

## Estimate of the global volume of surgery in 2012: an assessment supporting improved health outcomes



Thomas G Weiser\*, Alex B Haynes\*, George Molina, Stuart R Lipsitz, Micaela M Esquivel, Tarsicio Uribe-Leitz, Rui Fu, Tej Azad, Tiffany E Chao, William R Berry, Atul A Gawande

### Abstract

**Background** It was previously estimated that 234·2 million operations were performed worldwide in 2004. The association between surgical rates and population health outcomes is not clear. We re-estimated global surgical volume to track changes over time and assess rates associated with healthy populations.

**Methods** We gathered demographic, health, and economic data for 194 WHO member states. Surgical volumes were obtained from published studies and other reports from 2005 onwards. We estimated rates of surgery for all countries without available data based on health expenditure in 2012 and assessed the proportion of surgery comprised by caesarean delivery. The rate of surgery was plotted against life expectancy to describe the association between surgical care and this health indicator.

**Findings** We identified 66 countries reporting surgical data between 2005 and 2013. We estimate that 312·9 million operations (95% CI 266·2–359·5) took place in 2012—a 33·6% increase over 8 years; the largest proportional increase occurred in countries spending US\$400 or less per capita on health care. Caesarean delivery comprised 29·8% (5·8 million operations) of the total surgical volume in poor health expenditure countries compared with 10·8% (7·8 million operations) in low health expenditure countries and 2·7% (5·1 million operations) in high health expenditure countries. We noted a correlation between increased life expectancy and increased surgical rates up to 1533 operations per 100 000 people, with significant but less dramatic improvement above this rate.

**Interpretation** Surgical volume is large and continues to grow in all economic environments. A single procedure—caesarean delivery—comprised almost a third of surgical volume in the most resource-limited settings. Surgical care is an essential part of health care and is associated with increased life expectancy, yet many low-income countries fail to achieve basic levels of service. Improvements in capacity and delivery of surgical services must be a major component of health system strengthening.

### Funding None.

#### Contributors

TGW, ABH, and AAG conceived the study. TGW, GM, ME, TUL, TA, TEC, and ABH acquired the data. TGW, ABH, GM, SRL, RF, WRB, and AAG analysed and interpreted the data. TGW, ABH, GM, and SRL drafted the Abstract, which was critically reviewed by all authors.

#### Declaration of interests

We declare no competing interests.

#### Acknowledgments

We would like to thank the following people for helping identify data to support our work: Ulrike Schermann-Richter (Austria, Ministry of Health), Pandup Tshering (Bhutan, Ministry of Health), Ana Carolina Estupiñan Galindo (Colombia, Ministerio de Salud y Protección Social), Rasilainen Jouni (Finland, National Institute For Health And Welfare), Marina Shakh-Nazarova (Georgia, National Center for Disease Control and Public Health), Ziona Haklai (Israel, Ministry of Health), Sandra Distefano (Malta, Ministry for Energy & Health), Juan Alejandro Urquizo Soriano (Perú, Instituto Nacional de Enfermedades Neoplásicas), and Jan Mikas (Slovak Republic, Ministry of Health).

Published Online

April 27, 2015

Poster 13

\*Joint first authors

Department of Surgery, Stanford University, School of Medicine, CA, USA

(T G Weiser MD,

M M Esquivel MD,

T Uribe-Leitz MD); Ariadne Labs,

Boston, MA, USA

(A B Haynes MD, G Molina MD,

Prof S R Lipsitz PhD,

W R Berry MD,

A A Gawande MD); Department

of Surgery, Massachusetts

General Hospital, Boston, MA,

USA (A B Haynes, G Molina,

T E Chao); Harvard T H Chan

School of Public Health,

Department of Health Policy

and Management, Boston, MA,

USA (A B Haynes, W R Berry,

Prof A A Gawande); Department

of Surgery Brigham and

Women's Hospital, Boston,

MA, USA (Prof S R Lipsitz,

W R Berry, Prof A A Gawande);

Management Sciences and

Engineering, Stanford

University, Stanford, CA, USA

(R Fu MD); and Stanford

University School of Medicine,

Stanford, CA, USA (R Fu,

T Azad MD)

Correspondence to:

Dr Thomas G Weiser, Department

of Surgery, Stanford University

Medical Center, 300 Pasteur

Drive, S067 Stanford, CA 94305,

USA

[twaiser@stanford.edu](mailto:twaiser@stanford.edu)