

Correspondence



Global burden of surgical disease: an estimation from the provider perspective

Surgery is a cross-cutting intervention, with borders that are nebulous and ill-defined. Quantification of the global burden of surgical disease has therefore been difficult.

In 2006, Debas and colleagues¹ published an expert-opinion estimate that 11% of the overall global burden of disease was treatable by surgery. On-the-ground assessments, however, suggest that this could be an underestimate: the prevalence of untreated surgical pathology is nearly 25% in Sierra Leone.² This underestimation is potentially important in planning for health systems—surgery has often been viewed as a complex, expensive intervention with a potentially small impact.

Updated estimates vary widely and are sensitive to the question asked. For example, Stewart and colleagues³ recently published an estimate of the global burden of disease requiring emergency surgery. This very specific question yields a small estimate—fewer than 2% of the global burden of disease—likely representing a lower bound. Similarly, country-specific estimates have been undertaken: nearly 60% of all admissions to referral hospitals in Mozambique are for surgical conditions.⁴ Expert opinion has estimated that 28% of the global burden of disease is surgical.⁵

By focusing on the *provision* of surgery, however, these estimates

often ignore the fact that some “surgical” conditions are treated non-operatively. It is the presence of a robust surgical system that allows this—simply because, if the patient deteriorates, surgery is available.

We did an assessment of the burden of surgical disease with this point in mind. By asking providers—both surgical and non-surgical—to estimate what proportion of patients would, in an ideal setting, benefit from a surgeon in their management, we capture not only patients *undergoing* surgery, but also those for whom surgeons have a role in management.

We approached members of representative medical and surgical communities in the USA, Canada, sub-Saharan Africa, and southeast Asia, who were members of various global health delivery list-servers and who worked in academic communities, tertiary care centres, local or district hospitals, and the non-governmental sector. We also contacted global health delivery forums of paediatricians, surgeons, medical doctors, nurses, and public health practitioners, through GHDonline.com. Respondents were presented with 21 previously defined disease categories,⁶ and were asked, “What proportion of patients with each condition would require a surgeon in their management?” Full methodological details are given in the appendix.

173 respondents returned the survey. 87 identified as surgeons or anaesthesia providers, 36 of whom were general surgeons, 45 of whom were surgical specialists, and six of

whom were anaesthesia providers. Of the remaining participants, 50 were non-surgical physicians; 19 were nurses, nurse practitioners, or other mid-level providers; six were non-clinician practitioners, and five were students. The remaining listed other professions. 112 respondents spent at least some time working in low-income countries, of which sub-Saharan Africa was most heavily represented.

Our respondents estimated that surgery is involved, on average, in 28–32% of the global burden of disease, depending on whether “burden” is defined as deaths or disability-adjusted life years lost (table).

Inter-rater reliability was 0.617, indicating substantial agreement. The global burden of surgical disease was slightly lower when estimated by a non-surgeon (25–30%) than by a surgeon (30–35%). Besides this difference, no other subgroup analysis—tertiary hospitals versus other settings, respondents in low-income and middle-income countries versus high-income countries—changed our results significantly. Our results were also robust to sensitivity analyses (see appendix) and correlate well with a study examining the proportion of patients admitted to hospital in the USA who received a major operation.⁷

Because these results come from a survey, there are obvious limitations. The Global Burden of Disease 2010 study⁶ lists 291 diseases and injuries in total; our survey asks about the 21 broad classifications into which these 291 conditions fall. Cancer, for example, includes both solid and haematological malignancies, which require very different levels of surgical involvement. Asking respondents about each of the 291 conditions would have provided a more granular estimate, but it is likely to have done so at a significant loss in response rate.

In addition, clinicians likely respond based on their experience—which will necessarily include patients they have encountered. These findings,

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	Deaths	DALYs lost	YLL	YLD
Our survey				
Mode	31.6%	23.7%	28.0%	14.5%
Mean (95% CI)	32.9% (26.5–39.3)	28.1% (22.1–34.2)	30.3% (24.2–36.5)	23.3% (17.5–29.1)
Median	31.3%	25.1%	27.4%	20.2%
Inpatient admissions receiving major surgery (USA) ⁷	27.5%	24.6%	22.7%	28.4%
Expert opinion estimate ⁵	25.3%	28.0%	26.4%	32.5%

DALY=disability-adjusted life years. YLL=years of life lost. YLD=years lived with disability.

Table: Estimates of the proportion of the global burden of disease that is surgical

then, could overestimate the surgical burden due to some conditions (especially the more chronic) and underestimate that due to other conditions. Our sensitivity analyses imply, however, that this overestimate is small to moderate at worst.

The strengths of this study are what it can show. Our survey includes a broad range of providers actively engaged in health-care delivery in both developing and developed-nation contexts. The significant concordance among all the respondents and among our multiple estimation methods lends robustness to our conclusions. Finally, by asking respondents about the role of surgery writ large—as opposed to limiting our estimates only to patients who actually receive an operation—our results are arguably more representative of the involvement of surgery in global health.

In conclusion, about 30% of the global burden of disease could be surgical. This estimation is robust to multiple estimation methods and avoids limiting the delineation of “surgical disease” only to patients who end up on an operating table. Although non-surgeons estimate a lower burden of surgical disease than do surgeons, all providers estimate a burden that is more than double the canonical 11% estimation published in 2006.¹

This finding suggests that the scale-up of a functional surgical system could have a beneficial impact on a large portion of the global burden of disease. Importantly, these results also suggest that it might finally be time to retire the prior, lower estimate of the global burden of surgical disease. Acknowledging the size of the burden of surgical disease will enhance awareness among the global health community and advocate for closing the gaps in access to surgical services.

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Global distribution of surgeons, anaesthesiologists, and obstetricians

An insufficient surgical workforce is a major barrier to safe surgical care for billions of people worldwide.¹ Although a critical shortage of a spectrum of surgical providers has been described in many countries, the global number and distribution remain poorly assessed.² Meanwhile, more data on the surgical workforce are crucial for international com-

parisons and the development of national workforce plans tailored to populations needs. We aimed to quantify the global surgical specialist workforce by country, and to build a WHO surgical workforce database in the process.

Data on the number of licensed, qualified physician surgeons, anaesthesiologists, and obstetricians (see appendix for full definitions) were retrieved from Ministries of Health, WHO country offices, professional societies, members of the WHO Global Initiative for Emergency & Essential Surgical Care, and from publicly available sources (see appendix p 4) for full details of data sources). Data were entered in the WHO Global Surgical Workforce Database. Data were obtained for 167 countries representing 92% of the global population (for characteristics see appendix p 9). Estimates of missing values were developed using multiple imputation based on national health system indicators (appendix p 10). Median and IQR were calculated from the imputed data, and used together with primary data to provide global estimates. Estimated total number of providers and density per 100 000 population were calculated and tabulated and heat maps were created to show the surgical specialist workforce density by country.

Worldwide, there are an estimated 1 112 727 specialist surgeons (IQR 1 059 158–1 177 912), 550 134 anaesthesiologists (529 008–572 916) and 483 357 obstetricians (456 093–517 638; appendix p 11 and p 16). Low-income and lower-middle-income countries, representing 48% of the global population, have 20% of this workforce, or 19% of all surgeons, 15% of anaesthesiologists, and 29% of obstetricians. Africa and southeast Asia are particularly underserved. In terms of density, low-income countries have 0.7 providers per 100 000 population (IQR 0.5–1.9), compared with 5.5 (1.8–28.2) in lower-middle income countries, 22.6 (11.6–56.7)

See Online for appendix

