

**Notable Grand Rounds**

of the

**Michael & Marian Ilitch  
Department of Surgery**

Wayne State University  
School of Medicine

Detroit, Michigan, USA

**August 11, 2021**

### **About Notable Grand Rounds**

These assembled papers are edited transcripts of didactic lectures given by mainly senior residents, but also some distinguished attending and guests, at the Grand Rounds of the Michael and Marian Ilitch Department of Surgery at the Wayne State University School of Medicine.

Every week, approximately 50 faculty attending surgeons and surgical residents meet to conduct postmortems on cases that did not go well. That “Mortality and Morbidity” conference is followed immediately by Grand Rounds.

This collection is not intended as a scholarly journal, but in a significant way it is a peer reviewed publication by virtue of the fact that every presentation is examined in great detail by those 50 or so surgeons.

It serves to honor the presenters for their effort, to potentially serve as first draft for an article for submission to a medical journal, to let residents and potential residents see the high standard achieved by their peers and expected of them, and by no means least, to contribute to better patient care.

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## Global Surgery

by Todd Lavery, MD, FACS

August 11, 2021

### Objective

This paper seeks to elucidate the need globally for surgical care, to describe the challenge of getting global surgery accepted as an essential component of the global health conversation.

### The Need for Global Surgery

There are about 7.8 billion people on the earth. Their health is global health. But what exactly is that? It is hard to get agreement on a definition. Koplan et al. offer that it is “An area for study, research, and practice that places a priority on improving health and achieving health equity for all people worldwide.” Kickbush et al defines it as “Those health issues that transcend national boundaries and governments and call for action on global forces that determine the health of people.” And McFarlane et al. say it comprises the “Worldwide improvement of health, reduction of disparities, and protection against global threats that disregard national borders.”

There are certainly some commonalities among those definitions but also differences in focus—as between geography, justice and equity, and directionality (improvement).

However global health is defined, global surgery is a subset of it. There's a lot of ways we could talk about those 7.8 billion people. We could break them down by how many men and women there are in the world, we could break them down by gender, we could break them down according to their possession of cell phones—75% are going to have a cell phone already, and 25% won't. You could describe them in terms of access to clean water, income, language, and all the ways shown in Figure 1.



Figure 1

But what if we broke them down by access to safe surgical and anesthesia care? Currently, five billion people lack such access when they need it. It is estimated that about 143 million additional procedures are needed each year in low and middle income countries to save lives and prevent disability. In graphic terms, that means about one third of the world has access to surgical care when needed and two thirds do not (*Lancet* Commission on Global Surgery).

The distribution of those who lack access to surgical care is not even, as Figure 2 shows. America is clearly doing well but areas of sub-Saharan Africa and Asia could definitely use some help. Dr. Jim Kim, a former head of the World Bank, and his colleague Dr. Paul Farmer call surgery the “neglected stepchild of global health.” For a long time, it did not have a seat at the table discussing global health. This neglect stemmed largely from three myths dispelled only recent-

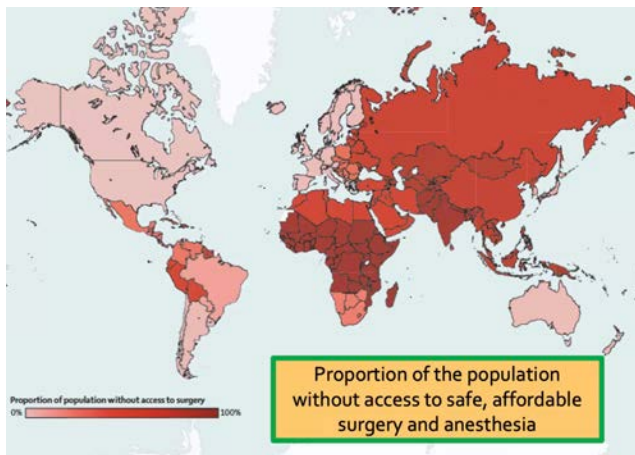


Figure 2

ly—within the last decade. Today, not only has Global Health become more prominent, but also global surgery has become more prominent within the realm of global health.

### Three Myths

It used to be thought that surgical disease was just a small part of the Global Burden of Disease, which was held to consist mainly of malaria, HIV/AIDS, TB, and other major medical conditions. Hernias were apparently not much of a burden. That was the first myth. The second myth was that surgical care was too complex and too expensive compared to vaccines and antibiotics. Conjuring up an operating room in the middle of nowhere was not thought to be an option. The third myth was that there were no surgical champions anyway—no one pushing the cause.

The seminal events and institutions that broke down these myths were the Global Burden of Disease study, the *Lancet* Commission, the World Health Assembly, and the World Health Organization (WHO). Figure 3, from Global Burden of Disease, destroys the myth that surgical burden of disease is minimal. It showed that trauma (injuries) constituted about 10% of the Global Burden of Disease. But there's been an epidemiologic shift between non-communicable diseases, which have been growing, and communicable diseases, which have been decreasing.

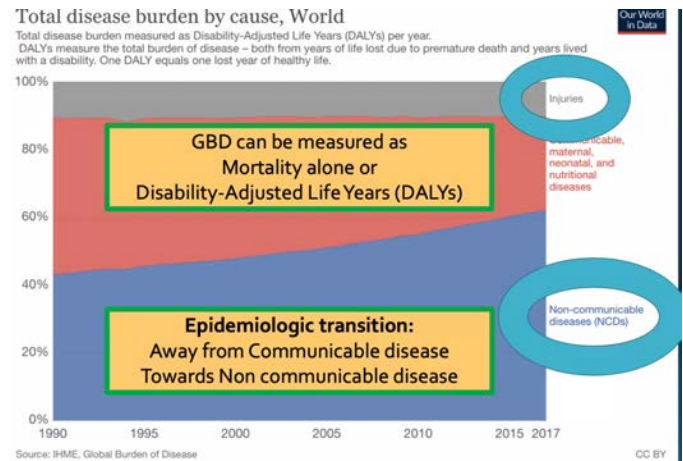


Figure 3

**Myth #1: The surgical burden of disease is negligible:** Mortality is often used as a measure of the burden of disease because it is easily measurable. But it does not tell the whole story. The disability-adjusted life year (DALY) tells it more fully. DALYs can be years of life lost (simple mortality) but also years of life lived with a disability. Figure 4 shows that 30 years ago communicable diseases such as diarrhea and infections imposed the heaviest burden.

Today, cancer and cardiovascular disease are by far the biggest component of the Global Burden of Disease. Neonatal disorders are decreasing, and diarrhea and other infectious diseases are essentially falling off the map. Much of the credit for that goes to clean water, waste management,



Figure 4

and primary care—drivers of the epidemiologic shift.

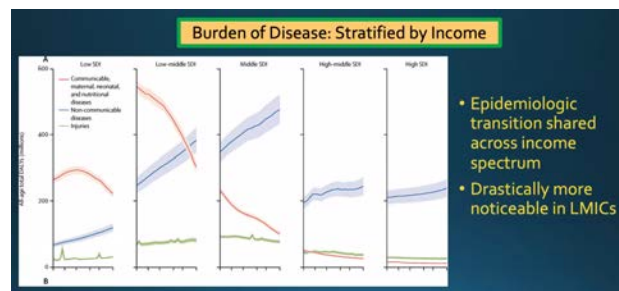


Figure 5

Figure 5 illustrate the transition in terms of national income. The red lines showing communicable diseases are falling decreasing while the blue lines representing non-communicable disease are increasing. The trend is across the board, but is especially salient in the low, middle and middle income countries.

Death and disability due to trauma exceeds death and disability due to HIV/AIDS, TB, and malaria combined. But for every \$1 spent on trauma internationally, \$32 is spent on those other diseases (see Figure 6). Of course we must not neglect those other diseases but it makes sense to put money wherever the Global Burden of Disease is actually at—which has not been happening.

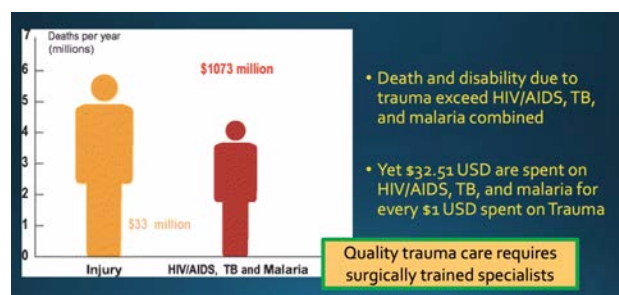


Figure 6

With regard to cancer, whose growth is shown in light blue in Figure 7, 65% of the burden is borne by surgery. This is a huge and growing need globally. Part of the injustice of cancer is that the survival rate is absolutely tied to national income

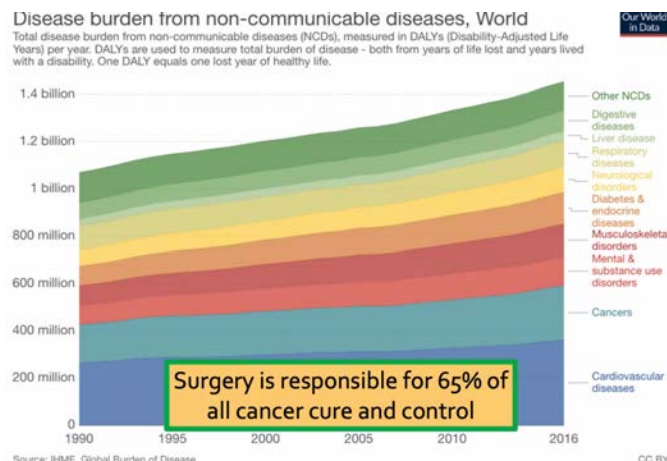


Figure 7

(see Figure 8). Citizens of high-income countries can survive many of the cancers listed, but in lower income countries, many of those cancers become much more mortal.

In 2006, the finding from Debas' Global Burden of Disease study that around 11% of the Global Burden of Disease was surgical turned heads. A few years later, Shrime updated Debas by re-framing the question from "How many people need to go to the OR?" to "How many people need a surgeon?" (surgeons do non-operative consults as well) and found that up to one third of the Global Burden of Disease involves surgical care in some form. That was a big enough slice of the pie in the global health conversation to secure a permanent seat for surgery at the table.

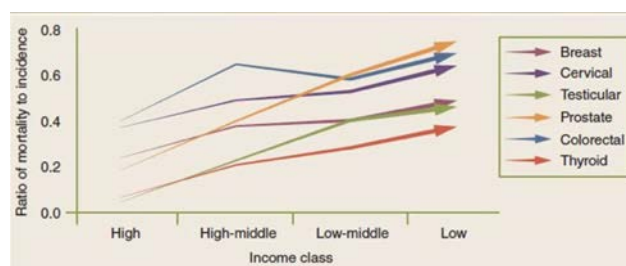


Figure 8



**Myth #2: Surgical care is too expensive:** Figure 9 shows that general surgery is quite cost effective in terms of dollars per DALY averted—not as much as bed nets and vaccines but more than antiretroviral therapy for HIV. Overall, surgery delivers "bang for the buck."

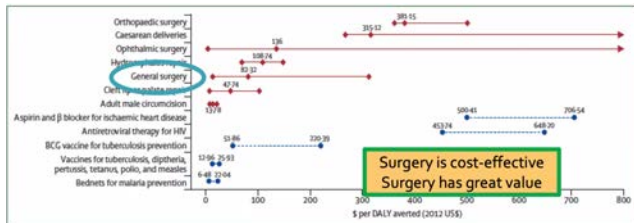


Figure 9: Cost-effectiveness of surgery in low-income and middle-income countries compared with other public health interventions. Data points are medians, error bars show range. Surgical interventions are denoted by the diamonds and solid lines, public health interventions by the circles and dashed lines. Reproduced from Chao and colleagues,<sup>20</sup> by permission of Elsevier. DALY=disability-adjusted life-year.

Figure 9

Figure 10 charts GDP lost because of the lack of surgical care. Over the course of this 15 year projection over \$12 trillion are estimated to be lost on gross domestic product for countries unable to provide surgical care for their populations. This is essentially showing that rather than being too expensive to deliver, surgical care it is actually too expensive *not* to deliver.

**Myth #3: There are no champions of surgery.** Scott *et al.* found that a majority (62%) of American medical students expressed interest in participating in a global surgical program, and that 84% reported that global surgery was rarely or never addressed during their medical school

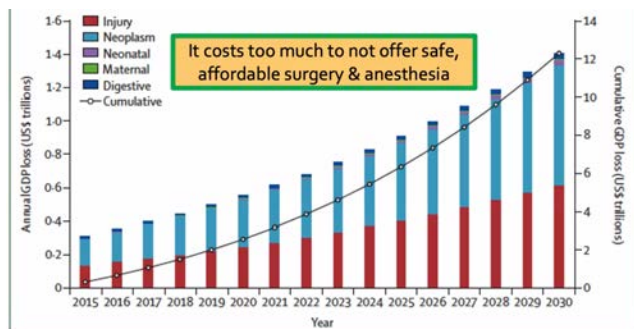


Figure 10: Annual and cumulative GDP lost in low-income and middle-income countries from five categories of surgical conditions (2010 US\$, purchasing power parity)<sup>20</sup>. Data are based on WHO's Projecting the Economic Cost of Ill-Health (EPIC) model (2010 US\$, purchasing power parity). GDP=gross domestic product.

Figure 10

curriculum. Powell *et al.* surveyed residents from the American College of Surgeons, finding that a majority (92%) expressed interest in international rotation, with many planning to volunteer in the future. Clearly the interest is there; the question now is how to pair interest with opportunity?

In sum: Surgery is by no means a small part of the burden of care, and may indeed account for up to a third of it; It is too expensive not to operate on people in need of surgery; and there is plenty of interest among surgeons in contributing to global surgical burden of disease reduction. The result is the relatively new field of Global Surgery, defined as an area of study, research, practice and advocacy that seeks to improve health outcomes and achieve equity for all people who need surgical and anesthesia care, with a special emphasis on underserved patients and populations in crisis.

## Challenges to Global Surgery

The moment the field was birthed, it faced several challenges.

**Challenge #1: terminology**—how to categorize countries. The map in Figure 11 (from the French magazine *L'Observateur* in 1952) divides the globe into first, second, and third world countries. But a third world nation is not necessarily a low income country, so the classification is not particularly helpful. It would have been more helpful at that time (during the Cold War) to talk about NATO allies versus the communist bloc.

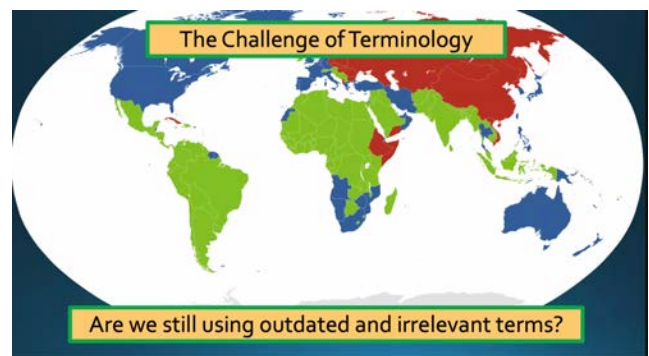


Figure 11

The World Bank updated the classification by going to "developed or developing" nations (Figure 12). The countries in green were assumed to be developing on the basis that they were not yet developed.



Figure 12

The problem with that is shown in Figure 13, depicting two "developing" nations, Mexico and Malawi. Mexico's gross national income per capita has more than doubled over the last 25 years, from \$4,000 to \$10,000. In that same period, Malawi has continued to get by at well under par for sub-Saharan Africa. Does it really help to lump Mexico and Malawi together as developing nations?

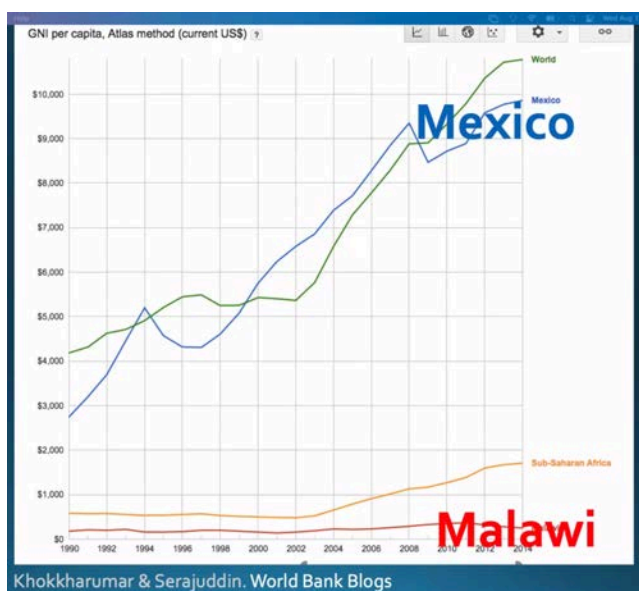


Figure 13

Today we are more likely to talk in terms of high, middle, and low income countries (Figure 14). It does a better breakdown and better correlates to the health care opportunities available within those countries. So those will be much more helpful terms for us to continue using.

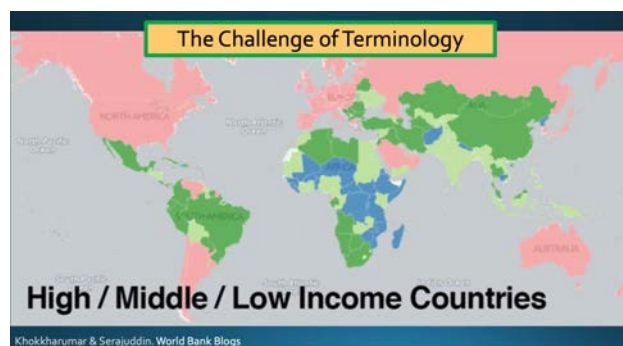


Figure 14

**Challenge #2: Culture.** Geert Hofstede offers a collection of maps showing national and cultural differences (Figure 15). There are many other aspects of culture but different cultures have different power gaps. Some think short term; others, long term. They have varied desires for avoidance, uncertainty, collectivism/individualism, etc. Culture affects how medicine and (particularly) how surgery is practiced. This presents huge challenges, but also huge opportunities. Steve Corbett and Brian Fickert's book *When Helping Hurts* presents a paradigm for preventing helpers from becoming herders. Offering the right kind of help at the right time in the right way

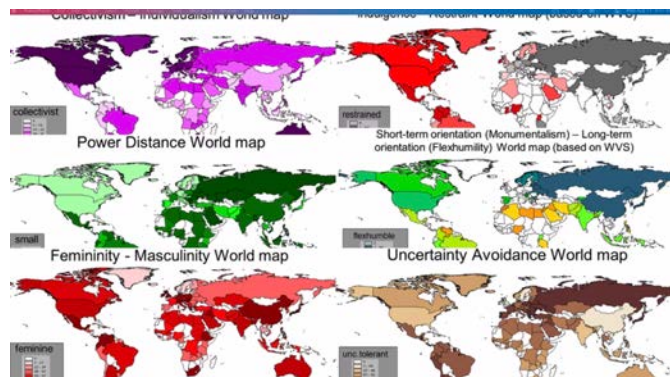


Figure 15

is critical. It is painful to watch the God complex of a “developed” or high income country offering help in a way that takes away the empowerment of people in low income countries. This happens, I believe, when people think of any kind of assistance as “relief work.” There is a time and a place for relief work—often after natural disaster, when people can do little for themselves because their infrastructure has been destroyed. But relief work should be followed as quickly as possible by rehabilitation—helping people get back on their feet, back to where they were.

Ultimately, the solution to the global health crisis is through development—empowering countries to develop their own national surgical colleges, their own practices, and their own healthcare systems. It should not be about outsiders coming in and doing for them. As a general rule, paternalism in medicine can be avoided by trying *not* to do things for people that they can do for themselves.

**Challenge #3: Imperfect solutions.** “Task shifting” is a possible long term solution for what to do if there are not enough surgeons for the whole world. It means letting people who are not surgeons—perhaps surgical techs and/or nurses who could be taught to operate—perform some surgical procedures. Task shifting is actually happening in Michigan in the form of a house bill presented in March this year that would lift supervisory roles for nurse anesthetists. This is not just a low income country issue.

Certainly there is disagreement about whether or not shifting the task of a doctor down to the certified registered nurse anesthetist is a good thing to do, and certainly there are legitimate questions about quality control. Is the same surgical procedure going to be done by a surgical tech as someone who's been residency trained? That's all part of the conversation.

**Challenge #4: Who will pay?** Will it be international aid organizations? The World Bank? NGOs? Governments? Low and middle income

countries are increasing their capacity to self-fund and really need to be encouraged to invest in their own health systems. There is a great deal of money at stake, and not just in the surgeon's bill. There is basic infrastructure such as the roads needed to get patients to the hospital, clean water, sterilization, electricity.... All of these things are part of it. So who does that bill go to?

And then there's the question of money from the patient. It is estimated that 33 million patients a year have faced catastrophic health costs due to surgery and anesthesia. They are wiped out financially. Forty-eight million additional individuals are also facing catastrophic costs due to non-medical costs of accessing health care. Figure 16 breaks this down by national income. In high income countries, even the poorest citizens still have a very low rate of medical costs and non-medical costs such as the transportation, lodging, and food that it takes to obtain medical care. The richest countries hardly see catastrophic cost at all. But in the poorer countries, families increasingly face catastrophic financial costs for access to surgical care. The financial aspect must be addressed.

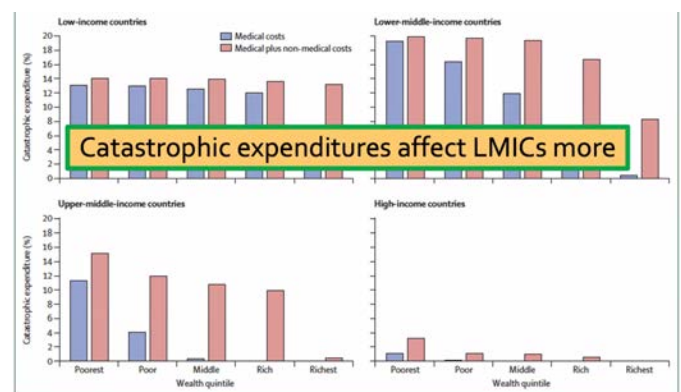


Figure 3: Risk of catastrophic expenditure due to costs of seeking surgery, by wealth quintile and income of country<sup>a</sup>  
Data with and without non-medical costs (eg. transportation, lodging, and food) are shown.

Figure 16

**Challenge #5: Surgical volume.** Of 313 million surgical procedures done each year worldwide, only 6% are done in the poorest countries. That is more than just inequitable: Our studies of hos-



pital volumes have shown that the lower the operative volume, the higher the mortality. Thus, not only is it hard to get access to basic surgical care such as a C section or an appendectomy, there is also increased mortality associated with procedures at low surgical volume hospitals.

**Challenge #6: Distance.** An interesting challenge seldom faced in the US is distance from the local hospital. High income countries average around five kilometers away but for low income and middle income countries the distance can be a huge obstacle to getting to a facility. (See Figure 17.)

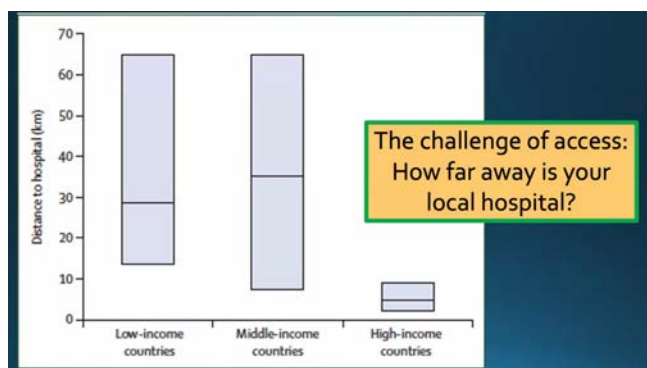


Figure 17

**Challenge #7: V/Q mismatch.** A further challenge is the mismatch between Global Burden of Disease (V in Figures 18 and 19) and the supply of doctors (Q). The red areas are where the Global Burden of Disease is greatest (Figure 18) and where the population of physicians is lowest (Figure 19). We need the exact opposite: The higher percentage of physicians to be where the Global Burden of Disease is greatest.

Figure 20 shows this mismatch in terms of percentages. Considering also that Africa has less than 1% of the world's financial resources devoted to medical care, the dilemma we're facing with global surgery becomes starker.

**Challenge #8: Migration.** In an informal survey I asked a group of surgical residents in Egypt "What do you think keeps doctors from serving

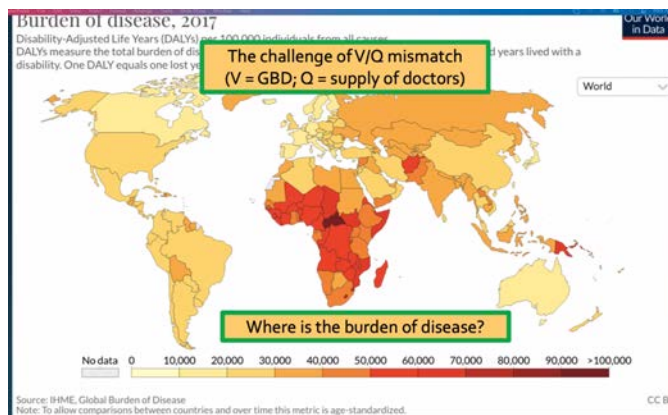


Figure 18

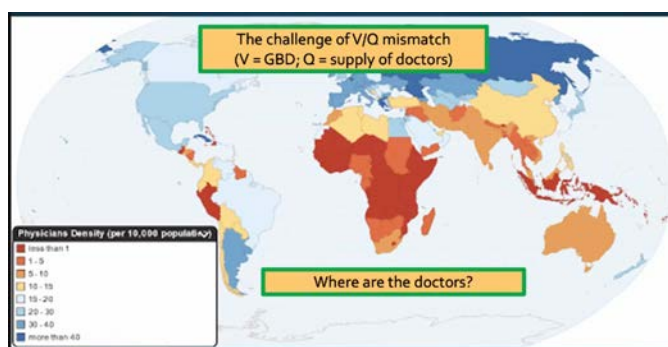


Figure 19

where it's most needed?" Some said economic incentives were better in bigger cities, where there are already other healthcare options, more opportunities for them and their family, and more resources. As a surgeon, it is extremely frustrating if you do not have the equipment required to do the operation you need to perform a procedure, and this is more likely to happen in rural areas where surgeons are most needed.

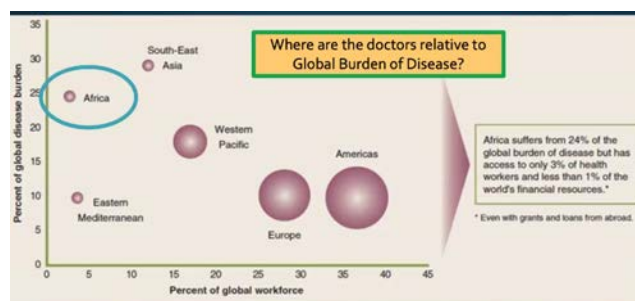


Figure 20

Schooling and opportunities for the surgeon's children, support staff, the presence or absence of other physicians all affect physician migration. Opportunities for professional development are probably better in better populated places. Some of my respondents felt restrained only by their sense of obligation to rural areas based on contracts they had signed.

**Challenge #9: Goal.** Yet another challenge is that of defining the goal for the number of health care professionals in a location. Figure 21 would suggest that 20 is a good number. Maternal survival really falls significantly in places with a workforce density lower than 20 surgeons or anesthesiologists or obstetricians per 100,000 people population. More is not necessarily better: The chart shows there is not a great increase in survival above 20 and even up to 150.

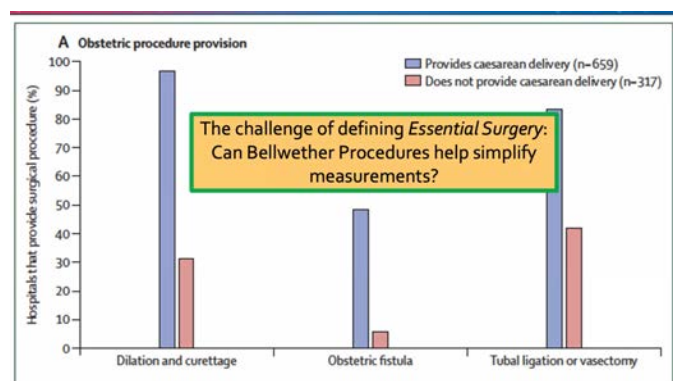


Figure 21

**Challenge #10: Definition.** What exactly is “essential surgery”? In discussing global surgery we should have a list of things essential for a hospital or other health facility to provide. Bellwether procedures can simplify this measurement, serving as indicators. For example, the bellwether procedure for obstetrics is the C section. If a hospital can do a C section (the blue bars in Figure 21) they are likely able to do the D&C, the fistula, and the tubal ligation. If they do not (the red bars) then it is unlikely that they will be able to provide those procedures. Thus, the C section

is the indicator for capability in obstetric procedures.

For general surgical bellwether procedure is the laparotomy (Figure 22). A facility that can offer a laparotomy is most likely able also to do a biopsy, remove a foreign body, do a wound debridement, an appendectomy, and a hernia repair. The bellwether procedure for orthopedics is treating open fractures [Figure 23] Rather than asking if a facility can do an amputation or treat clubfoot, it is enough to ask if it can treat open fractures.

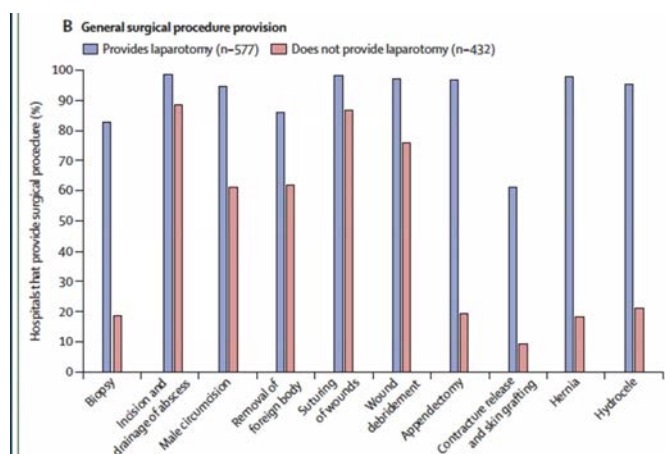


Figure 22

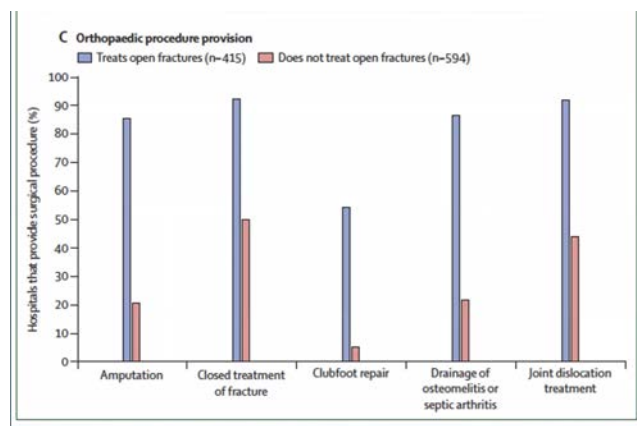


Figure 23

The *Lancet* Commission has an implementation side—it is not just a study of the role and need for global surgery to exist and to be effective. Figure 24 shows that the Commission uses la-

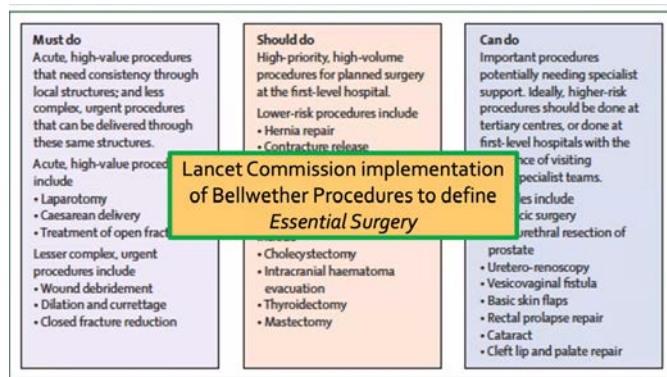


Figure 24

parotomies, C sections, and treatment of open fractures as their baseline for "must do"—essential—procedures.

**Challenge #11: A moving playing field.** Estimates of future world population (Figure 25) tend towards the high side. In any event, the need for surgical access is only going to get bigger. We are in the situation Lewis Carroll's Alice, in *Through the Looking Glass*, found herself in when the Red Queen told her: "My dear, here we must run as fast as we can, just to stay in place. And if you wish to go anywhere, you must run twice as fast as that." We are trying to keep up with a growing population with increased need. And that's just to maintain the *status quo*.

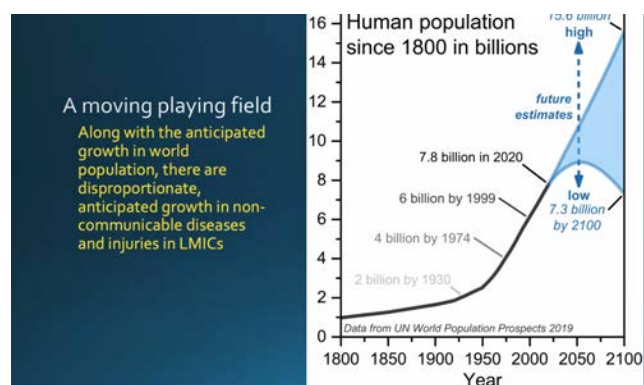


Figure 25

**Challenge #12: Income effect.** Figure 26 highlights the challenge of the income effect. Communicable diseases are in red and non-communicable diseases are in blue. The income of a

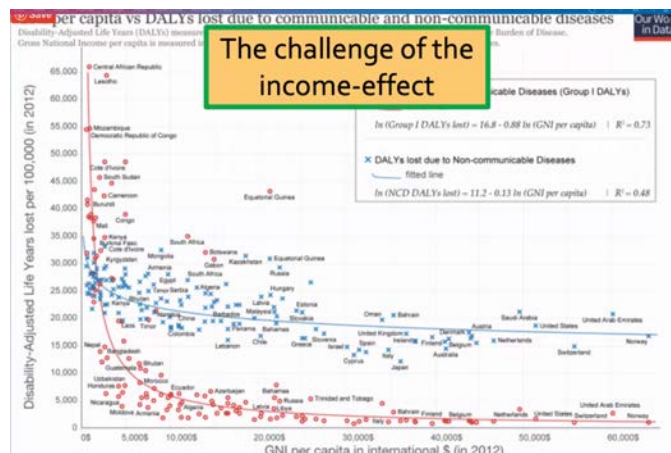
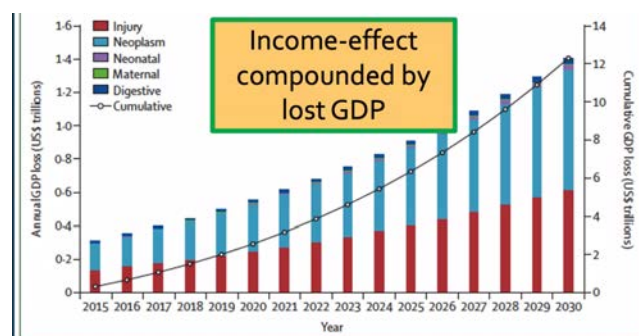


Figure 26

country per capita is on the x axis and disability adjusted life years (DALYs) lost are on the y axis. At the very top the Central African Republic is really low on GNI but really high on DALYs lost. The chart shows that both communicable and non-communicable disease is tied to the income of a country. Less than \$5,000 is a really steep increase in global burden of disease for lower income countries.

**Challenge #13: Lost GDP.** The income compounded by lost GDP (Figure 27) is another challenge. While once surgery was excluded from the conversation of global health because it was too expensive to do, we know now that it is too expensive *not* to do.



**Figure 4: Annual and cumulative GDP lost in low-income and middle-income countries from five categories of surgical conditions (2010 US\$, purchasing power parity)<sup>27</sup>**  
 Data are based on WHO's Projecting the Economic Cost of Ill-Health (EPIC) model (2010 US\$, purchasing power parity). GDP=gross domestic product.

Figure 27



## Opportunities

So far we have discussed the realities and challenges facing Global Surgery today. But there are also opportunities and programs contributing to overcoming the challenges. Those programs are often categorized as either vertical or horizontal. Horizontal programs are broad based, covering a wide range of disease, focused on prevention, driven by the affected community, and sustainably integrated into the health system. Vertical programs are usually disease-specific, focused on a cure (e.g. to stamp out polio), often require outside donors, and are usually seen as non-sustainable. The need is for a combination of horizontal and vertical programs.

The WHO's essential trauma care books represent the vertical approach in addressing trauma as opposed to specific diseases such as HIV, TB, and malaria. Another example is the Harvard Global Equity initiative, a global task force for cancer care, the other big component besides trauma.

The WHO also provides an excellent example of the horizontal approach in its Global Initiative for Emergency and Essential Surgery Care (GIEESC). Figure 28 shows the GIEESC results of a decade-long effort in Mongolia involving a tool kit of educational programming, training, and equipment. The program's success in a wide range of surgical procedures is clear. Figure 29 shows the result in terms of decreased mortality and morbidity.

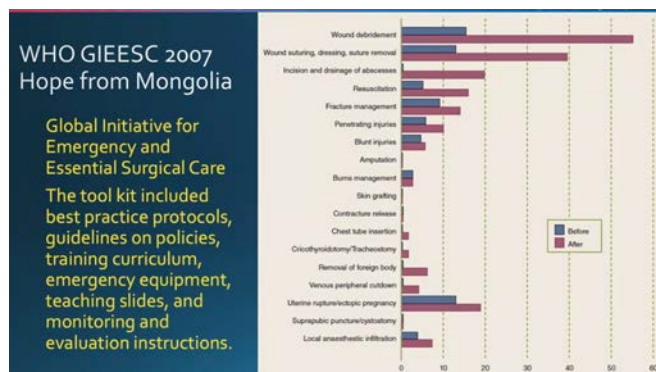


Figure 28

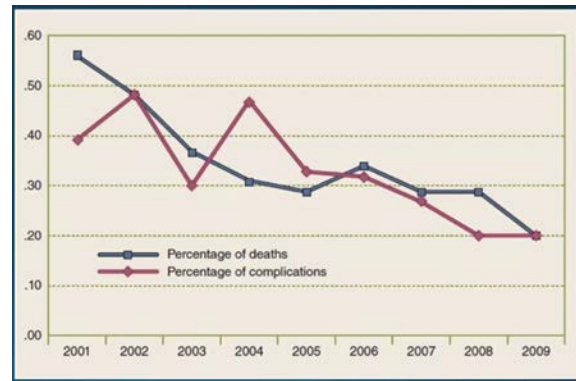


Figure 29

The Pan-African Academy of Christian Surgeons (PAACS) (with which I have been associated since 2012) has given 98 graduate certificates from 15 programs in eight countries throughout Africa, with 90 residents currently in training. A 20-year analysis of PAACS published in the World Journal of Surgery issue #43, pp. 75-86 (2019) revealed that 100% are currently practicing on the continent of Africa, just shy of 80% are practicing within their home countries. 51% were rural for a short term, and 35% have remained rural based in the long term.

Figure 30 is a map of our partnership with COSECSA (College of Surgeons of East Central and Southern Africa). We also partner with the

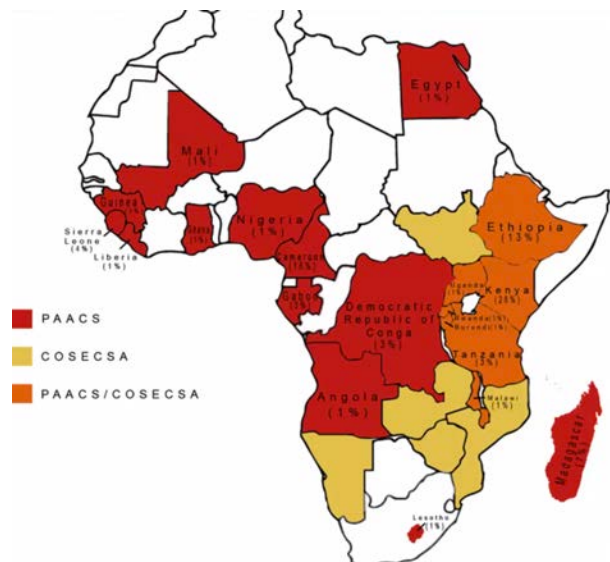


Figure 30



West African College of Surgeons (WACS) (not shown). Our graduates provide training in COSECSA and WACS countries, participating and growing colleges of surgeons and putting them on the path to continued growth.

Training surgeons is obviously one of the key ways to overcome the challenges of Global Surgery. A *Lancet* Commission 2014 study to determine the future of Global Surgery proposed, in addition to training surgeons, to:

- Increase recognition of the effects of non-communicable disease (because that's where the epidemiologic shift is going);
- Increase recognition of the effects of injury (because the burden loss to trauma is still huge);
- Increase participation domestically and internationally;
- Increase the mobilization of funds for scaling up surgical services; and
- Focus on new technologies specifically for low and middle income countries.

The cooperative mix of vertical and horizontal programming to achieve these goals requires a multidisciplinary approach. Global surgery must be seen in the context of the networked ecosystem (Figure 31) in which it operates. Surgical care cannot be delivered without a supply chain for sutures, sterile processing for clean instruments, a path lab and a regular lab, laundry, waste management, hospital safety, and so on.

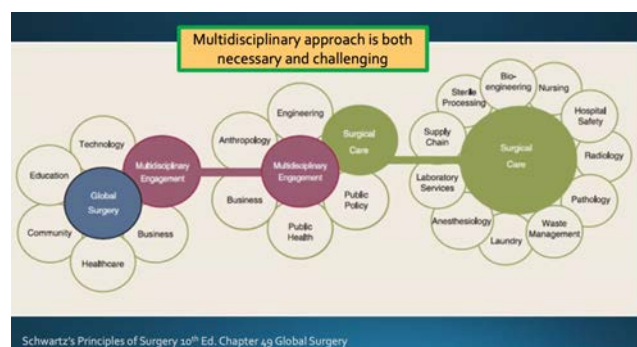


Figure 31

Like Russian Matryoshka wooden dolls of decreasing size, each nested inside another, that ecosystem is nested in a larger, multidisciplinary ecosystem of business and public health policy, engineering, and so on, and that in turn is nested in global society, community, and systems of health care, education, technology, and so on.

Dr. Jim Kim has said: "Surgery is an indispensable part of healthcare... I urge you to challenge this injustice, and to build a shared vision and strategy for global equity in essential surgical care." Figure 32 is my rough breakdown of things *you* can do to challenge the injustice. You can KNOW—you can read this paper and other sources of information about Global Surgery to assess the need, the challenges, and the opportunities—appreciating that to stand still is to lose ground. You can GROW by participating in local options and regional works advocacy—helping mobilize funds through the American College of Surgeons for example. And then you can GO—for the short or the long term. Training gives perhaps the best bang for your buck when it comes to putting your own time in for the short term, and you can also help resource and fund.



Figure 32

Since you began reading this paper, approximately 10,000 more people have been added to our world. How are we going to get them safe and affordable health care when they need it in the surgical realm? That is our challenge. \*\*\*

