Global Surgery

An Introduction

Dominique Vervoort

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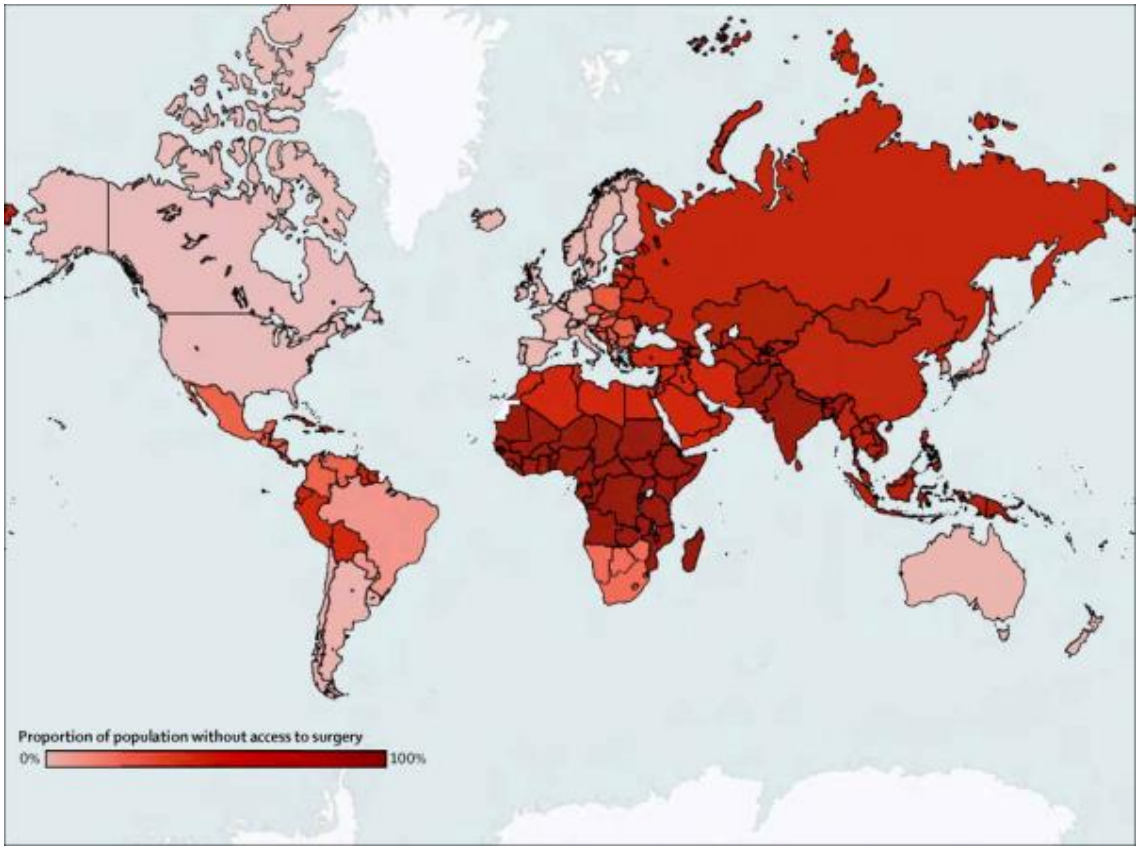
1. What is Global Surgery?

"Global Surgery" is the field of study, research, practice and advocacy within global health working towards the attainment of better health outcomes and health equity through timely access to safe surgical, anaesthesia and obstetric care throughout the world.

Facts & Figures[1]

Five billion people –five out of every seven people in the world- do not have timely access to safe surgical care when needed. Lack of surgical, anaesthesia and obstetric care is responsible for approximately 18 million preventable deaths every year, over four times the mortality due to HIV, tuberculosis and malaria combined. Besides high mortality rates, surgically treatable conditions make up 28-32% of the global burden of disease, ranging from congenital malformations to obstetric complications, from malignancies to cardiovascular disease, and from road traffic injuries to violence. Every year, 313 million operations take place around the world, yet only 6.5% takes place in the poorest third of the world, representing the people that need surgical care the most. As a result, by 2030, 2.28 million additional surgeons, anaesthesiologists and obstetricians are needed to provide the additional 143 million procedures needed per year. To support this and scale up surgical care globally, an investment of 'only' $350 billion is required, preventing a potential loss of $12.3 trillion in economic growth by LMICs.



History

In 1980, former Director-General of the World Health Organization (WHO) Dr. Halfdan Mahler brought disparities in access to and quality of surgical care to the attention of the world in his address "*Surgery and Health for All*" to the 12th biennial World Congress of the International College of Surgeons: "*The vast majority of the world's population has no access whatsoever to skilled surgical care and little is being done to find a solution. I beg of you to give serious consideration to this most serious manifestation of social inequity in health care*". Unfortunately, this moral call for action did not bring the needed paradigm shift, with surgery consistently being considered as too expensive and too complex to scale up on a global level.

In 2008, Paul Farmer (Harvard Medical School; Partners in Health) and Jim Y. Kim (Harvard Medical School; current (12th) President of the World Bank Group) published a non-surgical view of "global surgery" with their paper "*Surgery and Global Health: A View Beyond the OR*".[2] The paper coined surgery as "the neglected stepchild of global health", calling for increased attention and awareness of surgeons and policymakers about surgery as a vital component of global health.

In 2014, Caris E. Grimes et al. published "*Cost-effectiveness of Surgery in Low- and Middle-income countries: A Systematic Review*" in the World Journal of Surgery.[3] The review proved the favourable cost-effectiveness (dollars spent per DALY averted) of basic surgery in low-resource settings compared to other public health interventions, such as oral rehydration therapy, breast feeding promotion and anti-retroviral therapy for HIV. This led to the conclusion that simple surgical interventions, both life-saving and disability-preventing, should be integrated in public health policies and be accessible at district hospitals, further debunking the previous myth of the relative high costs of surgical care.

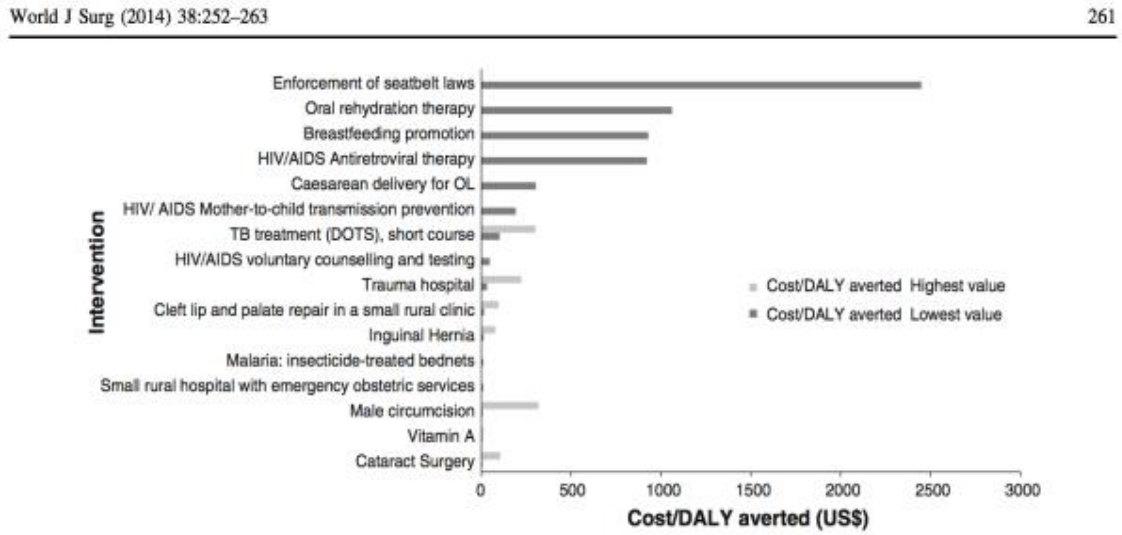


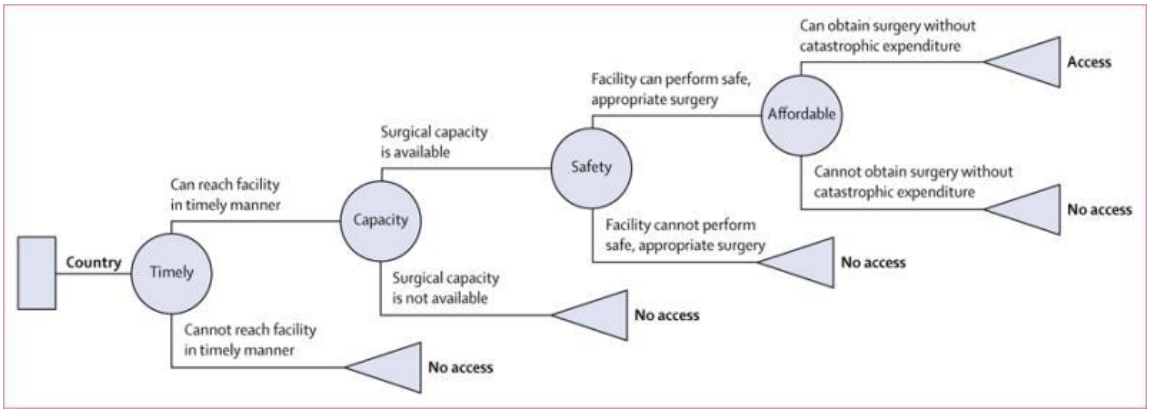
Fig. 2 Cost-effectiveness of surgical interventions compared with other public health interventions

2015 proved to be a pivotal year for global surgery. The Lancet Commission on Global Surgery (LCoGS) mapped the global state of access to surgical and anaesthesia care, which they published in their report "*Global Surgery 2030: evidence and solutions for achieving health, welfare and economic development*.", providing the international community with the needed rationale for addressing global surgical care.[1] Moreover, the WHO and its member states acknowledged the importance of addressing the global state of surgical systems to promote better health, well-being and economic growth. During the 68th World Health Assembly, the resolution WHA68.15 "*Strengthening Emergency and Essential Surgical and Anaesthesia Care as a Component of Universal Health Coverage*" was adopted, putting the surgical foot in the global health door. To bring this memorable point in time to the attention of social media, InciSioN – International Student Surgical Network started Global Surgery Day on May, 25th 2015, which has continued and increased in the years to come.

In 2017, the 70th WHA marked another big step towards achieving safe surgical care for all, with multiple stakeholders (WHO, Member States, and civil society, including NGOs and academic institutions) further drawing the attention to global surgery. Zambia was the first country to announce their National Surgical, Obstetric and Anaesthesia Plan (NSOAP) –a framework for integrating surgical care in a country's health agenda- which was incorporated in Zambia's National Health Strategic Plan for 2017-2021. Realizing that health systems strengthening cannot take place without addressing surgical systems, other countries are following, being in the process of developing their NSOAP or inspired to start the process for their country.

Access to Safe Surgery[4]

Five billion people –more than two-thirds of the world population- do not have access to safe surgical care when needed. Access is defined by the Lancet Commission on Global Surgery as (1) physically available in a timely manner, (2) having the necessary capacity, (3) being of sufficient quality and safety, and (4) being affordable.



Timely access to safe and affordable surgical care.
From: *Global Access to Surgical Care: a Modelling Study*[4]

1. *Timely*: a patient ought to be able to reach the nearest facility providing surgical care within a reasonable time (e.g., 2-hour access as defined by the LCoGS), and should be physically able to reach that facility. For example, a patient with an open-fractured leg having to walk 40 kilometres because of lack of public transportation and ambulatory services will not be able to (timely) reach the nearest facility before further complications arise.
2. *Capacity*: both infrastructure (hospital setting, hospital beds, equipment, medications) and human resources (surgical workforce, nurses, technicians, paediatricians, etc.) are needed to provide adequate surgical care, including careful pre-operative evaluation and post-operative follow-up, and, if applicable, rehabilitation.
3. *Safety*: the ability of performing safe surgery rather than mere surgery is of vital importance in order to prevent unnecessary high morbidity and mortality rates. Sterility, adequate equipment, and skilled workforce form the basis of this pillar.
4. *Affordable*: having timely availability of safe surgical care based on sufficient and capable workforce and the needed equipment is not enough to speak of full access. In many cases, patients have to pay out-of-pocket to receive the needed surgical care, which is often not possible or leads to being pushed (further) into poverty. Besides general disparities between countries, financial (and therefore health) inequity exists within countries, with the poorer parts of the populations –often the people needing care the most- having the least access.

Surgical Indicators[1]

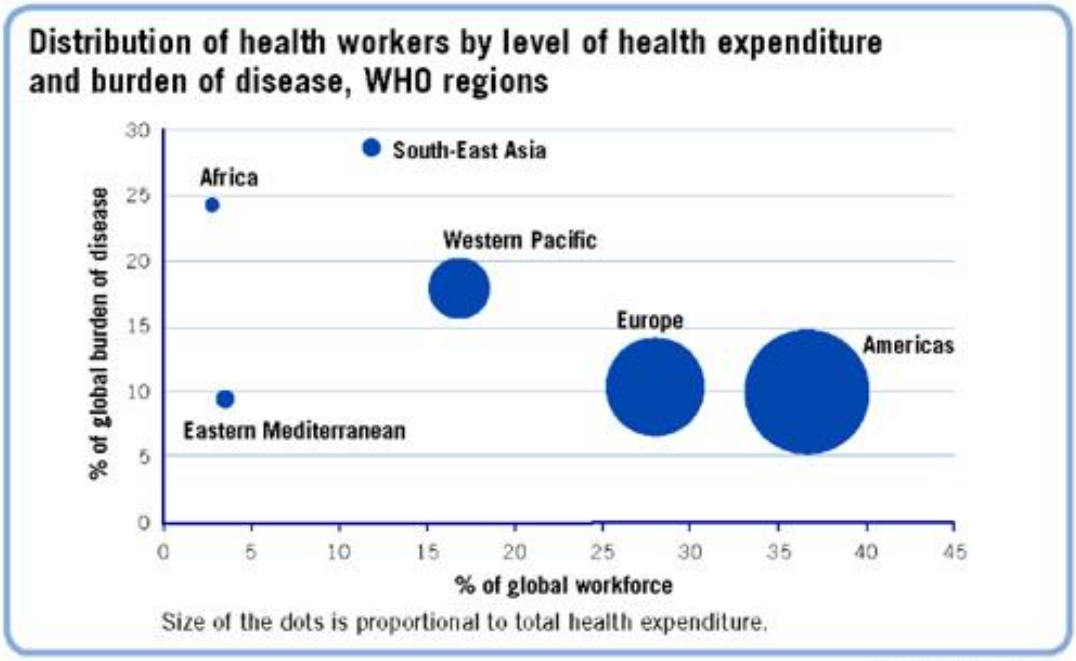
In their report "*Global Surgery 2030*", the LCoGS published 6 indicators to measure, evaluate and monitor surgical systems, which –if used together- allow for mapping a country's surgical care system and highlighting the barriers underlying reduced access:

1. *Two-hour access to surgical care*
   This indicator measures the percentage of population with theoretical two-hour access to the Bellwether procedures (caesarean section, emergency laparotomy and open fracture repair). District hospitals that are able to perform the Bellwether procedures function at a level of complexity that enables the delivery of other related surgical care. Access as such can be limited by the distance needing to travel to the nearest facility providing surgical care and transportation infrastructure (roads, public transportation, private transportation). By 2030, the LCoGS aims to have two-hour coverage of at least 80% of the population.
2. *Surgical specialist (surgeons, anaesthesiologists and obstetricians, SAO) workforce*
   The SAO indicator measures all surgeons, anaesthesiologists and obstetricians per 100,000 population. The effectiveness threshold, above which the decline in number of deaths reaches a plateau, comes down to approximately 20(-40) SAOs per 100,000 population. Therefore, the LCoGS proposes the goal of reaching 100% of countries with at least 20 SAOs per 100,000 population by 2030.

3. *Surgical volume*
   Surgical volume is measured as the number of operations done in an operating room per 100,000 population per year. Similar to the SAO workforce, increasing the number of interventions beyond a threshold of approximately 5,800 procedures per 100,000 population reduces the cost-effectiveness (and increases unnecessary interventions and risks) of surgical care. As a result, the LCoGS has set the target of 5,000 procedures per 100,000 population by 2030 for all countries.
4. *Post-operative mortality rate (POMR)*
   The POMR indicator includes all-cause mortality prior to discharge of patients who received surgical care in an operating room (number of patients divided by total number of procedures), to assess the safety and quality of the intervention in itself, and post-operative management by the respective facilities. To monitor, evaluate and address POMR, a 100% tracking rate of POMR is aimed for by 2030.
5. *Impoverishing expenditure*
   This indicator measures (percentage of households) the protection against impoverishing expenditure from out-of-pocket payments for emergency and essential surgical care. By 2030, a target of 100% protection against impoverishing expenditure is set for all countries.
6. *Catastrophic expenditure*
   This indicator measures (percentage of households) the protection against catastrophic expenditure from out-of-pocket payments for emergency and essential surgical care. By 2030, a target of 100% protection against catastrophic expenditure is set for all countries.

Human Resources for Health

The human resources for health (HRH) crisis surpassed health systems financing as (one of the) most critical issues underlying access to healthcare. Currently, a shortage of 7.2 million health workers exists, which is estimated to rise up to 12.9 million by 2035 as a result of the rapid increase in the world population.[5] Moreover, besides absolute shortages, inequity exists between and within regions, with the African Region and Southeast Asia possessing 2-3% and 12% of the health workforce, respectively, despite having 24% and 30% of the global burden of disease.[6]



(Source: WHO, 2006[5])

In terms of surgical workforce, relative shortages pose an even bigger problem. For example, in East Africa, there are only 2.5 fully trained surgeons per million population, compared to 56.8 per million in the United States of America.[7] Afghanistan has only 9 anaesthesiologists for 32 million people, whereas the Central African Republic recently lost its last anaesthesiologist, leaving 8.9 million inhabitants without physician anaesthesia providers.[8] Lastly, Africa holds only 3% of the world's 500,000 obstetricians, contributing to the global (preventable) maternal mortality rate of 300,000 women during childbirth.[9]

These shortages are largely a result of limited training and capacity building on the one hand, and brain drain on the other hand. Brain drain is the term used for the migration of skilled workers (e.g., healthcare professionals) from one country or region to another, resulting in the relative loss of capacity ("brain drain") in that area. In the field of medicine and surgery, brain drain occurs mostly from LMICs to HICs, with 12% of the SAOs in HICs originally being trained in LMICs. As a result, "the strong become stronger and the weak become weaker".

"It takes $150,000 to train a doctor here in Africa. That doctor leaves after an internship, and Africa has lost not just a $150,000 but everything that goes with it. A person should be able to do their studies and go and work anywhere in the world. That is what globalization probably is all about. But by so doing, the weaker get weaker and the stronger, get stronger."

Dr. Peter Ngatia, Director of Capacity Building for the African Medical Research Foundation (AMREF)

To make up for the lack of surgical services, up to 80% of procedures in the developing world are done by less specialized health workers (non-physician clinicians, NPCs) in terms of task-shifting. Task-shifting is defined as "*extending the scope of practice of existing cadres of health workers to allow for the rational redistribution of tasks among the health workforce in order to make better use of human resources and ease bottlenecks in the service delivery system*" by delegating certain medical responsibilities to less specialized health workers. These mid-level workers provide surgery and/or anaesthesia in 25 of 47 sub-Saharan African countries, with prominent roles in Mozambique ('*técnicos de cirurgia*') and Malawi ('*Clinical Officers*'), especially for obstetric surgery.[10]

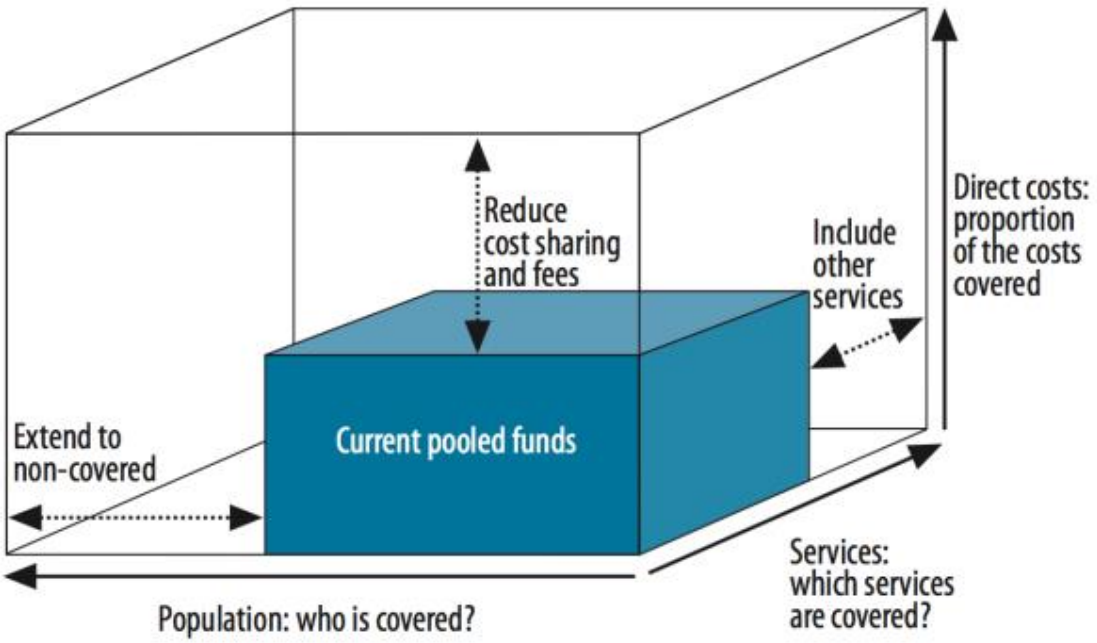
Mozambique is a country in East Africa with a population of 28.8 million people, yet only 425 physicians, 26 obstetricians and 18 general surgeons. As a result, in 1984, the country started training surgical NPCs, the *técnicos de cirurgia*, to cover the existing lack of care delivery.[10] These NPCs are graduated nurses or medical assistants that consequently undergo two-year classroom-based teaching and one year of surgical internship under the supervision of a surgeon. Besides a shorter training period, the costs of their training ($19,000 versus $74,000) and annual salary ($3,800 versus $10,000) are much lower compared to medical officers. As a result, over a calculated lifetime, these NPCs are three times more cost-effective than medical officers for obstetric surgery. Moreover, retention rates appear much higher than those of medical doctors, with 90% remaining in district hospitals, compared to none of the physicians in a 7-year follow-up study. Lastly, and maybe most importantly, NPCs are able to perform procedures safely and effectively, with similar complication rates compared to obstetricians, and as a result, maternal mortality rates dropped 64% between 1990 and 2013.

With only 1 physician per 62,000 people, Malawi has one of the lowest physician densities in the world as a result of expensive medical training programmes and continuous brain drain. In 1976, Malawi introduced *Clinical Officers*, NPCs with a similar training and role as those in Mozambique. These Clinical Officers perform up to 93% of major obstetric surgeries (C-sections, tubal ligations, hysterectomies, etc.) in district hospitals with immediate and 24-hour post-operative complications rates similar to specialists.[11] Similarly, 112 orthopaedic Clinical Officers have been trained since 1984, of which none have left the country, indicating higher retention rates because of the lack of formal recognition of these roles in other countries.

Universal Health Coverage[12]

Every year, 33 million people face catastrophic expenditure because of out-of-pocket payments for surgical care, with an additional 48 million when including non-medical costs (e.g., transportation, lodging, inability to provide income, meals). As a result, 81 million people are pushed (further) into poverty to access surgical care.[1]

Universal health coverage (UHC), as defined by the WHO, ensures *"…that all people and communities can use the promotive, preventive, curative, rehabilitative and palliative health services they need, of sufficient quality to be effective, while also ensuring that the use of these services does not expose the user to financial hardship.".* In 2005, the WHO adopted the resolution WHA58.33 "*Sustainable Health Financing, Universal Coverage and Social Health Insurance"* calling member states to scale up their respective health systems and include UHC packages, including financial risk protection at the time of needing medical care. In 2015, the new Sustainable Development Goals included UHC in SDG3 (*Ensure healthy lives and promote wellbeing for all at all ages*), as SDG3.8: *achieve UHC, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all*.



Three dimensions to consider when moving towards universal health coverage.
From: Tracking Universal Health Coverage: First Global Monitoring Report[12]

It is important, however, to make the distinction between universal health coverage and mere universal health access. Access is solely the *ability* to physically access healthcare, being financially accessible and overall acceptable. In contrast, coverage is *actual* access to healthcare, implying timeliness, universality and high quality of care, and including financial risk protection, thus ensuring that nobody suffers from financial hardship when accessing medical care.

Currently, UHC packages are available in only a limited number of (mainly high-income) countries, resulting in 11% of people in LMICs (a total of 150 million people globally) suffering catastrophic expenditure, and 5% of people in LMICs (100 million globally) being pushed into poverty for healthcare costs. In sub-Saharan Africa and Southeast Asia, only 5 to 10% of the population is covered, compared to 20 to 60% of people in middle-income countries.

Overall, health expenditure is correlated with the population's health status and longevity. However, LMICs invest only $60 per person per year on healthcare, compared to $3000-4000 per person per year by HICs. Nevertheless, all countries have the financial scope to (1) increase health expenditure, and (2) raise more money for health domestically through, for example, increasing the efficiency of revenue collection (taxation), reprioritizing government budgets, and innovative financing through taxation of air tickets and tobacco, and putting levies on foreign exchange markets.

Overall, UHC is a cost-effective investment, with every dollar invested in health giving a tenfold return in terms of economic growth and productivity. 24% of the full income growth in LMICs in the past decade is a result of health improvement (in terms of life years gained), further strengthening the correlation between health expenditure, health status and economic growth.

Sustainable Development Goals (SDGs)

In 2015, the Millennium Development Goals (MDGs) transitioned into the broader, inclusive framework the post-2015 Sustainable Development Goals (SDGs) represent, with a human rights-based (equity) and systems-based approach (horizontal health systems strengthening) at the core. The SDGs integrate actions across multiple sectors to enable human development to proceed in a manner that optimizes the equitable use of planetary resources without endangering sustainability. Herein, health plays a central role, being responsible for human development and economic growth, and child and maternal mortality having become measures to monitor nations' overall development.

The annual price tag of reaching the SDG health targets in 67 LMICs accounting for 75% of the world population is estimated at $371 billion (versus the current investments of $134 billion), or $58 per person.[13] Such an investment could prevent 97 premature deaths and add up to 8.4 additional years of life expectancy in some countries by 2030. Moreover, 85% of these costs can be met with domestic resources, with the 32 poorest countries needing additional support from higher-income countries. As such, investing in health is not only needed to achieve health for all, it is cost-effective and plausible on a global level.

However, achieving the health-related SDGs will not be possible without including emergency and essential surgical and anaesthesia care as vital components of effective and strong health systems.

SDG1: *End poverty in all its forms everywhere*

SDG1.2: *By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.*

- ⇨ Every year, 81 million people are pushed (further) into poverty due to out-of-pocket payments to access surgical care. Moreover, those unable to pay suffer preventable and/or treatable conditions preventing them to fully contribute to their nation's economy. As a result, low- and middle-income countries face a loss of $12.3 trillion in economic growth by 2030 unless urgent investments occur.

SDG3: *Ensure healthy lives and promote well-being for all at all ages*

SDG3.1: *By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births.*

- ⇨ In the past decades, maternal mortality during childbirth has dropped from over 500,000 to 300,000 women per year.[14] However, over 830 women continue to die during childbirth every day, a majority of which could be prevented with access to safe peripartum care, including the prevention and treatment of complications (e.g., bleeding, obstruction, fistula) and availability of safe caesarean section delivery.

SDG3.2: *By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births*.

- ⇨ At least 2.6 million babies are stillborn every year, of which at least 1.2 million begin labour alive, but die before birth. Of these, 98% occurs in LMICs due to the lack of the necessary obstetric care during childbirth.[15] Global under-5 mortality rates have decreased from 91 (12.7 million) to 43 (5.9 million) deaths per 1,000 live births between 1990 and 2015.[16] However, congenital conditions, conditions resulting from pregnancy complications, and injuries remain among the top five causes of under-5 mortality.

SDG3.4: *By 2030, reduce by one-third premature mortality from non-communicable diseases through prevention and treatment (and promote health and well-being).*

- ⇨ Surgical care plays an important role in many non-communicable diseases (NCDs), and is therefore often key in the treatment of NCDs in high-income countries. However, LMICs are increasingly faced with NCDs due to globalization and the consequent epidemiological transition, with cardiovascular disease, stroke and malignancies being the leading killers globally, most of which could be treated or halted with the necessary surgical care.

SDG3.6: *By 2020, halve the number of global deaths and injuries from road traffic accidents*.

- ⇨ Every year, 1.25 million people die on the roads, of which 90% occurs in LMICs, despite having only 54% of the world's vehicles. Moreover, an additional 20 to 50 million people remain injured or disabled as a result.[17] Road traffic injuries have a major economic impact on individuals, families and entire nations, costing up to 3% of the gross domestic product. Even though prevention and road safety measures remain the main focus in addressing this issue, timely access to essential surgical care is inevitable to severely reduce the mortality and morbidity following road traffic accidents.

SDG3.8: *achieve Universal Health Coverage (UHC), including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all*.

- ⇨ Every year, 81 million people are pushed (further) into poverty due to out-of-pocket payments to access surgical care. Countries should work to attain UHC packages in their countries, including free or affordable basic and emergency surgical services for all, given its life-saving, humanitarian and economic implication.

As a result, access to safe surgical care is able to contribute to achieving, and in fact necessary to achieve the Sustainable Development Goal health targets by 2030.

Social Determinants of Health[18]

The Social Determinants of Health (SDH) are "*the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life, including economic and social policies, development agendas, social norms and political systems. Shaped by an equal distribution of money, power and resources at global, national and local levels, the social determinants of health are mostly responsible for health inequities seen across the globe*".

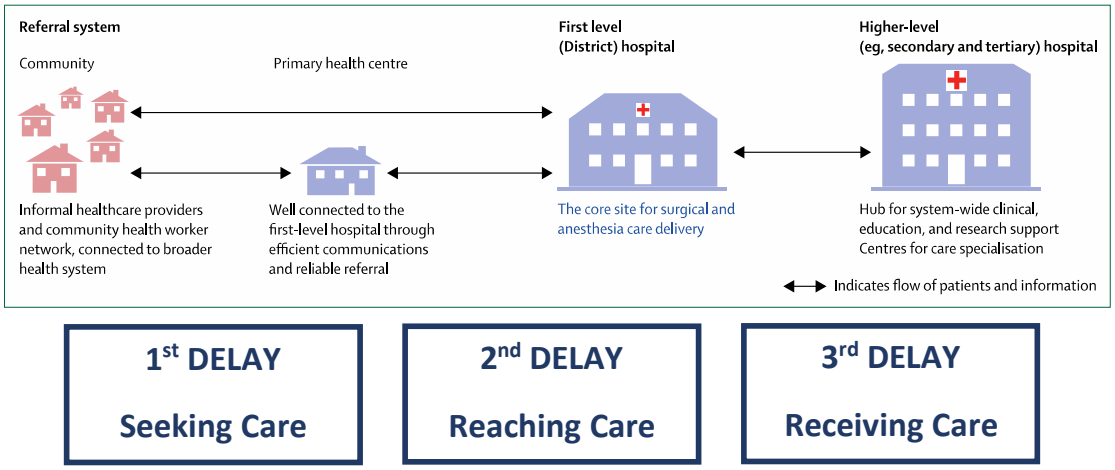
The SDH have been well-established in public and global health, yet have only minimally been applied to surgical and anaesthesia care. Nevertheless, the SDH form a concise and informative framework to discuss access to surgical care.

1. Misdiagnosis, and late or no diagnosis of surgically treatable conditions and preventable emergency conditions and deaths are promoted by poverty, lack of education, and general lack of access to healthcare;
2. Surgical health outcomes are influenced by political decisions and war promoting food maldistribution, population displacement, and health systems disturbance;
3. Surgical health outcomes are influenced by a country's policy decisiveness locally and globally;
4. Provision of adequate -qualitative and quantitative- equipment (including medicines and blood and tissue components), infrastructure and human resources;
5. Gender and age contribute to disparities in accessing emergency and/or surgical care, with women and children disproportionally discriminated again in some cultures and societies.

Three Delays Framework

The "Three Delays Framework" is a model used to better understand the factors influencing access to surgical and anaesthesia care, and solving the problems thereof.

1. *First Delay: delay in deciding to seek care.*
   This delay is a result of cultural beliefs, poor perception of quality of care, lack of awareness of available services, geographical restrictions, financial limitations, and societal inequalities.
2. *Second Delay: delay in reaching care.*
   Poor transportation and road infrastructure, costly transportation services, challenging geographical terrains, and poor organization of the relevant healthcare facilities promote and sustain the delay in reaching surgical care.
3. *Third Delay: delay in receiving care.*
   Inadequate referral systems, poorly trained health workforce, poor facilities, inadequate in-hospital care, and lack of (essential) medicines are a final barrier in accessing surgical care.



In order to tackle the issues affecting access to emergency and essential surgical care, it is important to reduce all three delays, for which a strong pre-hospital network, comprehensive community participation, emergency transportation, infrastructure and resource investment will prove crucial. Moreover, through advocacy and education, individuals and international organizations are able to positively affect health outcomes indirectly.

2. What are the next steps in Global Surgery?

To achieve safe and affordable surgical and anaesthesia care for everyone, everywhere, when needed, multidisciplinary efforts are needed on all levels, with a mixture of bottom-up and top-down involvement, dynamic stakeholder engagement, and leadership by Ministries of Health. The international community should transition to a coherent movement recognizing and including surgery and anaesthesia as integral components of universal health coverage and primary care, in order to strengthen public health overall.

Besides international involvement and policymaking, countries will have to address surgical systems on a country level through the creation of NSOAPs. The creation of such plans involves creating a baseline assessment of the current state of all health facilities (based on the surgical indicators) individually and the surgical health system nationally. This will allow for realistic goals to be set, and transparent monitoring and evaluation of the implementation thereof.

In terms of capacity building, both a national and international approach is necessary. Firstly, countries will have to increase the number of locally trained health workers through the establishment of affordable and adequate training institutions, and reprioritizing government budgets with a focus on healthcare and education. Medical students themselves enter a new field within global health, making them uniquely positioned as the first generation to have Global Surgery as a career option from the beginning, and potentially know more about this field than their professors and teachers. Even though career paths may not formally exist yet, students may be the first to walk or even create these paths. Being the changemakers of 2030, it is of utmost importance to recognize and invest in the (public) health professionals of the future.

Secondly, North-South and South-South collaborations allow for skills and knowledge exchange, and increased training and funding (scholarship) opportunities through, for example, twinning programs. Such twinning programs –linking a hospital or university from a HIC with one from an LMIC- ought to be based on due diligence (choosing partners wisely, and monitoring and evaluating them) and transparency. These partnerships allow for (1) the training of residents and specialists in a high-income, high-resource setting, and (2) local training of health workers by visiting teams. The latter, however, needs to be included in a sustainable framework, allowing follow-up, continuous patient care and sustainability of said programmes.

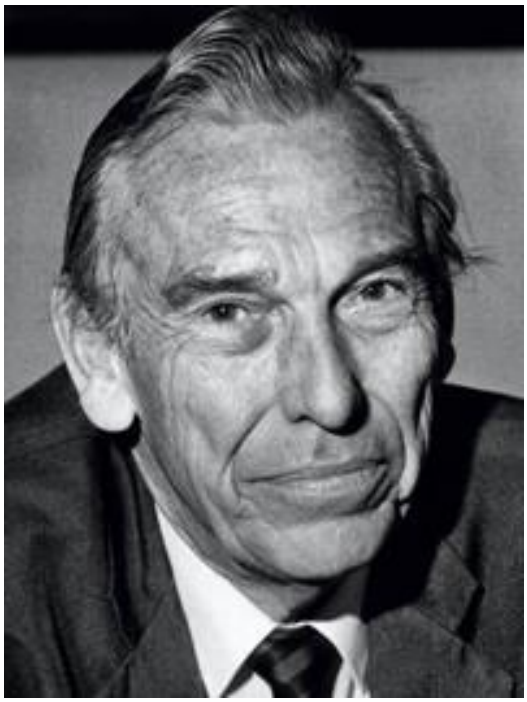
Similarly, building and rebuilding infrastructure in the public sector, with an emphasis on the district hospital level, ought to be prioritized to (1) increase physical accessibility of facilities providing the needed (surgical) care, and (2) increase in-hospital care delivery, improving safety and quality, and increasing timeliness.

Lastly, to make surgical care financially accessible for patients at the point of care, governments need to introduce universal health coverage packages with financial risk protection, including basic surgical and essential surgical care. UHC can only effectively be achieved and implemented, however, if equity mechanisms are strengthened, requiring identifying factors predisposing, precipitating or perpetuating people to reduced resilience and health risks. Therefore, it is crucial for UHC discussions to be inclusive, recognizing existing disparities and inequities underlying the global burden of disease and access to healthcare services.

Despite increasing awareness about the importance of surgical care as an essential part of health systems, sustained advocacy is needed to hold international and national leaders accountable for the inequities in accessing surgery and anaesthesia between and within regions and countries. If we are to reduce the more than 17 million preventable deaths due to lack of surgical care every year, and as such work to attain the Sustainable Development Goals by 2030, an integrated and collaborative approach is urgently needed.

"Surgery is a practical affair. It has to be by its very nature. Does it have underlying philosophy? I think it does. It cannot escape the political, social, and economic factors that influence all human endeavours. Social injustice is socially unjust in any field of endeavour, and the world will not tolerate it for much longer. So the distribution of surgical resources in countries and throughout the world must come under scrutiny in the same way as any other intellectual, scientific, technical, social or economic commodity. The era of only the best for the few and nothing for the many is drawing to a close."

Dr. Halfdan Mahler, former Director-General of the World Health Organization



3. Further Information

- *WHA68.15: Strengthening Emergency and Essential Surgical Care and Anaesthesia as a Component of Universal Health Coverage*
  http://apps.who.int/medicinedocs/documents/s21904en/s21904en.pdf
  World Health Organization
- *Surgical Care Systems Strengthening: Developing national surgical, obstetric and anaesthesia plans*
  http://www.who.int/surgery/publications/scss/en/
  World Health Organization; Harvard Medical School Program in Global Surgery and Social Change
- *Program in Global Surgery and Social Change*
  http://www.pgssc.org
  Harvard Medical School
- *Global Initiative on Emergency and Essential Surgical Care*
  http://www.who.int/surgery/en/
  World Health Organization – Emergency and Essential Surgical Care Programme
- *World Development Indicators (WDI)*
  http://data.worldbank.org/data-catalog/world-development-indicators
  World Bank Group
- *World Anaesthesiology Workforce*
  http://www.wfsahq.org/workforce-map
  World Federation of Societies of Anaesthesiologists
- *Surgical Workforce*
  http://www.who.int/gho/health_workforce/surgical/en/
  World Health Organization
- *Global Neurosurgical Workforce Map*
  http://www.wfns.org/menu/61/global-neurosurgical-workforce-map
  World Federation of Neurosurgical Societies
- *Creating a Global Surgery National Working Group*
  http://incisionetwork.org/about/national%20working%20groups.html
  InciSioN – International Student Surgical Network
- *Together on the Road to Universal Health Coverage: a Call to Action*
  http://www.who.int/universal_health_coverage/road-to-uhc/en/
  World Health Organization
- *Global Strategy on Human Resources for Health: Workforce 2030*
  http://who.int/hrh/resources/globstrathrh-2030/en/
  World Health Organization

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Email: incision.students@gmail.com

Author: Dominique Vervoort – InciSioN Coordinator 2017-2018

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