The IFSO Global Registry

IFSO GLOBAL REGISTRY

Third IFSO Global Registry Report

2017

Prepared by

Kelvin Higa MD FACS
Jacques Himpens MD PhD
Richard Welbourn MD FRCS
John Dixon PhD FRACGP FRCP Edin
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IFSO & Dendrite Clinical Systems

The International Federation for the Surgery of Obesity and Metabolic Disorders

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IFSO GLOBAL REGISTRY

The International Federation for the Surgery of Obesity and Metabolic Disorders operates the IFSO Global Registry in partnership with Dendrite Clinical Systems Limited. The Society gratefully acknowledges the assistance of Dendrite Clinical Systems for:

- building, maintaining & hosting the web registry
- data analysis and
- publishing this report

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Preface

The treatment of adiposity-based chronic diseases requires a thoughtful, evidence-based algorithm that targets not only metabolic syndrome but also obesity and the social stigma and prejudice that prevents universal coverage for our patients. Those of us who take care of the patients with the most severe form of the disease, the morbidly obese, intuitively know how beneficial our interventions can be and the life-changing effects of long-term weight control. But what really happens to our patients once we operate on them? Follow up continues to be a problem and will not be solved by regulatory enforced dictums by individual societies or organizations. It is too costly, and patients are not willing to participate, even with financial incentives. Yet, we still need the answers to the questions paramount to our specialty. What should be the criteria for surgery? How do I choose the right operation for the right patient? What are the long-term consequences of my intervention?

Bariatric / Metabolic Surgery is unlike any other surgical specialty. We look to the long-term effects and are not satisfied with one or two year data; even 10 to 20 year data may not be enough to judge if our interventions today should be continued. Participation in IFSO's registry is purely voluntary. Gathering and reporting data is onerous, time consuming and without immediate reward. But if we had data from the past 30 years of surgery to analyze and integrate with our current concepts of the pathophysiology of our operations, I think we would be closer to answering the questions above.

Reporting data and participating in a registry such as Dendrite is indicative of the serious commitment to the long-term care of our patients and the advancement of the universal standards by which we practice.

Kelvin Higa

IFSO President 2016-2017

Foreword

This 2017 issue is the third global registry report on *bariatric surgery* made available by Dendrite Clinical Systems at the occasion of the IFSO World Congress in London, United Kingdom. This remarkable effort provides a clear picture of what is being accomplished across the world in the field of the surgery for adiposity based chronic diseases (ABCD).

Thus, the 2017 global registry report contains data on close to 200,000 patients from over 40 databases and registries, and constitutes a benchmark effort in presenting the worldwide characteristics of surgery for ABCD, demonstrating the geographic diversity in patient population, surgical indications and procedural choices.

I commend the 8 nations that succeeded in submitting a national registry of patient data. Conversely, I regret that in these *evidence based* times a great number of large practices from different countries, and I must humbly confess that mine is one of them, still have widely omitted to submit their data, which undeniably biases the numbers presented in this report.

It remains a goal for the future to incorporate data from more databases, and, if at all possible, to collect data into national registries. At the same time, participants must be encouraged to include more complete details on patients. In order to gather a maximum of information concerning the efficacy of our surgical procedures, as mentioned by the authors of this very report, there is a definite need of standardization in reporting the different comorbidities, as *this would be the key towards achieving accurate reporting and a priority for international research*. The registry already demonstrates a number of irrefutable facts, such as the efficacy of *bariatric* surgery in type 2 diabetes with a one year 62.4% remission rate of the patients registered, and in other adiposity related conditions including depression, hypertension and musculo-skeletal pain. In the future, more evidence should be gathered proving the expected efficacy of our procedures, both primary and revisional, for a number of comorbidities.

At the same time, we should be able to demonstrate that we do not harm, and provide long-term outcomes indicating that our procedures do not cause delayed morbidity including endocrinological disorders or even cancer.

We at IFSO are convinced that one of our prime tasks is to provide global guidelines for safe and effective surgery to the benefit of the patient with adiposity. Critical appraisal of what we do is essential to achieve this goal. More than ever we must share our data with the world. More than ever we must contribute to a global and complete registry.

Jacques M Himpens

IFSO President 2017-2018

Introduction

It is a privilege to present data on baseline obesity-related disease, operation types, operative outcomes and disease status after bariatric surgery in over 196,000 patients accumulated from local and national databases and registries from 42 countries across the world. This Global Registry initiative of IFSO, the first of its kind, could help the bariatric community establish essential benchmark knowledge about the patients we are operating upon, their age and gender distributions, body mass index (BMI) and comorbidity disease burden, as well as track trends in surgery over time. The data are presented not as the standard abstract, introduction, methods, results, discussion and conclusions format of a peer-reviewed publication. Rather, using a small and necessarily far from comprehensive dataset, we present the data as simple tables and graphs using usually 2 variables, one for each axis, plus a dedicated commentary for each. Even though this is a very basic presentation of data, many of the results demonstrate clear and important differences in bariatric practice between countries.

A comprehensive Founding Charter has been set up regarding the use and ownership of the accumulated and merged data, and contributors can be assured that we have steered well clear of attempting to make statistical comparisons between different units, and that their submitted data will not be misused. We are also fully aware of the inherent problems of over interpretation and reading too much into the data.

If there are to be further developments and reports for the IFSO Global Registry, attractive aims could also include agreeing and developing risk stratification models and the setting of international benchmarks for post-operative complications or mortality. The registry could help in these aims by standardizing data collection. As it progresses, the data it contains might also be useful in influencing policy internationally and increasing service provision in countries where there is currently little or no bariatric surgery. I encourage all key stakeholders in bariatric surgery (especially surgeons, providers and commissioners of care) to embrace this data collection and reporting process at individual clinics and hospitals, and onwards / upwards at both national and international levels. It will require widespread involvement and on-going commitment from all those involved in the care of the bariatric patient to ensure high-quality data can be collected, properly analysed and shared, so that we will be better able to understand shifts in disease patterns, practice and outcomes on a global scale. Thank you to all those surgeons who have committed their data for inclusion in this second report, your contribution is very much appreciated. Bariatric surgery has great potential to improve health in a vast number of patients in a cost effective manner; however, it is made available to very few obese people who could benefit from it. Little is known internationally about which patients are being operated on, other than the worldwide survey of bariatric surgery undertaken by Prof. Scopinaro, Prof. Buchwald and more recently by Prof. Angrisani [1, 2, 3, 4, 5]. Although we know from their surveys which operations are being performed, we do not yet know basic demographic data on variables such as gender distribution, starting BMI, and prevalence of comorbidities such as type 2 diabetes, hypertension and sleep apnea. Nor do we have any data on surgical outcomes such as survival, length-of-stay or improvement in comorbidities between different populations. Therefore the aims of this project are to:

1. Establish baseline demographic characteristics for patients operated in different countries either from the respective national registries or individual units in these countries.
2. Report basic 1-year post-operative data.

The data presented are not intended to be a definitive global representation of bariatric surgery, as data from many countries with large volumes of surgery are not yet included. However, the report is the start of a process that shows what can be achieved within the constituent countries of IFSO. For instance, the data could in future be used to estimate inequalities of provision of surgery internationally, and provide benchmarks for access to surgery to those people with specific obesity-related disease such as diabetes.

Richard Welbourn

Richard Welbourn

President of the IFSO Congress 2017

1. Scopinaro N. The IFSO and obesity surgery throughout the world. *Obesity Surgery*. 1998; **8**: 3-8.
2. Buchwald H, Williams SE. Bariatric surgery worldwide 2003. *Obesity Surgery*. 2004; **14**: 1157-64.
3. Buchwald H, Oien DM. Metabolic / bariatric surgery worldwide 2008. *Obesity Surgery*. 2009; **19(12)**: 1605-11.
4. Buchwald H, Oien DM. Metabolic / bariatric surgery worldwide 2011. *Obesity Surgery*. 2013; **23(4)**: 427-36.
5. Angrisani L, Santonicola A, Iovino P, *et al.* Bariatric surgery worldwide 2013. *Obesity Surgery*. 2015; **25**: 1822-32.

Third IFSO Global Registry Report

Executive Summary

This is the third comprehensive, international analysis of outcomes from bariatric (obesity) and metabolic surgery, gathered under the auspices of the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) in collaboration with Dendrite Clinical Systems.

In overview

- 42 countries from 5 continents contributed a total of 196,188 operation records
- in total 410 hospitals contributed data either directly or *via* their national registry submissions
- the number of records submitted ranged from 51 from a single centre to over 56,000 submitted by the national registry from the United Kingdom
- this précis reports on 106,219 gastric bypass operations (54.1% of all the records submitted), 58,885 sleeve gastrectomy procedures (30.0%), and 19,101 gastric banding operations (9.7%)
- most of the database records fell in the period 2009-2017 (89.9% of the total); 102,157 of operations were dated in the calendar years 2013-2017 (52.1%)

The dataset and completeness of data entry

- the simple dataset used for the previous IFSO report was extended slightly to include a total of 40 variables (28 baseline data-items; 12 in the follow-up section)
- overall, 57.1% of the baseline records were >80% complete for operations dated in the calendar years 2013-2017

Initial data from 2013-2017

Funding and gender inequality

- 52.1% of operations were funded by public health services; there was a great deal of variation in the rates of publicly-funded surgery across the contributor countries
- there was also a wide variation in the country-specific gender ratios, ranging from 48.6% female (in Guatemala) to 86.7% female (in Kazakhstan)

Primary operations and BMI range

- the patients' median BMI pre-surgery was 43.1 kg m^{-2} (inter-quartile range: 39.4-48.6 kg m^{-2}); there was a wide variation between different contributor countries, medians ranging from 36.7 kg m^{-2} in Peru to 51.1 kg m^{-2} in Egypt
- patients' median age was 42.0 years (inter-quartile range: 33.0-51.0 years)
- the overall proportion of female patients was 71.3% (95% CI: 71.0-71.6%)
- Venezuela (100.0%) and Sweden (95.6%) reported the highest proportions of gastric bypass surgery; Kuwait (100.0%), Australia (100.0%) and Saudi Arabia (100.0%) reported the highest rates of sleeve gastrectomy operations
- 98.8% of all operations were performed laparoscopically
- 87.1% of patients who had a gastric band inserted were discharged within 1 day of their operation; after gastric bypass, 66.1% of patients were discharged within 2 days of surgery; and 80.2% of sleeve gastrectomy patients went home within 3 days of their operation

Comorbidities prior to surgery

- 21.8% of patients were on medication for type 2 diabetes (inter-country variation: 7.4-93.7%)
- 31.4% were treated for hypertension (inter-country variation: 2.5-90.9%)
- 15.3% of patients were on medication for depression (inter-country variation: 0.0-42.5%)
- 20.2% of patients required treatment for musculo-skeletal pain (inter-country variation: 0.0-57.4%)
- 20.3% of patients had sleep apnea (inter-country variation: 0.4-68.5%)
- 24.8% of patients had gastro-esophageal reflux disorder (inter-country variation: 0.0-54.8%)

Stratification for operative risk

- the Obesity Surgery Mortality Risk Score [1] (OSMRS) varied widely by country
- Georgia, Hong Kong and Argentina had the highest-risk patient populations (OSMRS groups B & C: 88.2%. 75.0% and 62.0% respectively)
- Kuwait, Colombia and the Netherlands appeared to have the least risk (OSMRS groups B & C: 17.9%, 20.4% and 23.9% respectively)

Follow up data for primary surgery carried out in the calendar years 2011-2017

- there were 171,886 valid follow up records
- average percentage weight loss was 30.1% one year after surgery
- one year after primary surgery 62.4% of those taking medication for type 2 diabetes beforehand were no longer on medication; the proportion of patients no longer treated for diabetes was highly dependent on weight loss achieved
- there were also significant reductions in the rates of treatment for depression, hypertension and musculo-skeletal pain
- rates of confirmed sleep apnea and GERD also fell one year after bariatric surgery

Implications for bariatric surgery

- a simple dataset and the willingness of many centres in different countries to contribute can lead to a large body of pooled and merged data
- this third report quantifies the gender inequality evident worldwide and also shows inequality of access to surgery in many countries
- on the scale of a large international collaboration, the data on improvement in diabetes demonstrate the profound treatment effect that bariatric surgery has on this disease
- therefore, this initiative continues to be useful in advancing the status and acceptability of bariatric surgery worldwide and suggests many international research projects that could be undertaken

1. DeMaria EJ, Portenier D, Wolfe L. Obesity surgery mortality risk score: proposal for a clinically useful score to predict mortality risk in patients undergoing gastric bypass. *Surgery for Obesity and Related Diseases*. 2007; **3(2)**: 134-140.

Contents

The epidemiology of obesity - a call for collaborative action

The inexorable increase in obesity rate among the OECD countries can clearly be seen (see following pages). The recently released 2017 data indicates that only one country has reported a lower obesity rate: Italy with a rate of 9.8%. All others have seen an increase, and the reported rate in the United States for those over 15 years of age is now 38.2% [1]. The catastrophic trend continues. Where will this end?

A decade ago I considered that rates in the US, the Middle East and Pacific Islands were so high that a ceiling would be reached by now and we would have an indication of a genetically driven upper limit, albeit at a very high level. Clearly this is not the case and the OECD has predicted that current trends will continue in a linear fashion out to 2030. Korea and Switzerland are likely to see an accelerated increase from their currently relatively low levels.

The relationship between obesity, poor education and lower socio-economic status is self-sustaining. Obese people have poorer job prospects, are less likely to be employed and have more difficulty re-entering the labour market. Obese people have more sick days, are less productive at work and earn less. Obesity rates are generally higher in women and the exponential rise in the more severe levels of obesity has been dominated by women globally [2]. Inequalities in education and economic opportunity are also greater in women [1]. The OECD stresses that addressing obesity and the negative labour market outcomes would help address the vicious cycle of social and health equality [1]. The impact of obesity on our communities is far greater than just the burden of type 2 diabetes, cardiovascular disease, and the cancers that obesity generates. As individuals and teams engaged in the effective management of obesity, especially those people with the greatest impairment, we are being called to action. Are we listening? Are our united voices indicating that we want to engage solutions? Do our actions suggest we are a key element of future solutions? Maybe.

A survey I conducted in 2015 prior to the Diabetes Surgery Summit Consensus Conference included 22 countries representing approximately 75% of all bariatric-metabolic procedures performed in 2014 and looked at the uptake of surgery as a treatment of type 2 diabetes [3]. Modelling based on numbers of individuals operated, population prevalence, and proportion of patients eligible for surgery indicated trivial uptake. The highest uptake was in The Netherlands with 1.9% of those eligible treated annually, with the lowest uptake in China and Japan (<0.01%). Most countries had national guidelines and several had diabetes-specific criteria, but it was rare to have more than 1% of those eligible operated in any given year. Bariatric-metabolic surgery as therapy for type 2 diabetes had not entered the established care pathways. The conference outcome was remarkable in that all major global diabetes organizations supported the recommendation that surgery become a recommended therapy for selected patients with type 2 diabetes [4].

Managing the health burden of the obesity-diabetes epidemic will require a chronic disease model of care that provides an appropriately trained trans-disciplinary team approach, sufficient clinical capacity, and well-defined clinical pathways. The care provided will need to be evidence-based, and regularly evaluated. Medical, surgical, and behavioural therapies will need to be combined to provide optimal health outcomes for individual patients. Currently managing clinically severe obesity and its complications is stigmatized and neglected. Effective surgical and medical therapies beyond those of behavioural-lifestyle interventions are used by less than 1% of those eligible [3]. This provides the most blatant example of clinical inertia. It would be unconscionable to report beyond behavioural-lifestyle intervention uptake at these levels for the management of hypertension, diabetes, cardiovascular disease and cancer. Weight management is extraordinarily challenging [5]. Currently we are not treading water, but drowning in a tsunami of increasing need. We need global data, and a collaborative will, to address this global epidemic. It is important to pool our resources and understand the delivery of bariatric-metabolic surgery on a global basis. The IFSO Global Registry provides a vital component in monitoring and evaluating our response to this epidemic.

John Dixon

Head Clinical Obesity Research, Baker Heart and Diabetes Institute

1. OECD. Obesity Update; 2017. www.oecd.org / els / health-systems / Obesity-Update-2017.pdf.
2. Collaboration NCDRF. Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. *Lancet*. 2016; **387(10026)**: 1377-96.
3. Dixon JB. Regional differences in the coverage & uptake of bariatric-metabolic surgery: A focus on type 2 diabetes. Surgery for obesity and related diseases. *Journal of the American Society for Bariatric Surgery*. 2016; **12(6)**: 1171-7.
4. Rubino F, Kaplan LM, Schauer PR, Cummings DE. The Diabetes Surgery Summit Consensus Conference: Recommendations for the Evaluation and Use of Gastrointestinal Surgery to Treat Type 2 Diabetes Mellitus. *Annals of Surgery*. 2010; **251(3)**: 399-405.
5. Bray GA, Fruhbeck G, Ryan DH, Wilding JP. Management of obesity. *Lancet*. 2016; **387(10031)**: 1947-56.

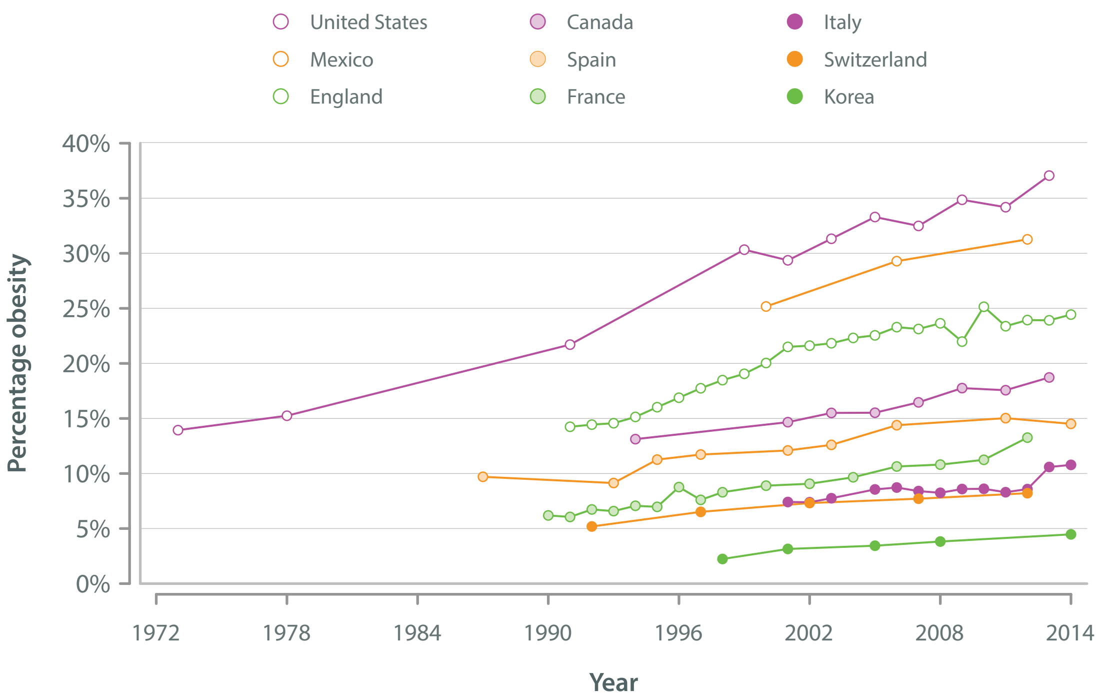
OECD and WHO data

Obesity rates over time

The chart below shows the continuing increase in obesity rate among the OECD countries. Baseline prevalence of obesity varies greatly with global region, but the trends are the same. Unfortunately obesity prevalence tells only part of the story as a doubling of the obesity rate in a country typically generates a 3-fold increase in the prevalence of a BMI >35 kg m^{-2}, a 5 fold increase of a BMI >40 kg m^{-2}, and a 9-10 fold increase in individuals with a BMI >50 kg m^{-2} [1]. Of course, these trends are not restricted to developed countries, but are universal as indicated in the recent NCD (non-communicable diseases) collaborative data from 200 countries following 19.2 million participants [2]. The data indicate a global exponential increase in the numbers of people with obesity, and severe obesity especially in women, between 1975 and 2014. Sadly there is no hint that trends are changing. This continuing epidemic is driving an extraordinary increase in the rates of obesity-related complications such as type 2 diabetes, cardiovascular disease and specific cancers.

Bariatric-metabolic surgery is one of few highly effective tools to manage this growing burden of chronic disease. However, there are major ethnic and regional differences in the pattern of obesity-related complications and the BMI that generates the risk of these. There may also be regional differences in the choice of surgery resulting from cultural acceptability, team skills and resources available, ethnic differences in the response to specific surgical procedures, and regional risks of specific GI malignancies.

OECD data: Obesity rates over time



A key element in the delivery of care to those in need and most likely to benefit will be an understanding of surgical risk-to-benefit throughout the life-cycle, and the influence of obesity-related complications on this analysis. This will assist in clarifying individual patient selection, but also guide the issue of surgical eligibility *versus* recommendation. Limited resources, an overwhelming need, and the preponderance of whole of community delivery of health services in developed countries will drive a priority for surgical recommendation rather than eligibility.

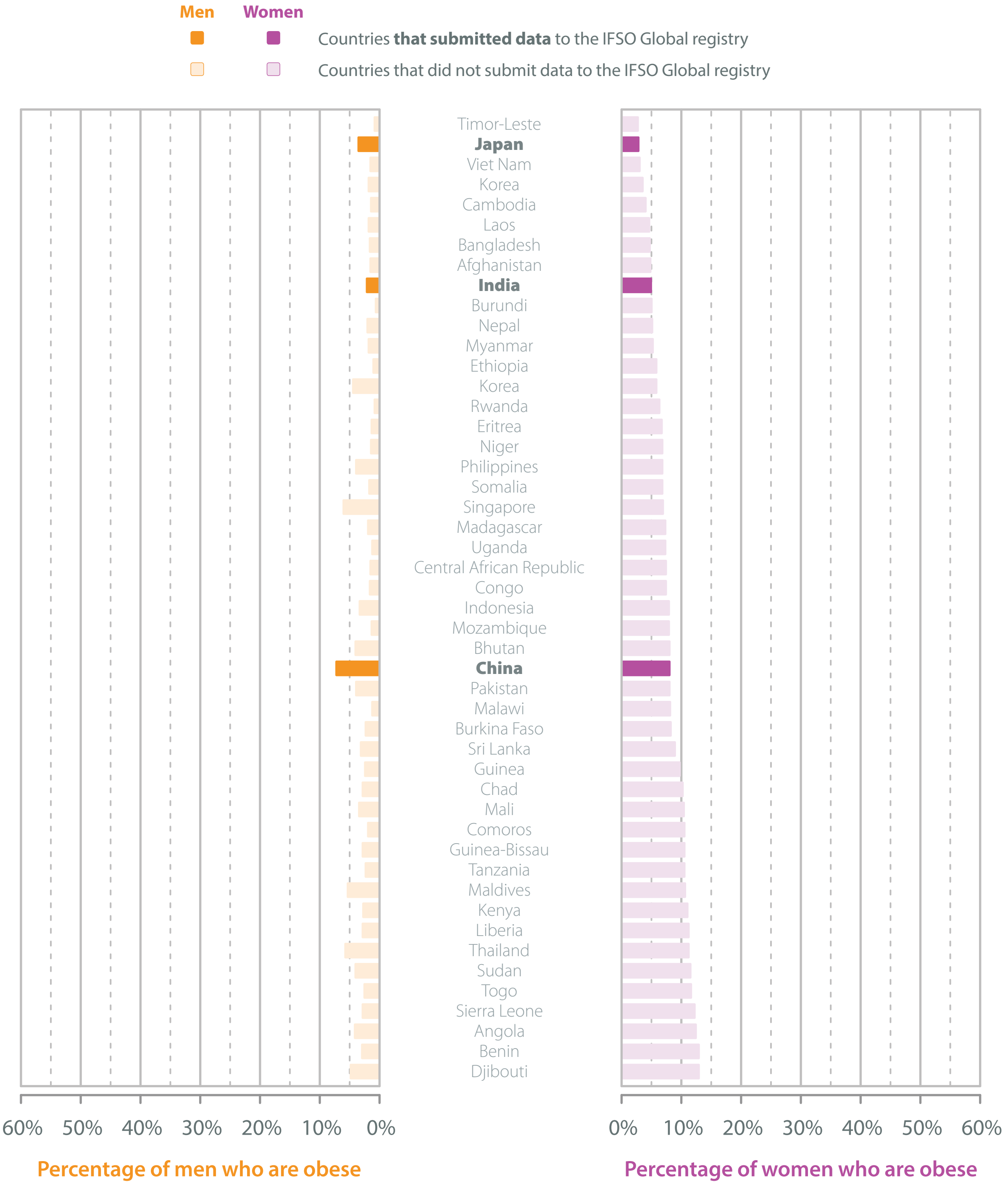
1. Sturm R. Increases in clinically severe obesity in the United States, 1986-2000. *Archives of Internal Medicine*. 2003; **163(18)**: 2146-8.
2. Collaboration NCDRF. Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. *Lancet*. 2016; **387(10026)**: 1377-96.

Global prevalence of obesity

The next four graphs show the latest data available for the prevalence of obesity (defined as body mass index of ≥30 kg m^{-2}) by gender from the World Health Organisation (apps.who.int/gho/data/view.main.CTRY2450A?lang=en). Together with the graph on the previous page they illustrate the severity of the problem affecting all, especially the more developed, countries.

Here we see the countries with the lowest prevalence of obesity. The difference in the prevalence between men and women is clear and consistent throughout these countries that currently exhibit the lowest levels of obesity, with female population, in general, having a higher rate of obesity than the male population; there are two exceptions: China and Japan.

WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2014



Countries represented on this page are from a range of regions. It is easy to recognise the European countries as it is in these countries that the prevalence of obesity in men is similar to or even exceeds that in the female population.

There are many developed countries contributing to the registry in this group of countries. It is noticeable that the gender divide in obesity prevalence is greatest in the sub-Saharan African nations.

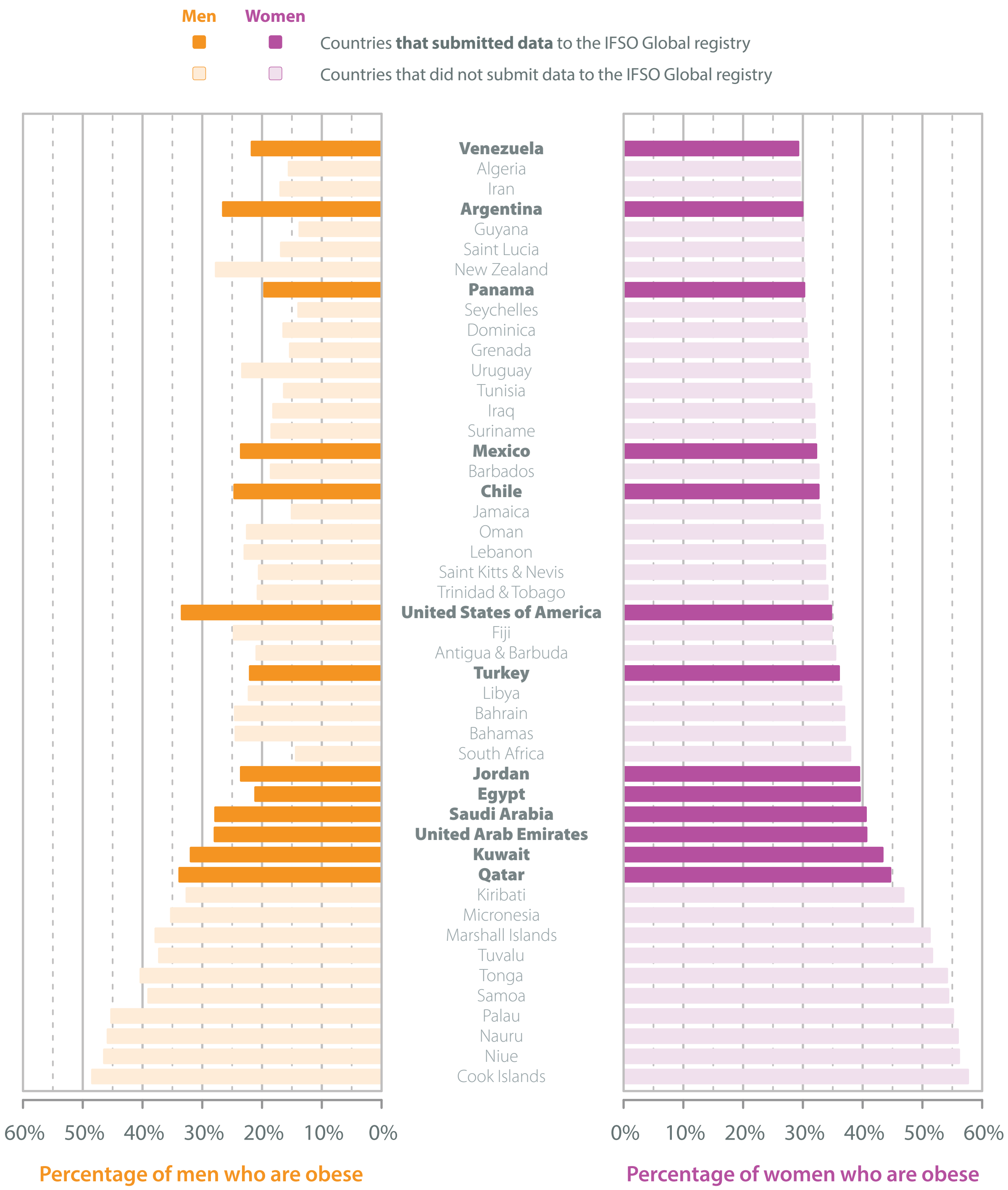
WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2014

The information on these four pages might suggest to some readers that countries represented in the first chart (those with the lowest rates of female obesity), should have less to worry about than those on the last page (in some of these countries more than half of the female population are obese). However, some simple calculations suggest otherwise: if, as indicated by the first chart, around 3% of the Indian population and 8% of the Chinese population are obese then just these two countries, which together currently account for about 36% of the world's population, would represent a burden of disease totalling approximately 150 **million** obese people.

WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2014

The countries represented here are those with the highest prevalence of obesity globally. Regions are very distinct and include the Pacific Islands, the Middle East, the United States, Mexico, Caribbean Islands, and parts of Central and South Americas.

WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2014



Contributors

Following the success of the IFSO Pilot Global Registry and subsequent expansion of the number of contributors (and the publication of the Second Global IFSO Registry Report at the IFSO congress in Rio de Janeiro in 2016), Dr Kelvin Higa, the President of IFSO, invited all IFSO members to join the registry. This year there are now more contributors than ever before, and the table spread across these two pages shows exactly which countries, in which continental region, were successful in submitting data either as national registries or as individual centres.

Contributors to the IFSO Global Registry

Region	Country	Operations	Data source
Europe	Belgium	8,163	Single centre
	Czech Republic	1,319	Single centre
	France	2,720	Multi-centre
	Georgia	110	Single centre
	Germany	471	Single centre
	Hungary	52	Single centre
	Ireland	503	Single centre
	Italy	2,398	Single centre
	Lithuania	67	Single centre
	Netherlands	6,742	**National registry**
	Poland	259	Multi-centre
	Russia	3,346	**National registry**
	Spain	709	Multi-centre
	Sweden	34,244	**National registry**
	Switzerland	5,050	Multi-centre
	Turkey	2,067	**National registry**
	United Kingdom	56,168	**National registry**
N America	Canada	2,143	Multi-centre
	Mexico	1,677	Multi-centre
	United States of America	5,197	Single centre
C America	Guatemala	51	Single centre
	Panama	96	Single centre

A complete list of all the hospitals / clinics that have submitted data on a country-by-country basis, is available in the Contributors section of this report on pages 58-65. Some of the established national registries were able to submit the totality of the data that they had collected over the years, while others were only able to submit data spanning one or two years. Notably Brazil has just commissioned a new National Registry, which is currently running in a limited pilot-mode and once this test phase has been completed, the registry will roll out across the country. As a consequence the hospitals listed as contributors for Brazil this year represent only the pilot centres.

Contributors to the IFSO Global Registry

Region	Country	Operations	Data source
S America	Argentina	52	Single centre
	Brazil	1,250	Multi-centre
	Chile	9,712	Multi-centre
	Colombia	205	Single centre
	Peru	705	Single centre
	Venezuela	148	Single centre
Middle East	Egypt	258	Single centre
	Israel	17,373	**National registry**
	Jordan	386	Single centre
	Kuwait	2,005	Multi-centre
	Qatar	2,832	Single centre
	Saudi Arabia	4,225	Multi-centre
	United Arab Emirates	1,294	Multi-centre
Asia	China	1,057	Single centre
	Hong Kong	753	Multi-centre
	India	12,480	**National registry**
	Japan	664	**National registry**
	Kazakhstan	147	Single centre
	Taiwan	6,769	Multi-centre
Australasia	Australia	321	Single centre

Database mechanics

New contributor invitees were sent an IFSO Global Registry *Charter* document that outlined and explained:

- aims of the Dendrite / IFSO Global Registry Project
- data protection
- access
- data ownership
- publication and other use of the data
- principles of operation: roles and responsibilities
- data validation
- supervising authorities

Once each invitee had returned their signed Charter document, for those that had the capability to upload data electronically, each was then sent a unique contributor *submit* identifier code, a username and password to access the dedicated Dendrite / IFSO *Upload-My Data* portal, and four key documents:

1. **The Database Form**: to provide a quick overview of the central database design. This is available in the Appendix in this report on pages 66 to 68.
2. **The File Specification Document**: that provides a detailed specification of the file format output required for submitting / uploading electronic data files.
3. **The Data Dictionary**: detailing the data definitions of the database answer options.
4. **The User Manual**: to explain how the Upload-My-Data software can be used.

All these documents are available on-line at:

https: //rs3.e-dendrite.com / csp / ifsogrv3umd / frontpages / docs.html

For those centres without a local database, Dendrite constructed and provided an on-line database system accessible over the Internet. This portal enables surgeons / data managers to enter cases (with anonymised patient identifiers) using a simple on-line data form with just 4 pages of questions, that typically takes just 3-4 minutes to complete *per* patient record.

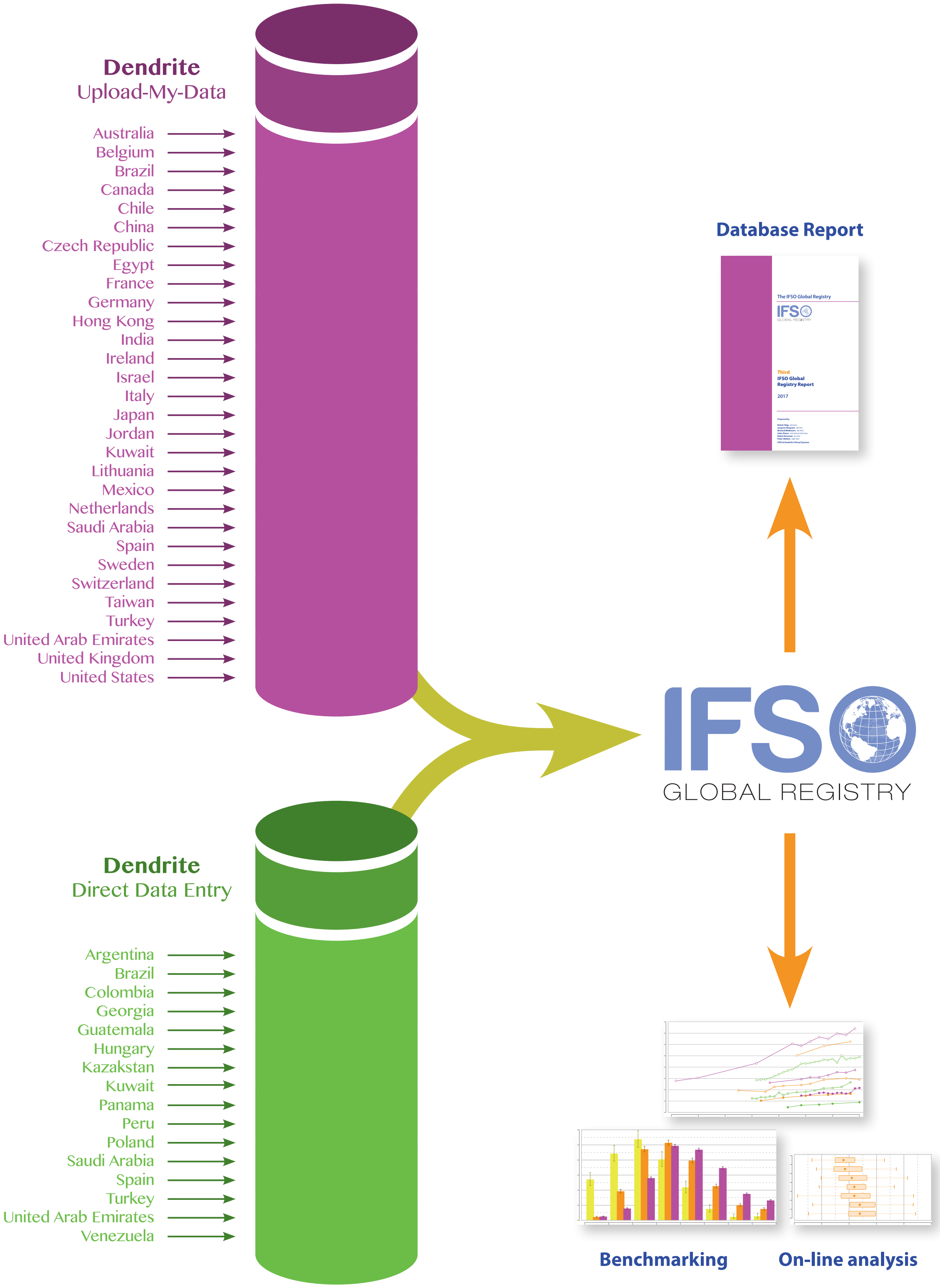
The Dendrite *Upload-My-Data* software platform is a proven interface, designed to enable a community of surgeons or physicians to create a national or international database; even if there are different database systems being used at the local level, the data from each can be integrated into the central, merged registry. This platform has been successfully utilised in a number of other national and international registries (*e.g.*, for cardiac surgery, thoracic surgery, and a number of medical device registries) and in this instance has been specifically tailored for the IFSO project to enable both individual centres and national registries to submit data in batches on-line.

The software has been designed to walk the user through a series of simple steps using a menu structure and on-screen instructions from an initial Welcome Page through a series of file and data validation checks to a final *Data Commit* page and a Summary Screen that provides a brief *précis* of the data received in the central IFSO Global Registry following each upload.

The diagram opposite illustrates the fact that most countries (and all national databases) were successfully able to upload data electronically through this Upload-My-Data web portal.

By combining the data from the Upload-My-Data area with the data submitted on-line case-by-case, through the Direct-Data-Entry module, it was then possible to run the analyses on data gathered from 42 countries as illustrated in this report.

The next step is to create and publish some dynamic on-line analyses so that these can be accessed anywhere in the world where there is an Internet connection. The design and publication work for this task is on-going.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Japan
Jordan
Kuwait
Lithuania
Mexico
Netherlands
Saudi Arabia
Spain
Sweden
Switzerland
Taiwan
Turkey
United Arab Emirates
United Kingdom
United States
Dendrite
Direct Data Entry
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Colombia
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Guatemala
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On-line analysis

A note on the conventions used throughout this report

There are several conventions used in the report in an attempt to ensure that the data are presented in a simple and consistent way. These conventions relate largely to the tables and the graphs, and some of these conventions are outlined below.

The specifics of the data used in any particular analysis are made clear in the accompanying text, table or chart. For example, many analyses sub-divide the data on the basis of the kind of surgery (primary *versus* revisional surgery), and the titles for both tables and charts will reflect this fact.

Conventions used in tables

On the whole, unless otherwise stated, the tables and charts in this report record the number of procedures (see the example below).

Primary operations in the calendar years 2013-2017; age at operation and gender

Age at surgery / years	Gender			
	Male	**Female**	**Unspecified**	**All**
<20	917	1,452	0	**2,369**
20-29	3,453	10,181	4	**13,638**
30-39	5,771	15,802	2	**21,575**
40-49	7,469	18,354	1	**25,824**
50-59	5,652	13,594	0	**19,246**
60-69	2,253	4,250	0	**6,503**
>69	159	274	0	**433**
Unspecified	**34**	**40**	**0**	**74**
All	**25,708**	**63,947**	**7**	**89,662**

Each table has a short title that is intended to provide information on the subset from which the data have been drawn, such as the patient's gender or particular operation sub-grouping under examination.

The numbers in each table are colour-coded so that entries with complete data for all of the components under consideration (in this example both age and gender) are shown in regular black text. If one or more of the database questions under analysis is blank, the data are reported as unspecified in **purple** text. The totals for both rows and columns are highlighted as emboldened text.

Some tables record percentage values; in such cases this is made clear by the use of an appropriate title within the table and a % symbol after the numeric value.

Rows and columns within tables have been ordered so that they are either in ascending order (age at procedure: <20, 20-29, 30-39 years, *etc.*; post-procedure stay 0, 1, 2, 3, >3 days; *etc.*) or with negative response options first (No; None) followed by positive response options (Yes; One, Two, *etc.*).

Row and column titles are as detailed as possible within the confines of the space available on the page. Where a title in either a row or a column is not as detailed as the authors would have liked, then footnotes have been added to provide clarification.

There are some charts in the report that are not accompanied by data in a tabular format. In such cases the tables are omitted for one of a number of reasons:

- insufficient space on the page to accommodate both the table and graph.
- there would be more rows and / or columns of data than could reasonably be accommodated on the page (for example, Kaplan-Meier curves).
- the tabular data has already been presented elsewhere in the report.

Conventions used in graphs

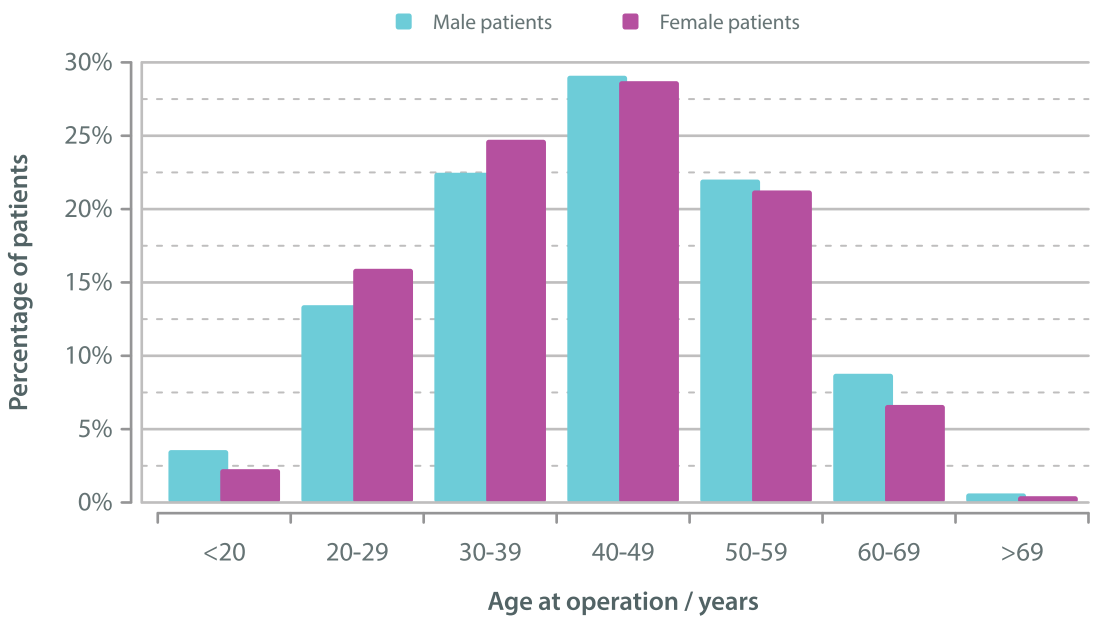
The basic principles applied when preparing graphs for this Third IFSO Global Registry Report were based, as far as possible, upon William S Cleveland's book *The elements of graphing data* [1]. This book details both best practice and the theoretical bases that underlie these practices, demonstrating that there are sound, scientific reasons for plotting charts in particular ways.

Counts: the counts (shown in parentheses at the end of each graph's title as n=) associated with each graph can be affected by a number of independent factors and will therefore vary from chapter to chapter and from page to page. Most obviously, many of the charts in this report are graphic representations of results for a particular group (or subset) extracted from the database, such as patients undergoing primary surgery. This clearly restricts the total number of database-entries available for any such analysis.

In addition to this, some entries within the group under consideration have data missing in one or more of the database questions under examination (reported as unspecified in the tables); all entries with missing data are excluded from the analysis used to generate the graph because they do not add any useful information.

For example, in the graph below, only the database entries where the patient is having primary surgery and both the patient's age and gender are known are included in the analysis; this comes to 89,581 patient-entries (917 + 1,452 + 3,453 + 10,181 + 5,771 + 15,802 + 7,469 + 18,354 + 5,652 + 13,594 + 2,253 + 4,250 + 159 + 274; the 74 + 7 entries with unspecified data are excluded from the chart).

Primary surgery: Age and gender; in the calendar years 2013-2017 (n=89,581)



Confidence interval: in the charts prepared for this report, most of the bars plotted around rates (percentage values) represent 95% confidence intervals [2]. The width of the confidence interval provides some idea of how certain we can be about the calculated rate of an event or occurrence. If the intervals around two rates do not overlap, then we can say, with the specified level of confidence, that these rates are different; however, if the bars do overlap, we cannot make such an assertion.

Bars around averaged values (such as patients' age, post-operative length-of-stay, *etc.*) are classical standard error bars or 95% confidence intervals; they give some idea of the spread of the data around the calculated average. In some analyses that employ these error bars there may be insufficient data to legitimately calculate the standard error around the average for each sub-group under analysis; rather than entirely exclude these low-volume sub-groups from the chart their arithmetic average would be plotted without error bars. Such averages without error bars are valid in the sense that they truly represent the data submitted; however, they should not to be taken as definitive and therefore it is recommended that such values are viewed with extra caution.

1. Cleveland WS. *The elements of graphing data*. 1985, 1994. Hobart Press, Summit, New Jersey, USA.
2. Wilson EB. Probable inference, the law of succession, and statistical inference. *Journal of American Statistical Association*. 1927; **22**: 209-212.

The growth of the IFSO Global Registry

The info-graphics shown here illustrate the numbers of operations accumulated into the IFSO Global Registry Pilot Project (2015), the Second Global Registry Report (2016) and this Third Global Registry Report (2017).

Unique in reports of bariatric surgery worldwide, each number represents an individual patient record containing a specific dataset. As the data continue to accumulate it will become possible to categorise with some accuracy the precise demographics and burden of obesity-related disease in patients worldwide having bariatric-metabolic surgery.

Healthcare planners in each affected country should then be able to use the data to improve access to bariatric surgery for their patients.

2015 data merge

100,092

operations

8 single centres
7 multi-centre submissions
3 national registries

2016 data merge

142,748

operations

19 single centres
5 multi-centre submissions
7 national registries

2017 data merge

196,188

operations

21 single centres
13 multi-centre submissions
8 national registries

The IFSO Global Registry project started out as a feasibility project to ascertain whether or not there was sufficient political will among contributors from a number of countries around the world to collaborate and share data, and then to assess whether or not Dendrite could merge all the incoming data (from multiple, disparate software systems) onto a single, unified database platform: Dendrite's *Intellect Web* national / international web registry system. The next stage of the feasibility project was to explore whether or not Dendrite could prepare analyses that would be meaningful and easy to interpret.

The project was deemed a success. In its first iteration, 100,092 individual procedure records from 18 contributing countries were merged and analysed. Commentators noted that there were intriguing **expected** and **unexpected** similarities and differences in demographic patterns of patient morbidity, comorbidity and in operative practice between countries. Necessarily the contributors that were involved in the initial pilot project could easily be deemed in one of the oldest social sciences theories as *innovators and early adopters* (as defined by Everett M. Rogers' Diffusion of Innovations 1962) as they joined the project without knowing in advance exactly what the output would be. But, they had confidence in new technology, believing that it would *just work*, which it did. Interestingly in a normal business setting, innovators and early adopters usually account for no more than 16% of the population. Perhaps not surprisingly, bariatric surgeons clearly demonstrated higher than usual levels of the behavioural characteristics normally associated with innovators and early adopters: namely intuition and vision. Because of this, almost a third of IFSO member countries joined the project in its very first wave!

Progress to the 2^{nd} and now the 3^{rd} IFSO Reports represent the inclusion of contributors from countries that could be best described as the *early majority* and *late majority*, using the same terminology coined in the Diffusion of Innovation Theory. Within three years of starting out, the reach of the IFSO Registry has already extended to approximately **two-thirds** of the IFSO membership countries, although the numbers of contributors within each country ranges from all-encompassing national database contributions to representation by data from a single centre with an enthusiastic surgical team. Nevertheless, the number of national registries that have submitted data has increased year-on-year, and the number that have committed to join next year is even higher still.

The challenge moving forwards is to attract data submission from **every** bariatric surgery centre worldwide and to gain acceptance that the Global Registry is trying to add additional value to national registry projects by providing international comparative analyses, and it is **not** trying to replace these national initiatives in any way, shape or form. As Data Protection legislation around the world seems to become increasingly complex and adds ever more restrictions on the sharing of data; there are clearly a number of regulatory hurdles that need to be crossed before some countries will be able to release their national registry data to this IFSO Global Registry project. Nonetheless, these barriers are being addressed, and consequently we expect contributions from national registries to increase substantially within the next year.

All contributors to the IFSO Global Registry are to be applauded, whether they come from an innovator, an early adopter or one of the early or late majority groups. We recognise that it is hard work collecting data in any clinic or hospital setting, so we are especially thankful for those surgeons and national societies who have made the effort to contribute their data onwards to the IFSO Global Registry. For those who have yet to join the project, we are looking forward to providing a warm welcome to you in the future when you are ready and able to join this project.

The goal for the next year is to hit a target of contributions from 50 countries, and hopefully see a doubling in the total number of records that have been submitted.

As the software company that provides the platform underpinning this registry, Dendrite Clinical Systems are ready to provide personal assistance to any newcomers; please make contact with Dr Peter Walton (Managing Director, Dendrite Clinical Systems: peter.walton@e-dendrite.com or phone: +44 1491 411 288) and he will provide encouragement, guidance and practical help on how to join the IFSO Global Registry and how to set up your own national registry if you don't yet have one in place.

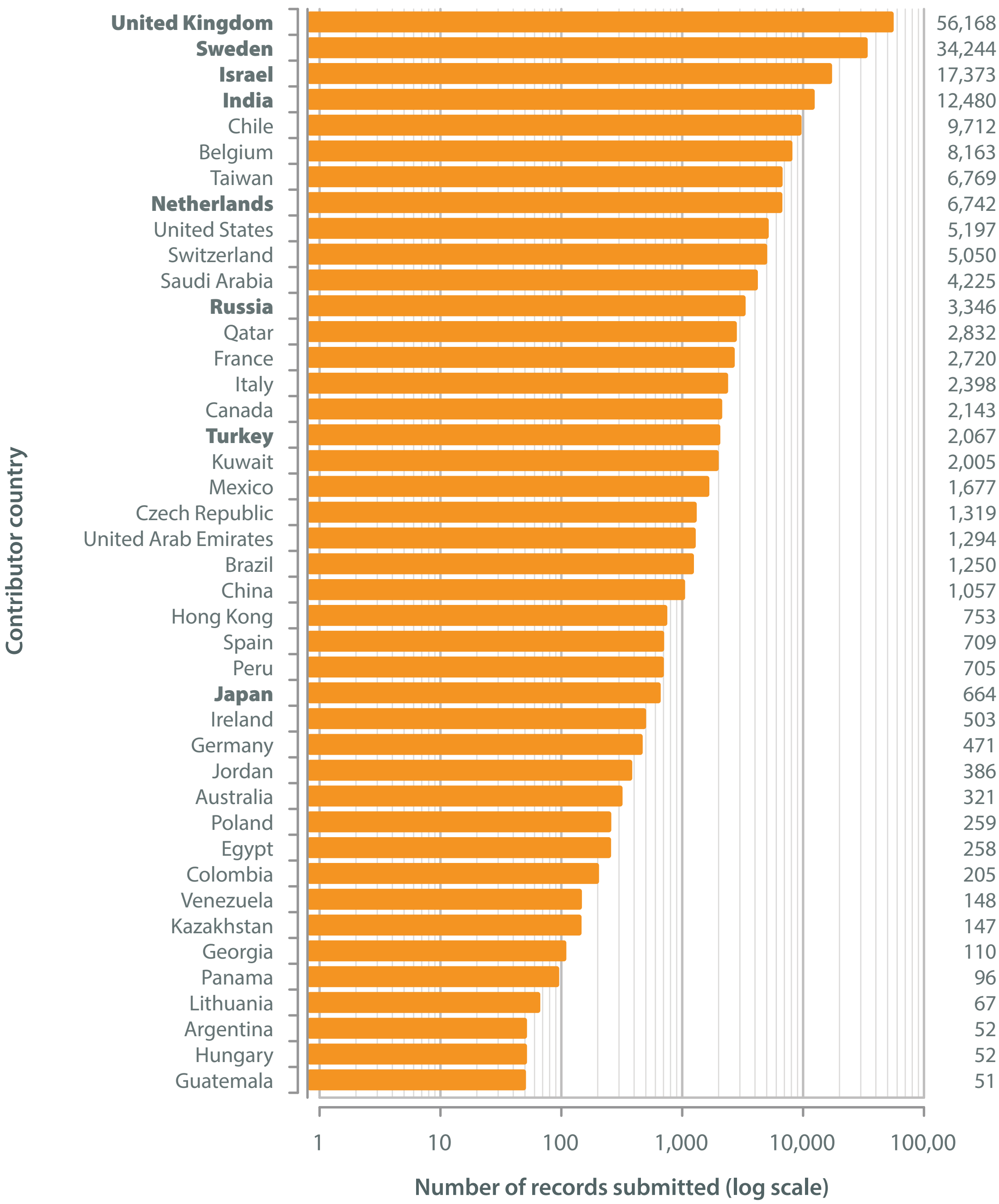
The first IFSO Global Registry Report was well received, and the second report was a step-wise improvement over the first report. We hope that you will agree that this third report is even more comprehensive and even more informative than the previous two iterations, and lays the foundations for ever more valuable analyses in the future. As the number of data submissions continues to rise and the data become increasingly representative of surgery in each of the contributor countries this IFSO Global Registry will truly reveal the current state of bariatric / metabolic surgery across the world.

Submissions

For this Third IFSO Global Registry Report data from over 196,000 patient records were submitted from 42 countries. The numbers submitted range from exports of data from existing national registries (*e.g.*, Sweden and the United Kingdom) to individual units in other countries that might not be fully representative of overall existing practice in those countries.

However, this is the first time that data have been combined from so many countries. Thus, this is the start of an iterative process as data accumulates over time. In future we hope to add data from more countries so that we can accurately describe the demographics and prevalence of baseline obesity-related disease between different populations undergoing bariatric surgery.

IFSO Global Registry 2017:
Number of operation records submitted (n=196,188)



The data opposite show the number of operations *per* contributing country on a logarithmic scale. Until we have more complete data for the total number of operations it is not possible to know how representative the data are for each country, especially for those countries submitting only a few patient records to the current report.

Clearly the data presented are also a snap-shot of surgery in many of the countries and are not the total volume of surgery performed. The data in the rest of the report are from the 5 calendar years 2013-17, so as to present the most recent information, indicated by the years highlighted in **orange** along this chart's horizontal axis.

IFSO Global Registry 2017: Scope of the data submitted

Data completeness

Mandatory questions (required to create an entry on the database) were:

- the patient's date-of-birth or age in years
- the patient's gender
- the patient's height
- date-of-operation
- operative approach
- type of operation

This table shows the completeness of data submitted in the required electronic format for inclusion in the report. There was wide variation; this could either be due to the specific data-point not being included in the patient record that was uploaded to the Global Registry, or the data were left out of initial entry into the local database. Some apparently missing data reported here may represent a simple incompatibility between the local database and the central IFSO registry, rather than representing a complete absence of information at the local level.

Data completenesss for selected fields in the merged IFSO Global Registry

	Contributor country																				
	Argentina	Australia	Belgium	Brazil	Canada	Chile	China	Colombia	Czech Republic	Egypt	France	Georgia	Germany	Guatemala	Hong Kong	Hungary	**India**	Ireland	**Israel**	Italy	**Japan**
Basic patient details																					
Age	100%	100%	100%	90.0-99.9%	100%	100%	90.0-99.9%	100%	100%	100%	100%	100%	90.0-99.9%	100%	100%	100%	90.0-99.9%	100%	100%	100%	100%
Gender	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	90.0-99.9%	100%	100%	100%	100%	100%	100%	100%	100%
Initial weight	100%	100%	90.0-99.9%	90.0-99.9%	0%	10.0-89.9%	90.0-99.9%	90.0-99.9%	0%	100%	0.1-10.0%	100%	90.0-99.9%	100%	100%	100%	90.0-99.9%	100%	10.0-89.9%	0%	90.0-99.9%
Funding	100%	0%	0%	0.1-10.0%	0%	10.0-89.9%	90.0-99.9%	90.0-99.9%	100%	100%	0.1-10.0%	100%	10.0-89.9%	100%	100%	100%	90.0-99.9%	100%	0%	0%	0%
Comorbidities																					
Type 2 diabetes	100%	100%	0%	0.1-10.0%	10.0-89.9%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0%	100%	90.0-99.9%	100%	100%	0%	100%	100%	90.0-99.9%	90.0-99.9%	10.0-89.9%	0%	100%
Hypertension	100%	0%	0%	0.1-10.0%	10.0-89.9%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0%	100%	90.0-99.9%	100%	100%	0%	90.0-99.9%	100%	90.0-99.9%	90.0-99.9%	10.0-89.9%	100%	100%
Depression	100%	0%	0%	0.1-10.0%	10.0-89.9%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0%	100%	0.1-10.0%	100%	100%	0%	10.0-89.9%	100%	90.0-99.9%	90.0-99.9%	10.0-89.9%	0%	0%
DVT risk	100%	0%	0%	0.1-10.0%	0%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0%	100%	0.1-10.0%	100%	100%	0%	10.0-89.9%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	0%	0%
Musculo-skeletal pain	100%	0%	0%	0.1-10.0%	0%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0%	100%	0.1-10.0%	100%	100%	0%	100%	100%	90.0-99.9%	90.0-99.9%	10.0-89.9%	100%	0%
Sleep apnea	100%	0%	0%	0.1-10.0%	0%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0%	100%	90.0-99.9%	100%	100%	0%	100%	100%	90.0-99.9%	90.0-99.9%	10.0-89.9%	100%	0%
Dyslipidemia	100%	0%	0%	0.1-10.0%	0%	0.1-10.0%	10.0-89.9%	90.0-99.9%	0%	100%	0%	100%	0%	0%	100%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	0%	100%
GERD	100%	0%	0%	0.1-10.0%	0%	0.1-10.0%	10.0-89.9%	90.0-99.9%	0%	100%	0%	100%	0%	0%	100%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	0%	0%
Surgery																					
Weight at operation	100%	90.0-99.9%	0%	90.0-99.9%	100%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0%	100%	90.0-99.9%	100%	90.0-99.9%	100%	100%	100%	90.0-99.9%	10.0-89.9%	90.0-99.9%	0%	0%
Previous surgery	100%	100%	100%	90.0-99.9%	0%	10.0-89.9%	90.0-99.9%	100%	0%	100%	10.0-89.9%	100%	100%	100%	100%	100%	100%	100%	90.0-99.9%	0%	0%
Surgical approach	100%	100%	0%	100%	100%	100%	100%	100%	100%	100%	0.1-10.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Outcomes																					
Leak	90.0-99.9%	0%	0%	0.1-10.0%	0%	10.0-89.9%	0%	90.0-99.9%	0%	100%	0.1-10.0%	100%	100%	100%	100%	100%	10.0-89.9%	0%	0%	0%	0%
Bleed	90.0-99.9%	0%	0%	0.1-10.0%	0%	10.0-89.9%	0%	90.0-99.9%	0%	100%	0.1-10.0%	100%	100%	100%	100%	100%	10.0-89.9%	0%	0%	0%	0%
Obstruction	90.0-99.9%	0%	0%	0.1-10.0%	0%	10.0-89.9%	0%	90.0-99.9%	0%	100%	0.1-10.0%	100%	100%	100%	100%	100%	10.0-89.9%	0%	0%	0%	0%
Re-operation	90.0-99.9%	0%	0%	0.1-10.0%	0%	0.1-10.0%	0%	90.0-99.9%	0%	100%	0%	100%	0%	100%	100%	100%	0.1-10.0%	0%	0%	0%	0%
Status at discharge	90.0-99.9%	0%	0%	0.1-10.0%	0.1-10.0%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0%	100%	0.1-10.0%	100%	10.0-89.9%	100%	90.0-99.9%	100%	10.0-89.9%	100%	100%	0%	0%
Date of discharge	90.0-99.9%	0%	0%	0.1-10.0%	0%	10.0-89.9%	10.0-89.9%	0%	0%	100%	0.1-10.0%	100%	0%	90.0-99.9%	90.0-99.9%	100%	10.0-89.9%	90.0-99.9%	0%	0%	0%

Completeness key: 100% · 90.0-99.9% · 10.0-89.9% · 0.1-10.0% · 0% complete

For example, the National Bariatric Surgery Registry in the United Kingdom does record operative complications, but not in a suitable format to map into the IFSO Global Registry. In some countries data were missing or unavailable for the purposes of this report in over 90% patients. Missing patient records, incomplete data entry and erroneous entries are major concerns, and act as impediments to meaningful and accurate reporting of outcomes. Some countries may have dedicated administrative staff who are able to check every record; however, it is unlikely that this is the case in perhaps the majority of countries submitting data here. The quality of data might be expected to improve in future, but it is important to state that the purpose of this third report is not to provide benchmarks nor quality control; rather, it is intended to demonstrate that data can be submitted successfully to a central registry and useful basic analyses can be performed. It is remarkable that so many of the data fields are shared between different registries and are over 90% complete (the green squares in the table). The term musculo-skeletal pain was chosen as a generic term for all related conditions, so as to be inclusive, and collect as much data as possible on this comorbidity. Confirmed sleep apnea includes only patients on therapy. The full question titles and corresponding response-options are documented in the Appendix at the end of this report.

Data completenesss for selected fields in the merged IFSO Global Registry

	Contributor country																				
	Jordan	Kazakhstan	Kuwait	Lithuania	Mexico	**Netherlands**	Panama	Peru	Poland	Qatar	**Russia**	Saudi Arabia	Spain	**Sweden**	Switzerland	Taiwan	**Turkey**	United Arab Emirates	**United Kingdom**	United States	Venezuela
Basic patient details																					
Age	100%	100%	100%	100%	100%	90.0-99.9%	100%	90.0-99.9%	100%	100%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	100%
Gender	100%	100%	100%	100%	90.0-99.9%	100%	100%	90.0-99.9%	100%	100%	100%	100%	90.0-99.9%	100%	100%	90.0-99.9%	100%	90.0-99.9%	100%	100%	100%
Initial weight	100%	100%	100%	100%	10.0-89.9%	90.0-99.9%	100%	90.0-99.9%	90.0-99.9%	0% complete	100%	90.0-99.9%	10.0-89.9%	100%	0% complete	10.0-89.9%	90.0-99.9%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%
Funding	100%	100%	100%	100%	100%	0% complete	90.0-99.9%	90.0-99.9%	100%	100%	100%	100%	100%	0.1-10.0%	0% complete	10.0-89.9%	90.0-99.9%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%
Comorbidities																					
Type 2 diabetes	100%	100%	10.0-89.9%	100%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	90.0-99.9%	90.0-99.9%	100%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%	90.0-99.9%	100%	90.0-99.9%
Hypertension	100%	100%	10.0-89.9%	100%	100%	10.0-89.9%	90.0-99.9%	90.0-99.9%	100%	100%	10.0-89.9%	90.0-99.9%	100%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%	90.0-99.9%	100%	90.0-99.9%
Depression	100%	100%	10.0-89.9%	100%	10.0-89.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%	0% complete	10.0-89.9%	10.0-89.9%	10.0-89.9%	10.0-89.9%	0% complete	90.0-99.9%
DVT risk	100%	100%	10.0-89.9%	100%	10.0-89.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	10.0-89.9%	0.1-10.0%	10.0-89.9%	10.0-89.9%	0% complete	10.0-89.9%	10.0-89.9%	10.0-89.9%	90.0-99.9%	100%	90.0-99.9%
Musculo-skeletal pain	100%	100%	10.0-89.9%	100%	10.0-89.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	0% complete	10.0-89.9%	0.1-10.0%	10.0-89.9%	0% complete	0% complete	10.0-89.9%	10.0-89.9%	10.0-89.9%	90.0-99.9%	0% complete	90.0-99.9%
Sleep apnea	10.0-89.9%	100%	10.0-89.9%	100%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	10.0-89.9%	90.0-99.9%	100%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%	90.0-99.9%	100%	90.0-99.9%
Dyslipidemia	100%	100%	10.0-89.9%	100%	10.0-89.9%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%	100%	10.0-89.9%	90.0-99.9%	0.1-10.0%	0% complete	0% complete	0% complete	10.0-89.9%	10.0-89.9%	90.0-99.9%	100%	90.0-99.9%
GERD	100%	100%	10.0-89.9%	100%	10.0-89.9%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%	100%	10.0-89.9%	90.0-99.9%	0.1-10.0%	0% complete	10.0-89.9%	0% complete	10.0-89.9%	10.0-89.9%	10.0-89.9%	100%	90.0-99.9%
Surgery																					
Weight at operation	0% complete	100%	90.0-99.9%	100%	90.0-99.9%	0.1-10.0%	90.0-99.9%	90.0-99.9%	100%	90.0-99.9%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	10.0-89.9%	90.0-99.9%	90.0-99.9%
Previous surgery	100%	100%	10.0-89.9%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Surgical approach	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Outcomes																					
Leak	100%	100%	10.0-89.9%	100%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	90.0-99.9%	100%	90.0-99.9%	90.0-99.9%	0% complete	0.1-10.0%	100%	0% complete	100%	90.0-99.9%
Bleed	100%	100%	10.0-89.9%	100%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	90.0-99.9%	100%	90.0-99.9%	0% complete	0% complete	0.1-10.0%	100%	0% complete	100%	90.0-99.9%
Obstruction	0% complete	100%	10.0-89.9%	100%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	90.0-99.9%	100%	90.0-99.9%	0% complete	0% complete	0.1-10.0%	100%	0% complete	100%	90.0-99.9%
Re-operation	0% complete	100%	10.0-89.9%	100%	10.0-89.9%	90.0-99.9%	90.0-99.9%	10.0-89.9%	90.0-99.9%	100%	100%	90.0-99.9%	0.1-10.0%	0% complete	10.0-89.9%	0% complete	0.1-10.0%	10.0-89.9%	0% complete	100%	90.0-99.9%
Status at discharge	100%	100%	10.0-89.9%	100%	100%	0.1-10.0%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	90.0-99.9%	100%	90.0-99.9%	90.0-99.9%	10.0-89.9%	90.0-99.9%	100%	90.0-99.9%	100%	90.0-99.9%
Date of discharge	10.0-89.9%	90.0-99.9%	90.0-99.9%	100%	90.0-99.9%	10.0-89.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	10.0-89.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	10.0-89.9%	90.0-99.9%	10.0-89.9%	10.0-89.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%

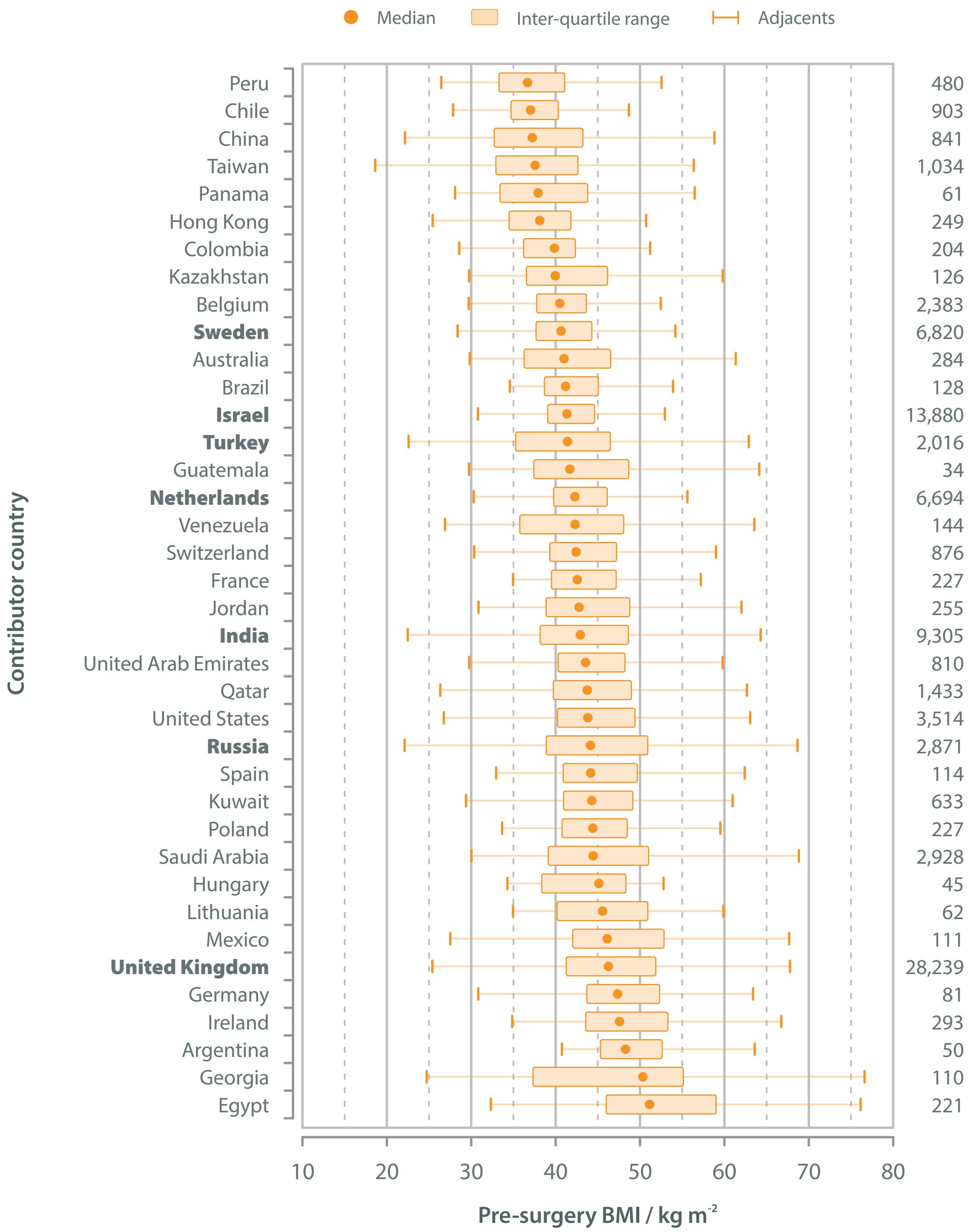
Completeness key 100% 90.0-99.9% 10.0-89.9% 0.1-10.0% 0% complete

Body Mass Index prior to surgery

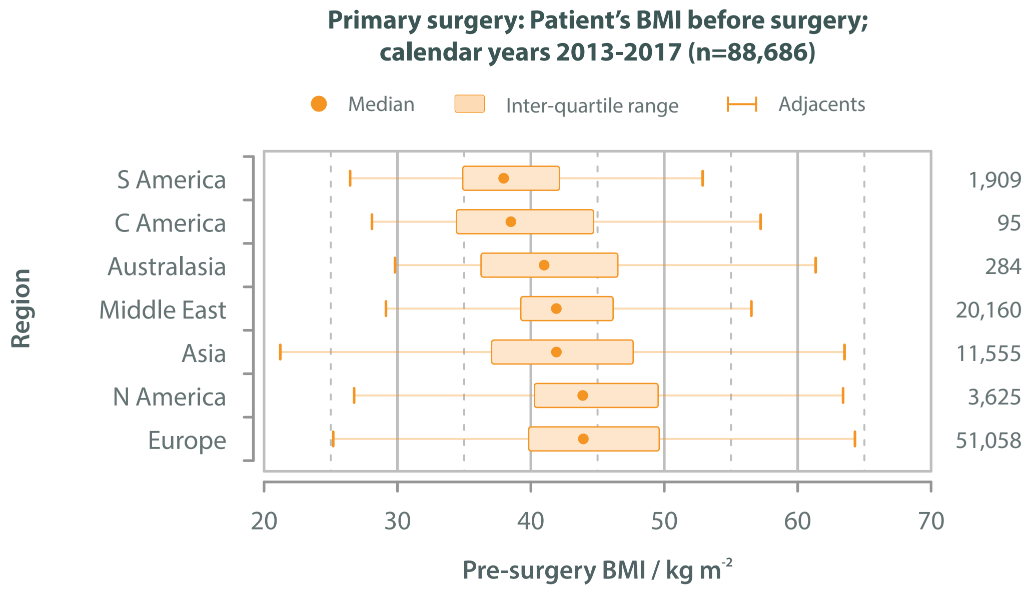
The graph below shows that there is a wide variation in the initial BMI of patients having bariatric surgery in different countries. Egypt, Georgia and Argentina have the highest reported BMIs. As increasing BMI is generally associated with a greatest risk of operative complications and mortality, the graph clearly implies that there needs to be caution applied when comparing complication rates between series of patients from different countries. We do not attempt to make these analyses.

We have not sub-divided the pre-operative BMI by funding mechanism. Subsequent analyses would show if there are differences internationally between patients funded by public health or insurance based systems, compared to patients paying for surgery privately.

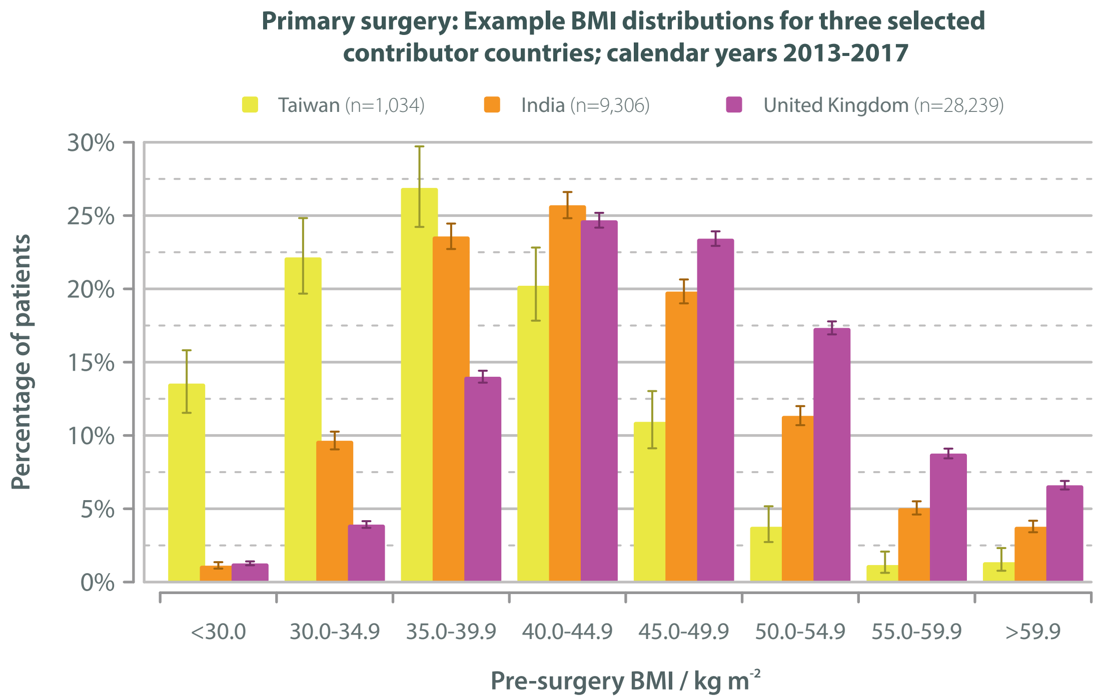
Primary surgery: Patient's BMI before surgery; calendar years 2013-2017 (n=88,686)



The data illustrate the differences in BMI before surgery in different continents. Although the inter-quartile ranges all overlap, South & Central American patients appear to be less obese than their North American & European counterparts.



This comparison graph of pre-operative BMI distributions in 3 countries shows clearly the variation in populations being operated upon in different healthcare systems.

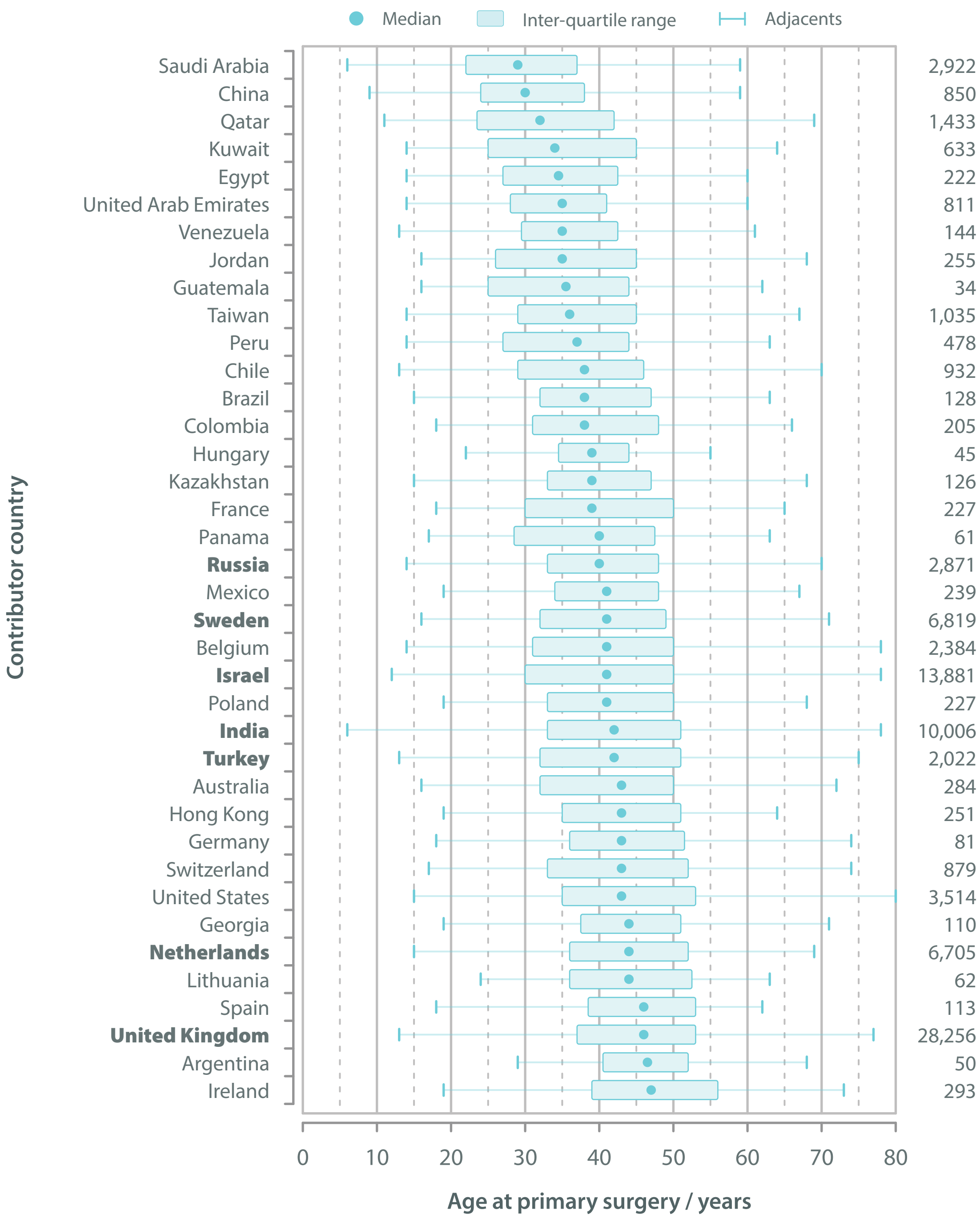


Age at surgery

The graph below shows the median age of patients at baseline for each of the contributing countries. The patients from Saudi Arabia have the lowest age at surgery, but the centre that submitted these data specialises in child & adolescent surgery, and so the age distribution data is unlikely be fully representative for this country.

The extremes of age are notable as we see surgery performed in the first and eighth decades of life. It will be important to evaluate this trend and provide evidence based guidance of for operating in these age groups.

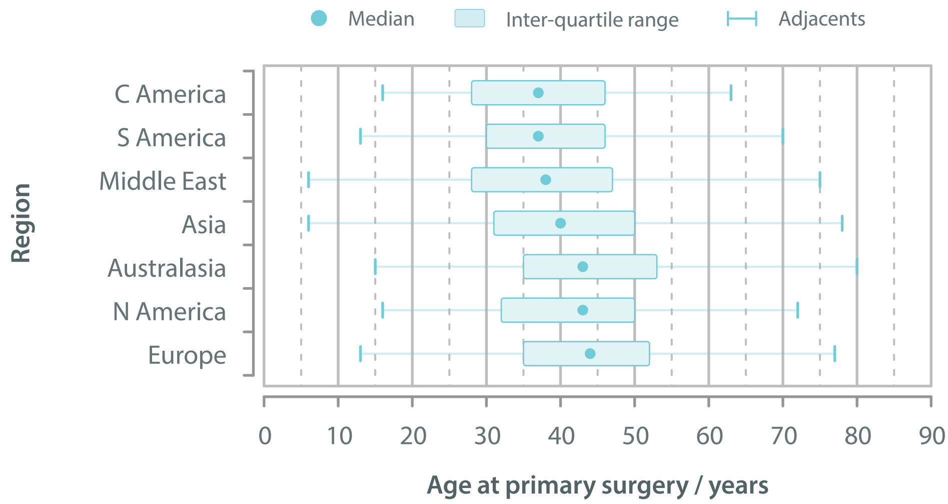
Primary surgery: Patient's age at the time of surgery; calendar years 2013-2017 (n=89,588)



Primary surgery in the calendar years 2013-2017: statistics on basic demographic data; all contributor countries are included

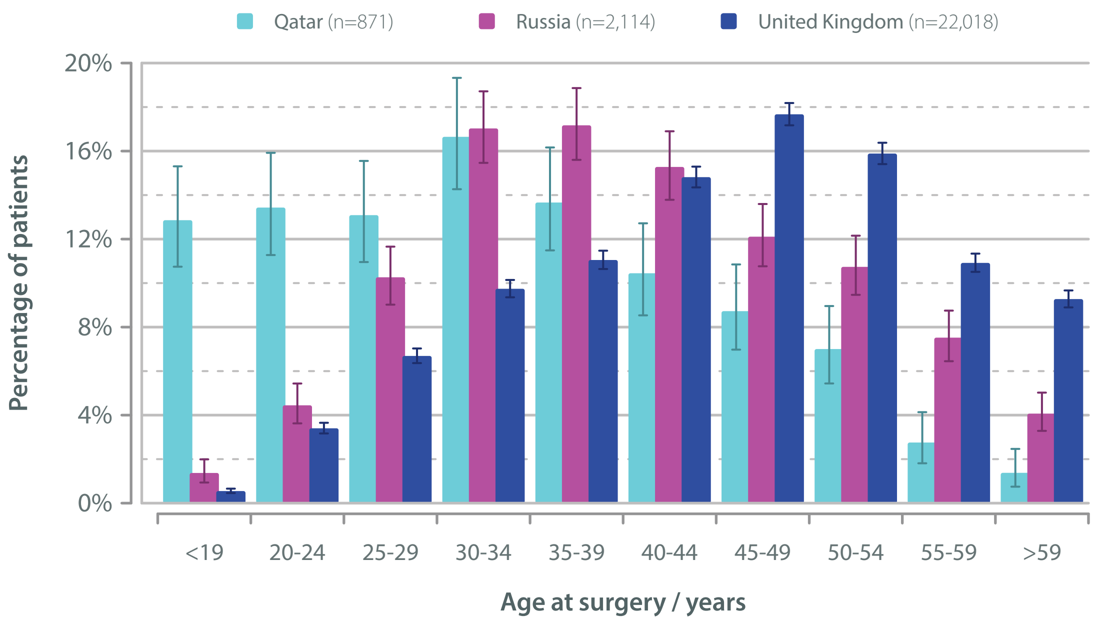
		Average (95% CI)	**Median** (IQR)
Pre-surgery demographics	Age / years	**42.0** (41.9-42.1)	**42.0** (33.0-51.0)
	Female patients / %	**71.3%** (71.0-71.6%)	

Primary surgery: Patient's age at the time of surgery; calendar years 2013-2017 (n=88,588)



This comparison graph shows clearly the differences in age distributions of patients being operated on in 3 different healthcare systems.

Primary surgery for female patients: Example age distributions for three selected contributor countries; calendar years 2013-2017

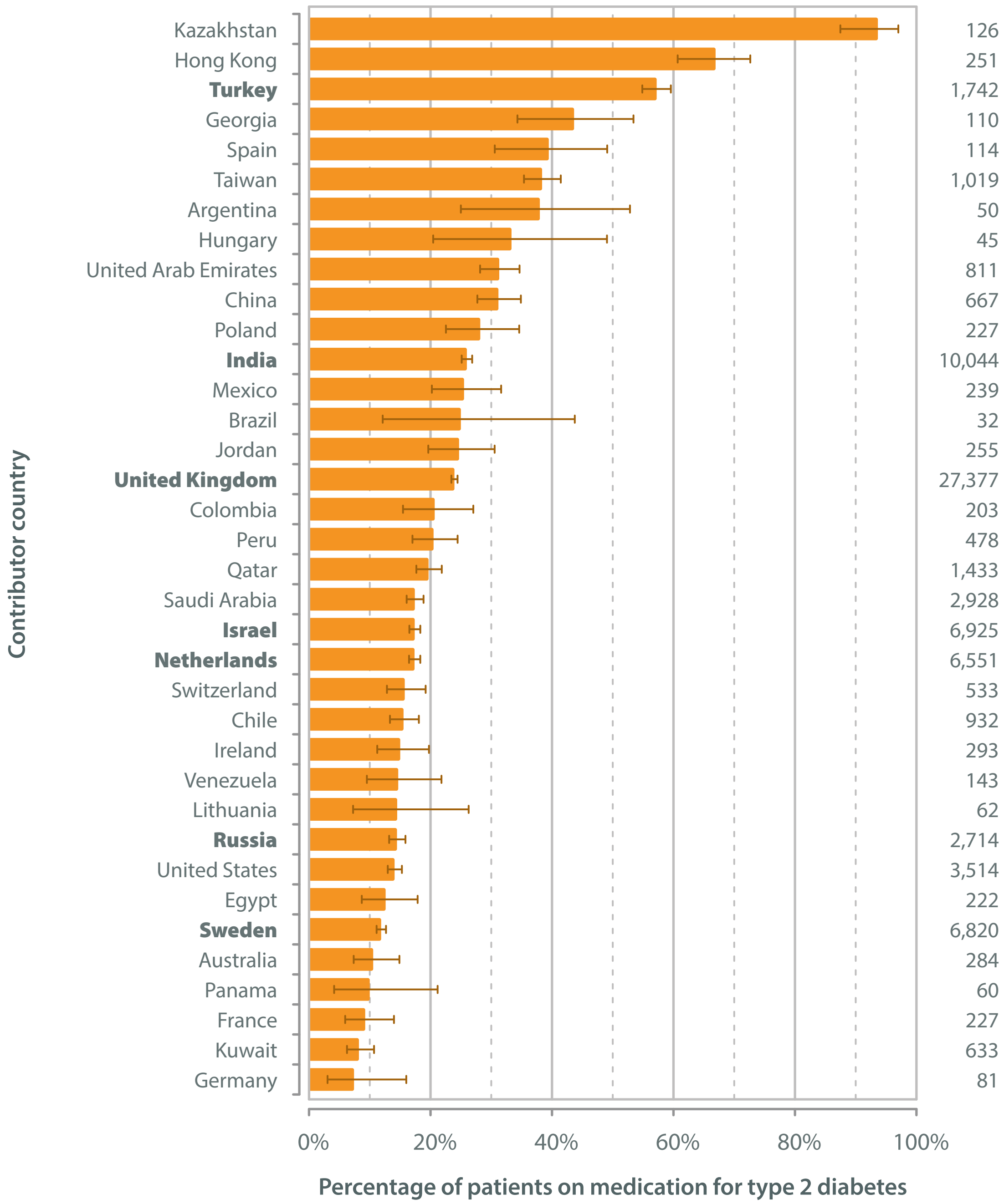


Comorbidity

Type 2 diabetes

Type 2 diabetes mellitus is the obesity-related disease that has attracted most attention in bariatric surgery due to the demonstrable improvement in diabetes control with surgery, and data suggesting that surgery is cost-effective. In publicly-funded healthcare systems, it may be that patients are being referred for surgery for these reasons, hence forming a substantial proportion of operated patients. This information constitutes basic demographic data as the bariatric community seeks to increase the provision of surgery for the increasing population with this comorbidity. The data are reported in order of prevalence on this page and by broader geographical region on the next page.

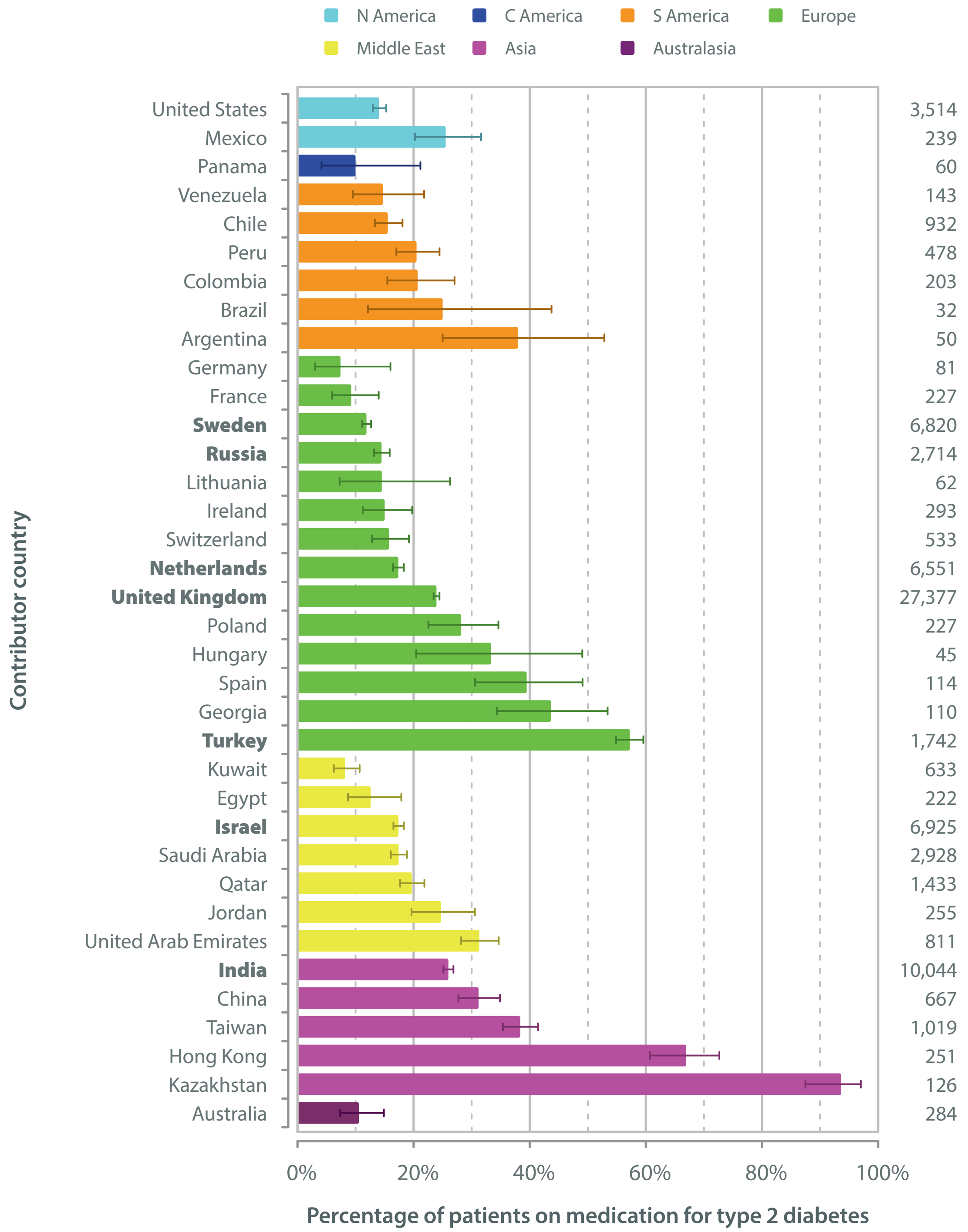
Primary surgery: Patients on medication for type 2 diabetes prior to surgery; calendar years 2013-2017 (n=78,145)



Interestingly Kazakhstan, Hong Kong & Turkey have some of the largest proportions of diabetic patients, possibly relating to the greater susceptibility of Asian people to developing diabetes at lower BMI levels. The data need to be interpreted in the context of diabetes risk with ethnicity. It may also be that the diabetes story has been taken up as a driver for surgery in these countries, contrasting with some other countries where the proportion of patients with diabetes having surgery is much lower. This area of inequality of access to bariatric surgery is ripe for research.

New international guidelines state that bariatric surgery should be a recommended treatment for type 2 diabetes in patients with BMI of 40 kg m^{-2} or more.

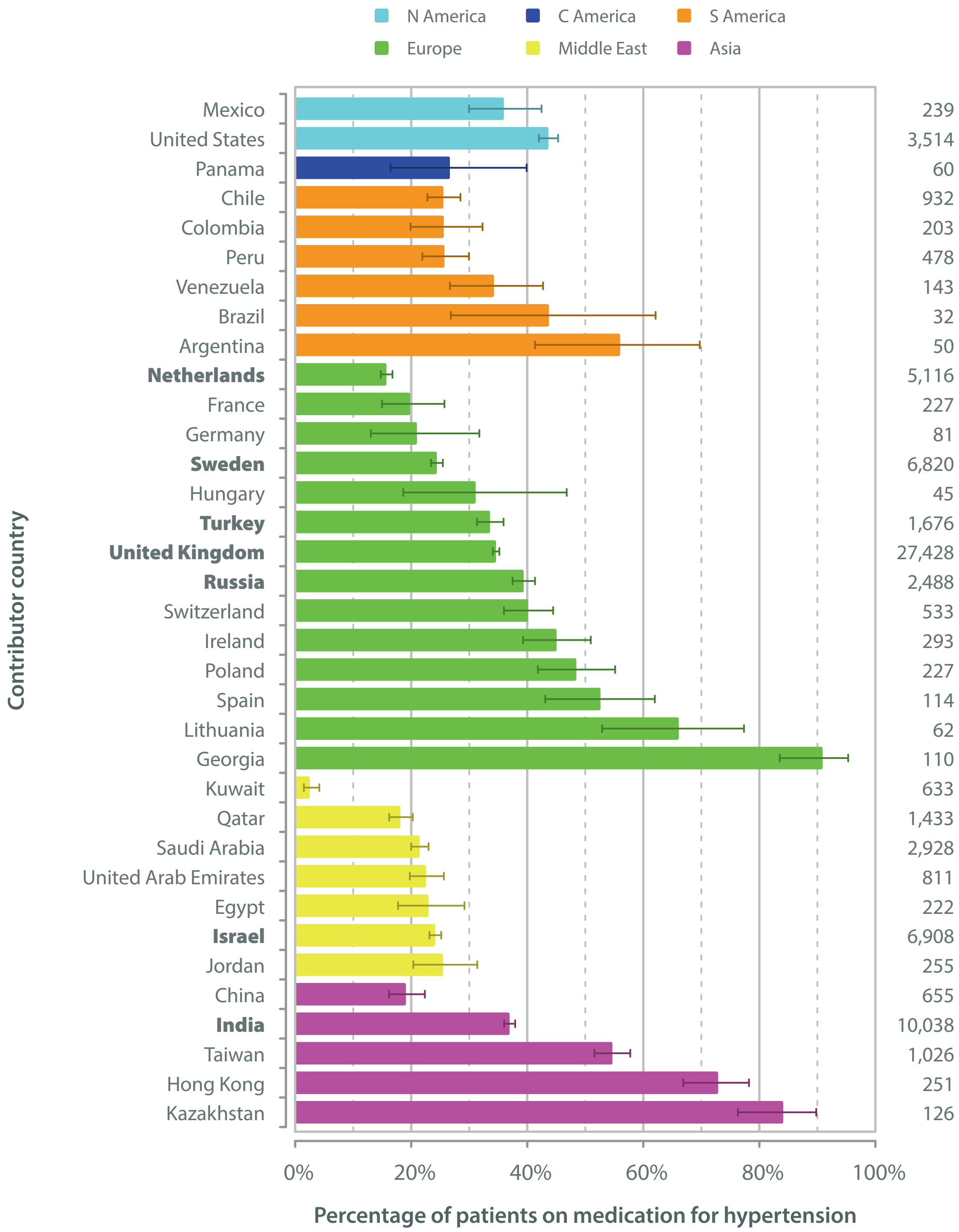
Primary surgery: Patients on medication for type 2 diabetes prior to surgery; calendar years 2013-2017 (n=78,145)



Hypertension

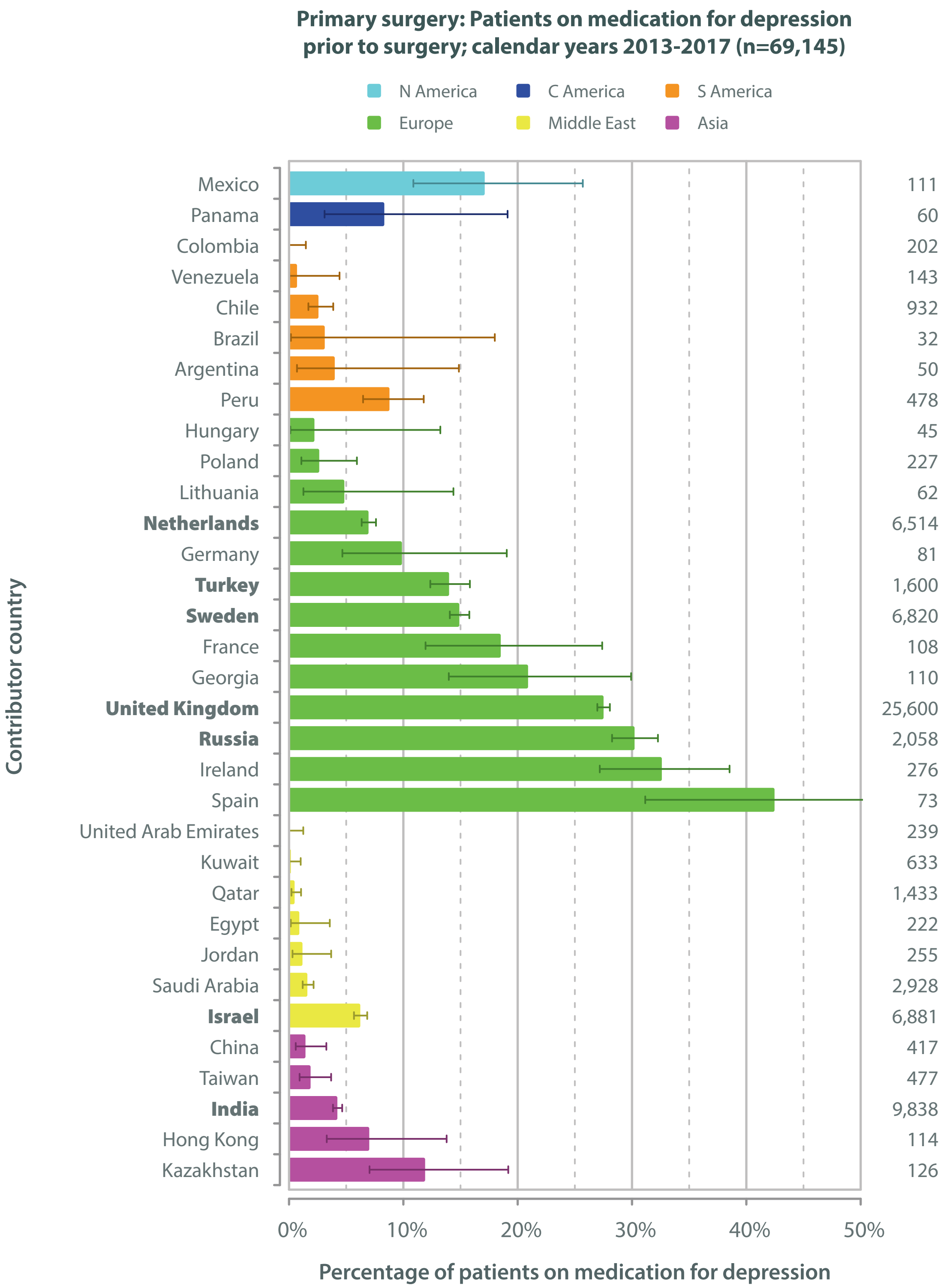
Again, there is widespread geographical variation in the prevalence of hypertension. In some countries hypertension is associated with diabetes as part of the Metabolic Syndrome. However, there is also strong ethnic propensity to one or the other condition. As hypertension is associated with central obesity, it would also be expected that this is a predictor of operative risk (more difficult laparoscopic surgery), and thus it is one of the factors included in the Obesity Surgery Mortality Risk Score (OSMRS) shown in a following section. Recording of the presence of hypertension is therefore needed as a prerequisite for comparing mortality between different series. The wide variation in the reported rates of hypertension between countries might indicate a need for standardization in the recording of blood pressure between different countries and surgical centres.

Primary surgery: Patients on medication for hypertension prior to surgery; calendar years 2013-2017 (n=76,157)



Depression

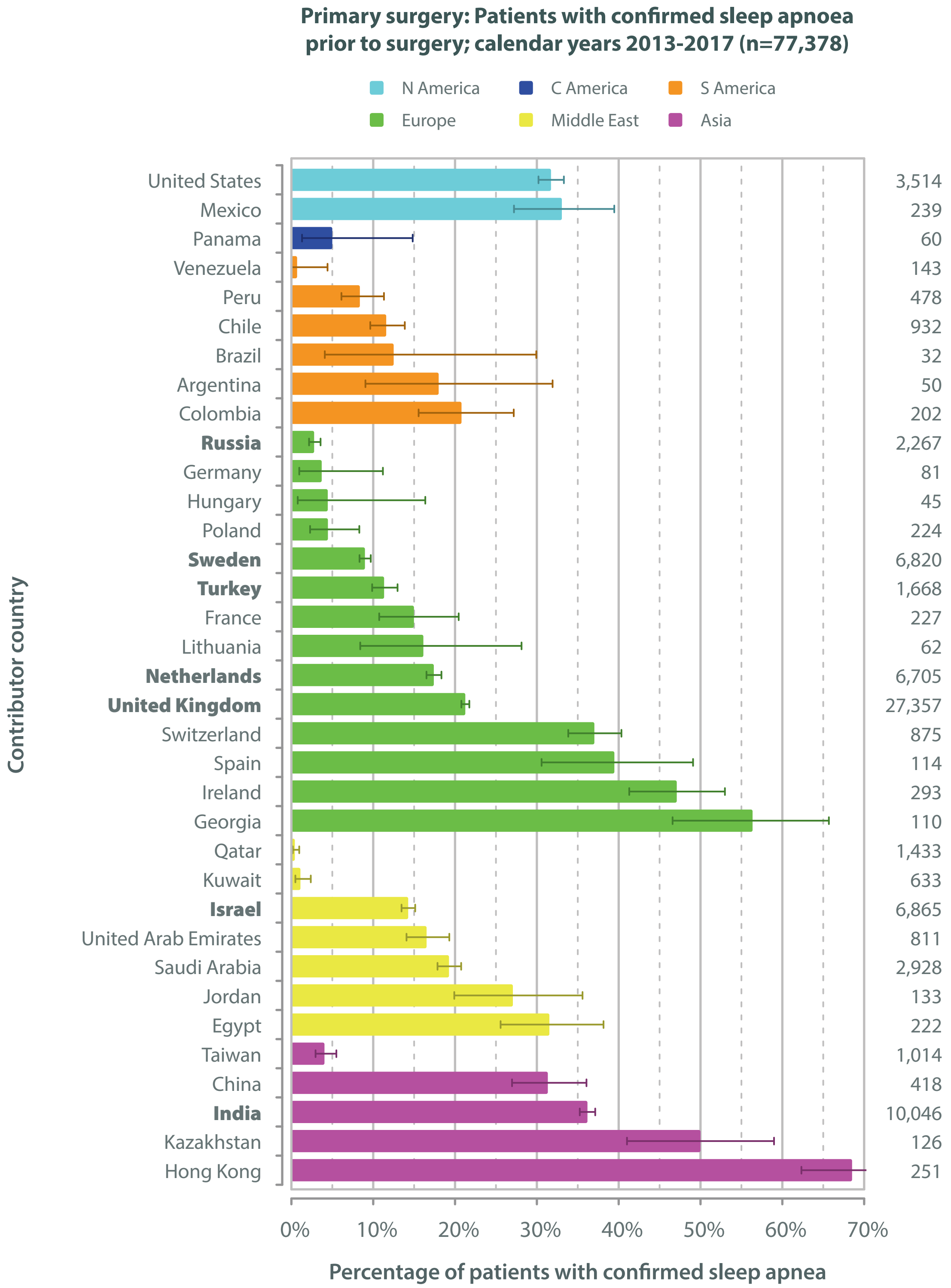
We report here country prevalence of patients having depression on medication at the time of surgery. Just looking at the data from countries submitting large numbers (those with national registries) there are striking differences. For instance the rate of recorded depression in the United Kingdom is nearly double that of Sweden, although the healthcare systems are very similar. Interestingly the rates recorded in most of the Middle East are only a few percent; we do not know the reasons for this. Possibly selection of patients is a factor; however, countries with higher prevalence may need to put infrastructure in place to address the large amount of psychological disease that their patients are likely to have.



Analysis

Sleep apnea

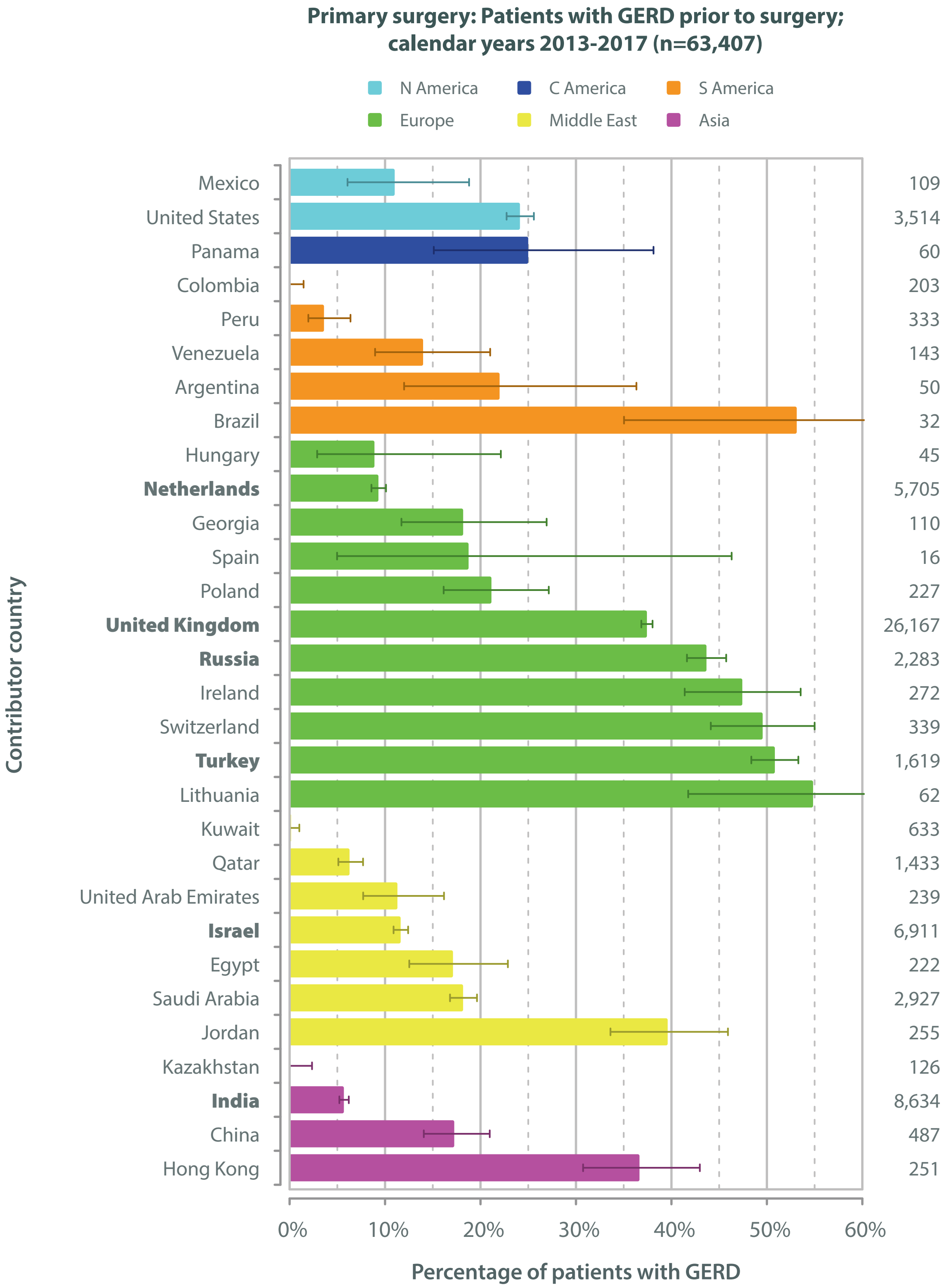
We present reported data on pre-operative sleep apnea here, on a country-by-country basis. Sleep apnea is a major risk factor for post-operative complications after gastric bypass surgery [1]. In future reports it may be possible to describe optimum pre-operative preparation of patients so that risk from sleep apnea is minimised, or even correlate prevalence of sleep apnea with complication rates after different operations.



1. Stenberg E *et al.* Early Complications After Laparoscopic Gastric Bypass Surgery: Results From the Scandinavian Obesity Surgery Registry. *Annals of Surgery*. 2014; **260**: 1040-1047.

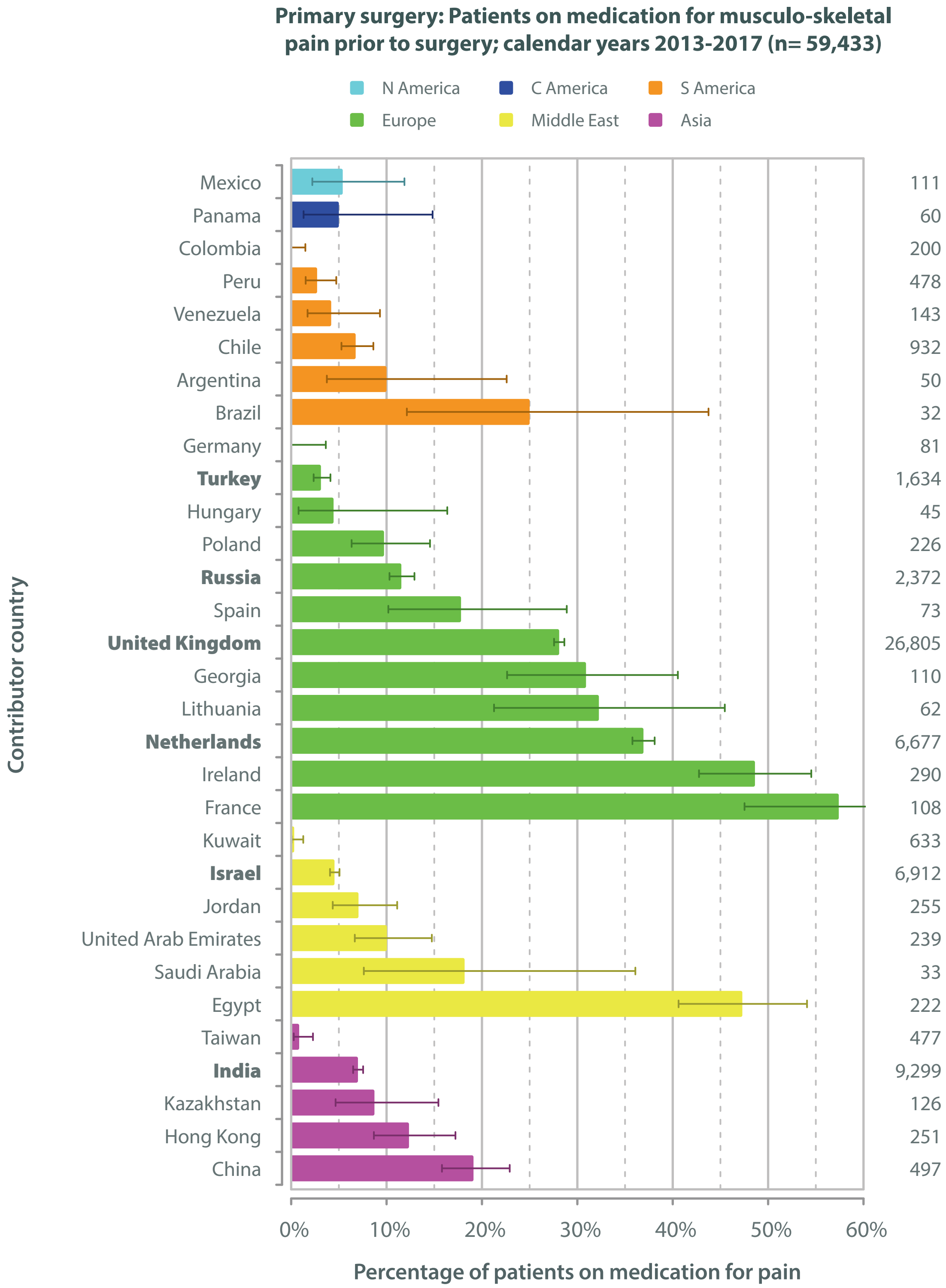
Gastro-esophageal reflux disorder (GERD)

The rising popularity of sleeve gastrectomy is interesting to note given the existing prevalence of gastro-esophageal reflux disease (GERD). Currently the long-term effects of having a sleeve gastrectomy in patients with pre-existing GERD are not known, and it is not known whether screening for Barrett's esophagus should be undertaken routinely for these patients before surgery.



Musculo-skeletal pain

For the first time in this report we present data on the prevalence of patients being medicated for musculo-skeletal pain before surgery. Surprisingly, France, Ireland and Egypt have the highest recorded prevalence, followed by the Netherlands. The reasons for the differences are not known but could be related to BMI on presentation for surgery. Further reports will be able to examine this relationship.

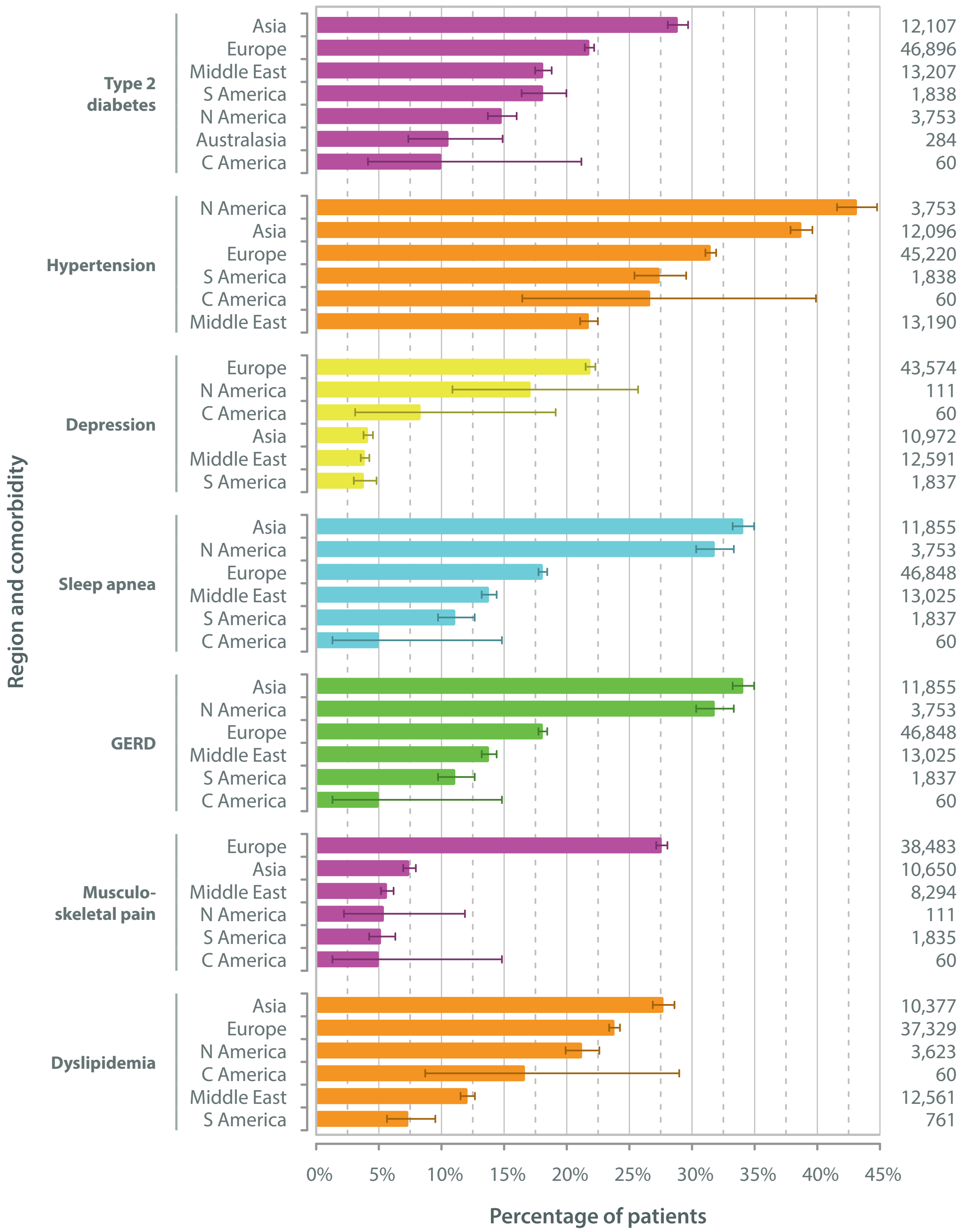


Inter-region comparisons of comorbidities

For the first time, we display here the prevalence at operation of the different comorbidities between the different regions around the world. Not surprisingly, Asia has the highest rate of type 2 diabetes and we have already noted that China and India have the largest populations of type 2 diabetics in the world. Surprisingly, Europe has by far the highest prevalence of musculo-skeletal pain compared to other regions and this is unexpected.

As more data accumulate we will achieve a clearer picture of differences in baseline disease in the patients having bariatric-metabolic surgery throughout the world (see appendix pages 71-70 for an additional chart & table).

Primary surgery: Comorbidity distributions by region; calendar years 2013-2017



Obesity Surgery Mortality Risk Score (OSMRS)

The OSMRS stratifies patients undergoing bariatric surgery into three categories depending on how many of the following risk factors they possess (each risk factor scores one point): male gender; age >44 years at the time of surgery; BMI >50 kg m^{-2}; hypertension; risk factors for deep vein thrombosis / pulmonary embolus.

The total score in points is then used to allocate patients into three groups: Group A (0-1 points); Group B (2-3 points); and Group C (4-5 points). These groups are considered **low**, **medium** and **high risk** respectively.

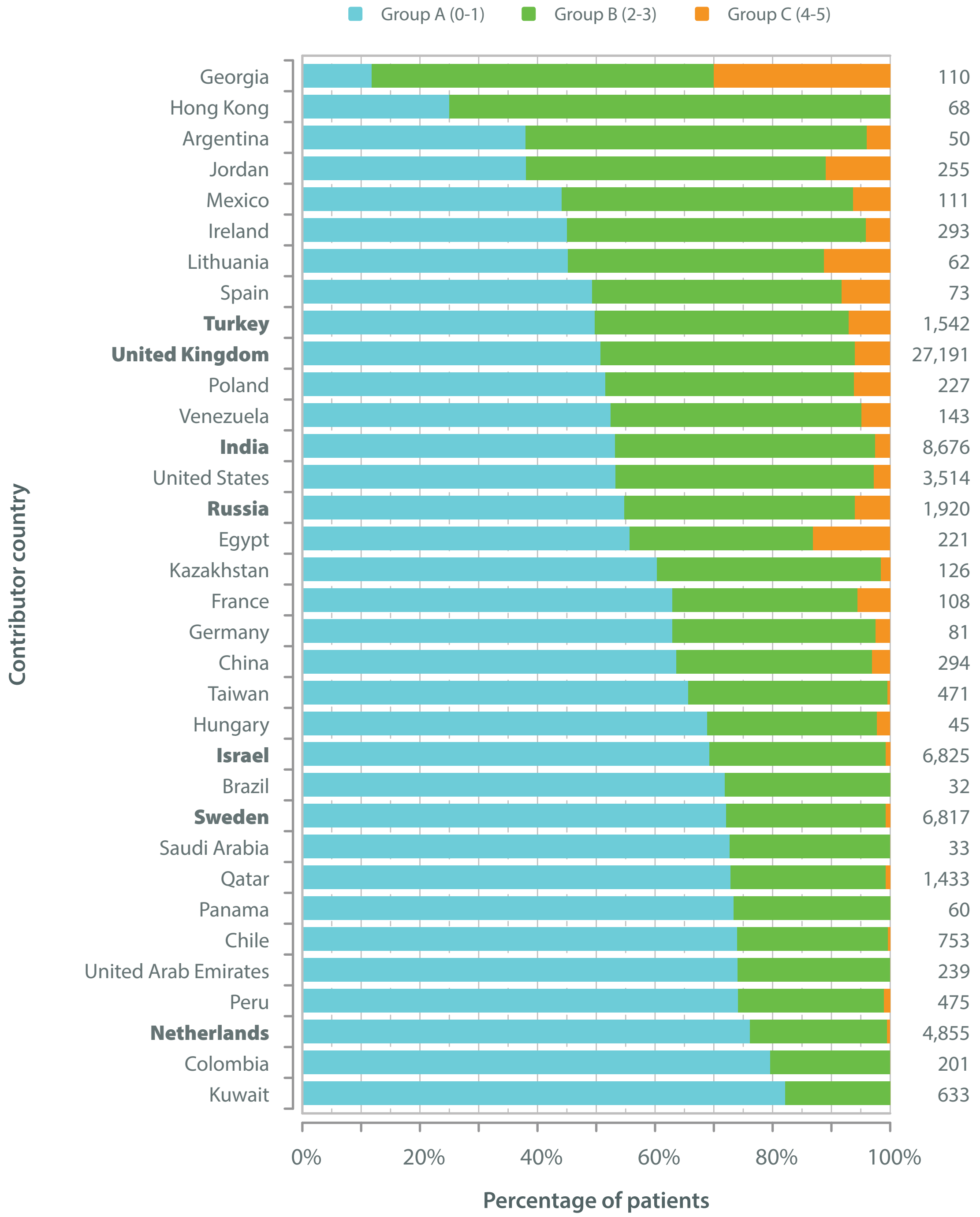
Primary surgery in the calendar years 2013-2017: Obesity Surgery Mortality Risk Score

Contributor country	OSMRS group				
	A (0-1)	**B** (2-3)	**C** (4-5)	**Unspecified**	**All**
Argentina	19	29	2	0	**50**
Australia	0	0	0	284	**284**
Belgium	0	0	0	2,384	**2,384**
Brazil	23	9	0	96	**128**
Chile	557	193	3	179	**932**
China	187	98	9	561	**855**
Colombia	160	41	0	4	**205**
Egypt	123	69	29	1	**222**
France	68	34	6	119	**227**
Georgia	13	64	33	0	**110**
Germany	51	28	2	0	**81**
Guatemala	0	0	0	34	**34**
Hong Kong	17	51	0	183	**251**
Hungary	31	13	1	0	**45**
India	4,615	3,840	221	1,381	**10,057**
Ireland	132	149	12	0	**293**
Israel	4,727	2,044	54	7,056	**13,881**
Jordan	97	130	28	0	**255**
Kazakhstan	76	48	2	0	**126**
Kuwait	520	113	0	0	**633**
Lithuania	28	27	7	0	**62**
Mexico	49	55	7	128	**239**
Netherlands	3,695	1,135	25	1,852	**6,707**
Panama	44	16	0	1	**61**
Peru	352	118	5	5	**480**
Poland	117	96	14	0	**227**
Qatar	1,044	378	11	0	**1,433**
Russia	1,051	754	115	951	**2,871**
Saudi Arabia	24	9	0	2,895	**2,928**
Spain	36	31	6	41	**114**
Sweden	4,916	1,849	52	3	**6,820**
Switzerland	0	0	0	881	**881**
Taiwan	309	160	2	564	**1,035**
Turkey	767	666	109	484	**2,026**
United Arab Emirates	177	62	0	572	**811**
United Kingdom	13,793	11,771	1,627	1,065	**28,256**
United States	1,872	1,543	99	0	**3,514**
Venezuela	75	61	7	1	**144**
All	**39,765**	**25,684**	**2,488**	**21,725**	**89,662**

The comparison of operative risk and mortality between different series and different countries is problematic unless there is a way of stratifying for pre-operative risk. This may be relevant in the situation where systematic reviews and meta-analyses are undertaken when the baseline data are not comparable. The data in the graph show that there is, again, wide variation in OSMRS, an accepted risk-assessment tool, between different countries.

As the IFSO Global Registry continues to gather data it may become representative of the whole operated population, and therefore will provide a benchmark for risk stratification in assessing outcomes. This graphical representation of operative risk also provides important baseline information for prioritisation of which patients should receive treatment in different countries.

Primary surgery: OSMRS groups; calendar years 2013-2017 (n= 67,937)



Surgery

Type of surgery

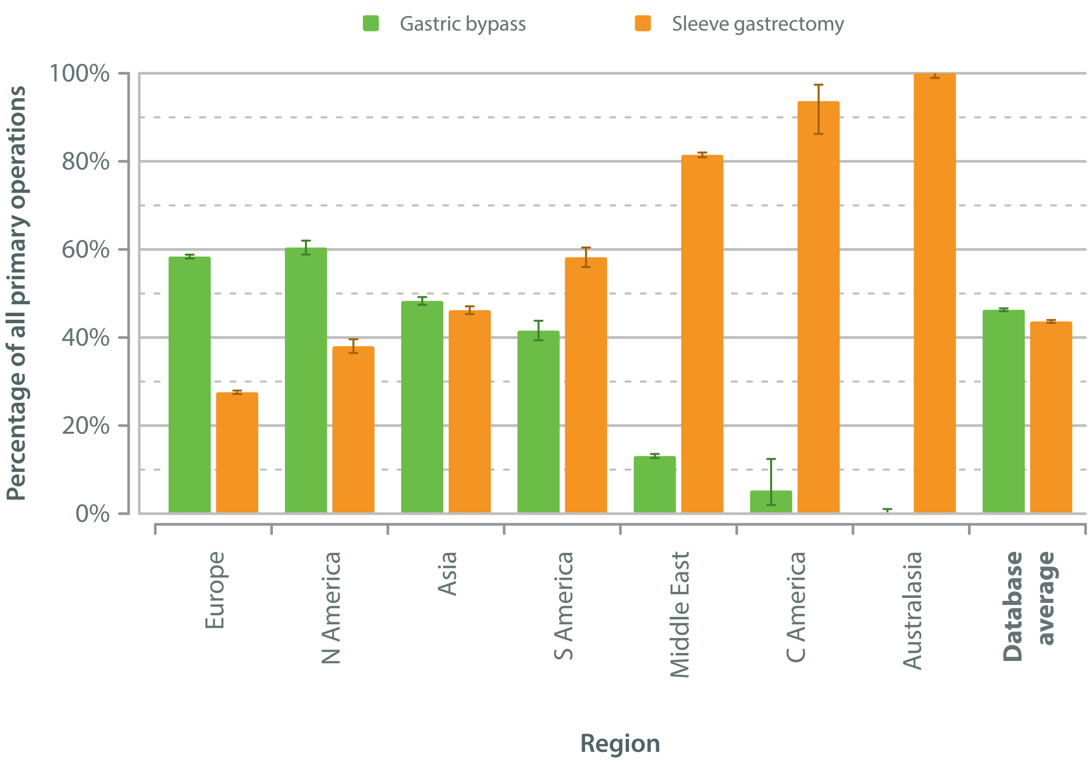
These data can be compared directly to those produced by Angrisani [1], where gastric bypass was the most common operation in 2011-2013, with the numbers of sleeve gastrectomies rapidly increasing, and the numbers of gastric banding operations decreasing.

It is interesting to note that almost all the operations in Kuwait, Australia & Saudi Arabia are sleeve gastrectomies, while in Sweden almost all are gastric bypasses. The reasons for these differences in practice are not known. It could be that countries newer to bariatric surgery have taken up sleeve gastrectomy, while countries with a longer history of bariatric surgery continue with the gastric bypass.

Primary surgery in the calendar years 2013-2017: operation performed

Operation	Count	Percentage
Gastric band	5,389	6.0%
Gastric bypass	41,508	46.3%
Sleeve gastrectomy	39,137	43.6%
Duodenal switch	50	0.1%
Duodenal switch with sleeve	321	0.4%
Bilio-pancreatic diversion	474	0.5%
Other	2,783	3.1%
All	**89,662**	

Primary surgery: Type of operation; calendar years 2013-2017 (n=89,662)

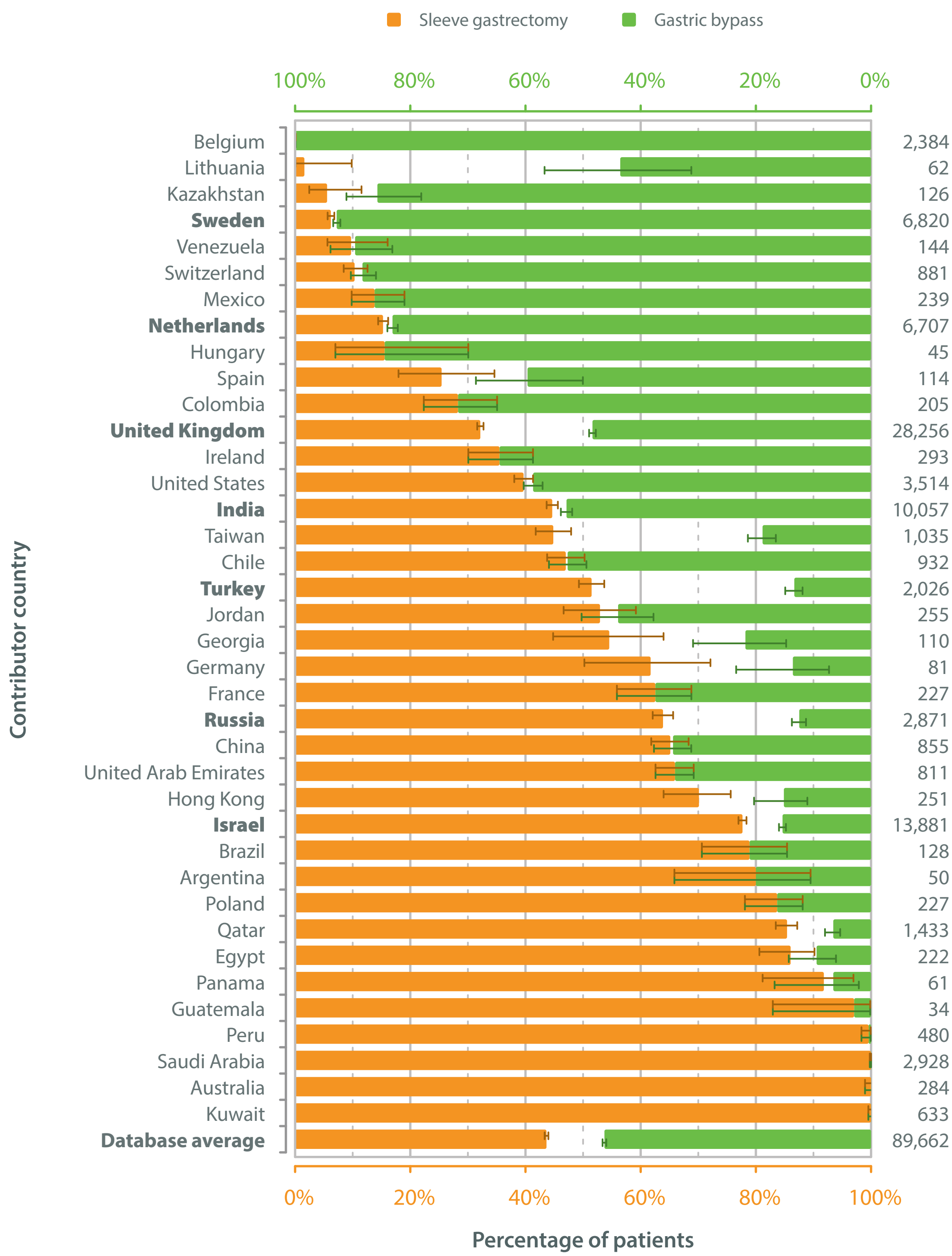


1. Angrisani L, Santonicola A, Iovino P, Formisano G, Buchwald H, Scopinaro N. Bariatric Surgery Worldwide 2013. *Obesity Surgery*. 2015; **25**: 1822-1832.

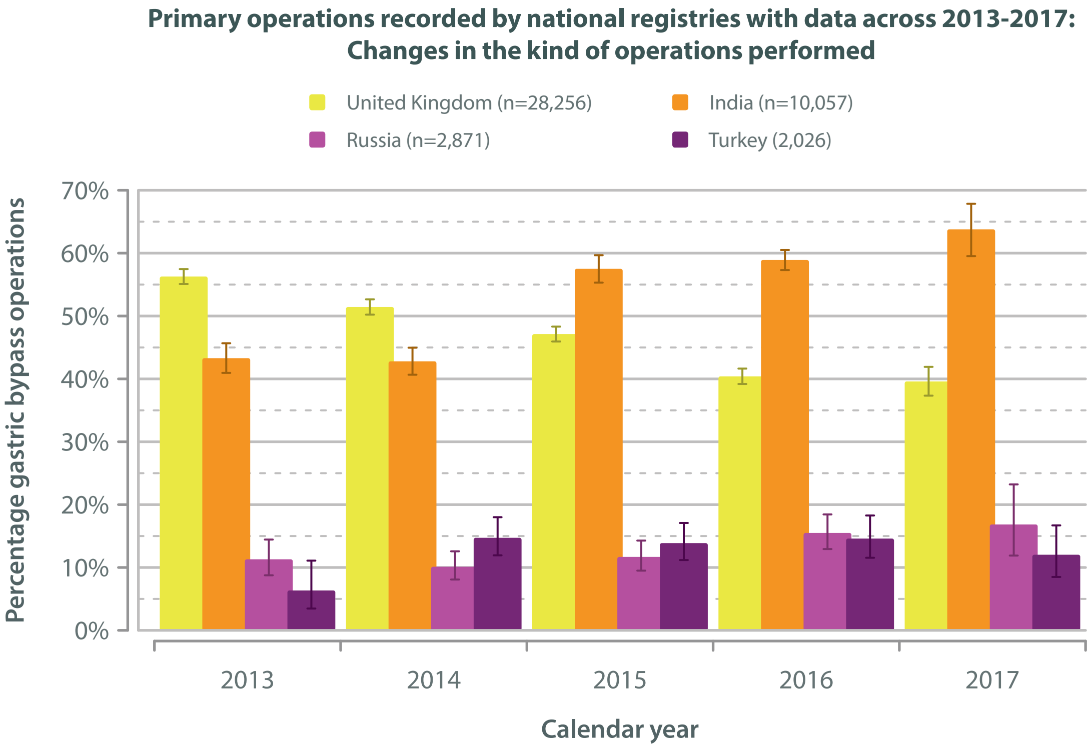
All other procedures such as gastric banding, bilio-pancreatic diversion and duodenal switch are represented by the blank spaces in between bypass and sleeve.

Two countries (Belgium and Australia) submitted data only for one type of operation: one centre in Belgium submitted data on gastric bypass and one centre in Australia submitted data on sleeve gastrectomy. Therefore, these data are not representative of these centres or countries.

Primary surgery: Type of operation; calendar years 2013-2017 (n=89,662)



This graph shows the proportion of gastric bypass operations reported in 4 national registries over the 5 most recent years of collected data. The differences in overall rates are striking, showing also changing rates over time. The data are similar to those reported by Angrisani [1]. Future reports would be able to study whether there are differences in BMI and comorbidity between patients having different procedures.



1. Angrisani L, Santonicola A, Iovino P, Formisano G, Buchwald H, Scopinaro N. Bariatric Surgery Worldwide 2013. *Obesity Surgery*. 2015; **25**: 1822-1832.

Operative approach

The rapid expansion of bariatric surgery over the last 25 years has mirrored the development of laparoscopic techniques. The following table shows the prevalence of the laparoscopic approach for the different operations.

Almost 99% of all operations were performed laparoscopically, an achievement that could not have been forecast even 20-25 years ago, when obesity was generally considered a contra-indication to laparoscopic surgery.

Primary operations in the years 2013-2017: operative approach

Operation	Approach: Laparoscopic	Laparoscopic converted to open	Endoscopic	Open	Unspecified
Counts					
Gastric band	5,345	4	9	31	0
Gastric bypass	38,829	82	2	196	2,399
Sleeve gastrectomy	38,830	79	2	122	104
All	**86,136**	**182**	**123**	**718**	**2,503**
Percentages					
Gastric band	99.2%	0.07%	0.17%	0.58%	
Gastric bypass	99.3%	0.21%	0.01%	0.50%	
Sleeve gastrectomy	99.5%	0.20%	0.01%	0.31%	
All	**98.8%**	**0.21%**	**0.14%**	**0.82%**	

Analysis

Outcomes

Post-operative stay

This is the third international comparison of post-operative length-of-stay between the 3 common kinds of operation: gastric banding, gastric bypass and sleeve gastrectomy. As expected, the shortest length-of-stay was for gastric banding, followed by gastric bypass and then sleeve gastrectomy. Over 87% of band patients were discharged within1 day of their operation, 66% of bypass patients were discharged by day 2 and 80% of sleeves were discharged by day 3. As is seen in the graphs on the next page, the timing of discharge may very much depend on the local healthcare environment.

After gastric bypass, over 91% of the North American patients were discharged by day 2 whereas in South America the figure was 38%. Patients operated on in Asia tended to stay longer, with only 28% being discharged by day 2.

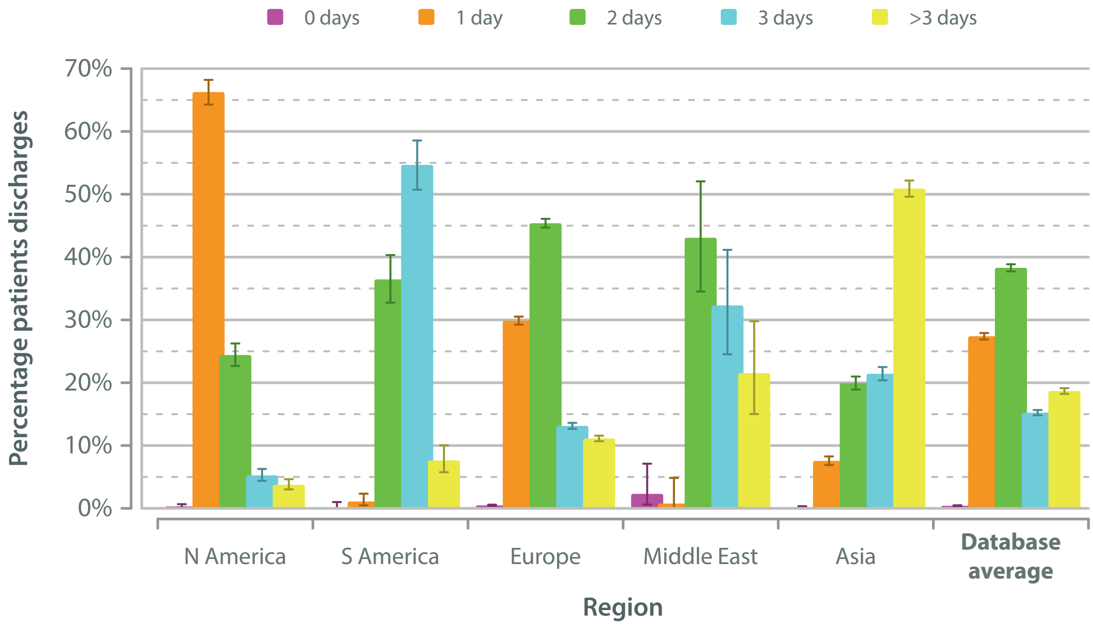
Similar to gastric bypass, about 93% of the North American sleeve gastrectomy patients were discharged home on day 2. In contrast 39% patients having a sleeve operation in the Middle East were discharged by day 2.

Primary surgery in the calendar years 2013-2017: post-operative stay for each of the major operations categories

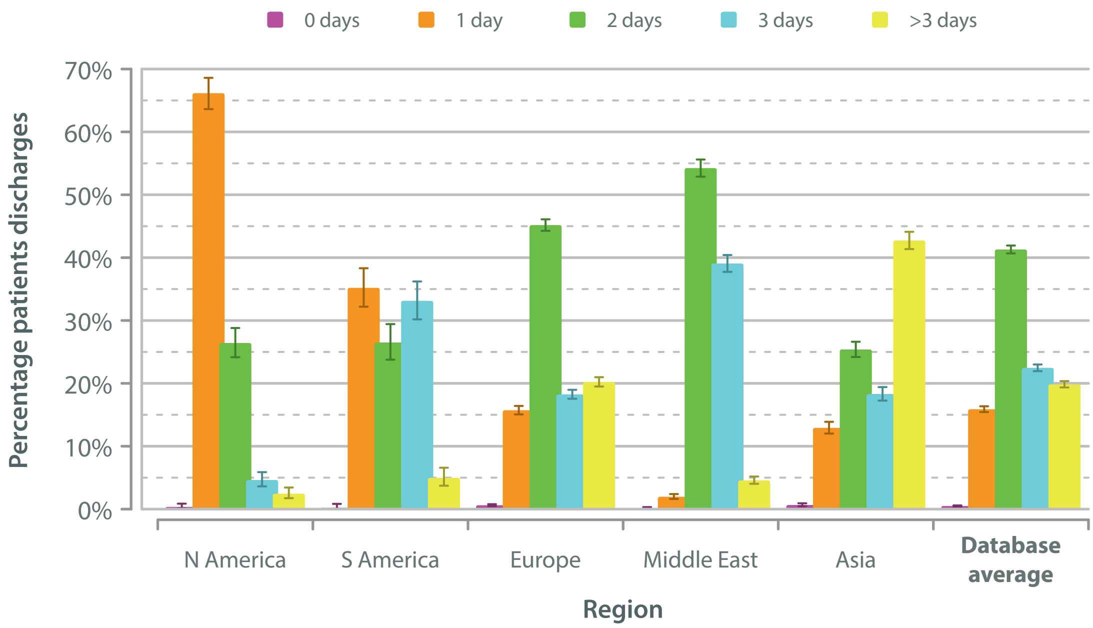
Operation and region		Post-operative stay: 0 days	1 day	2 days	3 days	>3 days	Unspecified	All
Gastric band	N America	1	51	5	1	0	0	**58**
	S America	0	0	0	0	0	1	**1**
	Europe	1,047	2,478	307	79	121	312	**4,344**
	Middle East	0	21	9	2	4	840	**876**
	Asia	0	5	1	4	2	2	**14**
Gastric bypass	N America	7	1,501	553	119	85	3	**2,268**
	C America	0	0	3	2	0	0	**5**
	S America	1	7	234	351	49	164	**806**
	Europe	94	5,871	8,919	2,580	2,186	4,615	**24,265**
	Middle East	3	1	56	42	28	2,396	**2,526**
	Asia	11	443	1,169	1,256	2,985	89	**5,953**
Sleeve gastrectomy	N America	5	944	377	66	35	0	**1,427**
	C America	0	1	83	1	2	2	**89**
	S America	2	340	256	320	48	163	**1,129**
	Europe	70	1,786	5,131	2,073	2,298	1,704	**13,062**
	Middle East	8	102	2,813	2,026	237	11,107	**16,293**
	Asia	33	653	1,283	925	2,159	641	**5,694**
	Australasia	0	0	0	0	0	284	**284**

The following charts on this page compare length-of-stay across the five regions (and following pages on a country-by-country basis). The differences do not necessarily reflect good or bad care, as there are multiple factors that can affect a patient's stay after surgery, including: the impact of standard clinical practice in a given country, various clinical factors and the traditions found in different healthcare systems.

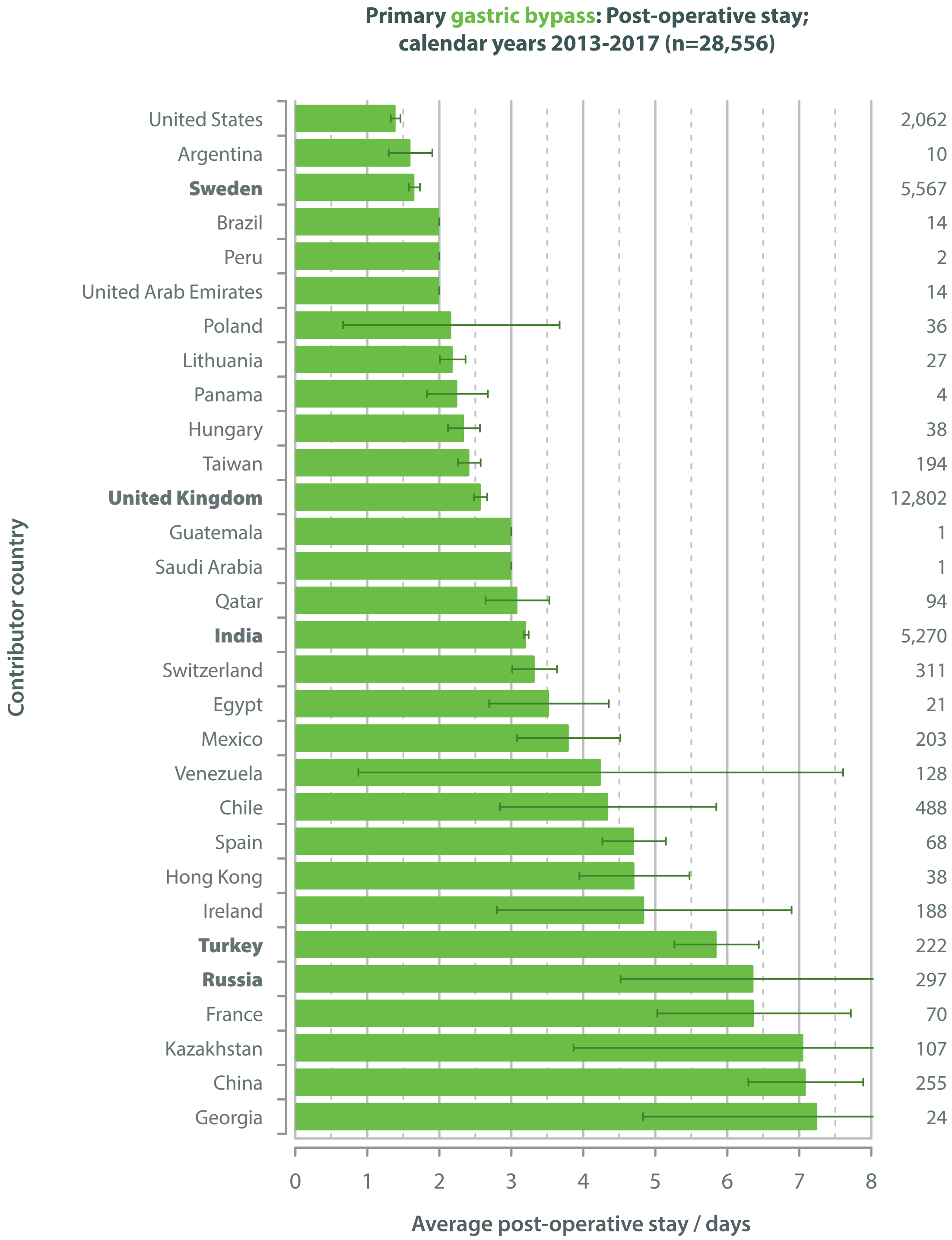
Primary surgery: Post-operative stay after gastric bypass; calendar years 2013-2017 (n=28,556)



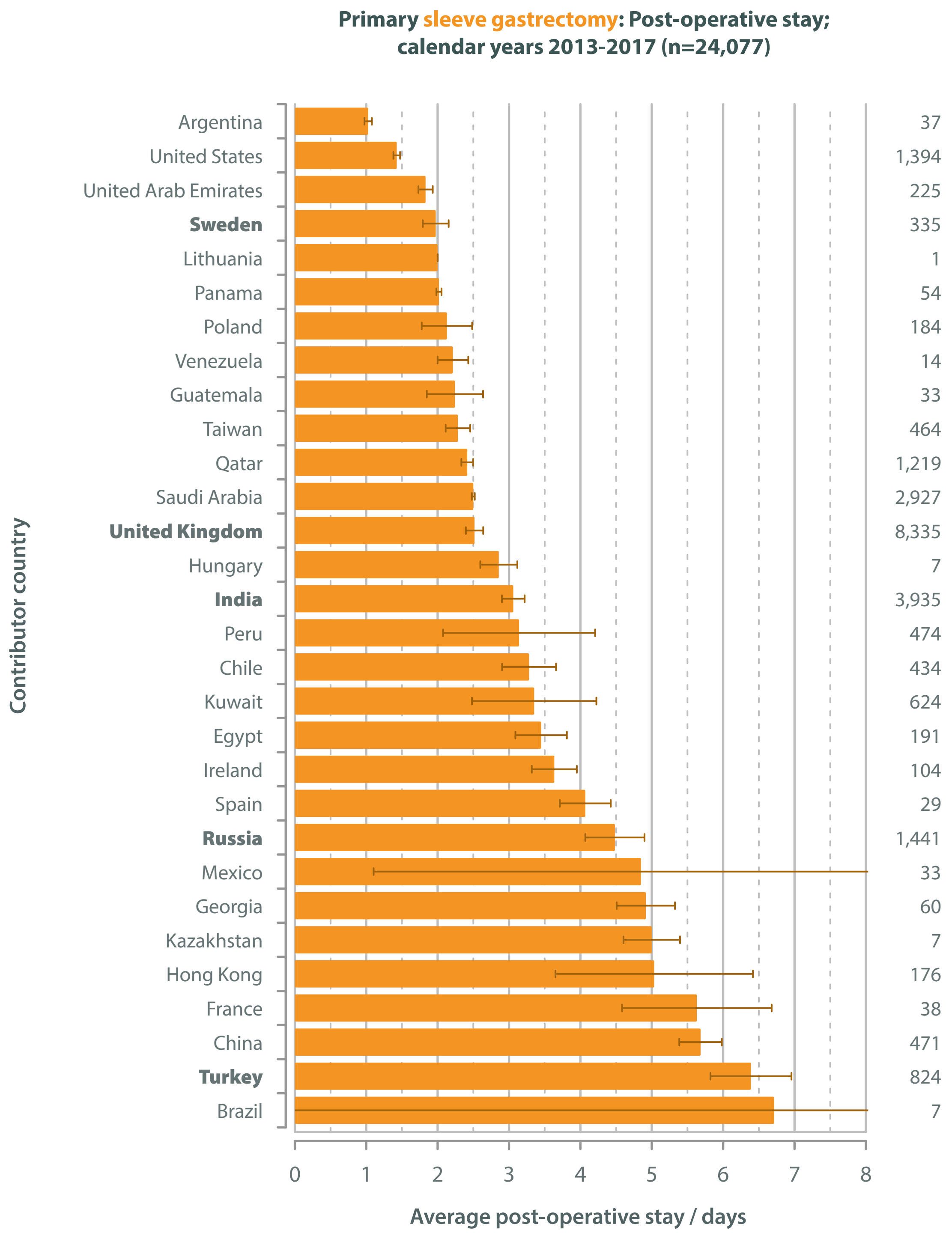
Primary surgery: Post-operative stay after sleeve gastrectomy; calendar years 2013-2017 (n=24,077)



The data here on post-operative stay for gastric bypass indicate that in some countries most patients go home in less than 48 hours. However, there is significant variation between countries, with some average lengths-of-stay exceeding 1 week.



Similar to gastric bypass, there is wide variation in post-operative stay after sleeve gastrectomy, from around 24 hours in Argentina to several days in other countries.



One-year weight loss

We present weight loss data here as % weight loss.

Percentage weight loss (%PWL) has been defined as:

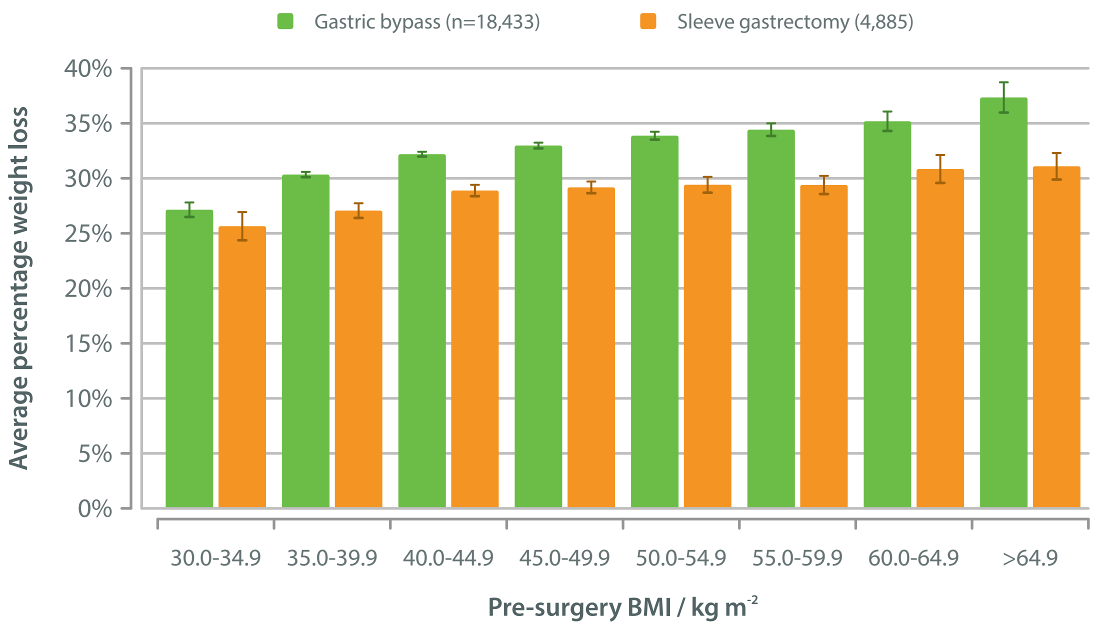
$$\text{Percentage weight loss} = \frac{\text{initial weight (kg)} - \text{current weight (kg)}}{\text{initial weight (kg)}} \times 100\%$$

The table and graph below show aggregate analysis of percentage weight loss one year after surgery for all patients undergoing primary gastric bypass and sleeve gastrectomy operations according to the patient's initial body mass index. The presented data indicate in large numbers of patients that the percentage weight loss at one year for gastric bypass patients is greater than for sleeve gastrectomy patients.

Primary surgery in the calendar years 2011-2017: average weight loss one year after surgery according to the patient's BMI before surgery

Pre-surgery BMI / kg m^{-2}	Percentage weight loss one year after surgery: Gastric bypass — **Average** (Count; 95% CI)	Sleeve gastrectomy — **Average** (Count; 95% CI)
30.0-34.9	**27.15%** (479; 26.49-27.81%)	**25.65%** (218; 24.37-26.94%)
35.0-39.9	**30.35%** (4,331; 30.11-30.59%)	**27.07%** (754; 26.40-27.74%)
40.0-44.9	**32.20%** (5,982; 31.98-32.41%)	**28.89%** (1,141; 28.38-29.41%)
45.0-49.9	**32.98%** (3,983; 32.72-33.24%)	**29.18%** (1,043; 28.65-29.71%)
50.0-54.9	**33.88%** (2,165; 33.52-34.24%)	**29.42%** (792; 28.70-30.13%)
55.0-59.9	**34.42%** (973; 33.85-35.00%)	**29.40%** (465; 28.57-30.22%)
60.0-64.9	**35.19%** (349; 34.31-36.07%)	**30.85%** (252; 29.58-32.12%)
>64.9	**37.35%** (171; 35.98-38.73%)	**31.10%** (220; 29.89-32.31%)

Primary surgery: Percentage weight loss at one year by pre-surgery BMI; operations in calendar years 2011-2017



We also present weight loss data as percentage **excess** weight loss.

Percentage excess weight loss (%EWL) has been defined as:

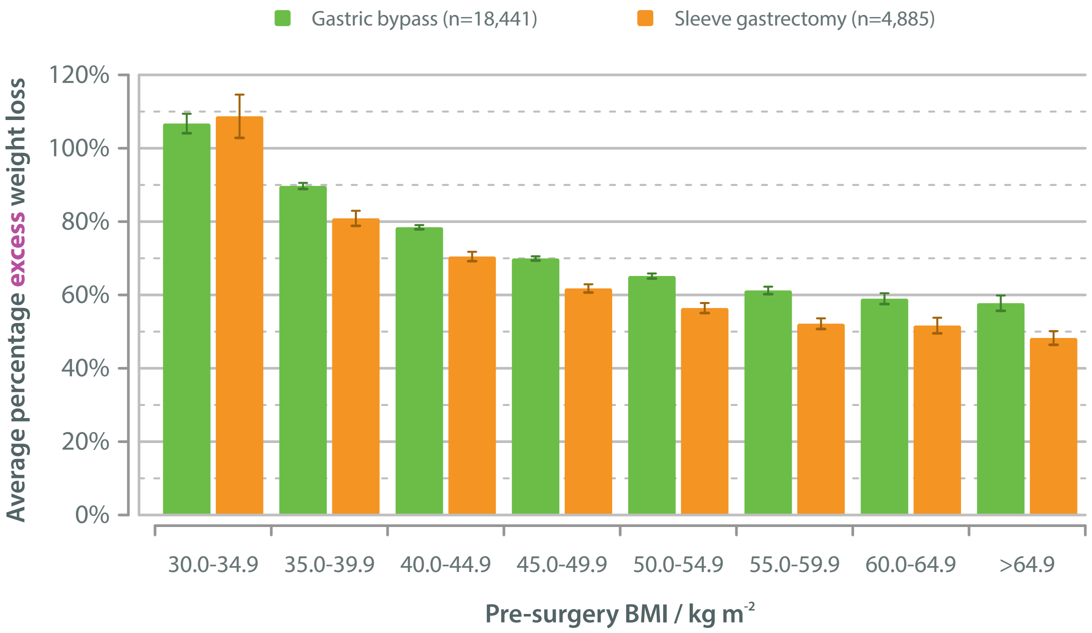
$$\text{Percentage excess weight loss} = \frac{\text{initial weight (kg) - current weight (kg)}}{\text{initial weight (kg)- [25 (kg m}^{-2}) \times \text{height}^2 \text{ (m}^2\text{)]}} \times 100\%$$

The same data are presented here looking at percentage **excess** weight loss. As expected, patients with higher initial BMI lose less in terms of percentage excess weight, although their percentage weight loss is greater (see the graph on the facing page).

Primary surgery in the calendar years 2011-2017: average excess weight loss one year after surgery according to the patient's BMI before surgery

Pre-surgery BMI / kg m^{-2}	Percentage excess weight loss one year after surgery: Gastric bypass — **Average** (Count; 95% CI)	Sleeve gastrectomy — **Average** (Count; 95% CI)
30.0-34.9	**106.7%** (n=479; 104.1-109.4)	**108.7%** (n=218; 102.8-114.6)
35.0-39.9	**89.7%** (n=4,335; 88.9-90.6)	**80.9%** (n=754; 78.8-82.9)
40.0-44.9	**78.5%** (n=5,985; 77.9-79.0)	**70.5%** (n=1,141; 69.2-71.8)
45.0-49.9	**70.0%** (n=3,984; 69.4-70.5)	**61.8%** (n=1,043; 60.7-62.9)
50.0-54.9	**65.2%** (n=2,165; 64.5-65.9)	**56.4%** (n=792; 55.1-57.8)
55.0-59.9	**61.2%** (n=973; 60.2-62.3)	**52.2%** (n=465; 50.7-53.6)
60.0-64.9	**59.0%** (n=349; 57.5-60.5)	**51.7%** (n=252; 49.5-53.8)
>64.9	**57.8%** (n=171; 55.7-59.8)	**48.3%** (n=220; 46.4-50.1)

Primary surgery: Percentage excess weight loss at one year by pre-surgery BMI; operations in calendar years 2011-2017



Effect of surgery on obesity-related disease

The data presented here show the prevalence of obesity-related disease before surgery **and** at 12 months after surgery in patients for whom this information was recorded in both the baseline and follow up sections of the database.

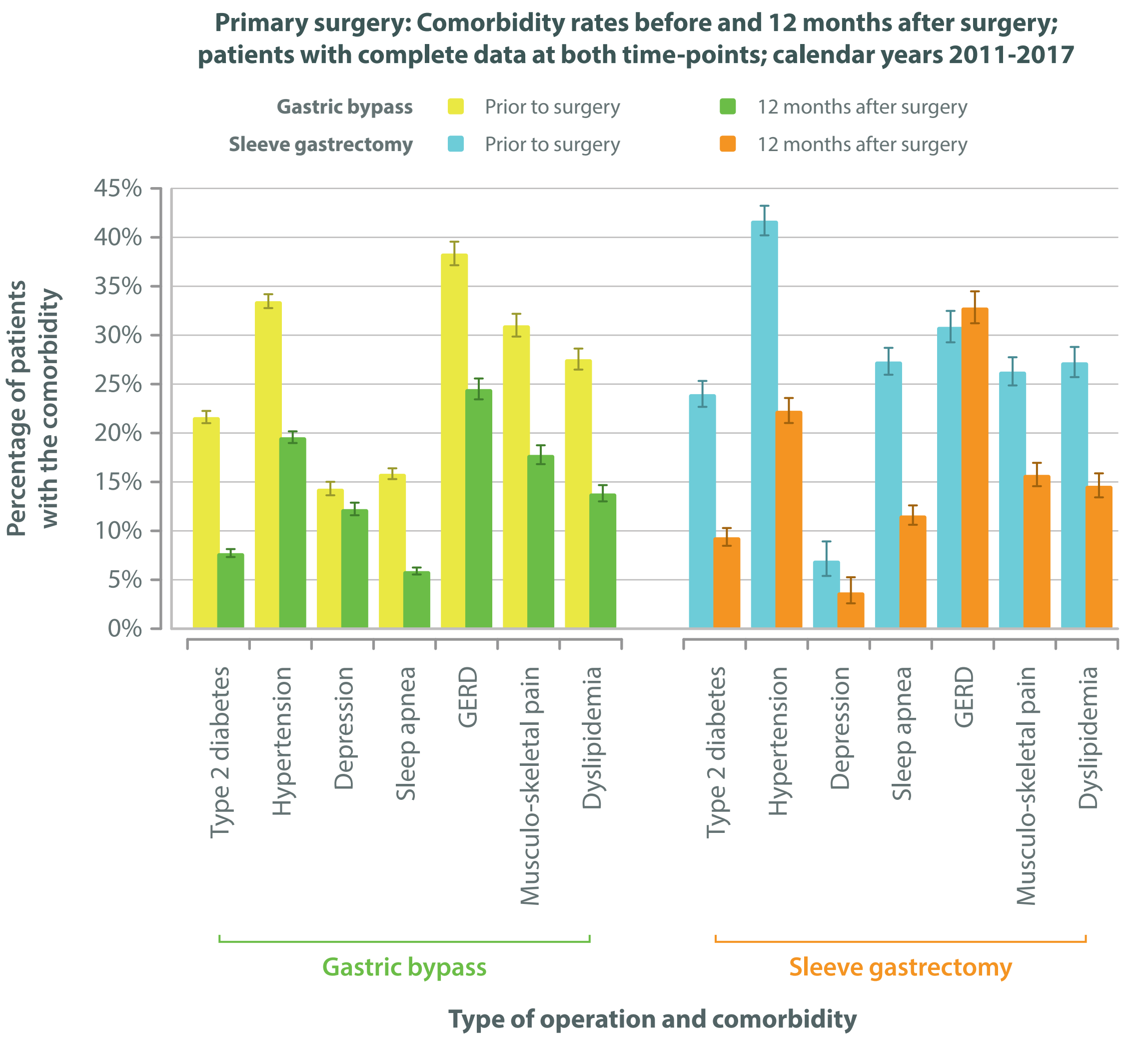
There were a total of 68,374 baseline records in this 7-year period for gastric bypass, and a further 47,334 operation records relating to sleeve gastrectomy procedures.

Primary surgery in the calendar years 2011-2017: comorbidity before and 12 months after surgery; records with complete data at both time-points

Type of operation and comorbidity		Prior to surgery			12 months after surgery		
		No	Yes	Rate	No	Yes	Rate
Gastric bypass	Type 2 diabetes	13,224	3,649	21.6%	15,570	1,303	7.7%
	Hypertension	11,400	5,736	33.5%	13,783	3,353	19.6%
	Depression	8,664	1,447	14.3%	8,875	1,236	12.2%
	Sleep apnea	14,368	2,703	15.8%	16,066	1,005	5.9%
	GERD	3,912	2,433	38.3%	4,791	1,554	24.5%
	Musculo-skeletal pain	4,245	1,908	31.0%	5,060	1,093	17.8%
	Dyslipidemia	4,885	1,857	27.5%	5,810	932	13.8%
Sleeve gastrectomy	Type 2 diabetes	3,092	975	24.0%	3,687	380	9.3%
	Hypertension	2,418	1,730	41.7%	3,224	924	22.3%
	Depression	802	60	7.0%	830	32	3.7%
	Sleep apnea	2,989	1,123	27.3%	3,636	476	11.6%
	GERD	2,239	999	30.9%	2,175	1,063	32.8%
	Musculo-skeletal pain	2,696	961	26.3%	3,082	575	15.7%
	Dyslipidemia	2,376	889	27.2%	2,788	477	14.6%

The proportion of patients who were medicated for type 2 diabetes before surgery but no longer treated for the condition one year later was 65.7% for gastric bypass and 62.6% for sleeve gastrectomy (assessed according to the information in the IFSO merged database). As these procedure-based data are not directly comparable we do not attempt to assess statistically any differences in outcome between the two operations.

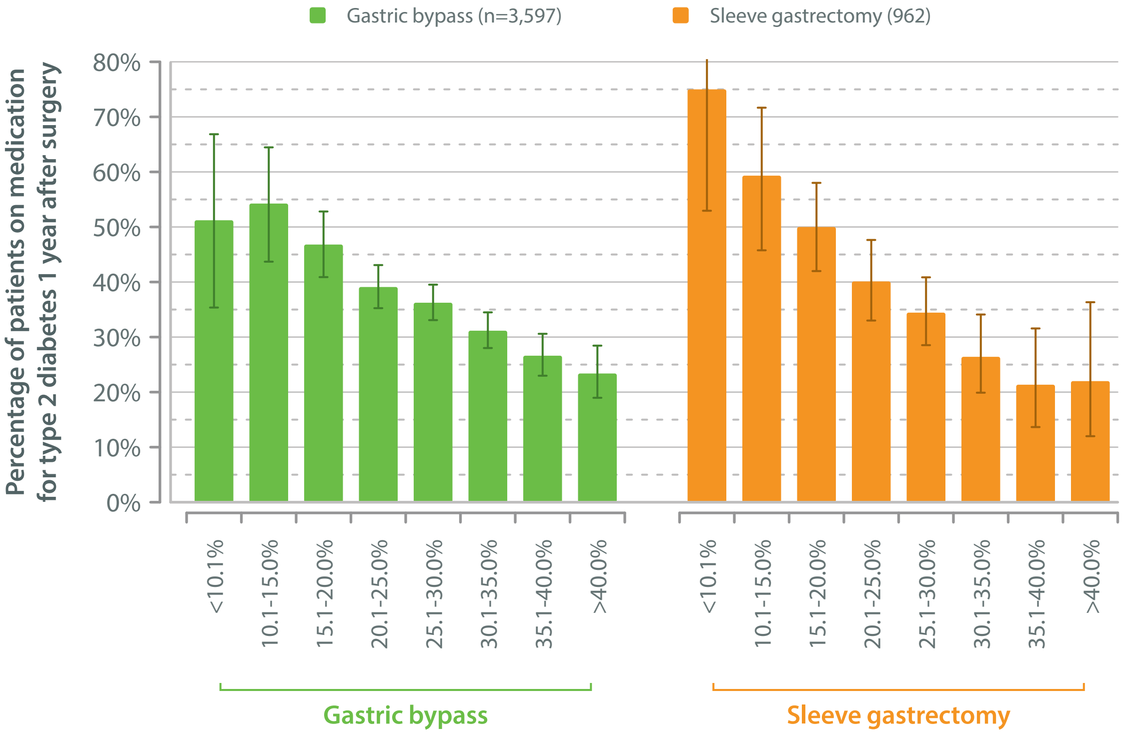
However, it is notable that GERD does not appear to improve after sleeve gastrectomy.



For patients who were on treatment for diabetes prior to surgery, the graph below shows the prevalence of recorded type 2 diabetes 12 months after surgery according to the extent of the patients' weight loss at that time, for the two main procedures: gastric bypass and sleeve gastrectomy. The graph suggests that increased weight loss is associated with greater rates of recovery from type 2 diabetes irrespective of the kind of surgery performed.

Note that the 95% confidence intervals (depicted by the error bars) around the rates for the two procedures overlap at each point of weight loss.

Primary surgery for patients on medication for type 2 diabetes pre-operatively: Medication for type 2 diabetes one year after surgery; operations in calendar years 2011-2017

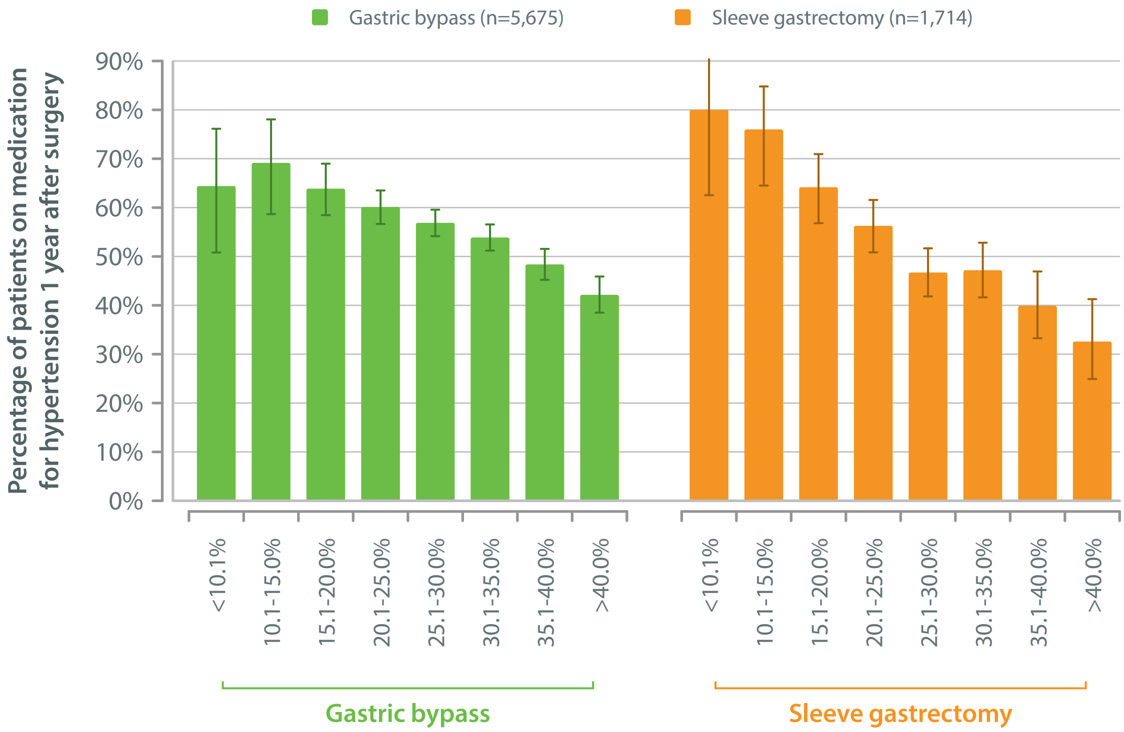


Type of operation and percentage weight loss one year after surgery

This next chart, shows the corresponding post-operative effect on the reduction of the proportion of patients on treatment for hypertension according to extent of the patient' weight loss post-surgery, again for the two main types of operation.

There is the same general pattern of a reduction in treatment rates associated with greater percentage weight loss.

Primary surgery for patients on medication for hypertension pre-operatively: Medication for hypertension one year after surgery; operations in calendar years 2011-2017

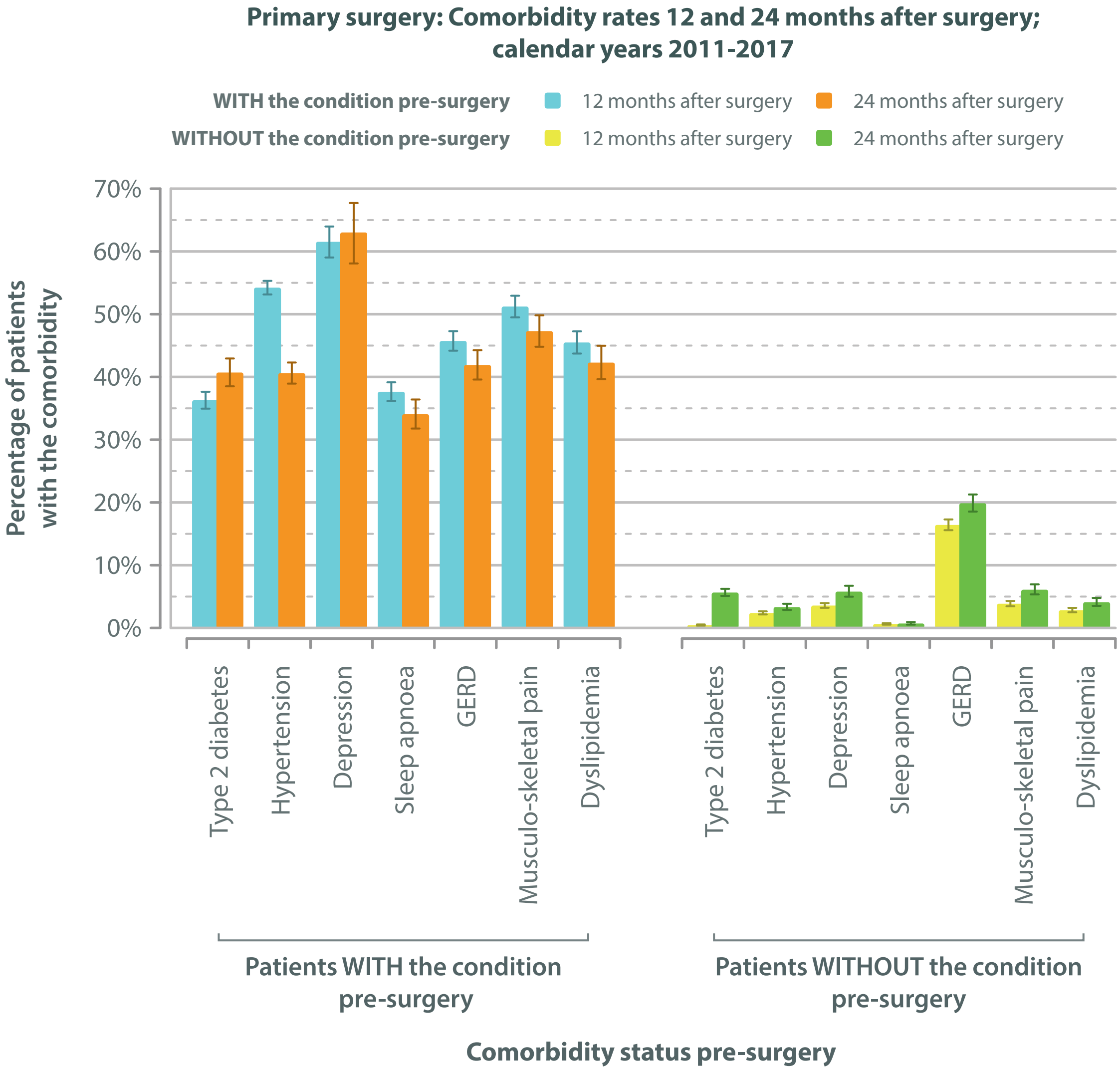


Type of operation and percentage weight loss one year after surgery

The graph below shows combined data for all primary operations. In general, the greater part of recovery from obesity-related disease seems to occur within 12 months after surgery. For patients with hypertension, the effect of surgery appears to increase in the second year after the operation.

It is noteworthy that around 5% of patients seem to develop incident diabetes after their operation (diabetes is recorded present at 24 months in those who were not diabetic before surgery). An appreciable proportion of patients, up to 20%, who did not have GERD pre-operatively develop this condition at 12-24 months.

These data can be compared to the Swedish Obese Subjects study reports [1].

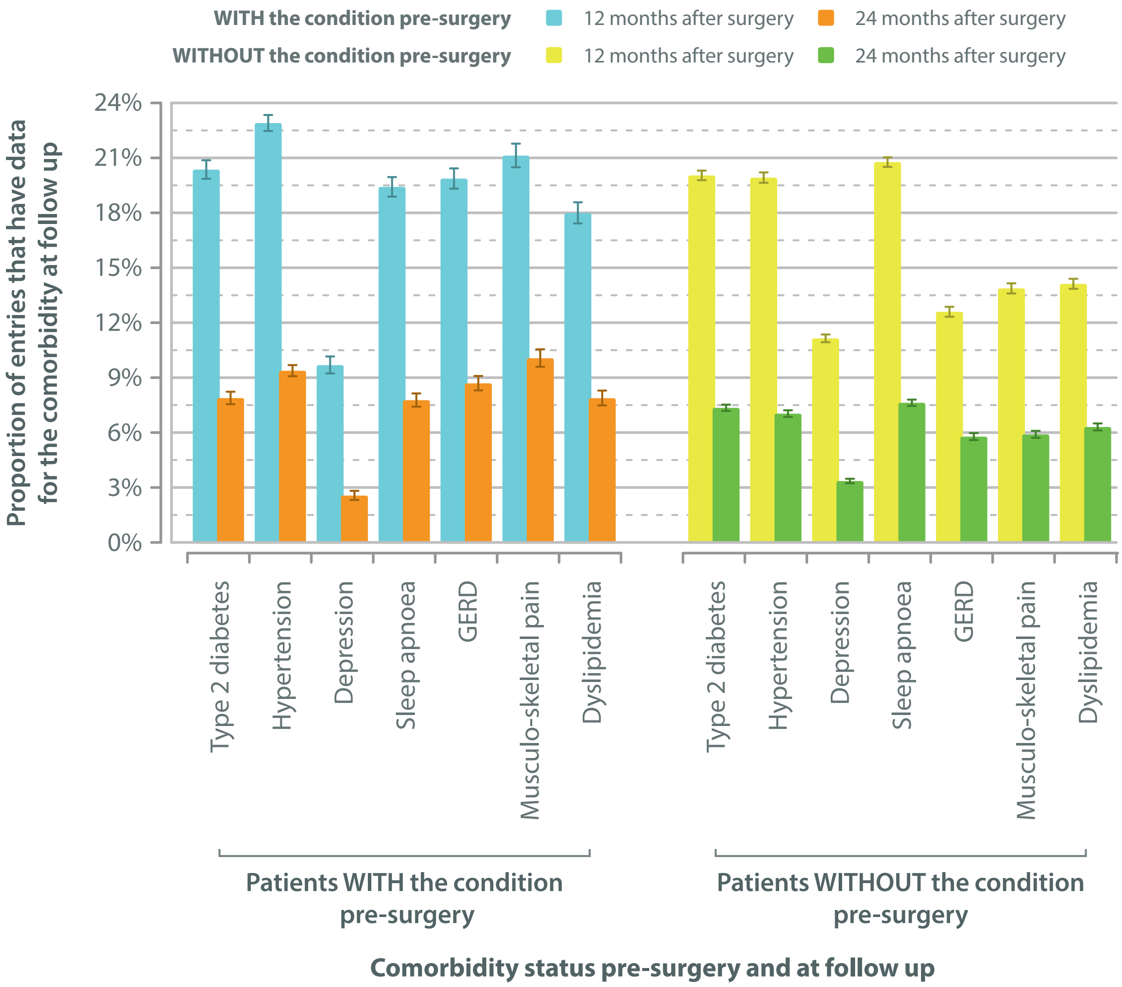


1. Sjostrom L. Review of the key results from the Swedish Obese Subjects (SOS) trial – a prospective controlled intervention study of bariatric surgery (Review). *Journal of Internal Medicine*. 2013; **273**: 219–234.

The graph below shows the extent of data completeness when tracking patient-comorbidity 12 and 24 months post-surgery. They illustrate the enormity of the challenge facing bariatric surgeons worldwide if we are to improve data collection outside of funded studies, as, at most, only 1 in 5 patients have follow up data recorded at 12 months and even fewer, less than 1 in 10, have follow up data recorded at 24 months.

Collecting data after surgery is expensive, time consuming and subject to patients being contactable or attending follow up. However, if we can clearly demonstrate the medium- to long-term benefits that our patients get after their surgery then there is a strong possibility that more and more healthcare systems might be prepared to fund this beneficial treatment of obesity-related disease.

Primary surgery: Data completeness for comorbidity questions 12 and 24 months after surgery; calendar years 2011-2017



Contributor hospitals

Argentina
Fundación Sanatorio Guemes / Hospital Argerich

Australia
St John of God Hospital, Subiaco, Western Australia
St John of God Hospital, Murdoch, Western Australia

Belgium
The Center of Obesity Surgery, AZ Sint-Jan Hospital, Bruges

Brazil

Sociedade Brasileira de Chirurgia Bariátrica e Metabólica
Fabio Viegas Instituto de Cirurgia do Aparelho Digestivo e Obesidade, Rio de Janeiro
Gastro Obeso Center São Paulo
Hospital das Clinicas, Universidade Federal de Pernambuco, Recife
Hospital Esperanca, Recife
Hospital Meridional, Cariacica
Hospital Santa Joana, Recife
Hospital Unimed Recife
Real Hospital Portuguêse de Beneficência, Recife

Canada
Hôpital du Sacré-Coeur de Montreal

Chile
Centro Clínico de la Obesidad, Santiago
Hospital Dipreca, Santiago
Center for the Treatment of Obesity and Metabolic Diseases, Pontificia Universidad Católica de Chile, Santiago

China
The First Affiliated Hospital of Jinan University, Guangzhou

Colombia
Clínica la Colina, Bogotá

Czech Republic
OB Klinika Mediczech, Prague

Egypt
Cairo University / Gastrointestinal Surgery Center, Mansoura University, Egypt

France
Centre Médico-Chirurgical du Mans, Pôle Santé Sud, Service de Chirurgie Viscérale, Le Mans
Polyclinique, Lyon Nord-Rillieux

Georgia

Tbilisi Central Hospital, Tbilisi
Health House, Tbilisi
Innova Medical Center, Tbilisi
Caraps Medline, Tbilisi
J.S.C.K.Eristavi National Center of Experimental and Clinical Surgery, Tbilisi

Germany

Marienkrankenhaus Kassel Chirurgische Klinik
Adipositaszentrum Nordhessen, Kassel

Guatemala

Centro de Tratamiento Integral del Metabolismo y la Obesidad, New Life Center, Guatemala City

Hong Kong

Prince of Wales Hospital, Shatin
United Christian Hospital, Kowloon

Hungary

Duna Medical Center / Duna Medical Centre Private Hospital, Budapest, Hungary

India

OSSI

Obesity Surgery Society of India

A V Da'Costa Hospital, Goa
Apollo Hospital, Chennai
Apollo Hospital, Kakinada
Apollo Hospital Indraprastha, New Delhi
Apollo Hospital, Mumbai
Apollo Spectra Hospitals, Mumbai
Asian Bariatrics, Ahmedabad
Asian Bariatrics, Hyderabad
Asian Institute of Gastroenterology, Hyderabad
Aster CMI Hospital, Bangalore
Baroda Laparoscopy hospital, Vadodara
BelleVue Clinic, Kolkata
Care Institute of Medical Sciences, Ahmedabad
Centre for Obesity & Digestive Surgery, Mumbai
Columbia Asia Hospital, Ahmedabad
Columbia Asia Referral Hospitals, Yeshwantpura
Continental Hospital, Telengana
Dhawn Hospital, Panchkula
Digestive Health Institute, Mumbai
Dr. Todkar Hospital, Pune
Endocare Hospital, Vijayawada
Excel Hospital, Surat
Fortis Flt. Lt. Rajan Dhall Hospital, Vasant Kunj
Fortis Hospital, Shalimar Bagh
GEM Hospitals, Coimbatore
Gunasheela Surgical & Maternity Hospital, Bangalore
Hindija Healthcare Speciality, Mumbai
ILS Hospital, Kolkata
Jammu Hospital, Jalandhar
Jeewan Mala Hospital, New Delhi
Kirloskar Hospital, Hyderbad
Kokilaben Dhirubhai Hospitals, Mumbai
Kular Hospital, Ludhiana
Lilavati Hospital, Mumbai
LivLife Hospitals, Hyderabad
Max Hospital, Shalimarbagh, New Delhi
Max Super Speciality Hospital, Saket, New Delhi
Mohak Hitech Specialty Hospital, Indore
National Hospital, Mumbai
Shanthi Memorial Hospital, Cuttack
Shree Hospital, Pune
Surat Institute of Digestive Sciences (SIDS), Gujurat
Sushrisha Hospital, Kolhapur
Unique Hospital, Surat
Wings Hospital, Surat
Wockhardt Hospitals, Mumbai
Zen Hospital, Mumbai

Ireland

Bon Secours Hospital, Cork

Israel

The Israel National Bariatric Surgery Registry

Assaf Harofeh Medical Center
Assuta Medical Center Haifa
Assuta Medical Center Rishon Lezion
Assuta Medical Centers Beer-Sheva
Assuta Medical Centers Tel Aviv
Barzilai Medical Center
Bnai Zion Medical Center
Carmel Medical Center
Elisha Medical Center
Galilee Medical Center
Hadassah Mt. Scopus Medical Center
HaEmek Medical Center
Herzliya Medical Center
Hillel Yaffe Medical Center
Kaplan Medical center
Meir Medical Center
Rabin Medical Center – Belinson & Hasharon Hospitals
Rambam Health Care Campus
Shaare Zedek Medical Center
Sheba Medical Center
Soroka Medical Center
St. Joseph Hospital
Tel Aviv Sourasky Medical Center
The Baruch Padeh Medical Center, Poriya
The Hadassah University Hospital-Ein Kerem
The holy family hospital Nazareth
The Nazareth hospital
Wolfson Medical center
Ziv Medical Center

Italy

Hospital San Giovanni Bosco, Naples

Japan

Department of Surgery, Univercity of Osaka
Department of Digestive and Pediatric Surgery Tokushima University Faculty of Medicine
Department of Gastroenterological and Pediatric Surgery, Oita University Faculty of Medicine
Department of General Surgical Science Gunma University Graduate School of Medicine
Department of Surgery and Science,Graduate School of Medical Science,Kyushu University
Department of Surgery Iwate Medical University School of Medicine
Department of Surgery Jichi Medical University
Department of Surgery Nagasaki University, Graduate School of Biomedical Science
Department of Surgery Shiga University of Medical Science
First Towakai Hospital
Frontier Surgery Chiba University Graduate School of Medicine
Kansai Medical University Hospital
Kusatsu General Hospital
Ohama Daiichi Hospital
Takeda General Hospital
Tochigi Medical Center Shimotsuga Hospital
Toho University Sakura Medical Center
Tohoku University, Department of Surgery
Tokyo Metropolitan Tama Medical Center
Yotsuya Medical Cube

Jordan

Gastrointestinal Bariatric & Metabolic Center, Jordan Hospital, Amman

Kazakhstan

National Scientific Center for Oncology & Transplantation

Kingdom of Saudi Arabia

King Saud University Hospital, Riyadh
King Salman Armed Forces Hospital, Tabuk New You Medical Center, Riyadh

Kuwait

Al Amiri Hospital, Kuwait City
Mubarak Hospital

Lithuania

Lithuanian University of Health Sciences Hospital, Kaunas

Mexico

Instituto Nacional de la Nutrición Salvador Zubirán, Mexico City
Centro Médico ABC, Mexico City
Centro Medico de Colima
Grupo Hospitales Angeles
Group Hospitales Star Medica

Netherlands

DATO
DUTCH AUDIT FOR TREATMENT OF OBESITY

Dutch Audit for Treatment of Obesity

Albert Schweitzer Ziekenhuis Dordrecht
Bariatrisch Centrum Zuid West Nederland
Catharina Ziekenhuis Eindhoven
Maasstad Ziekenhuis Rotterdam
Máxima Medisch Centrum Eindhoven / Veldhoven
MC Zuiderzee Lelystad
MC Slotervaart Amsterdam
Medisch Centrum Leeuwarden
Nederlandse Obesitas Kliniek (NOK) Heerlen
Nederlandse Obesitas Kliniek (NOK) West
Onze Lieve Vrouwe Gasthuis (OLVG) Amsterdam
Rijnstate Ziekenhuis Arnhem
Rode Kruis Ziekenhuis Beverwijk
Sint Franciscus Gasthuis Rotterdam
St Antonius Ziekenhuis Nieuwegein
TweeSteden Ziekenhuis Tilburg
Waterlandziekenhuis Purmerend
Ziekenhuis Groep Twente (ZGT)
ZorgSaam Ziekenhuis Zeeuws-Vlaanderen

Panama

Cirugía General y Laparoscópica Avanzada
Hospital Punta Pacifica

Peru

Clinica de dia Avendaño, Lima

Poland

Ceynowa Hospital, Wejherowo
Medical University Hospital of Gdansk
Department of General, Transplant and Liver Surgery, Medical University of Warsaw

Qatar

Hamad General Hospital, Hamad Medical Corporation, Doha

Russia

Russian National Bariatric Surgery Registry

AVA- Kazan
Clinic of Endoscopic & Minimal Invasive Surgery, Stavropol State Medical University
Clinic of Excess Weight and Diabetes, Moscow
Clinic UGMK Health, Ekaterinburg
LLC Medical Center, Medeor, Chelyabinsk
LLC SM Clinic, Kazan
Moscow Clinical and Scientific Centre, Moscow
Non-State Health Care Facility, Central Clinical Hospital № 2 JSC, Russian Railways Hospital, Moscow
Non-State Health Care Facility, Clinical Hospital, The Station Krasnodar of JSC, Russian Railways Hospital, Krasnodar
Non-State Health Care Facility, Clinical Hospital, The Station Mineral Water of JSC, Russian Railways Hospital
Non-State Health Care Facility, The Station Khabarovsk-1 of JSC, Russian Railways Hospital, Khabarovsk
Non-State Health Care Facility, The Station Voronezh-1 of JSC, Russian Railways Hospital, Voronezh
Pavlov First Saint Petersburg State Medical University, St. Petersburg
Regional Clinical Hospital № 2, Krasnodar
Regional Clinical Hospital, Khanty-Mansiysk
Republic Clinical Hospital of First Aid, Grozny
Samara Regional Hospital
State Clinical Hospital of First Aid № 2, Omsk
State Clinical Hospital, South Regional Medical Center of Federal Medical Biological Agency, Rostov-on-Don
State Hospital № 5, Nizhny Novgorod
State Hospital of First Aid, Ufa
State Hospital of First Aid, Ufa State Hospital No 5, Nizhny Novgorod
State Regional Clinical Hospital, Ryazan
The Center of Endosurgery and Lithotripsy (CELT), Moscow
The Federal Almazov North-West Medical Research Centre, St. Petersburg
The Federal State Budgetary Institute, The Nikiforov Russian Center of Emergency & Radiation Medicine, St. Petersburg
Treatment & Rehabilitation Center of The Ministry of Health of the Russian Federation, Moscow
Tver Regional Clinical Hospital, Tver

Spain

Hospital de Torrevieja, Alicante
Hospital Clínico San Carlos, Universidad Complutense de Madrid

Sweden

Scandinavian Obesity Surgery Registry

Aleris Motala
Aleris Skåne
Axcess Medica Smirishamn
Bariatric Center Skåne
Bariatric Center Sophiahemmet
Blekinge Hospital
Borås Hospital
Capio St Göran Hospital
Carlanderska Hospital
Centrum för titthålskirurgi
Danderyd Hospital
Eksjö Hospital
Ersta Hospital
Falun Hospital
Gävle Hospital
Hudiksvall Hospital
Kalmar Hospital
Ljungby Hospital
Lund University Hospital
Lycksele Hospital
Mora Hospital
Norrköping Hospital
Norrtälje Hospital
Nyköping Hospital
Sahlgrenska University Hospital
Skövde Hospital
Sunderbyn Hospital
Sundsvall Hospital
Södersjukhuset Hospital
Södertälje Hospital
Torsby Hospital
Trollhättan Hospital
Uppsala University Hospital
Varberg Hospital
Värnamo Hospital
Västervik Hospital
Västerås Hospital
Västra Frölunda Hospital
Växjö Hospital
Örebro / Lindesberg University Hospital
Österlenkirurgi Simrishamn
Östersund Hospital

Switzerland

Hirslanden Klinik, Bern
Hôpital du Chablais, Aigle

Taiwan

Min Sheng General Hospital, Bariatric & Metabolic International Surgery Center E-Da Hospital, Kaohsiung City

Turkey

Turkish National Obesity Database

Acıbadem Hospital, Kocaeli
Büyük Anadolu Hospital, Samsun
Cerrahpasa Faculty of Medicine, Istanbul
Doruk Çekirge Hospital, Bursa
Doruk Yıldırım Hastanesi, Bursa
Fatsa State Hospital, Ordu
Fırat University Faculty of Medicine, Elazig
İbn-i Sina Hospital, Osmaniye
Medical Park Hospital, Samsun
Medilife Beylikdüzü Hospital, Istanbul
Metabolic Surgery Clinic, Istanbul
Murat Üstün Center for Obesity & Metabolism Surgery, Istanbul
Selçuk University Faculty of Medicine, Konya
Tekden Hospital, Denizli
Tınaztepe Hospital, Izmir

United Arab Emirates

Bariatric & Metabolic Institute Abu Dhabi, Sheikh Khalifa Medical City, Abu Dhabi
Healthpoint Hospital, Abu Dhabi
Mediclinic Dubai Mall

United Kingdom

The UK National Bariatric Surgery Registry

Ashford Hospital, Middlesex
Ashtead Hospital
Berkshire Independent Hospital, Reading
BMI Albyn Hospital, Aberdeen
BMI Bath Clinic
BMI Chelsfield Park Hospital, Orpington
BMI Mount Alvernia Hospital, Guildford
BMI Sarum Road Hospital, Winchester
BMI The Alexandra Hospital, Manchester
BMI The Clementine Churchill Hospital, Harrow
BMI The Droitwich Spa Hospital
BMI The Hampshire Clinic, Basingstoke
BMI The Harbour Hospital, Dorset
BMI The London Independent Hospital
BMI The Meridien Hospital, Coventry
BMI The Park Hospital, Nottingham
BMI The Princess Margaret Hospital, Windsor
BMI The Priory Hospital, Birmingham
BMI The Ridgeway Hospital, Swindon
BMI The Runnymede Hospital, Chertsey
BMI The Shelburne Hospital, High Wycombe
BMI The South Cheshire Private Hospital, Leighton
BMI Thornbury Hospital, Sheffield
Bradford Royal Infirmary
Castle Hill Hospital, Cottingham
Chelsea & Westminster Hospital, London
Cheltenham General Hospital
Churchill Hospital, Oxford
Circle Bath Hospital
Claremont Hospital, Sheffield
Countess of Chester Hospital
Cromwelll Hospital, London
Darlington Memorial Hospital
Derriford Hospital, Plymouth
Dewsbury & District Hospital, West Yorkshire
Dolan Park Hospital, Bromsgrove
Doncaster Royal Infirmary
Duchy Hospital, Truro
Gloucestershire Royal Hospital, Gloucester
Heartlands Hospital, Birmingham
Hexham General Hospital
Holly House Hospital, Essex
Homerton University Hospital, London
Hospital of St John and St Elizabeth, London
Huddersfield Royal Infirmary
King's College Hospital, London
Lanarkshire University Hospital
Leicester General Hospital
London Bridge Hospital, London
Luton & Dunstable University Hospital
Maidstone Hospital, Kent
Manchester Royal Infirmary
McIndoe Surgical Centre, East Grinstead
Morriston Hospital, Swansea
Musgrove Park Hospital, Taunton
Ninewells Hospital, Dundee
Norfolk & Norwich University Hospital
Northern General Hospital, Sheffield
North Tyneside General Hospital, North Shields
Nuffield Health Bournemouth Hospital
Nuffield Health Brentwood Hospital
Nuffield Health Bristol Hospital
Nuffield Health Cheltenham Hospital
Nuffield Health Derby Hospital
Nuffield Health Glasgow Hospital
Nuffield Health Guildford Hospital
Nuffield Health Leeds Hospital
Nuffield Health Newcastle-upon-Tyne Hospital
Nuffield Health North Staffordshire Hospital
Nuffield Health Plymouth Hospital
Nuffield Health Shrewsbury Hospital
Nuffield Health Taunton Hospital
Nuffield Health The Grosvenor Hospital, Chester
Nuffield Health Warwickshire Hospital
Nuffield Heath The Manor Hospital, Oxford
Nuffield Health Hospital York
Orpington Treatment Centre
Parkside Hospital, London
Poole Hospital, Dorset
Princess Royal Hospital, Telford
Princess Royal University Hospital, Orpington
Queen Alexandra Hospital, Portsmouth
Queen's Hospital Romford
Ramsay Mount Stuart Hospital, Torquay
Ramsey Winfield Hospital, Gloucestershire
Rivers Hospital, Sawbridgeworth
Royal Berkshire Hospital, Reading
Royal Bournemouth General Hospital
Royal Cornwall Hospital, Truro
Royal Derby Hospital
Royal Infirmary of Edinburgh
Royal Shrewsbury Hospital
Salford Royal Hospital
Salisbury District Hospital

United Kingdom continued ...

Southampton General Hospital
Southmead Hospital, Bristol
Spingfield Hospital, Chelmsford
Spire Bushey Hospital, Watford
Spire Dunedin Hospital, Reading
Spire Elland Hospital, West Yorkshire
Spire Fylde Coast Hospital, Blackpool
Spire Gatwick Park Hospital, Horley
Spire Harpenden Hospital
Spire Hull & East Riding Hospital, Anlaby
Spire Leeds Hospital
Spire Little Aston Hospital, Sutton Coldfield
Spire Manchester Hospital
Spire Murrayfield Hospital, Edinburgh
Spire Murrayfield Hospital Wirral
Spire Norwich Hospital
Spire Parkway Hospital, Solihull
Spire Portsmouth Hospital
Spire Regency Hospital, Macclesfield
Spire Roding Hospital, Redbridge
Spire Southampton Hospital
Spire South Bank Hospital, Worcester
Spire Thames Valley Hospital, Slough
Spire Washington Hospital, Tyne & Wear
Spire Yale Hospital, Wrexham
St Anthony's Hospital, London
St George's Hospital, London
St James's University Hospital, Leeds
St Mary's Hospital, London
Stobhill Hospital, Glasgow
St Peter's Hospital, Chertsey
St Richard's Hospital, Chichester
St Thomas's Hospital, London
Sunderland Royal Hospital
The James Cook University Hospital, Middlesbrough
The London Clinic
The Princess Grace Hospital, London
The Yorkshire Clinic, Bingley
University College Hospital London
University Hospital Ayr
University Hospital Aintree
University Hospital Coventry
University Hospital Crosshouse, Kilmarnock
University Hospital Lewisham
University Hospital of North Staffordshire
University Hospital of North Tees, Stockton-on-Tees
Walsall Manor Hospital
Wansbeck Hospital
Whittington Hospital, London
Worcestershire Royal Hospital
York Hospital
Yorkshire Surgicentre, Rotherham

United States of America

Fresno Heart & Surgical Hospital, California

Venezuela

Sagrada Famlia Hospital, Maracaibo

Database form

International Federation for the Surgery of Obesity and metabolic disorders

IFSO Global Registry

Baseline section; Page 1; Version 3.0 (1 Feb 2017)

Basic demographic data

All baseline data refer to the condition of the patient at the time of surgery, unless otherwise specified.

Unique patient identifier		

Baseline data

Basic patient details

Date of birth	dd / mm / yyyy	
Gender	○ Male ○ Female	○ Unknown
Height	cm	
Weight on entry to the weight-loss program	kg	
Funding category	○ Publicly funded ○ Self-pay	○ Private insurer

Comorbidities

Type 2 diabetes on medication	○ No	○ Yes
Diabetes medication type	○ Oral therapy	○ Insulin
Hypertension on medication	○ No	○ Yes
Depression on medication	○ No	○ Yes
Increased risk of DVT or PE	○ No	○ Yes
Musculo-skeletal pain on medication	○ No	○ Yes
Confirmed sleep apnea	○ No	○ Yes
Dyslipidemia on medication	○ No	○ Yes
GERD / GORD	○ No	○ Yes

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International Federation for the Surgery of Obesity and metabolic disorders

IFSO Global Registry

Baseline section; Page 2; Version 3.0 (1 Feb 2017)

Unique patient identifier		
Date of operation	dd / mm / yyyy	
	Surgery	
Date of operation	dd / mm / yyyy	
Has the patient had a prior gastric balloon	○ No	○ Yes
Weight at surgery	kg	
Has the patient had bariatric surgery before	○ No	○ Yes
Operative approach	○ Laparoscopic ○ Lap converted to open	○ Endoscopic ○ Open
Type of operation	○ Gastric band ○ Gastric bypass ○ Sleeve gastrectomy ○ Duodenal switch	○ Duodenal switch with sleeve ○ Bilio-pancreatic diversion ○ Other
Type of bypass	○ Roux-en-Y ○ Single anastomosis	○ Banded gastric bypass
Details of other procedure	○ Gastric plication ○ Single anastomosis duodenal-ileal surgery ○ Vertical banded gastroplasty ○ Other	
	Outcomes	
Leak within 30 days of surgery	○ No	○ Yes
Bleeding within 30 days of surgery	○ No	○ Yes
Obstruction within 30 days of surgery	○ No	○ Yes
Re-operation for complications within 30 days of surgery	○ No ○ Yes	
Patient status at discharge	○ Alive	○ Deceased
Date of discharge or death	dd / mm / yyyy	

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Database form

International Federation for the Surgery of Obesity and metabolic disorders

IFSO Global Registry

Follow up section; Page 3; Version 3.0 (1 Feb 2017)

Unique patient identifier		
Date of follow up	dd / mm / yyyy	
	Follow up	
Weight at follow up	kg	
Type 2 diabetes on medication	○ No	○ Yes
Diabetes medication type	○ Oral therapy	○ Insulin
Hypertension on medication	○ No	○ Yes
Depression on medication	○ No	○ Yes
Musculo-skeletal pain on medication	○ No	○ Yes
Confirmed sleep apnea	○ No	○ Yes
Dyslipidemia on medication	○ No	○ Yes
GERD / GORD	○ No	○ Yes
Clinical evidence of malnutrition	○ No	○ Yes
Patient status	○ Alive	○ Deceased

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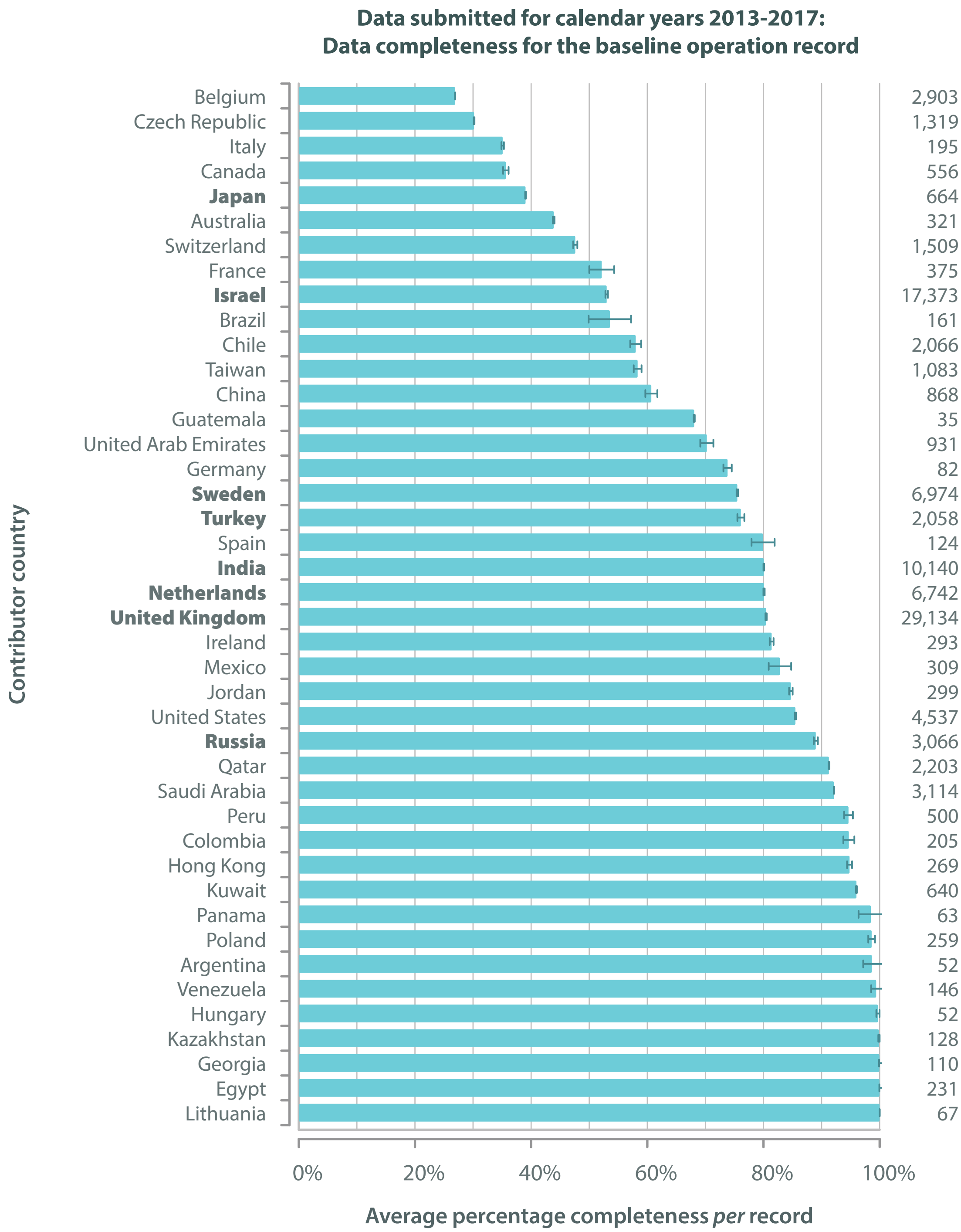
Appendices

On the following pages are some additional charts that were not included in the main Analysis section of the report.

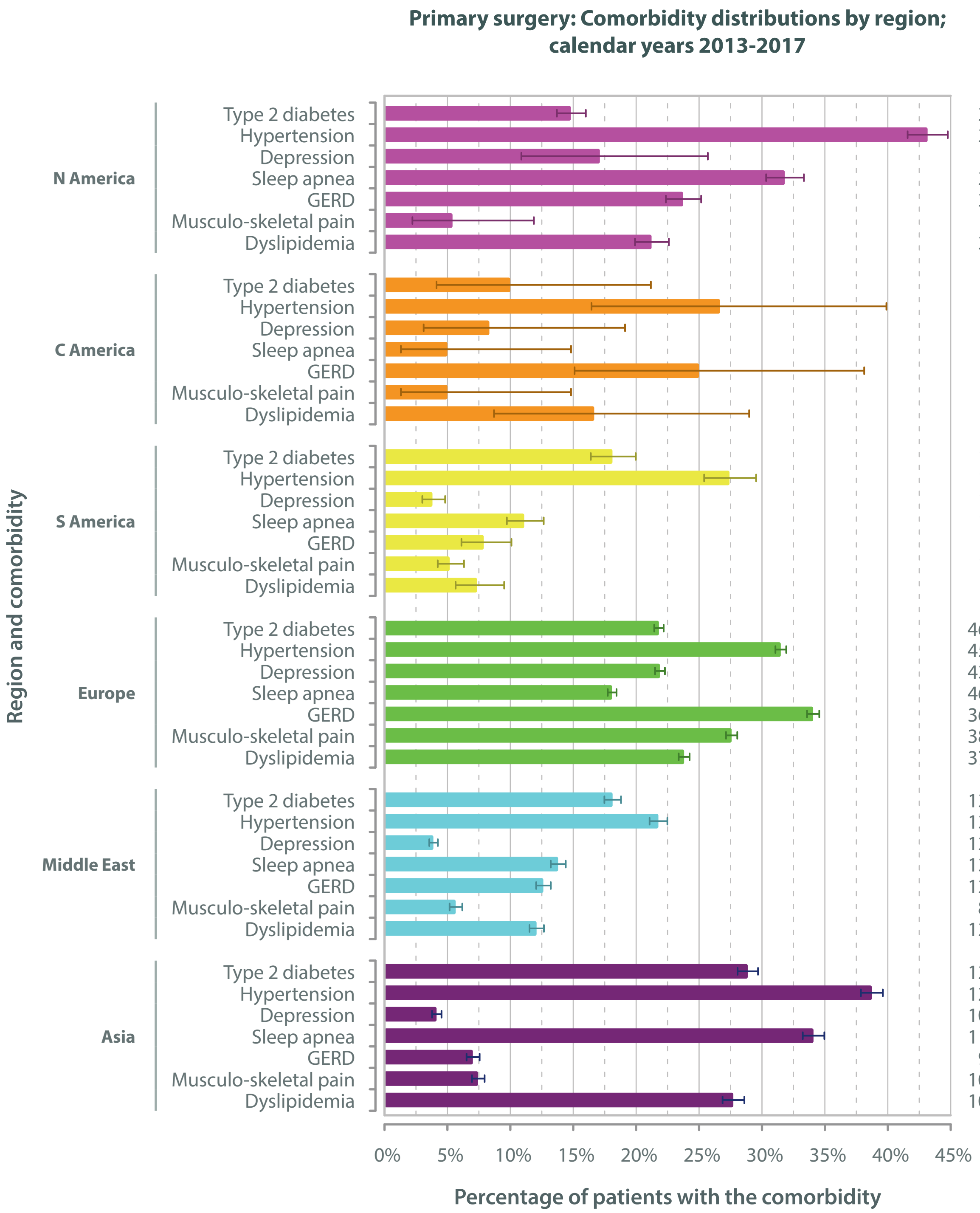
The chart below records data completeness for the baseline operative records for each contributor country.

Many of the contributors with lower rates of data completeness should certainly not be criticised for apparently having poor compliance, probably because their local databases were designed prior to the IFSO Global Registry dataset, and so there will be inevitable differences and some potential mismatches between the two.



As reported in **Inter-region comparisons of comorbidities** on page 39 there are striking differences in the rates of comorbidities by geographical region around the world. The chart below and the table opposite provide additional perspectives on the data presented previously.

Over time it will be interesting to see if these patterns change or remain the same. As more data become available the confidence intervals around the calculated rates will narrow, and we will be more certain that the calculated rates for each region's comorbidity rates are truly representative of global differences and / or similarities.



Primary surgery: comorbidity rates in each of the regions; operations in the calendar years 2013-2017

Comorbidity and region		Presence of the comorbidity			
		No	Yes	Unspecified	Rate
Type 2 diabetes	N America	3,197	556	0	14.8%
	C America	54	6	35	10.0%
	S America	1,505	333	101	18.1%
	Europe	36,668	10,228	4,208	21.8%
	Middle East	10,813	2,394	6,956	18.1%
	Asia	8,612	3,495	217	28.9%
	Australasia	254	30	0	10.6%
Hypertension	N America	2,133	1,620	0	43.2%
	C America	44	16	35	26.7%
	S America	1,334	504	101	27.4%
	Europe	30,978	14,242	5,884	31.5%
	Middle East	10,319	2,871	6,973	21.8%
	Asia	7,411	4,685	228	38.7%
Depression	N America	92	19	3,642	17.1%
	C America	55	5	35	8.3%
	S America	1,767	70	102	3.8%
	Europe	34,034	9,540	7,530	21.9%
	Middle East	12,102	489	7,572	3.9%
	Asia	10,518	454	1,352	4.1%
Sleep apnea	N America	2,559	1,194	0	31.8%
	C America	57	3	35	5.0%
	S America	1,633	204	102	11.1%
	Europe	38,373	8,475	4,256	18.1%
	Middle East	11,228	1,797	7,138	13.8%
	Asia	7,813	4,042	469	34.1%
GERD	N America	2,559	1,194	0	31.8%
	C America	57	3	35	5.0%
	S America	1,633	204	102	11.1%
	Europe	38,373	8,475	4,256	18.1%
	Middle East	11,228	1,797	7,138	13.8%
	Asia	7,813	4,042	469	34.1%
Musculo-skeletal pain	N America	105	6	3,642	5.4%
	C America	57	3	35	5.0%
	S America	1,740	95	104	5.2%
	Europe	27,867	10,616	12,621	27.6%
	Middle East	7,825	469	11,869	5.7%
	Asia	9,858	792	1,674	7.4%
Dyslipidemia	N America	2,854	769	130	21.2%
	C America	50	10	35	16.7%
	S America	705	56	1,178	7.4%
	Europe	28,440	8,889	13,775	23.8%
	Middle East	11,043	1,518	7,602	12.1%
	Asia	7,500	2,877	1,947	27.7%

Primary surgery for female patients: Serial comparisons of age at surgery for submissions from selected national registries; calendar years 2013-2017

The Third IFSO Global Registry Report 2017

This is the third international analysis of outcomes from bariatric (obesity) and metabolic surgery, gathered under the auspices of IFSO (the International Federation for the Surgery of Obesity and Metabolic Disorders).

Bariatric / Metabolic Surgery is unlike any other surgical specialty. We look to the long-term effects and are not satisfied with one or two year data; even 10 to 20 year data may not be enough to judge if our interventions today should be continued. Participation in IFSO's registry is purely voluntary. Gathering and reporting data is onerous, time consuming and without immediate reward. But if we had data from the past 30 years of surgery to analyze and integrate with our current concepts of the pathophysiology of our operations, I think we would be closer to answering the questions above.

Reporting data and participating in a registry such as Dendrite is indicative of the serious commitment to the long-term care of our patients and the advancement of the universal standards by which we practice.

Kelvin Higa

This 2017 issue is the third global registry report on bariatric surgery made available by Dendrite Clinical Systems at the occasion of the IFSO world congress in London, United Kingdom. This remarkable effort provides a clear picture of what is being accomplished across the world in the field of the surgery for adiposity based chronic diseases (ABCD).

We at IFSO are convinced that one of our prime tasks is to provide global guidelines for safe and effective surgery to the benefit of the patient with adiposity. Critical appraisal of what we do is essential to achieve this goal. More than ever we must share our data with the world. More than ever we must contribute to a global and complete registry.

Jacques M Himpens

We need global data, and a collaborative will, to address this global epidemic. It is important to pool our resources and understand the delivery of bariatric-metabolic surgery on a global basis. The IFSO Global Registry provides a vital component in monitoring and evaluating our response to this epidemic.

John Dixon

IFSO GLOBAL REGISTRY

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