sama G, et al. Measuring surgical systems worldwide: an update. https://blogsworldbankorg/opendata/measuring-surgical-systems-worldwide-update. World Bank: World Bank, 2018.
15. Maternal mortality. Levels and trends 2000 to 2017: WHO; 2020 [Available from: http://mmr2017.srhr.org/ accessed 11 July 2020.
16. WHO. Universal Health Coverage Geneva: WHO; 2021 [cited 2021 5 May]. Available from: https://www.who.int/healthsystems/universal_health_coverage/en/ accessed 4 May 2021.
17. Schäferhoff M, Martinez S, Ogbuoji O, et al. Trends in global health financing. *BMJ* 2019;365:l2185. doi: 10.1136/bmj.l2185
18. Watkins DA, Yamey G, Schäferhoff M, et al. Alma-Ata at 40 years: reflections from the Lancet Commission on Investing in Health. *Lancet* 2018;392(10156):1434-60. doi: 10.1016/s0140-6736(18)32389-4 [published Online First: 2018/10/23]
19. Watkins DA, Qi J, Kawakatsu Y, et al. Resource requirements for essential universal health coverage: a modelling study based on findings from Disease Control Priorities, 3rd edition. *Lancet Glob Health* 2020;8(6):e829-e39. doi: 10.1016/s2214-109x(20)30121-2 [published Online First: 2020/05/25]
20. WHO. Global spending on health: Weathering the storm. Geneva, 2020.
21. Financing Global Health 2020 [Available from: https://vizhub.healthdata.org/fgh/ accessed 13 July 2020.
22. Ritchie H, Roser M. Causes of death: OurWorldInData.org; 2018 [cited 2020 21 July]. Available from: https://ourworldindata.org/causes-of-death accessed 21 July 2020 2020.
23. The World Bank Data: The World Bank; 2021 [cited 2021 15 August 2021]. Available from: https://data.worldbank.org/country/XM accessed 15 August 2021 2021.
24. Nepogodiev D, Martin J, Biccard B, et al. Global burden of postoperative death. *Lancet* 2019;393(10170):401. doi: 10.1016/S0140-6736(18)33139-8 [published Online First: 2019/02/07]
25. Biccard BM, Madiba TE, Kluyts HL, et al. Perioperative patient outcomes in the African Surgical Outcomes Study: a 7-day prospective observational cohort study. *Lancet* 2018;391(10130):1589-98. doi: 10.1016/S0140-6736(18)30001-1 [published Online First: 2018/01/08]
26. Vollset SE, Goren E, Yuan CW, et al. Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100: a forecasting analysis for the Global Burden of Disease Study. *Lancet* 2020;396(10258):1285-306. doi: 10.1016/S0140-6736(20)30677-2 [published Online First: 20200714]
27. WHO. Projections of mortality and causes of death, 2016 to 2060: WHO; 2020 [updated 22 July 2020. Available from: https://www.who.int/healthinfo/global_burden_disease/projections/en/.
28. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med* 2006;3(11):e442. doi: 10.1371/journal.pmed.0030442 [published Online First: 2006/11/30]
29. Gouda HN, Charlson F, Sorsdahl K, et al. Burden of non-communicable diseases in sub-Saharan Africa, 1990-2017: results from the Global Burden of Disease Study 2017.

Lancet Glob Health 2019;7(10):e1375-e87. doi: 10.1016/S2214-109X(19)30374-2
30. Bollyky TJ, Templin T, Cohen M, et al. Lower-Income Countries That Face The Most Rapid Shift In Noncommunicable Disease Burden Are Also The Least Prepared. *Health Aff (Millwood)* 2017;36(11):1866-75. doi: 10.1377/hlthaff.2017.0708
31. Bukhman G, Mocumbi AO, Atun R, et al. The Lancet NCDI Poverty Commission: bridging a gap in universal health coverage for the poorest billion. *Lancet* 2020;396(10256):991-1044. doi: 10.1016/S0140-6736(20)31907-3 [published Online First: 2020/09/18]
32. Fawcus S, Moodley J. Postpartum haemorhage associated with caesarean section and caesarean hysterectomy. *Best Practice & Research Clinical Obstetrics & Gynaecology* 2013;27(2):233-49. doi: https://doi.org/10.1016/j.bpobgyn.2012.08.018
33. Biccard BM, Madiba TE, South African Surgical Outcomes Study I. The South African Surgical Outcomes Study: A 7-day prospective observational cohort study. *S Afr Med J* 2015;105(6):465-75. doi: 10.7196/SAMJ.9435 [published Online First: 2015/12/31]
34. Christie SA, Nwomeh BC, Krishnaswami S, et al. Strengthening Surgery Strengthens Health Systems: A New Paradigm and Potential Pathway for Horizontal Development in Low- and Middle-Income Countries. *World J Surg* 2019;43(3):736-43. doi: 10.1007/s00268-018-4854-9 [published Online First: 2018/11/18]
35. Stenberg K, Hanssen O, Edejer TT, et al. Financing transformative health systems towards achievement of the health Sustainable Development Goals: a model for projected resource needs in 67 low-income and middle-income countries. *Lancet Glob Health* 2017;5(9):e875-e87. doi: 10.1016/s2214-109x(17)30263-2 [published Online First: 2017/07/22]
36. Rose J, Chang DC, Weiser TG, et al. The role of surgery in global health: analysis of United States inpatient procedure frequency by condition using the Global Burden of Disease 2010 framework. *PLoS One* 2014;9(2):e89693. doi: 10.1371/journal.pone.0089693 [published Online First: 2014/03/04]
37. Wasserman I, Peters AW, Roa L, et al. Breaking Specialty Silos: Improving Global Child Health Through Essential Surgical Care. *Glob Health Sci Pract* 2020;8(2):183-89. doi: 10.9745/GHSP-D-20-00009
38. Disease control priorities cost model: World Bank; 2021 [cited 2021 15 September]. Available from: https://dcp-uw.shinyapps.io/dcp-cm/ accessed 15 September 2021.
39. Samuel JP, Reed A. The costing of operating theatre time in a secondary-level state sector hospital: A quantitative observational study. *S Afr Med J* 2021;111(6):595-600. doi: 10.7196/SAMJ.2021.v111i6.15345 [published Online First: 2021/08/13]
40. WHO. Global Health Expenditure Database Geneva: WHO; 2021 [cited 2021 4 March]. Available from: https://apps.who.int/nha/database accessed 4 March 2021.
41. Agyepong IA, Sewankambo N, Binagwaho A, et al. The path to longer and healthier lives for all Africans by 2030: the Lancet Commission on the future of health in sub-Saharan Africa. *Lancet* 2017;390(10114):2803-59. doi: 10.1016/S0140-6736(17)31509-X [published Online First: 20170913]
42. List of development aid country donors: Wikipedia; 2021 [cited 2021 15 September]. Available from: https://en.wikipedia.org/wiki/List_of_development_aid_country_donors accessed 15 September 2021.
43. Marmot M. Lower taxes or greater health equity. *The Lancet* 2022;400(10349):352-53. doi: 10.1016/S0140-6736(22)01392-7
44. Marmot M. The health gap: the challenge of an unequal world. *Lancet* 2015;386(10011):2442-4. doi: 10.1016/s0140-6736(15)00150-6 [published Online First: 2015/09/14]
45. Brinkley J. Brinkley: National leaders go abroad when they get sick. 2012.

https://www.newsday.com/opinion/commentary/national-leaders-go-abroad-when-they-get-sick-joel-brinkleyh-y24424.
46. Liedong TA. African politicians seeking medical help abroad is shameful, and harms health care. *The Conversation* 2017. https://theconversation.com/african-politicians-seeking-medical-help-abroad-is-shameful-and-harms-health-care-82771.
47. List of countries by tax revenue to GDP ratio. 2022. https://en.wikipedia.org/wiki/List_of_countries_by_tax_revenue_to_GDP_ratio.
48. Shawar YR, Shiffman J, Spiegel DA. Generation of political priority for global surgery: a qualitative policy analysis. *Lancet Glob Health* 2015;3(8):e487-e95. doi: 10.1016/s2214-109x(15)00098-4
49. Shiffman J, Smith S. Generation of political priority for global health initiatives: a framework and case study of maternal mortality. *Lancet (London, England)* 2007;370(9595):1370-79. doi: 10.1016/S0140-6736(07)61579-7
50. Greenhalgh T. How to Implement Evidence-Based Healthcare. Oxford, United Kingdom: Wiley Blackwell, 2017.