The IFSO Global Registry

5th IFSO Global Registry Report

2019

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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. IFSO gratefully acknowledge the assistance of Dendrite Clinical Systems for:

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

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Preface

As IFSO President, it is my pleasure and privilege to introduce you to the Fifth IFSO Global Registry Report 2019 with data on over 833,000 bariatric / metabolic interventions, coming from 61 different countries. This represents a Herculean effort by the Registry Committee led by Wendy Brown (Australia-APC) and a great team to work with, including Lilian Kow (Australia-APC), Richard Welbourn (UK-EC), John Dixon (Australia-APC), the Dendrite Clinical Systems partnership with Peter Walton and Robin Kinsman, and finally myself.

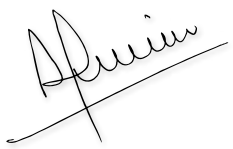
My first job here is to express IFSO's gratitude to everyone who has contributed to the Registry and congratulate them for the tremendous job they are doing in favour of bariatric / metabolic surgery in reporting their data. Also we should invite Societies, countries, groups and surgeons that did not participate in this registry project to be prepared to submit data next time. Real and true data is the only way for convincing our peer specialties, governments, insurers, health care companies and the general community about the benefits of bariatric / metabolic surgery. This is part of IFSO's mission in establishing universal standards of care for the treatment of individuals with chronic adiposity-based disease. At this time it is important to highlight why IFSO has been interested in the Global Registry:

1. This is an opportunity to learn and educate using real-world data.
2. As IFSO is a cooperation of 5 Chapters this is a good opportunity to better understand the differences and similarities of the different regions in order to develop a global strategy to support our bariatric / metabolic interventions in the fight against obesity / adiposity.
3. Understand better the differences of obesity / adiposity as a disease across the world.
4. Have a clear vision of the real benefits our procedures can offer in terms of control of comorbidities, weight loss and general improvement of the quality of life.
5. Identify what kind of barriers we should overcome in order to consolidate bariatric / metabolic interventions as the procedure of choice for the treatment of severe obesity / adiposity and its related conditions.
6. Recognize the different levels of response to our interventions.
7. Evaluate the role and results of the different techniques used around the world to try to understand whether or not there are any loco-regional components that influence the quality of the outcomes that patients experience.
8. Have adequate material to convince our peers about the great quality of life improvements we can offer *via* bariatric / metabolic surgery.
9. Increase credibility of bariatric / metabolic surgeries by a transparent and trustworthy database.
10. And finally the main reason: improve the outcomes offered to our patients.

The Fifth IFSO Global Registry 2019 represents the largest bariatric / metabolic registry ever published. The amount of information we can extract from it is amazing. I'm sure you will find some very interesting surprises.

There is a great deal of variation in terms of demographics and the frequency of obesity-related conditions across the five IFSO Chapters. Outcomes also seem to vary from region to region, and by the choice of surgical technique. You should take a look at the report to draw your own conclusions from the data presented here.

We believe that this Registry initiative is an important part of the IFSO global response to the adiposity epidemic, and we would like to encourage all our members and national societies to actively participate and join us in the next edition. If we don't make our numbers known, we simply don't exist!



Almino Ramos

IFSO President 2018-2019

Foreword

This Fifth edition of the IFSO Global Registry Report will be a landmark publication with the highest number of database records on operations performed around the world. With over 800,000 operations recorded from 17 national registries and 61 countries, this report reflects the problem of a global disease that has many devastating consequences with no relief in sight. Whilst this may be a record number of bariatric operations submitted from around the world in the last 12 months, this Registry is by no means comprehensive and is still in its infancy. This is because not all data has been captured in this Registry. Hence it is the goal of the IFSO Global Registry to try to work towards providing the most credible and transparent information available on bariatric and metabolic surgery within our international federation. To achieve this, the IFSO Global Registry is continuing to work on collecting good descriptive data about caseload / penetrance of surgery for metabolic disease and obesity in various countries and real-world data on outcome measures for our patients with adiposity-based chronic diseases.

To help achieve this, I would like to take the opportunity to reach out to all National Presidents and Chapter Presidents to assist in this IFSO Global Registry initiative. I would like to propose that all national registries aim to cover at least 80% of all procedures carried out in their countries, and I would also like to encourage countries that have not yet established a registry to get started with IFSO's assistance. For a successful meaningful Global Registry for the future, the IFSO registry committee are working on identifying the core outcome measures that can be reliably defined, measured, provided and compared internationally by all contributors.

In the collection of data, privacy of individuals and data protection are, of course, of the utmost importance. The IFSO Global registry adheres to the International Organization for Standardization (ISO) requirements and will assist all contributing National societies to ensure that ISO requirements for de-identification are adhered to and will have checking process in place to ensure quality, safety and efficiency. In addition, the General Data Protection Regulation (GDPR) is a 2018 regulation in EU law on data protection and privacy for all individuals within the European Union (EU) and the European Economic Area (EEA). As many European national societies contribute to the IFSO Global Registry, IFSO and Dendrite will also ensure that IFSO is compliant and fulfilling its requirement as Data Controller under the GDPR.

To ensure better outcomes for bariatric surgery and to ensure future high-quality annual reports, the IFSO Global Registry committee had a strategic planning meeting in Lyon, France in May 2019 as part of the IFSO-European Chapter meeting. The Committee, under the leadership of Professor Wendy Brown and with good representation of members across all IFSO Chapters, have been busy with various activities aimed at raising the quality of information collected for the IFSO Global Registry such that the data collected can be used to benefit all stakeholders especially on the universal standards for the treatment of individuals with adiposity-based chronic disease.

Finally, I would to thank all the members of the Data Registry Committee for their input and time spent and offer a special thank you to Richard Welbourn and Peter Walton for their commitment and hard work to putting this Fifth Registry Report together.

Lilian Kow

IFSO President 2019-2020

Preamble

The IFSO Global Registry is shaping up to be one of the most important activities of our professional Society. An effective collaboration of all IFSO national societies will bring with it a significant opportunity to meaningfully compare the disease of obesity and its surgical treatment across the globe.

Every report from the IFSO Global Registry has shown increased participation rates and more acquisition of data from national societies rather than from single centres. The foundations have been laid for a very bright future collecting data that is meaningful and useful. I would be remiss not to acknowledge the hard work and dedication of Richard Welbourn who has undoubtedly been the driving force behind the Registry. Along with current and previous IFSO Presidents, and his Committee, he has worked tirelessly with the dedicated team at Dendrite to bring us to where we are today.

As we look to the future, the IFSO Global Registry Committee has agreed on the following mission statement:

The IFSO Global Registry aspires to provide the most credible and transparent information available on bariatric / metabolic surgery.

We aim to provide descriptive data about caseload / penetrance of surgery for metabolic disease and obesity in various countries as well as aspire to provide real-world post-approval surveillance of procedures / devices once we are sure the data are robust.

Over the next few months we will agree on 5-6 core outcome measures, eventually including Patient Reported Outcome Measures (PROMs), that relate to the Registry's purpose. These outcome measures will sit within the current registry and will only be chosen if they are reliably defined, measured and comparable internationally. By limiting outcome measures to only a few core pieces of information, we should improve data acquisition and ensure that the data we are presenting are as accurate and free from bias, as possible.

To inform these outcome measures we are currently reviewing the data dictionaries of societies from around the globe and are planning a process whereby the case ascertainment for each national registry / country is presented in the report so that potential bias can be recognised.

Once these outcome measures are agreed upon, we hope to develop a protocol, or template, for a bariatric surgery registry, which could be used as the framework for new national registries.

The IFSO Global Registry has achieved an enormous amount already. We are now poised to learn from this experience and move forward to provide not only the most accurate data available, but also support those Societies seeking to start their own registry. I am very privileged to be a part of the team that is working on this initiative and I look forward to building on this very solid foundation of a fifth report.

Wendy Brown

IFSO Global Registry Committee Chair

Introduction

It is a privilege to present accumulated data on 833,687 bariatric operations in this report, including sections on patients' obesity-related diseases, the types of operation performed and observed outcomes after surgery. The data have been accumulated from national registries, regional systems and even individual hospitals, from 61 countries around the world. Compared to last year, this represents a near doubling in the volume of data submitted, further adding to the strength and value of the registry.

Since the publication of the last report there have been two peer-reviewed publications of Registry data in the IFSO Obesity Surgery journal, the first presenting data from 2013-2015 (Second IFSO Global Registry Report) [1] and the second presenting data from 2014-2018 (Fourth IFSO Global Registry Report) [2]. To date these publications have already been cited more than 50 times, indicating the enthusiasm among IFSO members for promoting the registry as an authoritative resource for recording bariatric and metabolic surgery activity among members.

For this Fifth Report, data are presented according to the IFSO Chapter to which each contributing country belongs. A large tranche of data are also submitted for the first time from North America, a valuable addition to the Registry as it progress steadily towards its aim of recording baseline demography of the whole worldwide operated population. Thus, as before, age and gender distributions, body mass index (BMI) and burden of obesity-related disease are described, using the dataset that has not changed from that used at the time of the fourth report [3]. The dataset is included in the Appendix (see page 93).

The aims of this fifth iteration of the Global Registry project are, as *per* previous reports, to:

1. Establish baseline demographic characteristics for patients operated in different countries either from the appropriate national registries or, failing that, individual units in these countries.
2. Report basic one-year post-operative data within the limitations of the accumulated data.

We therefore describe the different kinds of operations being performed, the burden of obesity-related disease, and a measure of operative risk, as defined by the Obesity Surgery-Mortality Risk Score. As far as the limitations of the submitted data allow, weight loss and change in obesity-related disease one year after surgery are also presented.

No attempt has been made to analyze complications or mortality data. Our analyses comply with the comprehensive Founding Charter that was originally set up regarding the use and ownership of the accumulated and merged data. Contributors can continue to be reassured that we have steered well clear of attempting to make statistical comparisons based on these unvalidated data.

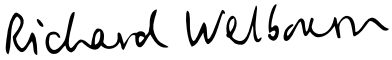
It is appropriate to acknowledge here the work of the IFSO Registry Committee, in particular Almino Ramos, IFSO President 2018 / 2019 for his commitment and encouragement for the project, taking over in this role from Jacques Himpens, IFSO President 2017 / 2018, and previous IFSO Presidents. Also acknowledged are Wendy Brown (Australia), the current Chair of the Registry, and the other committee members (in alphabetical order):

- Salman Al Sabah (MENAC)
- Mehran Anvari (NAC)
- Ricardo Cohen (LAC)
- John Dixon (APC)
- Amir Ghaferi (NAC)
- Kelvin Higa (NAC)
- Lilian Kow (APC)
- Ronald Liem (EC)
- John Morton (NAC)
- Johan Ottosson (EC)
- Francois Pattou (EC)
- Villy Våge (EC)

Each has exceptional working knowledge of their own national registry and consequently they have been able to contribute enormously to the development of this IFSO project as it looks to the future.

Lastly, many thanks to Peter Walton and his team at Dendrite team for initiating the IFSO Global Registry in the very first place and for building, supporting and growing the Registry from its initial Pilot Project phase into this very valuable and rapidly maturing data and information resource. Dendrite have been a steady and reliable partner in this venture and particular thanks must go to their Senior Data Analyst, Dr Robin Kinsman, for his steadfast and professional work in performing all the analyses you see in this Report.

Special credit must go to all those surgeons who have committed their data for inclusion in this fifth report: your contribution is very much appreciated. We intend in the future for the Registry data to become an increasingly authoritative reference work as metabolic and bariatric surgeons worldwide strive to increase the availability of this powerful tool to potential patients.



Richard Welbourn

Member IFSO Global Registry Committee

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Fifth IFSO Global Registry Report

Executive summary

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

In overview

- 61 countries contributed a total of 833,687 operation records representing some 14.6 million individual baseline data-items now held in the registry.
- well over 1,000 hospitals contributed data either directly or *via* their national registry submissions.
- the number of records submitted ranged from 1 entry from a single centre to over 335,000 submitted for the very first time by the national registry from the United States of America; this is by far the largest tranche of data from a single country by a factor of around 4 to 1, and this means that any headline figures in this report are heavily influenced by the data from the USA.
- this report covers data on 294,530 Roux en Y gastric bypass operations (35.3% of all operation records submitted), 391,423 sleeve gastrectomy procedures (47.0%), 30,914 one anastomosis gastric bypass procedures (3.7%), and 70,085 gastric banding procedures (8.4%).
- most of the records fell in the period 2012-2019 (86.3%) of which 594,235 (71.3%) were operations dated in the calendar years 2015-2018.

The dataset and completeness of data entry

- the dataset contains 41 variables (28 in the baseline record, and 13 in the follow up section).
- overall, 78.3% of the baseline records were >70% complete for operations dated in the calendar years 2015-2018.

Initial data on primary surgery from 2015-2018

Gender inequality

- overall the proportion of female patients was 77.1% (95% CI: 76.9-77.2%).
- there was a wide variation in country-specific gender ratios, ranging from 43.3% female (in Belgium) to 93.1% (in Guadeloupe).

Patient age & BMI at the time of primary surgery

- the patients' median age was 43.0 years (inter-quartile range: 34.0-52.0 years).
- the patients' median body mass index (BMI) before surgery was 44.3 kg m^{-2} (inter-quartile range: 40.4-49.8 kg m^{-2}); there was a wide variation between different contributor countries, medians ranging from 36.4 kg m^{-2} in Chile to 52.9 kg m^{-2} in Bulgaria.

Obesity-related disease prior to surgery (contributor countries with >100 records)

- 23.3% of patients were on medication for type 2 diabetes (inter-country variation: 8.7-93.9%).
- 41.0% were on medication for hypertension (inter-country variation: 15.5-90.4%).
- 16.5% were on medication for depression (inter-country variation: 0.2-77.4%).
- 12.0% were on medication for musculo-skeletal pain (inter-country variation: 0.0-64.7%).
- 18.9% had sleep apnea (inter-country variation: 0.0-74.4%).
- 25.1% had gastro-esophageal reflux disorder (inter-country variation: 0.0-54.8%).

Stratification for operative risk

- the distribution of Obesity Surgery Mortality Risk Scores (OSMRS) varied widely country by country.
- Georgia, Hong Kong and Mexico had the highest risk patient-populations (OSMRS groups B & C: 88.1%, 68.2% and 57.7% respectively).

- **Qatar, Kuwait and the United Arab Emirates had the lowest risk patient-populations** (OSMRS groups B & C: 15.3%, 21.8% and 23.2% respectively).

Surgery performed

- there was a wide variation in the kinds of surgery performed, from countries that reported only sleeve gastrectomy, to others reporting almost 85% Roux en Y gastric bypass; there was one country where almost all recorded operations were one anastomosis gastric bypass (OAGB / MGB).
- the highest rates of sleeve gastrectomy operations were reported by **Australia** (a multi-centre contributor; 100% sleeve gastrectomy), **Guadeloupe and Peru** (both 100% sleeve gastrectomy, both represented by a single hospital).
- **Canada** (84.3%), **Colombia** (80.7%) and **Brazil** (76.6%) reported the highest proportions of Roux en Y gastric bypass surgery.
- 99.1% of all operations were performed laparoscopically.

Immediate outcomes

- the patterns of post-operative stay are similar across most of the IFSO Chapters, with the exception of the Asia Pacific Chapter, where patients tend to stay a little longer in hospital after their surgery. The reasons for this are not clear from the data, but are more likely to be driven by organisational issues than anything to do to with the quality of surgery.
- on average, patients' length-of-stay in hospital was reported as follows:
    - gastric banding: average stay **1.0** days; median stay **1.0** days.
    - Roux en Y gastric bypass: average stay **2.1** days; median stay **2.0** days.
    - OAGB / MGB: average stay **2.8** days; median stay: **2.0** days.
    - sleeve gastrectomy: average stay **1.9** days; median stay **2.0** days.

Follow up data for primary surgery carried out in the calendar years 2012-2017

- there were 559,256 primary operation records for operations in the calendar years 2012-2017; of these 168,580 had one or more follow up records (30.1%); in total there were 509,999 separate follow up records.
- average recorded percentage weight loss was 31.1% one year after surgery.
- one year after primary surgery 64.2% of patients taking medication for type 2 diabetes no longer needed their medication; this was correlated with the weight loss achieved.
- there were similar reductions in the need for medication for hypertension (45.4% no longer required their medication) and dyslipidemia (51.8% off medication).
- patients also saw improvement in other obesity-related conditions such as sleep apnea and gastro-esophageal reflux disorder, but the extent of these improvements seemed to vary from operation to operation.

Implications for bariatric surgery

- a relatively simple dataset and a great deal of willing engagement from many centres across 61 countries has yielded a large resource of data on bariatric surgery.
- this Fifth Report includes information on the burden of obesity worldwide, especially in many countries' female populations. There is a general under-provision of surgical treatment for this condition relative to the extent of disease, and there is evidence that there are issues around access to surgery for men in many countries.
- again, this Report demonstrates the profound positive treatment-effects of bariatric and metabolic surgery.

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The epidemiology of obesity –barriers to effective care

A World Health Organization (WHO) report, published in February 2018, indicated that obesity rates have tripled since 1975 [1]. The WHO also stresses that obesity is preventable. This statement rolls off the tongue with minimal thought, and obesity is paired with smoking as the two great opportunities to prevent chronic disease and early death. As smoking rates have fallen so have smoking-related morbidity and mortality. For obesity, the public health solutions appear simple: improve and reduce dietary intake, and increase the community's exercise, and all will be well. The reality, however, is quite different. Smoking is a behavioural choice, albeit one that may be difficult to stop. Obesity is not a behaviour. It's not choice, but a chronic progressive heritable neuro-behavioural disorder that is highly sensitive to environmental conditions [2]. Largely heritable neural systems established during the first 1,000 days of life following conception control the drive to eat and set an individual's weight trajectory for life [3, 4]. We are not trying to prevent and manage a behavioural problem, but to understand, prevent and manage a complex disease. Simple solutions, and shaming and blaming, do not work and damage those living with obesity [5]. IFSO represents an important sector of the global front line effectively managing obesity and its numerous complications and risks. We understand the frustrations, challenges and complexity of this disease through the patients we help. We experience the positive health outcomes. Our major challenge is to be seen as an important player in providing safe, effective solutions for those with clinically severe obesity, and applying these solutions to many more in need.

Global obesity prevalence data has not been updated in the last 12 months, however, individual country data provided in 2019 is concerning. The latest adult prevalence rates in Australia and the United Kingdom are 31% and 29%, up from 28% and 26% respectively in just 3-years. Since 2014, the United States of America has reported a small but progressive fall in life expectancy bucking the upward trend of life expectancy in all other highly developed countries. Increased mid-life mortality has driven this change and one of the significant contributors was the group of nutritional and metabolic diseases, such as diabetes and obesity [6]. This change in overall life-expectancy was predicted [7], and the United States may be the first to lead in this unfortunate trend. Uptake of bariatric-metabolic surgery is very poor (0-3% annually) in all regions globally when considering numbers eligible for care [8]. There are now clear guidelines for the surgical management of type 2 diabetes, including defining a group in whom metabolic surgery is recommended [9]. This Fifth IFSO Global Registry Report does not suggest that these management recommendations have generated action. There are a number of countries where patients with type 2 diabetes appear to be under-represented in those having surgery, as a higher prevalence of diabetes is expected in the BMI range that is eligible for surgery. Many countries report less than 20% of those having surgery taking medications for type 2 diabetes.

Barriers to care and poor uptake of bariatric-metabolic surgery were a major focus of the 4th World Congress on Interventional Therapies for type 2 diabetes held in New York in April, 2019. Experts with a broad range of relevant expertise examined putative barriers to care, given the established efficacy, safety and cost effectiveness of surgery, through an informed Delphi process. Barriers to surgical care for type 2 diabetes included lack of available surgical therapies; poor understanding that surgery was a treatment for type 2 diabetes; mis-perceptions about the safety of surgery; and payer reluctance to cover surgery. Of course, the reason for most of these barriers relates to weight bias, stigma and discrimination. Bariatric-metabolic surgery is not alone in this. Effective therapies including very low calorie diets, other meal replacements, and a growing list of pharmaceuticals suffer exactly the same barriers. It should not be a surprise that unintentional bias extends to health care professionals providing care for those living with obesity. How often do we hear surgeons say that surgery is the only effective therapy providing sustained weight loss? How long have bariatric physicians been minimising referral for *dangerous irreversible surgery* while awaiting the next generation effective medication? How often do we hear scathing views from surgeons about other safe and effective surgical therapies that are different from the main surgery they choose to perform? None of our safe effective therapies, medical or surgical, are under any threat from competition. All are grossly under-utilised.

The congress set aside a full day to examine the overarching barrier of weight bias. The depth and breadth of the damming evidence presented, and effect on those living with obesity, was overwhelming. Perhaps the most damaging aspect that has emerged over recent years is weight bias internalization that occurs when individuals apply negative weight stereotypes to themselves and self-derogate because of their body weight [5]. Internalised weight bias has been shown to have significant detrimental effects on mental and physical health, engagement with health services, and adverse behavioural outcomes including low self-esteem and efficacy, poor body image, maladaptive eating behaviours, and exercise avoidance. Weight shaming is often used with the intention of intrinsically motivating others to engage in the desired morally beneficial behaviour. However, moralization may well achieve the opposite effect, namely disengagement and withdrawal from the behaviour. This is particularly the case where an individual has experienced repeated perceived failure in attempts to address

moral behavioural outcomes [10]. The emerging evidence that perceived *moral failure* generates internalised weight bias, major personal injury, and counter-productive behaviours, holds important implications for the design and communication of public health policy and campaigns, healthcare, and media portrayal [10]. Are our messages doing more harm than good? I look forward to the published outcomes of this conference, its recommendations, and its impact on health outcomes. I have previously indicated that the messaging in our area of health care is so often inappropriate [11].

This year we have thought carefully about the future role of the IFSO Global Registry as it rapidly expands. Researchers naturally want a focus on quality research and scientific outputs in their (our) incrementally slow moving carefully managed world. The registry report can provide a more immediate impact on key stakeholders by normalising bariatric-metabolic surgery as totally acceptable non-stigmatised therapy. Our messaging needs to be positive about our collective ability to monitor the broad impact of our therapies globally. Let us not ignore the potential that our team effort can have by strengthening and promoting the Registry Report.

John Dixon

Head Clinical Obesity Research, Baker Heart and Diabetes Institute

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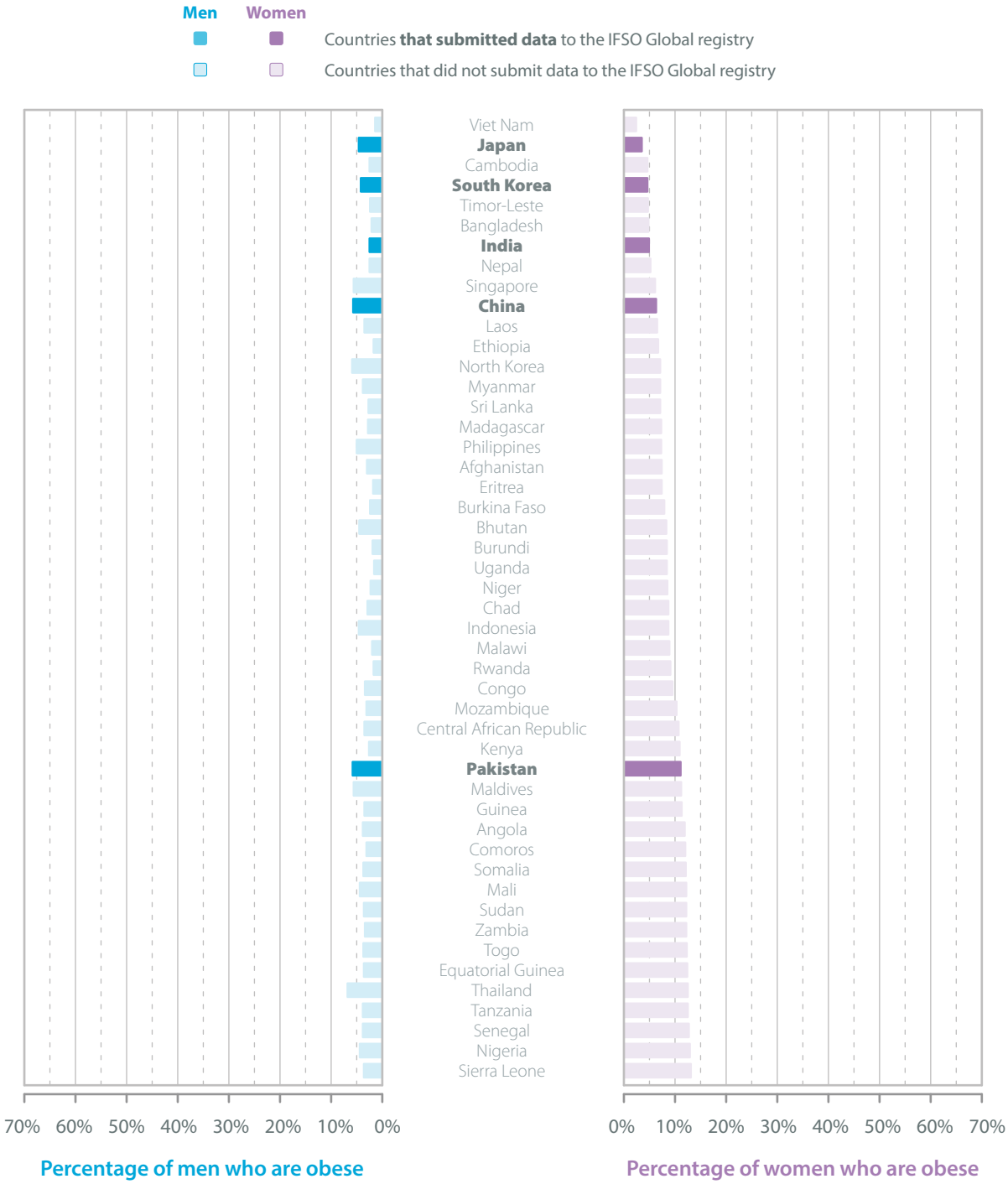
WHO data

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). The following charts illustrate the severity of the problem affecting all countries, especially the more developed. The countries represented in the analyses in the main body of the report are represented here as heavy bars and with their country names in **bold** text.

On this page we see the countries with the lowest prevalence of obesity in the world.

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 2016



Countries represented on this page are from a range of geographical regions. As before, 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 IFSO Global Registry in this group of countries. It is noticeable that the gender divide in obesity prevalence is greatest in the sub-Saharan African nations where obesity is much more prevalent in women. Notably, there are more contributors to the IFSO Global Registry in this group of countries than in previous iterations of the database. Two countries listed on this page contributed data for this report for the first time, namely Uzbekistan and Iceland.

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 2016

Since the publication of the last report there are two new contributor countries to the IFSO Global Registry shown in the chart below; namely Greece and Ukraine. Greece is represented in the report by a single centre. It is hoped that more centres from Greece will contribute their data in the future.

WHO data

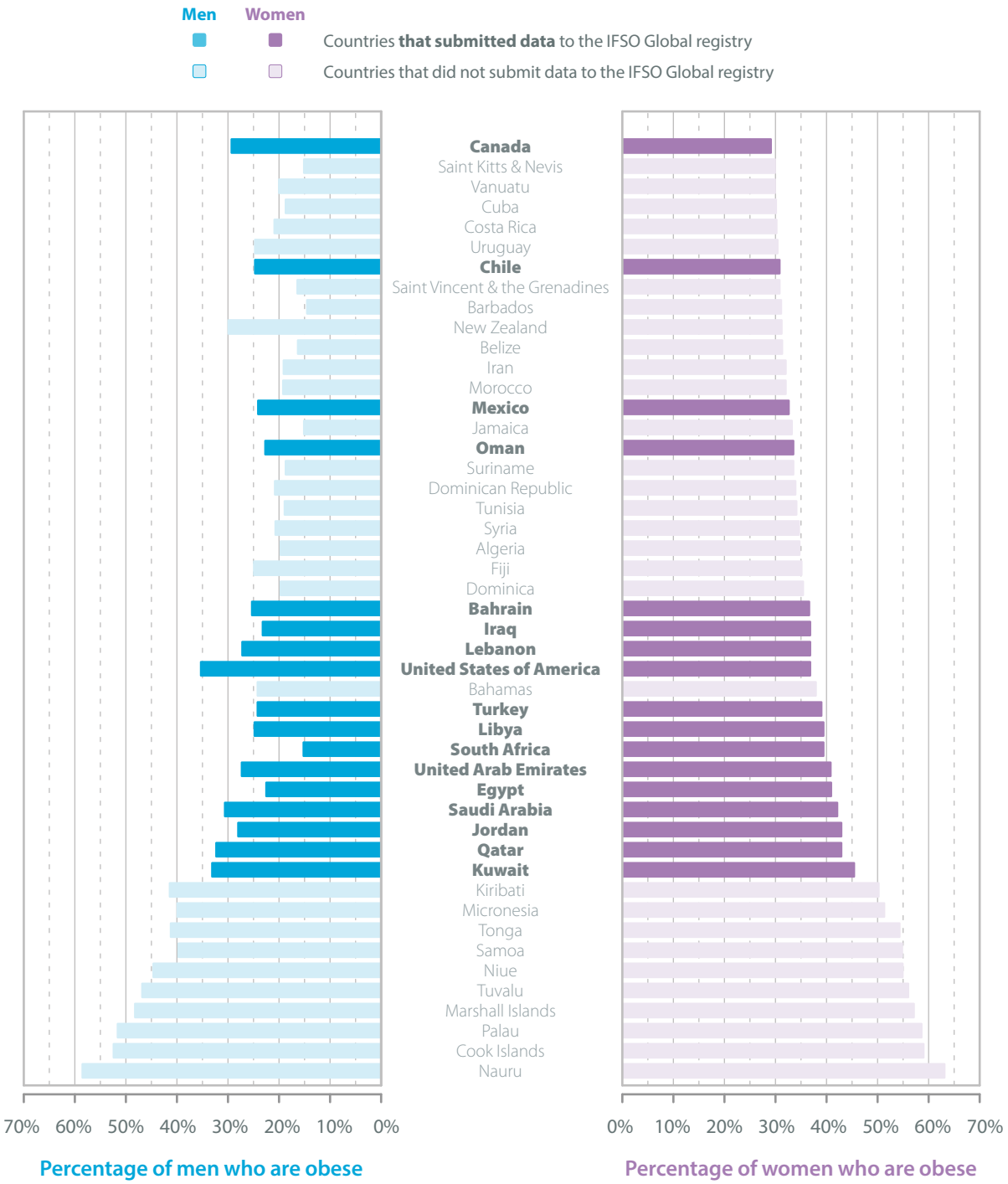
WHO data: Gender & age standardised rates of obesity by country; countries ordered by increasing rates of obesity in the female population; people over the age of 17; data from the year 2016

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 & Canada, Mexico, Caribbean Islands, and parts of Central and South Americas.

New contributors to the Global Registry from the countries listed in this chart include: Iraq, Lebanon, Libya, Oman, and South Africa, albeit with low or very low numbers of operation records submitted from some of these countries.

The United States of America and Canada have provided much more substantive data this time around, having both been represented by single centres in previous reports.

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 2016



Database mechanics

Dendrite Clinical Systems, as the information management provider for the IFSO Global Registry, have provided two parallel web-portals for submitting data (now updated to version 5.0):

- an Upload-My-Data portal for submission of electronic data files, and
- a Direct-Data-Entry portal for entering cases one-by-one over the Internet for those individual surgeons who do not have a local or national database system.

Access to these portals was arranged *via* the setup of secure ID and passwords to ensure that only authorized users could gain access to the registry. For those that had the capability to upload data electronically, each was then sent a unique contributor identifier code, 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 93-95.
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 definitions of the database answer options.
4. The **User Manual**: to explain how the Upload-My-Data software works.

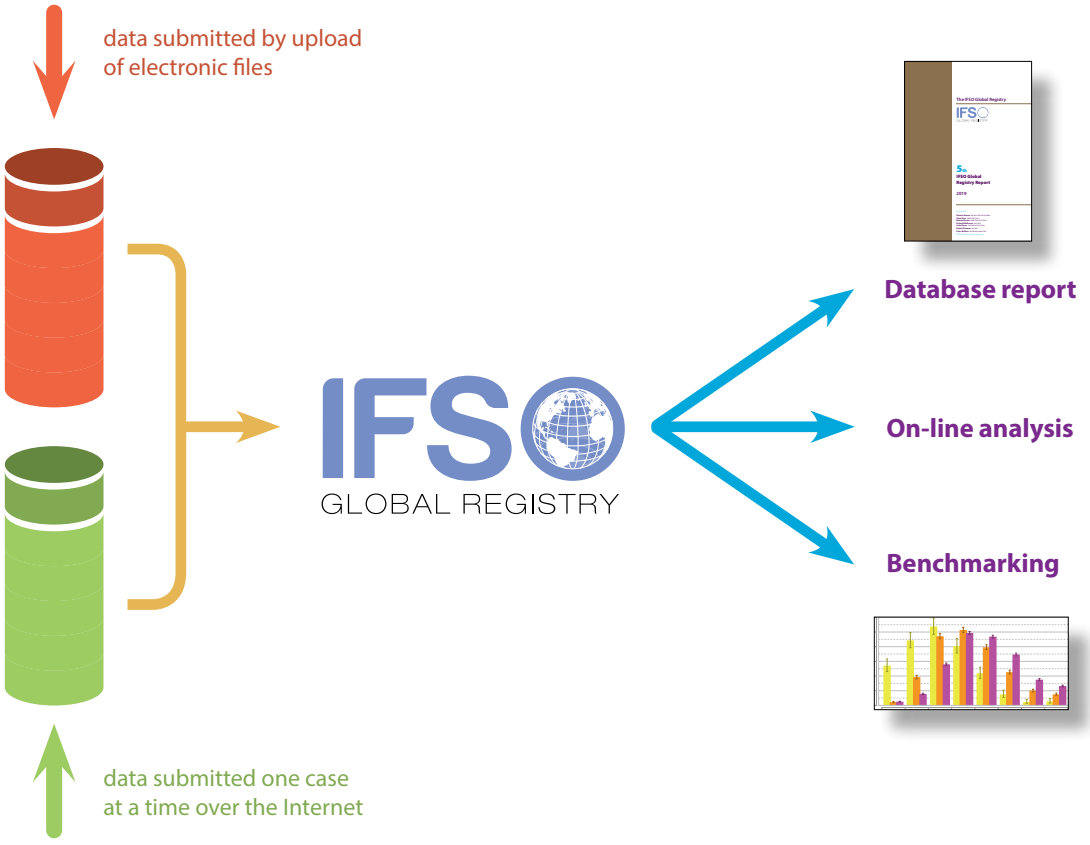
The diagram opposite illustrates which submissions came through which route, and shows that most countries (and all national databases) were successfully able to upload data electronically through the Upload-My-Data web portal. Data from some countries came in *via* both routes *e.g.,* India, Saudi Arabia and the United Arab Emirates.

By combining / merging 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 in this report on data gathered from 61 countries from around the world.

For more information on how to participate in the Dendrite / IFSO Global Registry *via* either the Upload-My-Data or Direct-Data-Entry route, please contact Dr Peter K H Walton, Managing Director, Dendrite Clinical Systems *via* e-mail: peter.walton@e-dendrite.com

Dendrite Upload-My-Data contributors

- Argentina
- Australia
- Austria
- Bahrain
- Belarus
- Belgium
- Brazil
- Canada
- Chile
- China
- Colombia
- Czech Republic
- Egypt
- France
- Germany
- Greece
- Guatemala
- Hong Kong
- Iceland
- India
- Ireland
- Israel
- Italy
- Japan
- Jordan
- Kuwait
- Lithuania
- Mexico
- Netherlands
- Norway
- Oman
- Portugal
- Qatar
- Russia
- Saudi Arabia
- South Africa
- South Korea
- Spain
- Sweden
- Switzerland
- Taiwan
- Turkey
- Ukraine
- United Arab Emirates
- United Kingdom
- United States of America
- Uzbekistan



Dendrite Direct-Data-Entry contributors

- Argentina
- Bolivia
- Brazil
- Bulgaria
- Colombia
- France
- Georgia
- Guadeloupe
- Hungary
- India
- Iraq
- Jordan
- Kazakhstan
- Kuwait
- Lebanon
- Libya
- Lithuania
- Mexico
- Pakistan
- Panama
- Peru
- Poland
- Portugal
- Saudi Arabia
- South Korea
- Spain
- Turkey
- United Arab Emirates
- Venezuela

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 type of surgery (primary or redo), 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 surgery: age and gender; calendar years 2015-2018

		Gender			
		Male	**Female**	**Unspecified**	**All**
Age at surgery / years	<19	1,220	2,583	9	**3,812**
	19-29	12,734	54,003	169	**66,906**
	30-39	25,627	100,398	418	**126,443**
	40-49	34,956	114,775	402	**150,133**
	50-59	28,304	86,383	161	**114,848**
	60-69	13,014	33,690	40	**46,744**
	>69	1,650	2,922	0	**4,572**
	Unspecified	34	118	2	**154**
	All	**117,539**	**394,872**	**1,201**	**513,612**

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 at surgery 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 orange 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, 20-24, 25-29,30-34, 35-39 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 had already been presented elsewhere in the report.

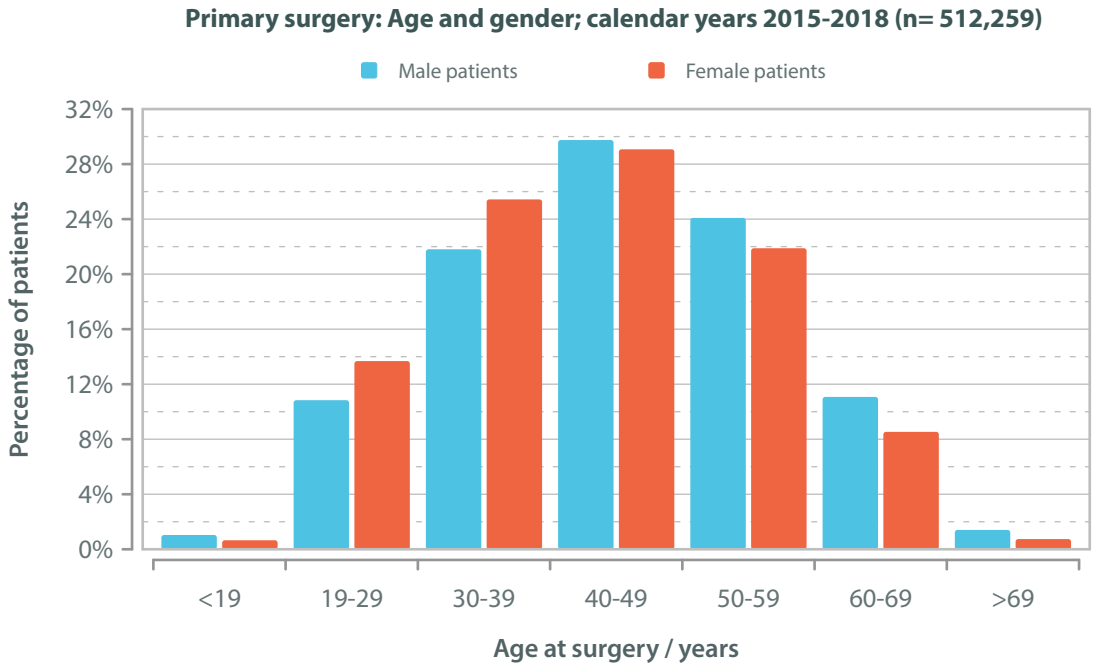
Conventions used in graphs

The basic principles applied when preparing graphs for this Fifth 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 having primary bariatric 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 bariatric surgery and both the patient's age and gender are known are included in the analysis; this comes to 512,259 patient-entries (see table opposite; the 1,353 entries with unspecified data are excluded from the chart).



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.

Contributors

The tables on these two facing pages show which countries from each IFSO Chapter have contributed data to the Fifth IFSO Global Registry Report. In previous years the countries have been grouped by geographical area, this has now been superseded by using the IFSO Chapter categories.

For each country the number of procedure records that have been submitted is listed and each is categorised as to whether the data arise from a national registry, from multiple centres within a country or from single hospitals / clinics.

The Chapters that have submitted most data to this Fifth Report are the European and North American Chapters, by nature of the volume of surgery performed in these regions and the longer tradition of establishing surgical registries within the countries in these Chapters.

The submission of data from the American Society for Metabolic and Bariatric Surgery (ASMBS) Registry in the United States of America is the newest and the single largest national registry contributor by far.

A detailed, alphabetically-ordered listing of the individual centres that have contributed data from each country is provided in the appendix (pages 76-92).

European Chapter (IFSO-EC)		**381,627** records	
	Austria	3,174	**National registry**
	Belarus	170	Single hospital
	Belgium	12,794	**National registry**
	Bulgaria	73	Multi-centre
	Czech Republic	1,319	Single hospital
	France	13,187	**National registry**
	Georgia	149	Multi-centre
	Germany	472	Multi-centre
	Greece	245	Single hospital
	Hungary	76	Single hospital
	Iceland	1,464	Single hospital
	Ireland	578	Multi-centre
	Israel	40,573	**National registry**
	Italy	88,192	**National registry**
	Kazakhstan	426	Single hospital
	Lithuania	134	Single hospital
	Netherlands	52,316	**National registry**
	Norway	5,815	**National registry**
	Poland	812	Multi-centre
	Portugal	548	Multi-centre
	Russia	6,239	**National registry**
	South Africa	50	Single hospital
	Spain	738	Multi-centre
	Sweden	67,814	**National registry**
	Switzerland	7,863	Multi-centre
	Turkey	4,760	**National registry**
	Ukraine	84	Multi-centre
	United Kingdom	71,505	**National registry**
	Uzbekistan	57	Single hospital

Throughout this report we have made it easier to identify the data from **national registries** by highlighting the country names in bold text. This is true for both tables and chart axes. The data from national registries are represented as **orange** bars in the chart on page 30 in order to provide further contrast in this distribution plot.

North American Chapter (IFSO-NAC)	**357,684** records	
Canada	22,560	Multi-centre (Province)
United States of America	335,124	**National registry**

Latin American Chapter (IFSO-LAC)	**27,498** records	
Argentina	3,500	Multi-centre
Bolivia	189	Single hospital
Brazil	2,450	Pilot **National registry**
Chile	10,125	Multi-centre
Colombia	7,573	Multi-centre
Guadeloupe	270	Single hospital
Guatemala	408	Single hospital
Mexico	1,924	Multi-centre
Panama	96	Multi-centre
Peru	815	Single hospital
Venezuela	148	Single hospital

Middle East - N African Chapter (IFSO-MENAC)	**28,737** records	
Bahrain	2,115	Multi-centre
Egypt	4,503	**National registry**
Iraq	226	Single hospital
Jordan	859	Multi-centre
Kuwait	5,081	**National registry**
Lebanon	60	Single hospital
Libya	2	Single hospital
Oman	48	Single hospital
Qatar	9,391	Multi-centre
Saudi Arabia	4,453	Multi-centre
United Arab Emirates	1,999	Multi-centre

Asia Pacific Chapter (IFSO-APC)	**38,137** records	
Australia	321	Multi-centre
China	6,881	Multi-centre
Hong Kong	1,028	Multi-centre
India	20,857	**National registry**
Japan	1,176	**National registry**
Pakistan	1	Single hospital
South Korea	84	Multi-centre
Taiwan	7,789	Multi-centre

Data analysis

The growth of the IFSO Global Registry

The info-graphics and the charts on these two pages help to visualise the growth of the registry since its inception in 2014. The goal set out last year for this year's merge was:

> *To hit a target of contributions of data from 55 countries and to have over half a million procedure records under analysis.*

Since the publication of the Fourth Report, the Dendrite team have worked closely with Almino Ramos and IFSO colleagues to chivvy the Presidents of National Societies and individual surgeons and centres from around the world to join the registry and, as the graphs, on the page opposite, show so very clearly, the targets have been surpassed with great ease. The registry is gathering momentum and 10 new countries have joined the registry, since last year. The total number of records submitted has doubled in one year and many more countries than ever before are now represented either by national registries or by submission of data from multiple centres.

2019 data merge

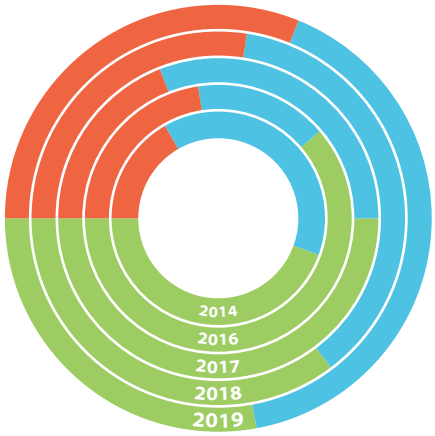
833,687
operations

17 national registries
25 multi-centre submissions
19 single centres

The next info-graphic makes this clear: it shows the changes in the make-up of the registry over the last six years, in terms of the kinds of contributors that have added data to the IFSO Global Registry.

Using the same colour-coding as the donut chart above, it is easy to see from this chart that the proportion of countries represented by national registries (in orange) has generally risen over time.

Countries represented by data from a single-centre (in green) are falling as a proportion of the whole, all of which means that the veracity and representativity of data presented on a country-by-country basis has increased as the registry has continued to mature.



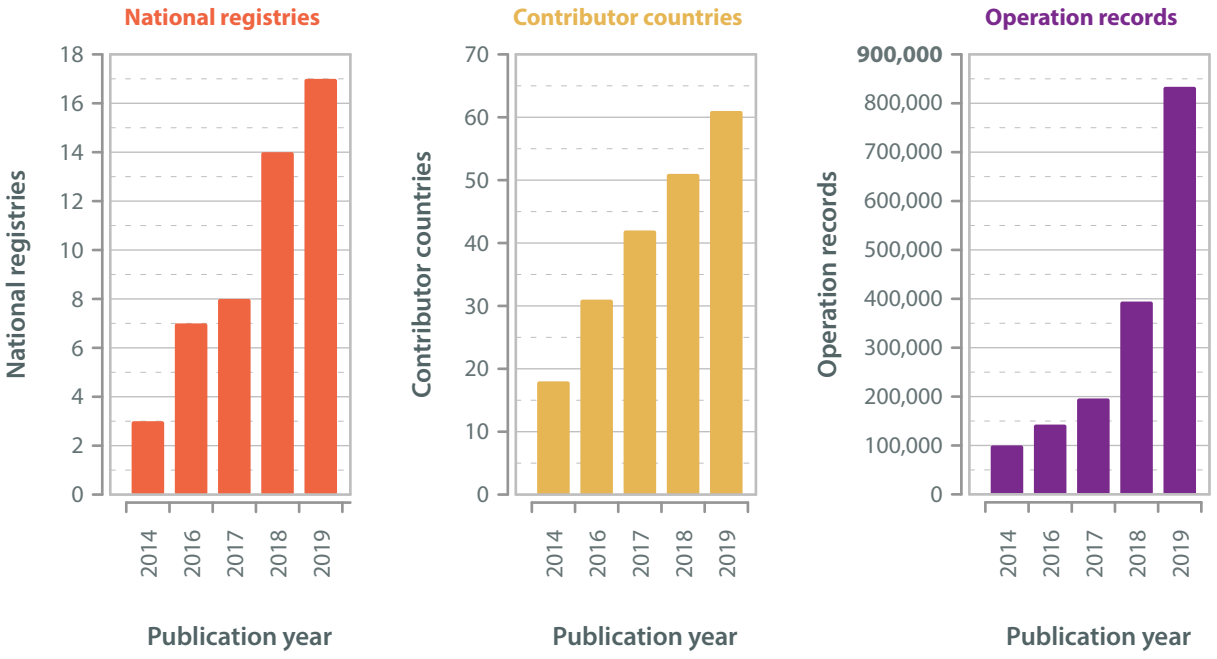
As shown previously, the number of operations submitted to the registry has shown an inexorable increase, which is greatest in the latest iteration of the Global Registry, largely thanks to a substantial contribution from the United States of America together with continued major contributions from IFSO-EC national registries (Italy, United Kingdom, Sweden, the Netherlands, and Israel) .

It is also evident that the active encouragement from IFSO Presidents, past and present, has borne fruit, successfully encouraging contributions from more and more countries over the last five years.

The hope is that eventually every IFSO member country will have its own national registry, which will contribute data to the IFSO Global Registry, which will then, in turn, become **the** key resource for information on bariatric surgery worldwide.

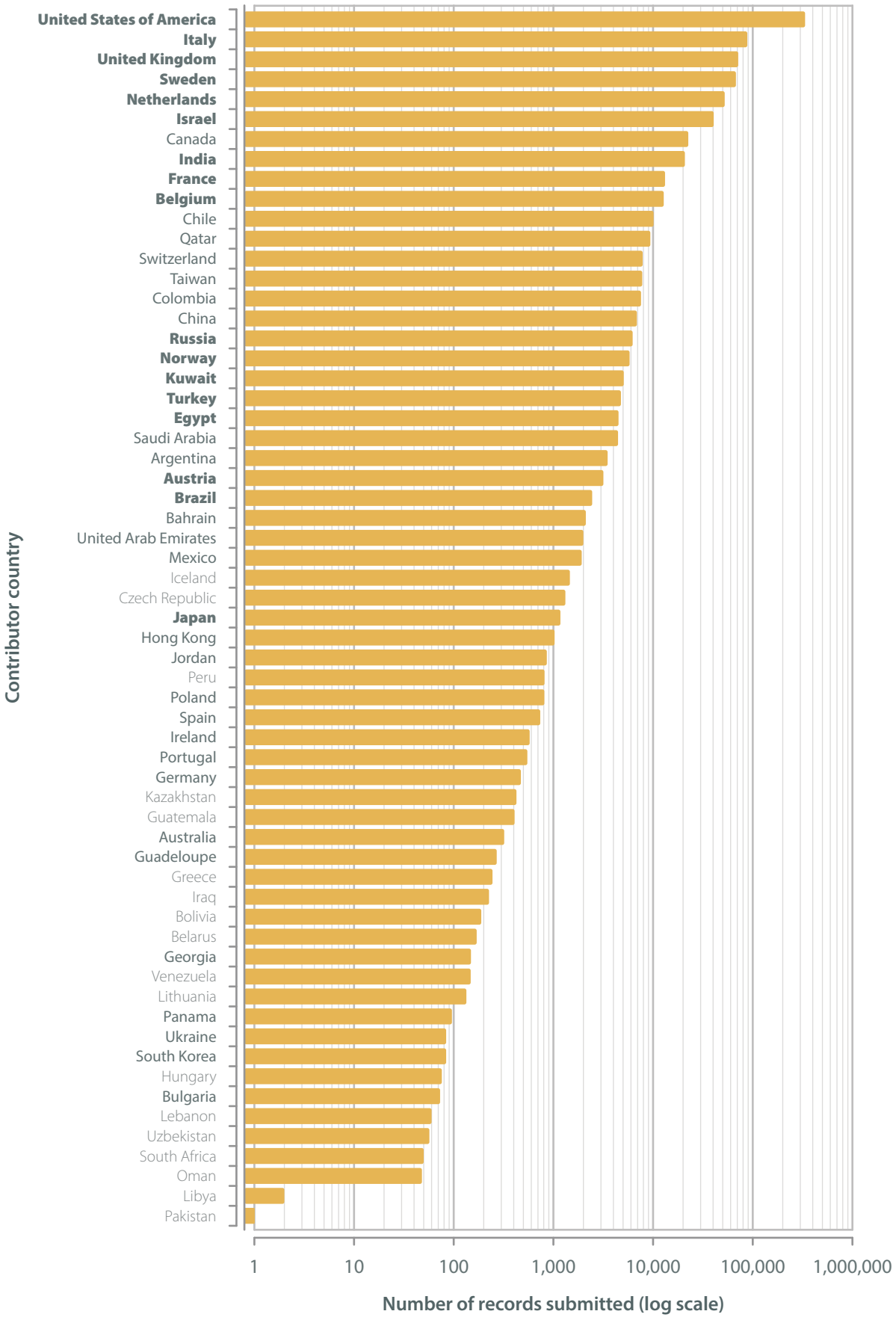
IFSO merge	Countries	Operations
2019	61	833,687
2018	51	394,431
2017	42	196,188
2016	31	142,748
2014	18	100,092

The growth of the IFSO Global Registry

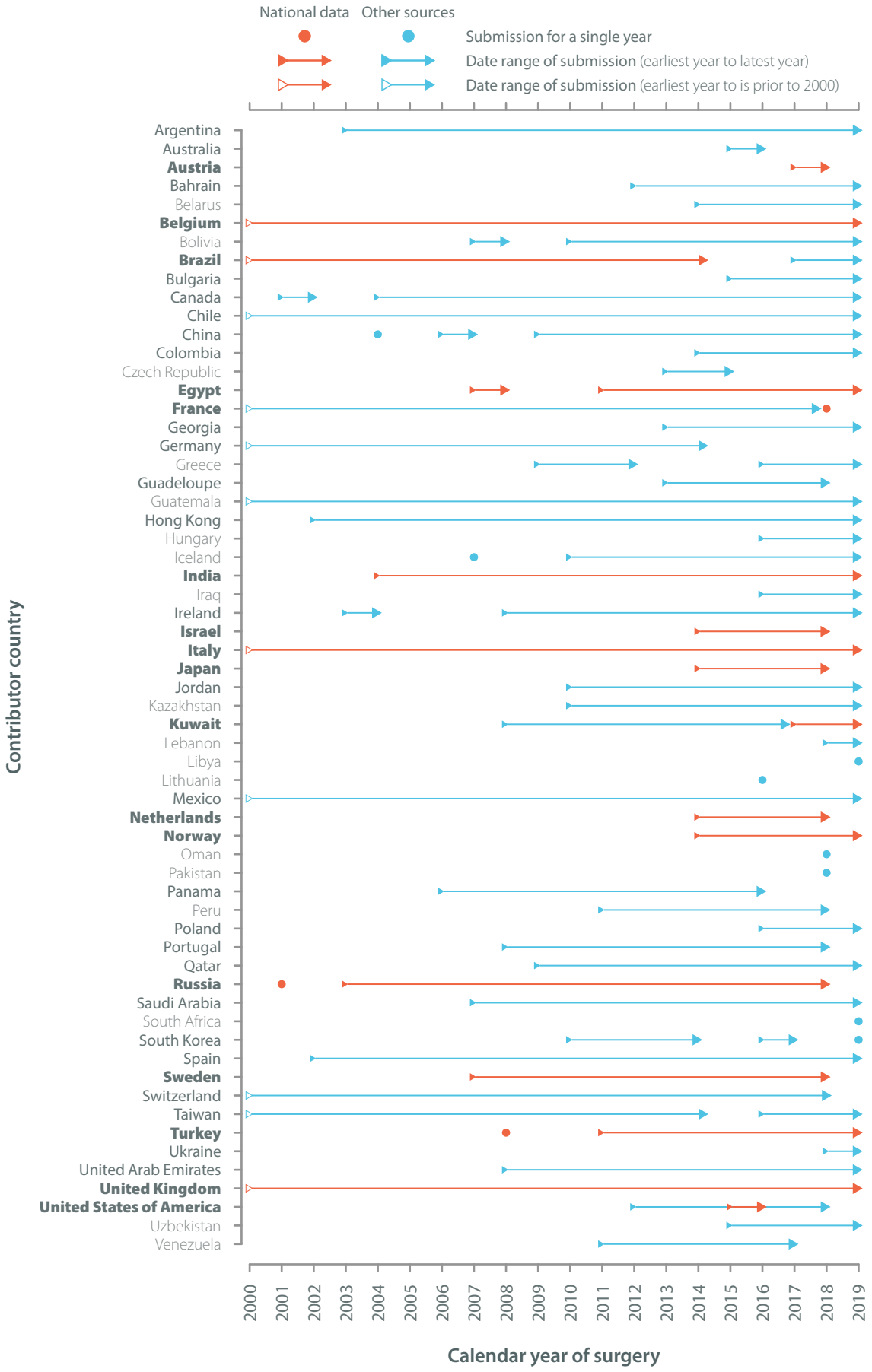


Analysis

IFSO Global Registry 2019:
Number of operation records submitted (n=833,687)



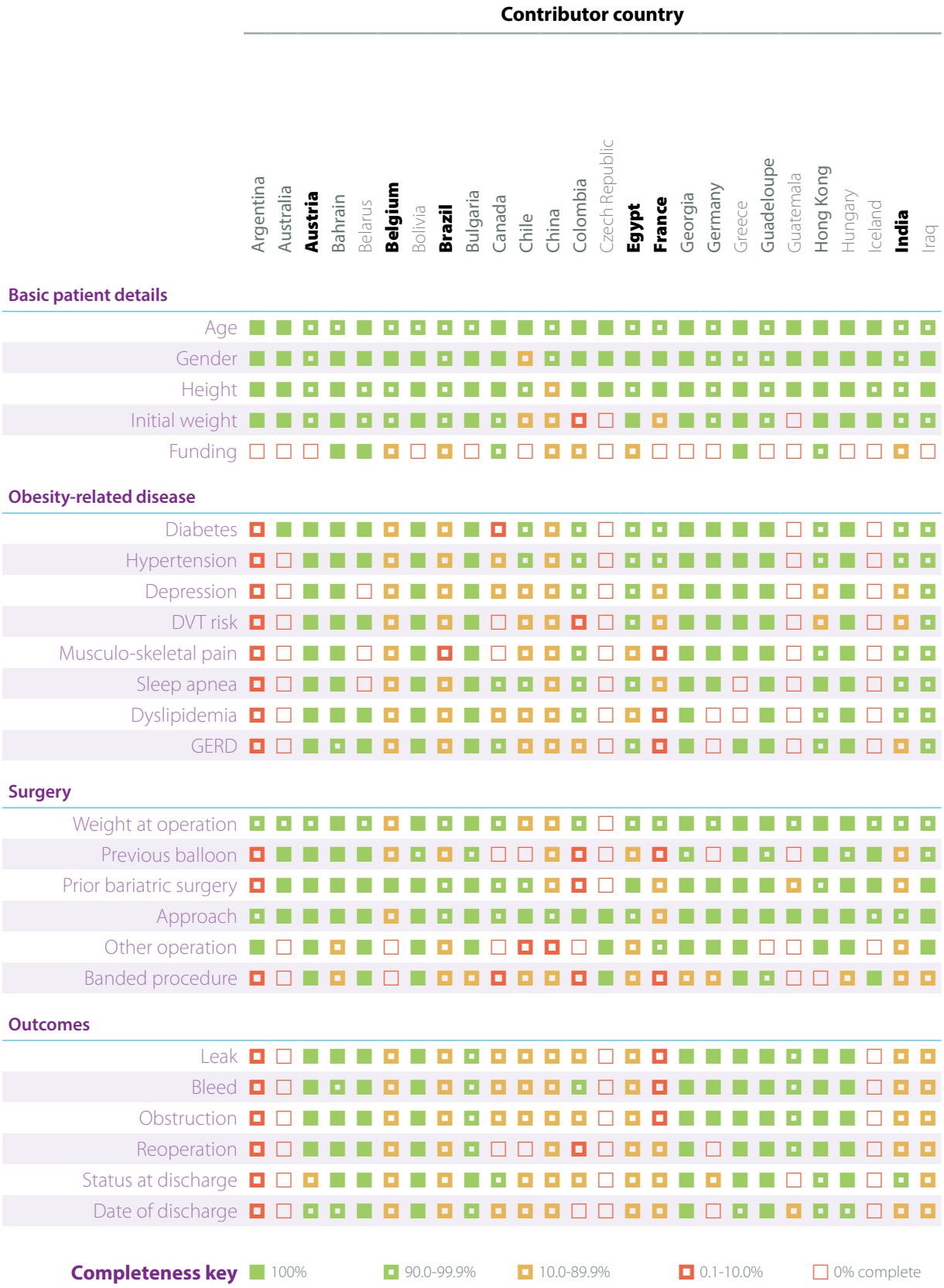
IFSO Global Registry 2019: Date-range of the data submitted



Data completeness

The table below shows a précis analysis of the completeness of data submitted by each country, with a solid **green** box representing complete data collection, all the way through to an empty **orange** box for wholly missing data.

Data completeness for selected fields in the merged IFSO Global Registry

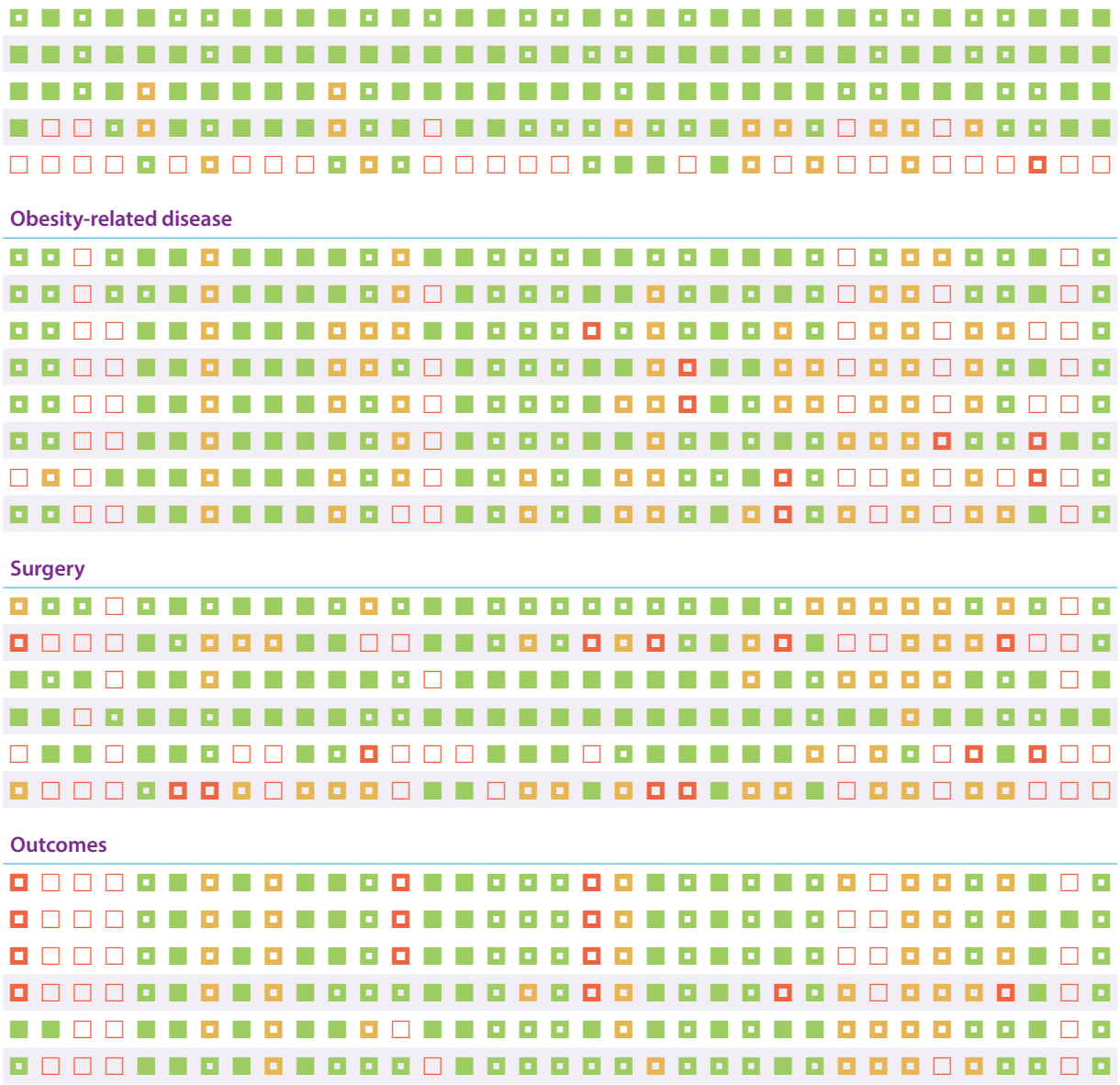


These two pages and the table following (page 31) show data completeness ordered alphabetically by country, while the graph overleaf shows the countries ranked by the rate of data completeness, with countries identified as national registries being represented by **orange** bars, with the country name in bold text.

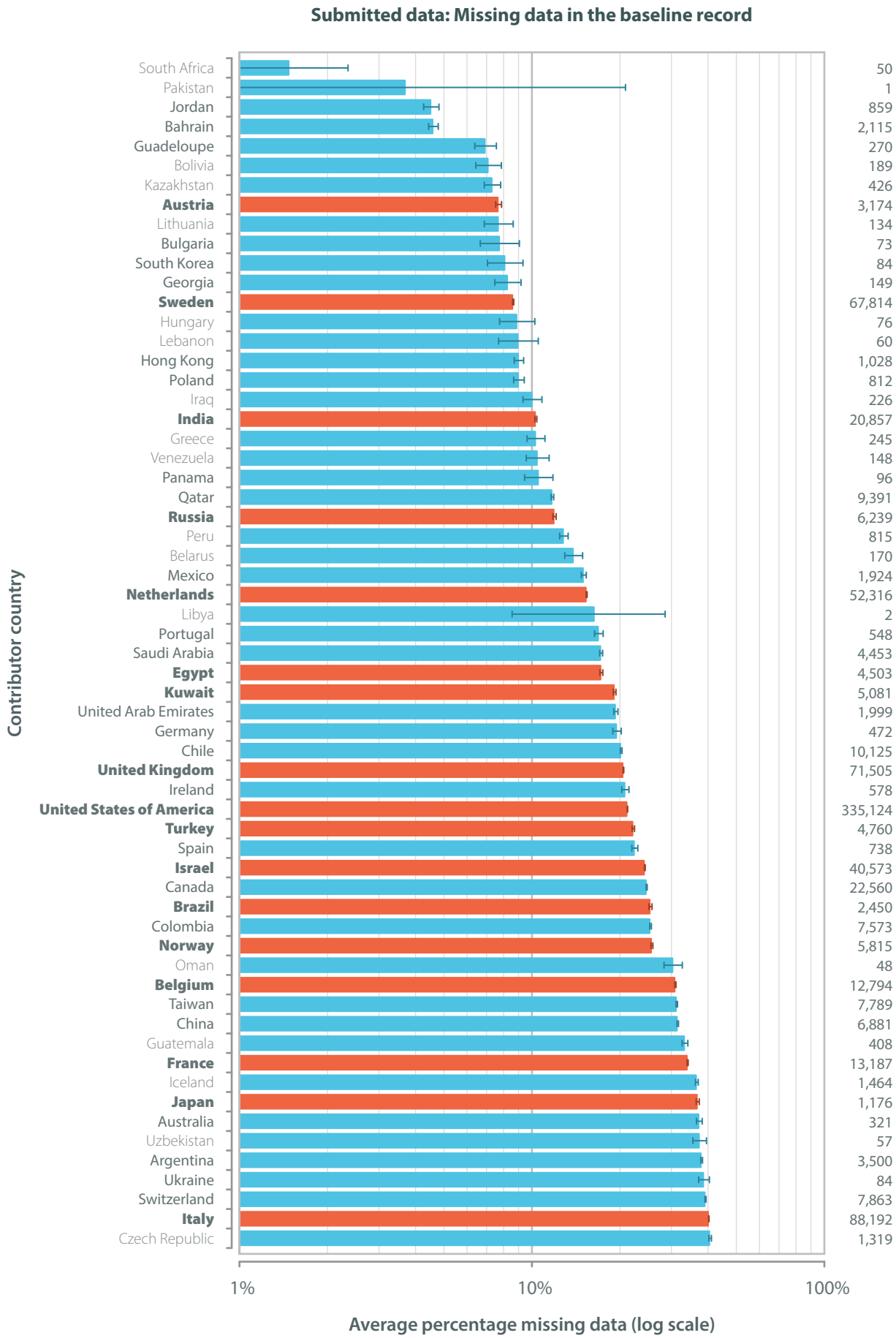
Data completeness for selected fields in the merged IFSO Global Registry

Contributor country

Ireland, **Israel**, **Italy**, **Japan**, Jordan, Kazakhstan, **Kuwait**, Lebanon, Libya, Lithuania, Mexico, **Netherlands**, **Norway**, Oman, Pakistan, Panama, Peru, Poland, Portugal, Qatar, **Russia**, Saudi Arabia, South Africa, South Korea, Spain, **Sweden**, Switzerland, Taiwan, **Turkey**, Ukraine, United Arab Emirates, **United Kingdom**, **United States of America**, Uzbekistan, Venezuela



Analysis

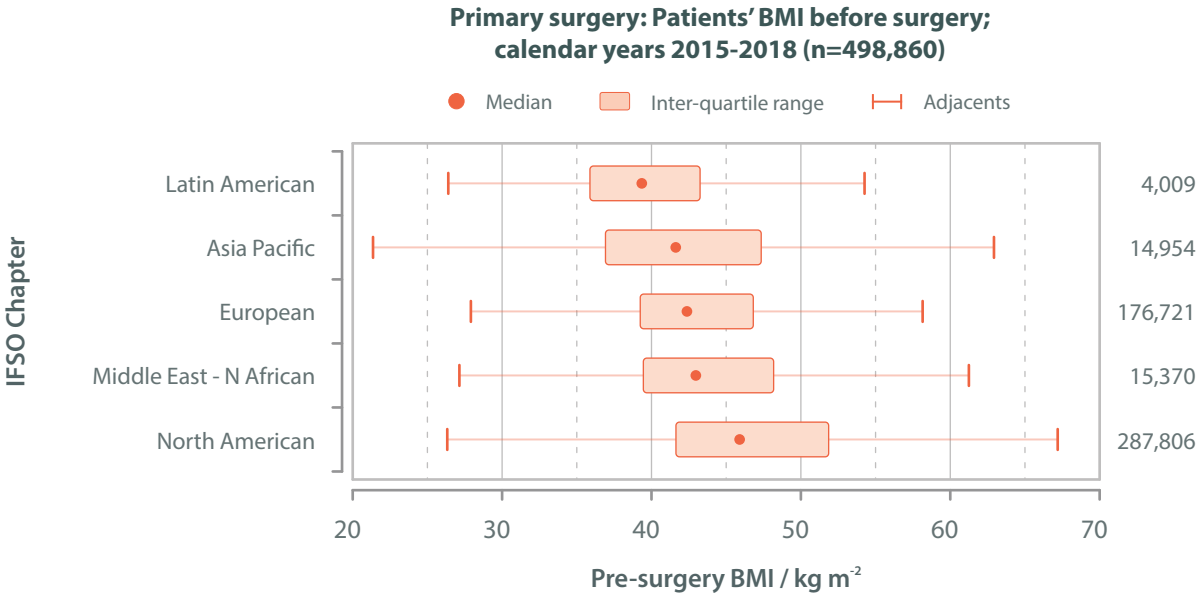

Submitted data: Missing data in the baseline record
Contributor country
South Africa 50
Pakistan 1
Jordan 859
Bahrain 2,115
Guadeloupe 270
Bolivia 189
Kazakhstan 426
Austria 3,174
Lithuania 134
Bulgaria 73
South Korea 84
Georgia 149
Sweden 67,814
Hungary 76
Lebanon 60
Hong Kong 1,028
Poland 812
Iraq 226
India 20,857
Greece 245
Venezuela 148
Panama 96
Qatar 9,391
Russia 6,239
Peru 815
Belarus 170
Mexico 1,924
Netherlands 52,316
Libya 2
Portugal 548
Saudi Arabia 4,453
Egypt 4,503
Kuwait 5,081
United Arab Emirates 1,999
Germany 472
Chile 10,125
United Kingdom 71,505
Ireland 578
United States of America 335,124
Turkey 4,760
Spain 738
Israel 40,573
Canada 22,560
Brazil 2,450
Colombia 7,573
Norway 5,815
Oman 48
Belgium 12,794
Taiwan 7,789
China 6,881
Guatemala 408
France 13,187
Iceland 1,464
Japan 1,176
Australia 321
Uzbekistan 57
Argentina 3,500
Ukraine 84
Switzerland 7,863
Italy 88,192
Czech Republic 1,319
1%
10%
100%
Average percentage missing data (log scale)

IFSO Global Registry: data completeness for the baseline record

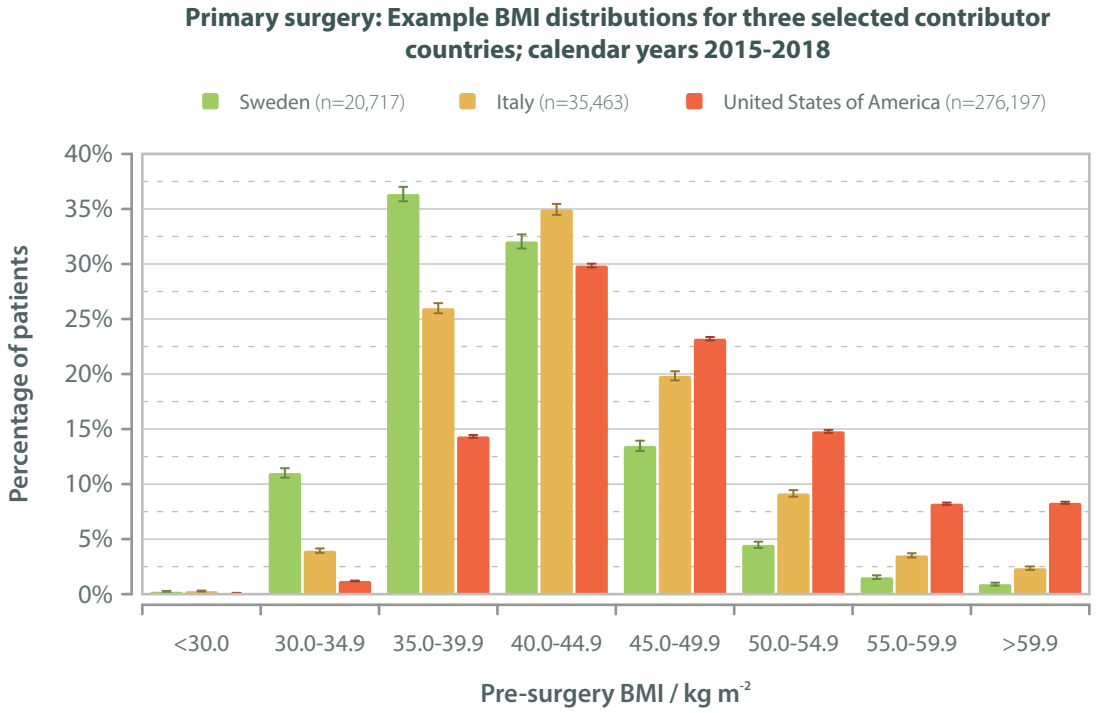
Contributor country	Data completeness information			
	Operation records	Missing data items	Data items required	Missing data rate
Argentina	3,500	53,791	87,564	61.4%
Australia	321	4,809	8,058	59.7%
Austria	3,174	6,780	81,359	8.3%
Bahrain	2,115	2,572	53,287	4.8%
Belarus	170	684	4,237	16.1%
Belgium	12,794	139,723	311,773	44.8%
Bolivia	189	363	4,742	7.7%
Brazil	2,450	20,940	61,375	34.1%
Bulgaria	73	156	1,850	8.4%
Canada	22,560	184,849	564,041	32.8%
Chile	10,125	64,501	254,930	25.3%
China	6,881	79,678	173,084	46.0%
Colombia	7,573	64,984	190,409	34.1%
Czech Republic	1,319	22,423	32,694	68.6%
Egypt	4,503	23,635	113,208	20.9%
France	13,187	169,727	328,215	51.7%
Georgia	149	340	3,766	9.0%
Germany	472	2,833	11,659	24.3%
Greece	245	709	6,155	11.5%
Guadeloupe	270	507	6,793	7.5%
Guatemala	408	5,081	10,143	50.1%
Hong Kong	1,028	2,589	26,086	9.9%
Hungary	76	188	1,921	9.8%
Iceland	1,464	20,510	35,464	57.8%
India	20,857	60,595	526,786	11.5%
Iraq	226	635	5,685	11.2%
Ireland	578	3,837	14,547	26.4%
Israel	40,573	327,241	1,017,961	32.1%
Italy	88,192	1,468,630	2,177,194	67.5%
Japan	1,176	17,454	29,850	58.5%
Jordan	859	1,027	21,652	4.7%
Kazakhstan	426	873	11,034	7.9%
Kuwait	5,081	30,234	127,367	23.7%
Lebanon	60	149	1,506	9.9%
Libya	2	10	51	19.6%
Lithuania	134	281	3,366	8.3%
Mexico	1,924	8,597	48,546	17.7%
Netherlands	52,316	239,064	1,314,683	18.2%
Norway	5,815	50,615	146,160	34.6%
Oman	48	529	1,209	43.8%
Pakistan	1	1	26	3.8%
Panama	96	285	2,413	11.8%
Peru	815	3,029	20,521	14.8%
Poland	812	2,035	20,501	9.9%
Portugal	548	2,802	13,740	20.4%
Qatar	9,391	31,355	235,453	13.3%
Russia	6,239	21,184	156,121	13.6%
Saudi Arabia	4,453	23,362	112,092	20.8%
South Africa	50	19	1,263	1.5%
South Korea	84	187	2,118	8.8%
Spain	738	5,368	18,504	29.0%
Sweden	67,814	160,875	1,703,659	9.4%
Switzerland	7,863	124,757	193,322	64.5%
Taiwan	7,789	89,294	196,150	45.5%
Turkey	4,760	34,308	120,085	28.6%
Ukraine	84	1,341	2,116	63.4%
United Arab Emirates	1,999	12,138	50,520	24.0%
United Kingdom	71,505	462,842	1,789,071	25.9%
United States of America	335,124	2,273,242	8,441,646	26.9%
Uzbekistan	57	855	1,425	60.0%
Venezuela	148	435	3,720	11.7%

Body mass index prior to surgery

The chart below shows patients' body mass index (BMI) prior to primary surgery by IFSO Chapter Region. The medians range from 39.4 kg m^{-2} in Latin America to 45.9 kg m^{-2} in North America. Notably, the Middle East - N African Chapter is now second only to North American Chapter in terms of average BMI.

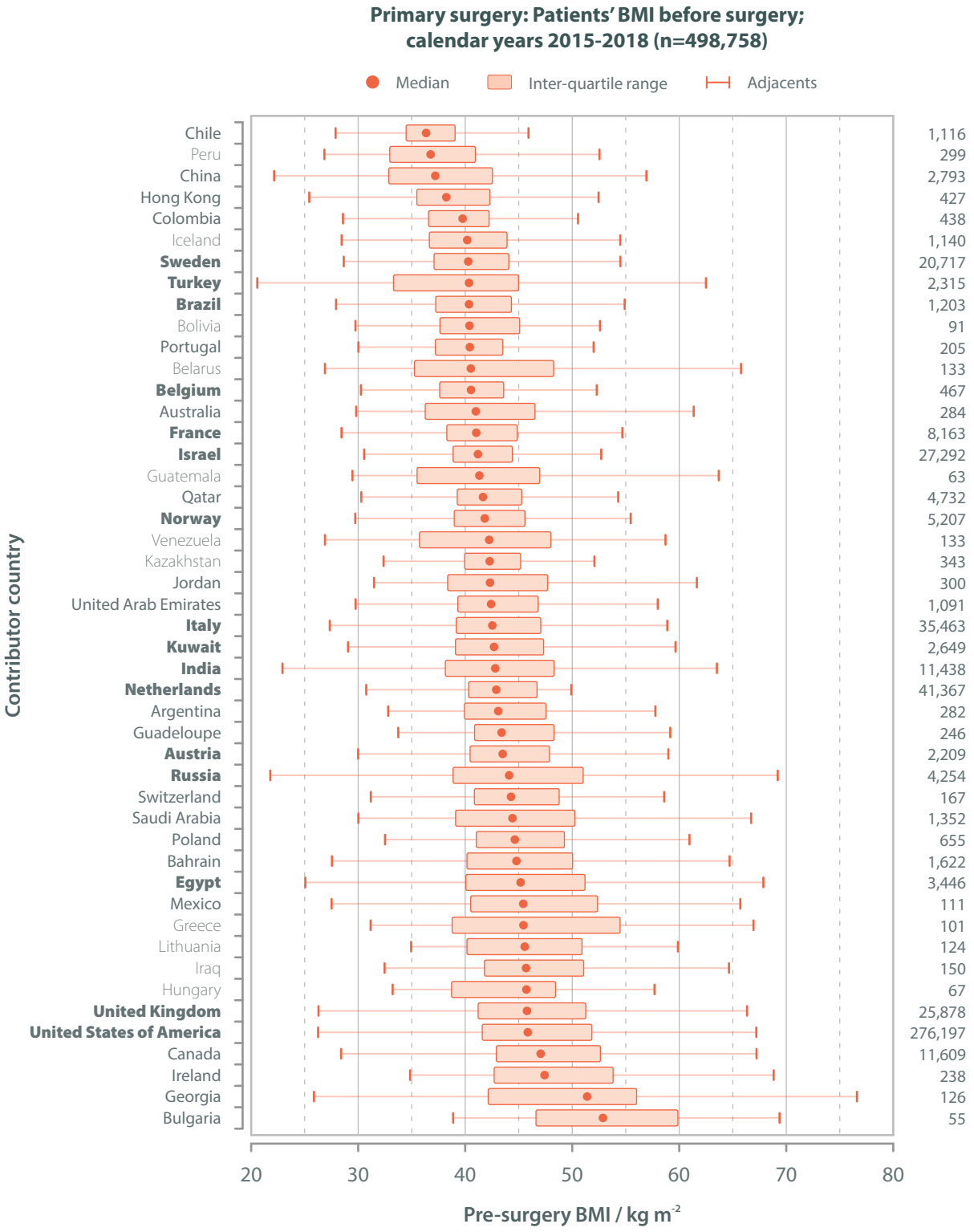


The next chart shows the BMI distributions for three selected contributor countries with national registries: Sweden has a relatively lower average BMI, the patient population from Italy falls in the middle of the ranked distribution opposite, and the United States of America has some of the most overweight patients in the world.



The graph below shows that there is a wide variation in the distribution of pre-surgery BMI for patients from different countries, ranked in order of increasing median BMI.

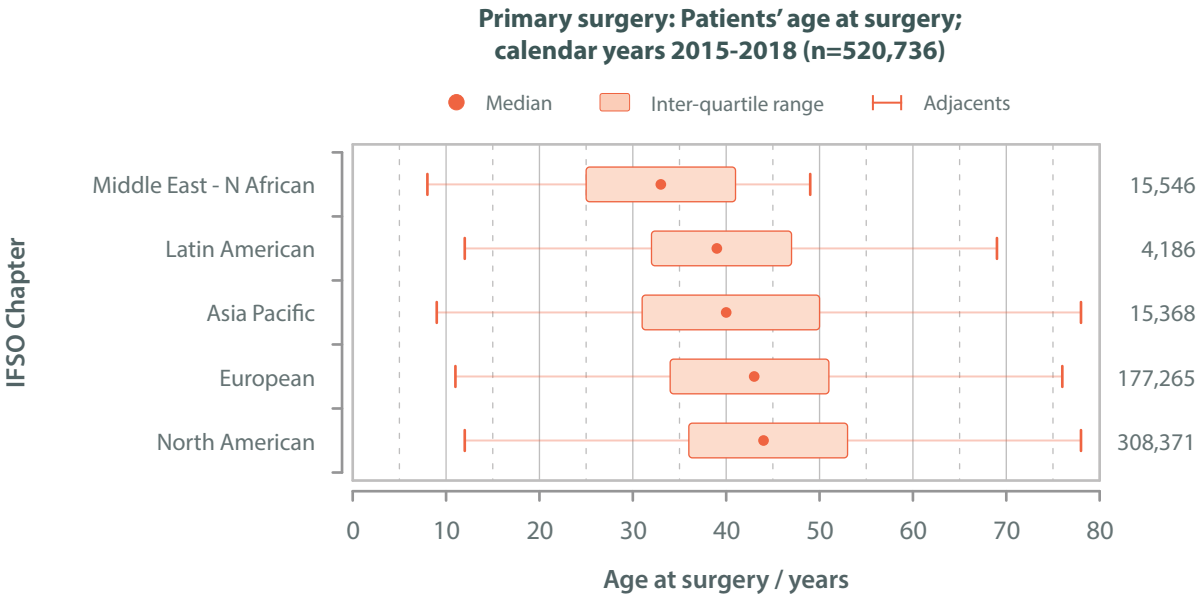
This chart makes it very clear that countries around the globe are faced with quite different patient populations. For the majority countries the median BMI ranges between 40 and 46 kg m^{-2}.



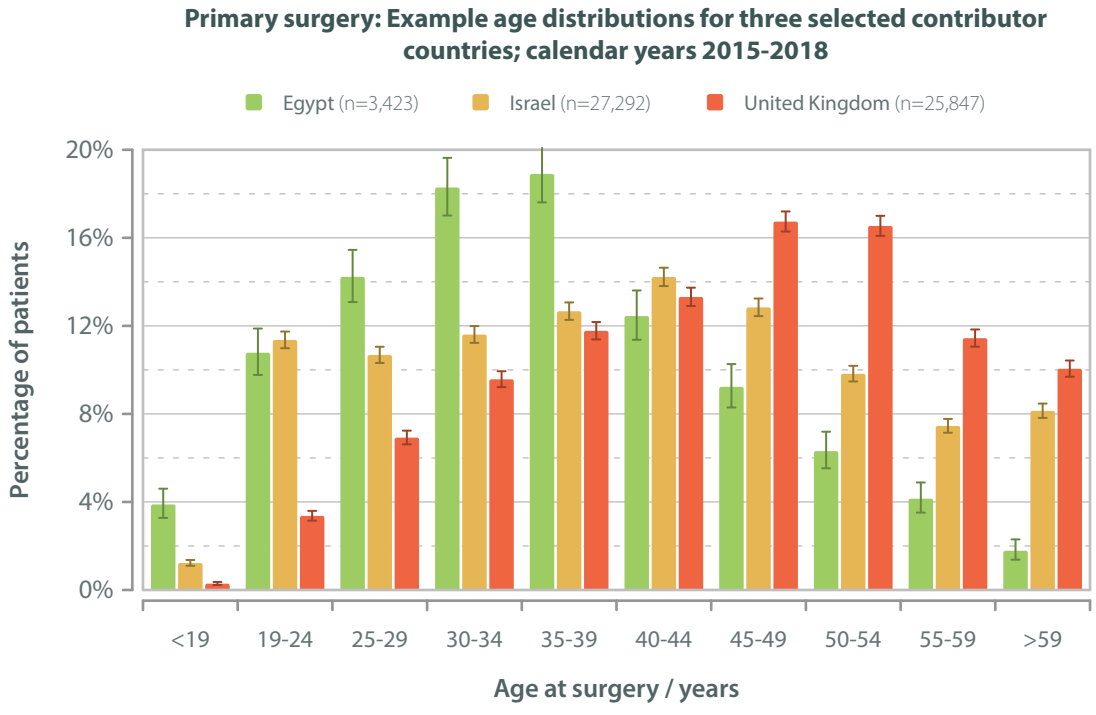
Age at surgery

The graph below show the distributions of age at the time of primary bariatric surgery, firstly according to IFSO Chapter, and then for three selected contributor countries. There are clearly regional variations and marked differences between the three selected countries below, which are intended to be representative of the lower, central and upper portions of the ranked distribution.

Age is important as it has an impact on all kinds of outcomes.



This chart clearly demonstrates that the populations of patients from different countries are not all the same. As we will see later, there is wide variation from country-to-country in almost all the risk factors and obesity-related conditions.



Notwithstanding the fact that the majority of patients in the registry from Saudi Arabia have come from a Child & Adolescent surgical unit, **eight** of the **ten** countries with the lowest median age are all from the **MENAC** Chapter. Conversely, **seven** out of the **ten** countries with the highest median age are from the **European** Chapter.

Even if we exclude the data from Saudi Arabia the fact that on average IFSO-MENAC surgeons are operating on patients more than 8 years younger than IFSO-EC surgeons is new to this report. The reasons for this apparent difference are not known; however, it is possible to speculate that patients in the MENAC region seek treatment earlier in the obesity disease process. The burgeoning prevalence of obesity at younger ages in the Middle East could account for this difference, as could different access to surgery in different healthcare settings.

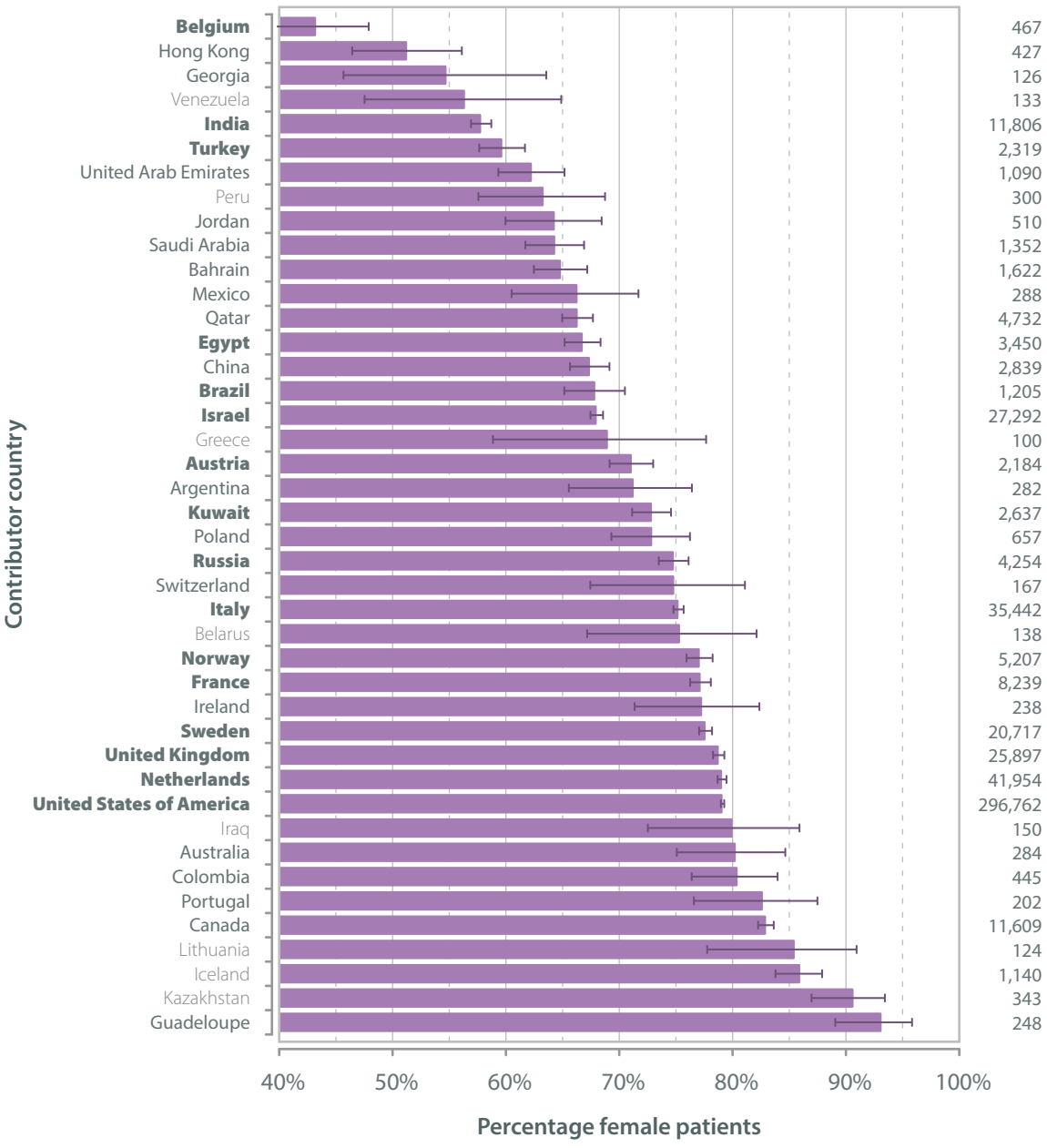
Gender

In this Fifth Report, yet again, it is evident that the distribution of gender for patients undergoing primary surgery is widely divergent, both from country to country and from one IFSO Chapter Region to another.

In nearly every country penetrance of surgery is greatest in female patients, for reasons that are largely unknown. In countries with publicly funded bariatric surgery it may be important to prioritise male patients at a younger age, since they typically present for surgery when they are older and have more established disease. These differences could be due to the relative rates of obesity for men and women in each country, but may also be impacted by issues around equity of access to surgery.

For countries reporting more than 1,000 primary procedures the reported percentage of women operated varies from as low as 58% in India to 86% in Iceland. It is expected that women would out-number men because the global prevalence of Class II and III obesity are greater in women (data presented on page 38). India, and countries throughout the Middle East have the highest proportion of men seeking surgery, while Western European and North American countries have the lowest. The reasons for these large differences might be important to explore.

Primary surgery: Proportion of female patients; calendar years 2015-2018 (n=519,378)

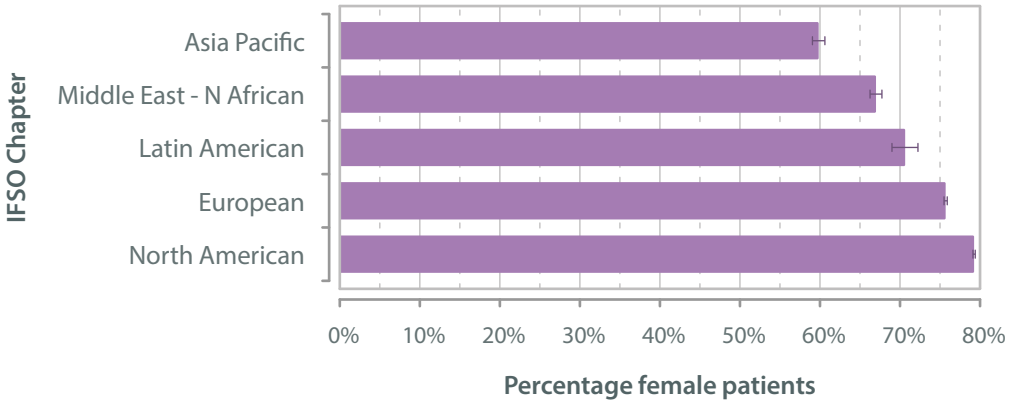


The following table shows the relationship between gender and age for each of the IFSO Chapter regions. In general, more women undergo bariatric surgery than men, and this is most evident in the more Westernised regions of the world. It is notable that Asia Pacific and Middle East - North African regions of IFSO have a smaller proportion of female patients presenting for bariatric surgery by comparison to European and North American regions. The reasons for this apparent difference are not known.

Primary surgery: statistics on patients' age; calendar years 2015-2018

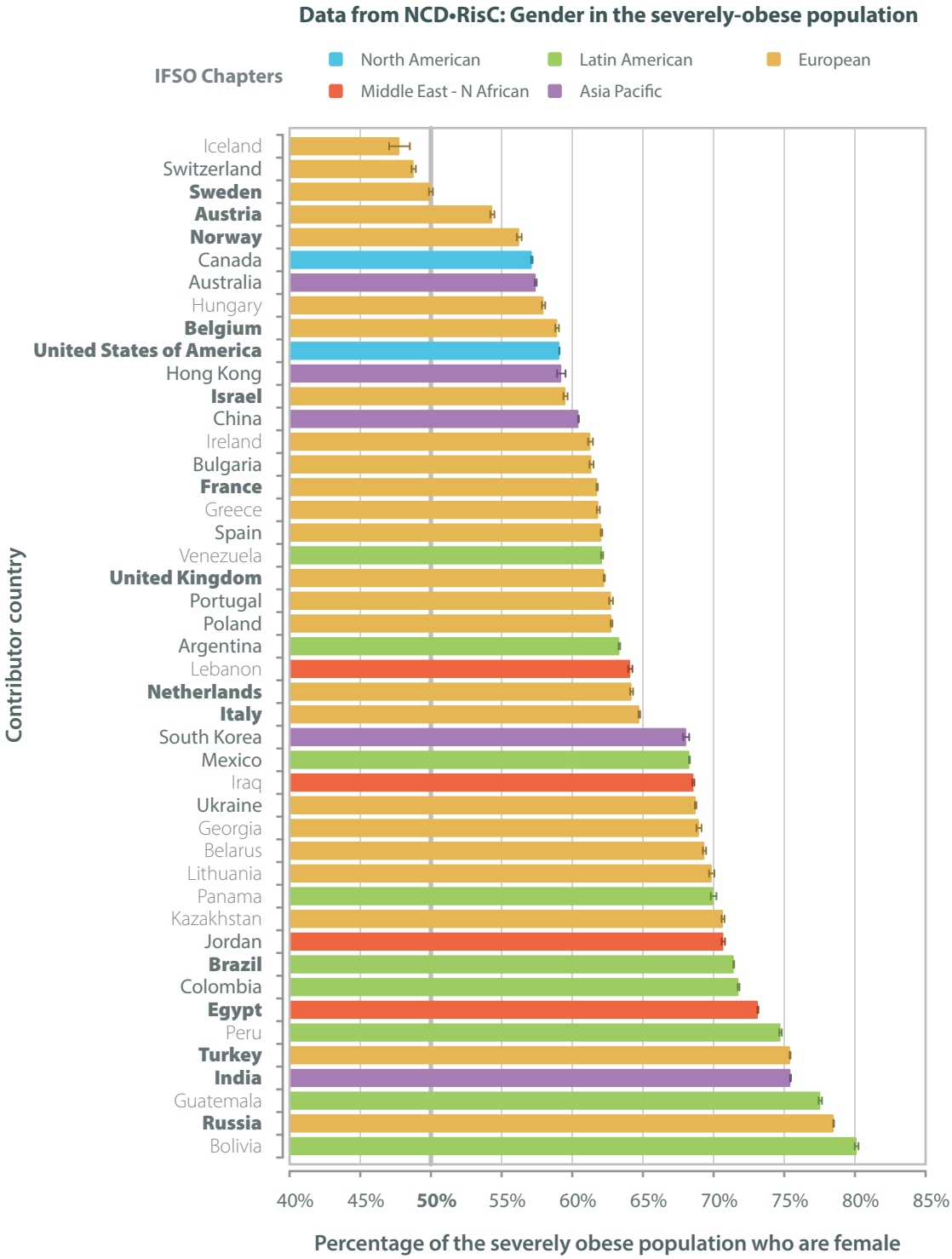
Gender and IFSO Chapter			Count	Average (95% CI)	Median (IQR)
	All regions	All patients	520,736	**43.5** (43.4-43.5)	**43.0** (34.0-52.0)
		Female patients	400,321	**43.1** (43.0-43.1)	**43.0** (34.0-52.0)
		Male patients	119,216	**44.8** (44.7-44.9)	**45.0** (36.0-54.0)
	Female patients	North American	244,413	**44.1** (44.1-44.2)	**44.0** (35.0-53.0)
		Latin American	2,167	**39.2** (38.7-39.6)	**38.0** (31.0-47.0)
		European	134,145	**42.1** (42.0-42.1)	**43.0** (33.0-51.0)
		Middle East - North African	10,404	**34.1** (33.9-34.3)	**33.0** (26.0-41.0)
		Asia Pacific	9,192	**40.5** (40.2-40.8)	**40.0** (31.0-50.0)
	Male patients	North American	63,958	**46.7** (46.6-46.8)	**46.0** (38.0-55.0)
		Latin American	902	**40.5** (39.8-41.3)	**40.0** (33.0-49.0)
		European	43,060	**44.1** (44.0-44.2)	**45.0** (36.0-53.0)
		Middle East - North African	5,124	**32.7** (32.4-33.0)	**32.0** (24.0-40.0)
		Asia Pacific	6,172	**40.5** (40.2-40.9)	**40.0** (31.0-50.0)

Primary surgery: Proportion of female patients; calendar years 2015-2018 (n=519,782)



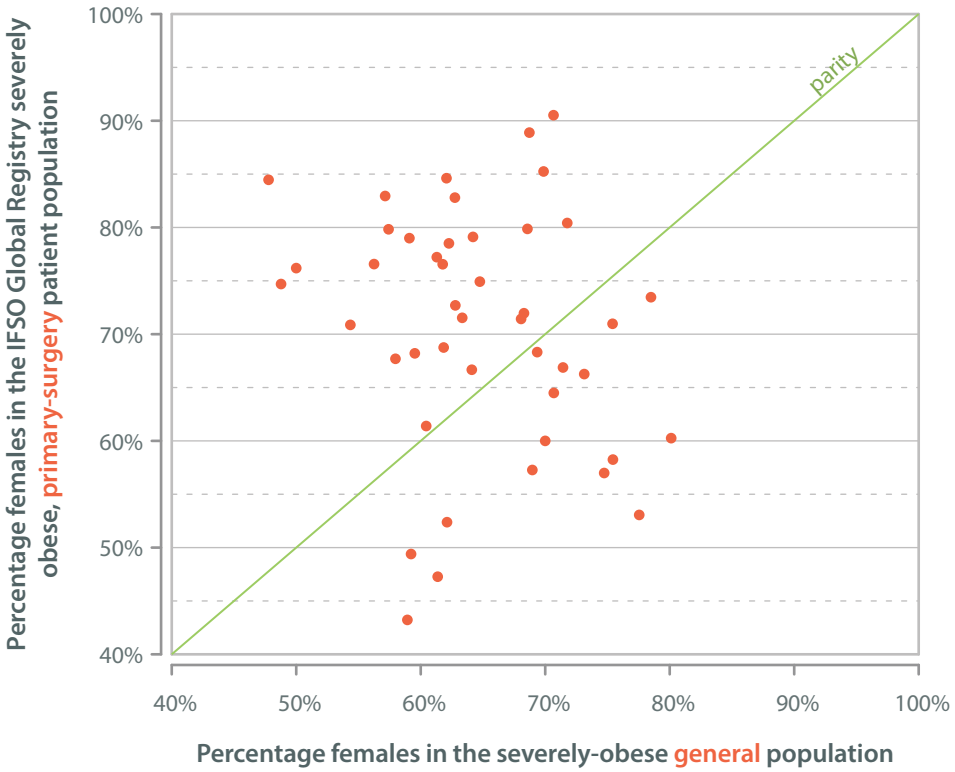
The interaction between gender and age in those seeking surgery also varies regionally. In Europe, North America and Latin America, regions with a low proportion of men seeking surgery, the men present at an older age than the women. In the Asia Pacific and Middle East - North African regions, where higher proportions of men undergo surgery, men present at the comparable age as women, or in the case of the Middle East - North African region at a younger age.

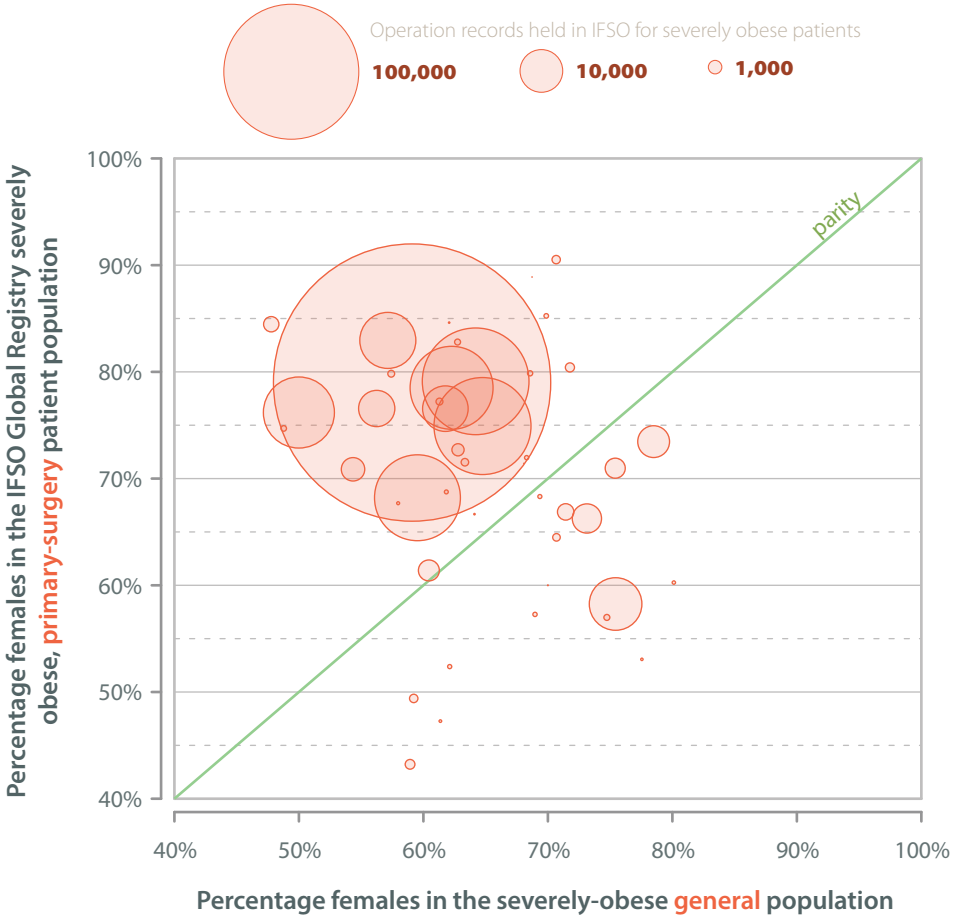
This chart demonstrates that women out-number men in the severely obese (BMI >35kg m^{-2}) general populations; on the whole, women make up 55-65% of individuals with severe obesity in most countries. The lowest proportion of women (highest proportion of men) generally occur in Westernised countries and the highest proportion of women are found in Eastern European and Latin American countries.



The charts opposite show that women, based on the proportion with severe obesity in a country, can be both over- and under-represented in those having bariatric surgery. However, in the countries providing the highest patient numbers to the registry, women are generally over-represented (lower chart on the facing page).

Severely obese populations: Proportion of female patients in selected IFSO contributor countries; calendar years 2015-2018 (n=471,483)

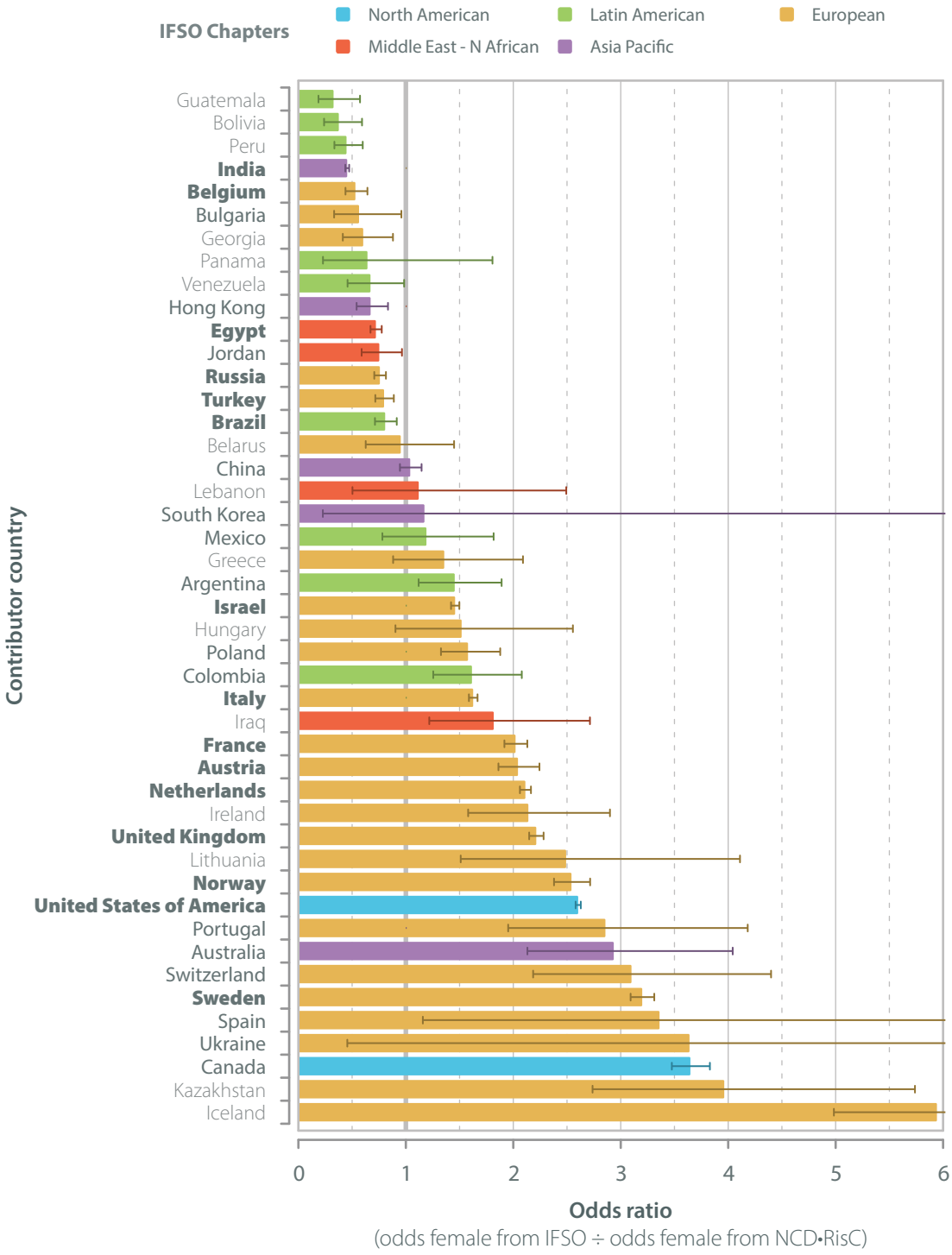




The charts on the following two pages show the odds ratio of female representation of the severely obese sub-group of patients in the IFSO Global Registry compared to the proportion of women in the general population that is severely obese (BMI >35kg m^{-2}) on a country-by-country basis. The latter information is taken from the NCD•RisC website (Non-Communicable Diseases Risk Factor Collaboration; www.ncdrisc.org).

The chart here has been ranked according to increasing value of the calculated odds ratio, on a country-by-country basis. On the opposite page there is a primary sort according to IFSO Chapter region.

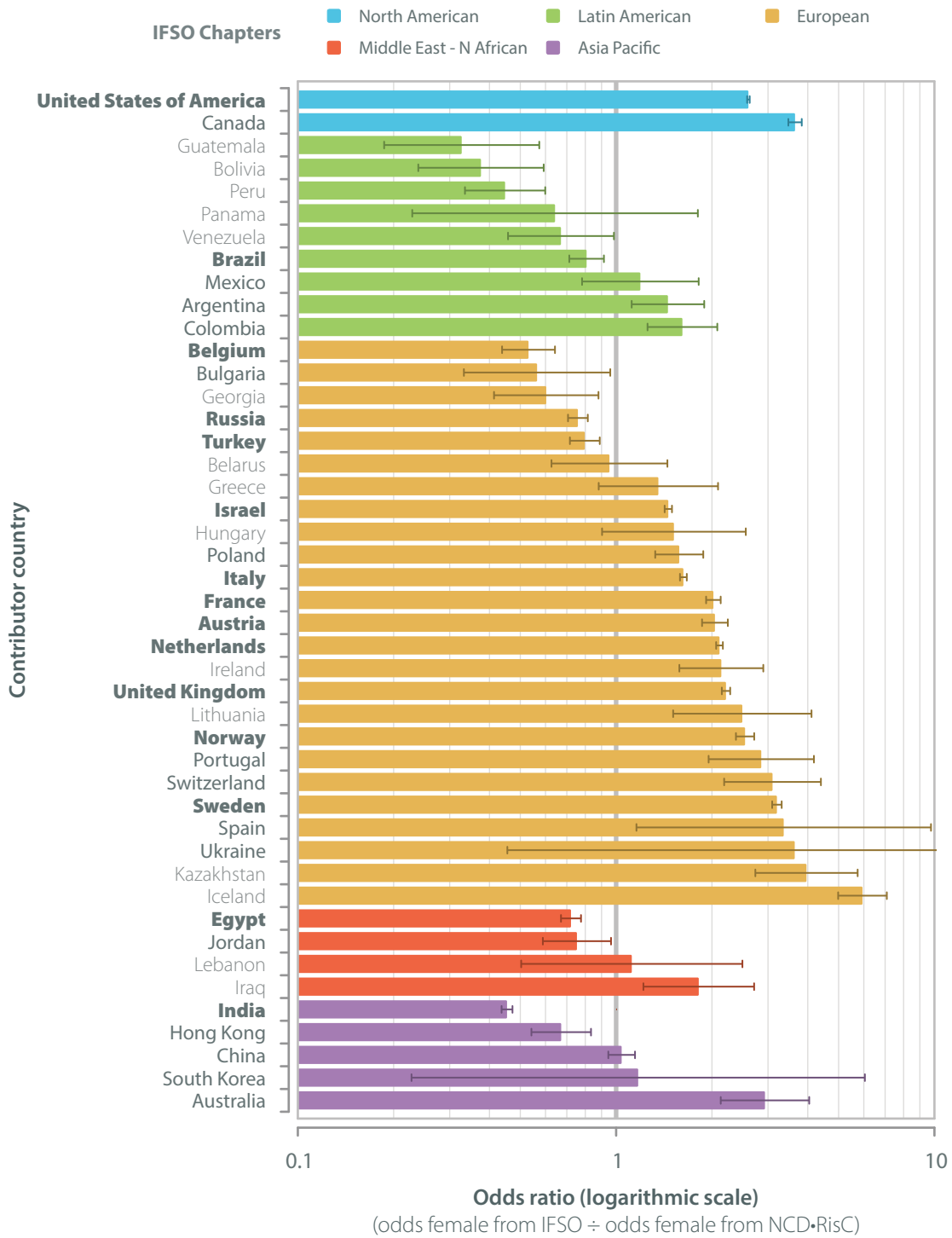
Severely obese populations: The proportion of females in the IFSO Global Registry having primary surgery versus general population data from NCD•RisC



The meaning of the heavy line (odds ratio = 1) is that there is no difference between the two rates. Where a 95% confidence interval does not cross the heavy line, the proportion of women in the IFSO Global Registry is significantly different to the proportion in the general population; for bars **below** the heavy line, women are **under**-represented in the population having surgery, and for bars **above** the line, women are **over**-represented.

The European and North American countries generally predominate in terms of female over-representation. The precise reasons for this are worthy of further, detailed exploration.

Severely obese populations: The proportion of females in the IFSO Global Registry having primary surgery versus general population data from NCD•RisC



Obesity-related disease

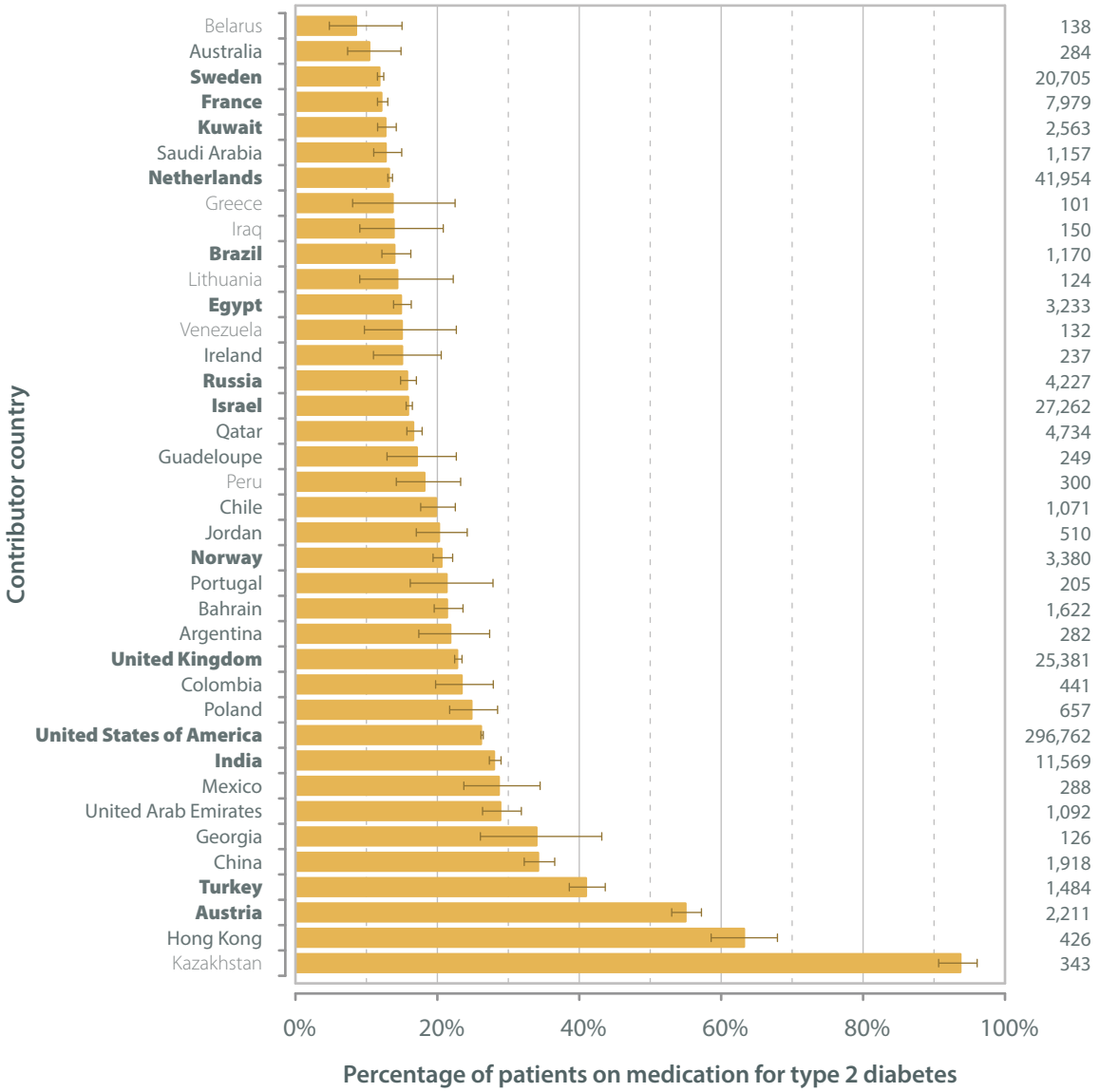
Type 2 diabetes

Over the last decade, the potential to put patients into remission from their diabetes has been the focus of much research in the scientific literature on *metabolic and bariatric surgery*. Decreasing the need for anti-diabetic medication is an important benefit of weight-loss surgery. The fact that it has been shown to be cost-effective in the short-term to medium-term for this group of patients is another key driver for healthcare providers to increase rates of surgery for these patients.

However, despite the significant scientific interest in *metabolic surgery* for diabetes, **only** around 20% of patients that present for surgery are on medication for type 2 diabetes. It is probable that there is a large unmet need in the general population for metabolic surgery. In public healthcare systems this means that obese patients with diabetes are probably not being appropriately prioritised for surgery.

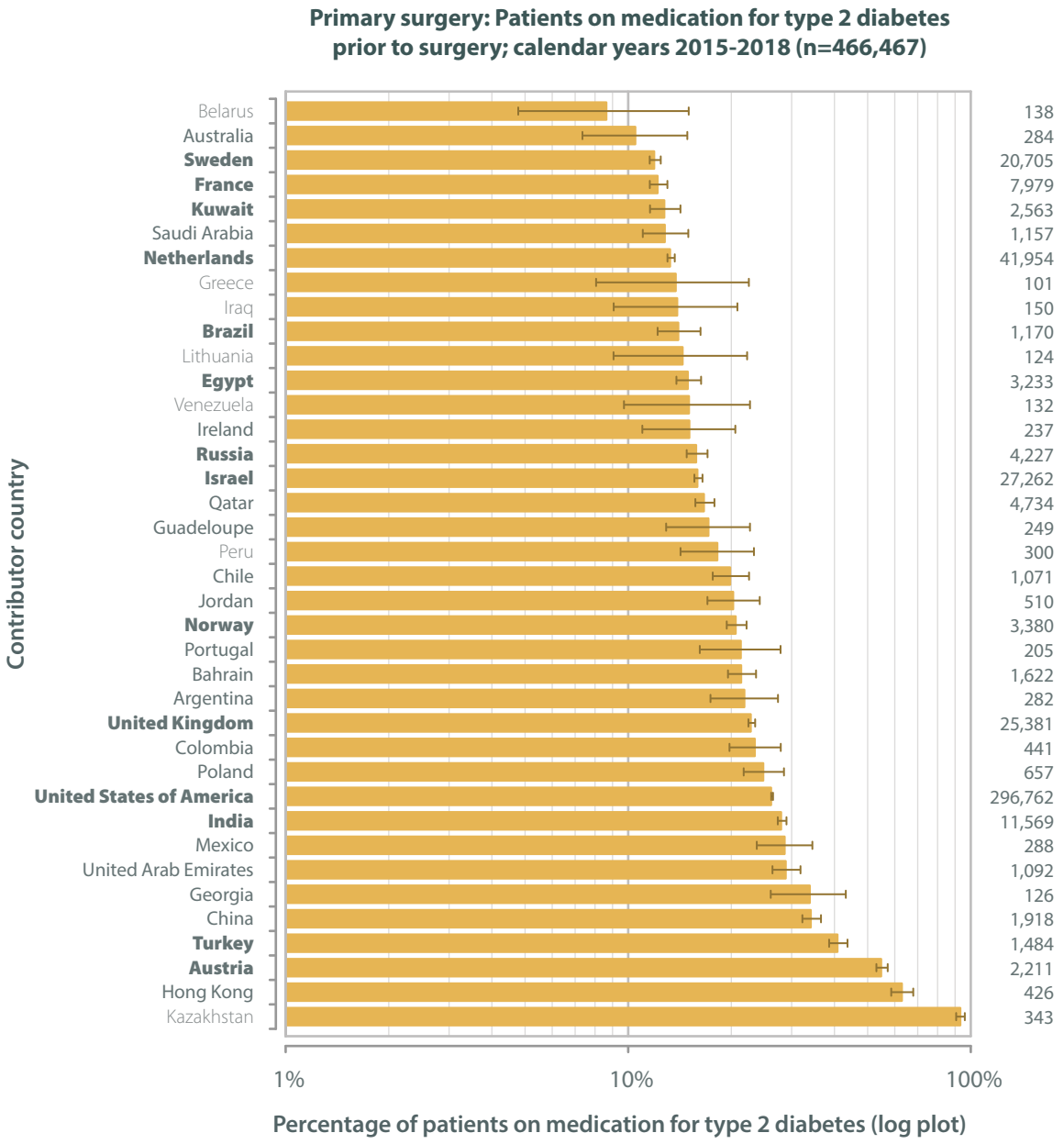
The chart below shows that there is a wide variation in the reported rates of patients on medication for type 2 diabetes at the time of presentation for primary surgery. Most countries have rates in the range 10-30%, but there are 6 countries where the rates are considerably higher. This chart is repeated from previous iterations of the report, but now, data from four additional countries have been added, namely: France, Greece, Iraq and Argentina.

Primary surgery: Patients on medication for type 2 diabetes prior to surgery; calendar years 2015-2018 (n=466,467)



This graph represents the same data as the chart on the facing page but is presented here with a logarithmic scale on the horizontal x-axis, and ordered by increasing rates of patients on treatment for type 2 diabetes in the operated populations.

It will be interesting to watch matters evolve over time, and to see whether or not there is any convergence in terms of the rates of obesity-related disease in the operative patient population, especially in countries that currently occupy the two extreme ends of this distribution.

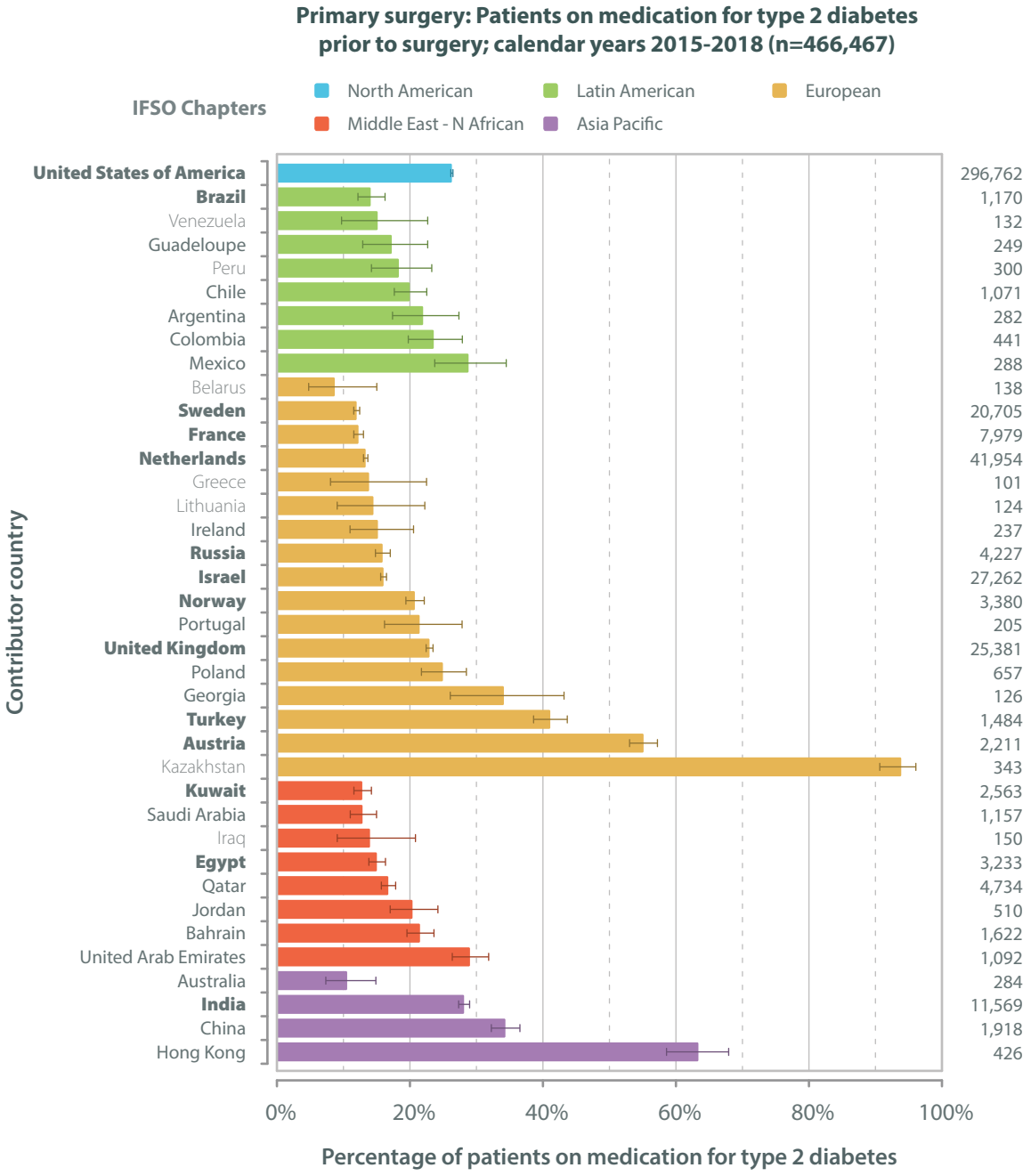


Analysis

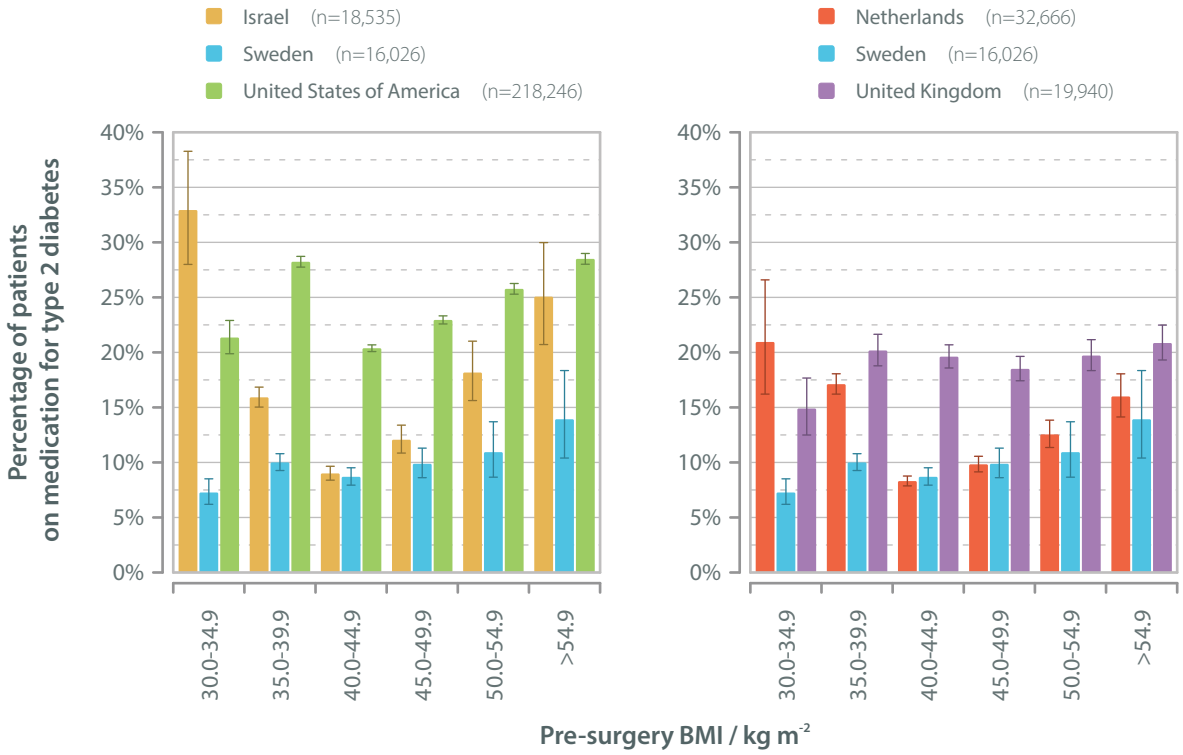
The graph below shows the rates of medication for type 2 diabetes in the surgical population as recorded in the IFSO Global Registry, grouped according to the IFSO Chapter to which the country belongs. As in the Fourth Global Registry Report 2018, there are obvious and large differences between the rates of treatment for type 2 diabetes in the operated populations between countries within each region as well as between different regions.

On the opposite page the analyses have been further split by gender and BMI group, for data from five national registries to show differences and similarities within one IFSO Chapter region, and across different continents. The interactions between medication for this obesity-related disease and BMI are not identical across all counties, with some showing an upward trend and others a downward trend, and one with a U-shaped distribution.

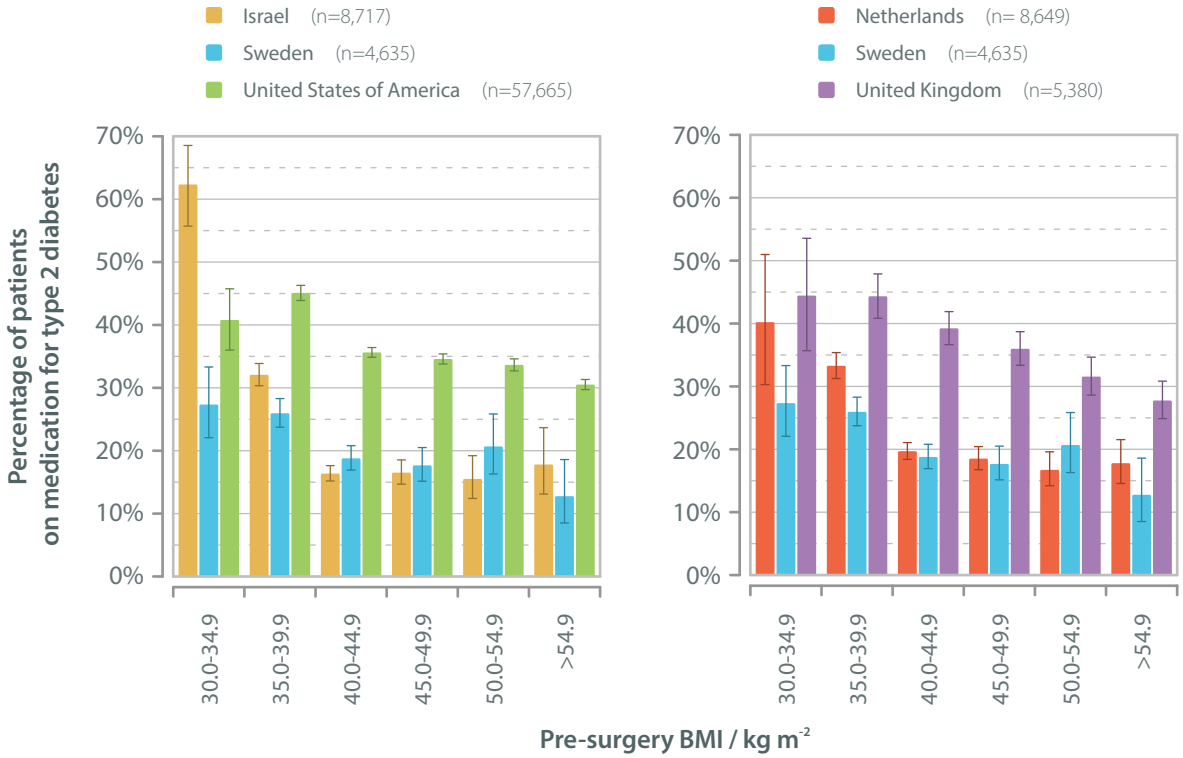
The elevated proportion of patients on treatment for type 2 diabetes in the lower BMI range, especially in the data from Israel and the Netherlands, probably indicates that these patients are being selected for their surgery because of their diabetic status. The ethnic propensity to develop diabetes at a lower BMI may also influence this.



Primary surgery for female patients: Patients on medication for type 2 diabetes prior to surgery; selected contributor countries; calendar years 2015-2018



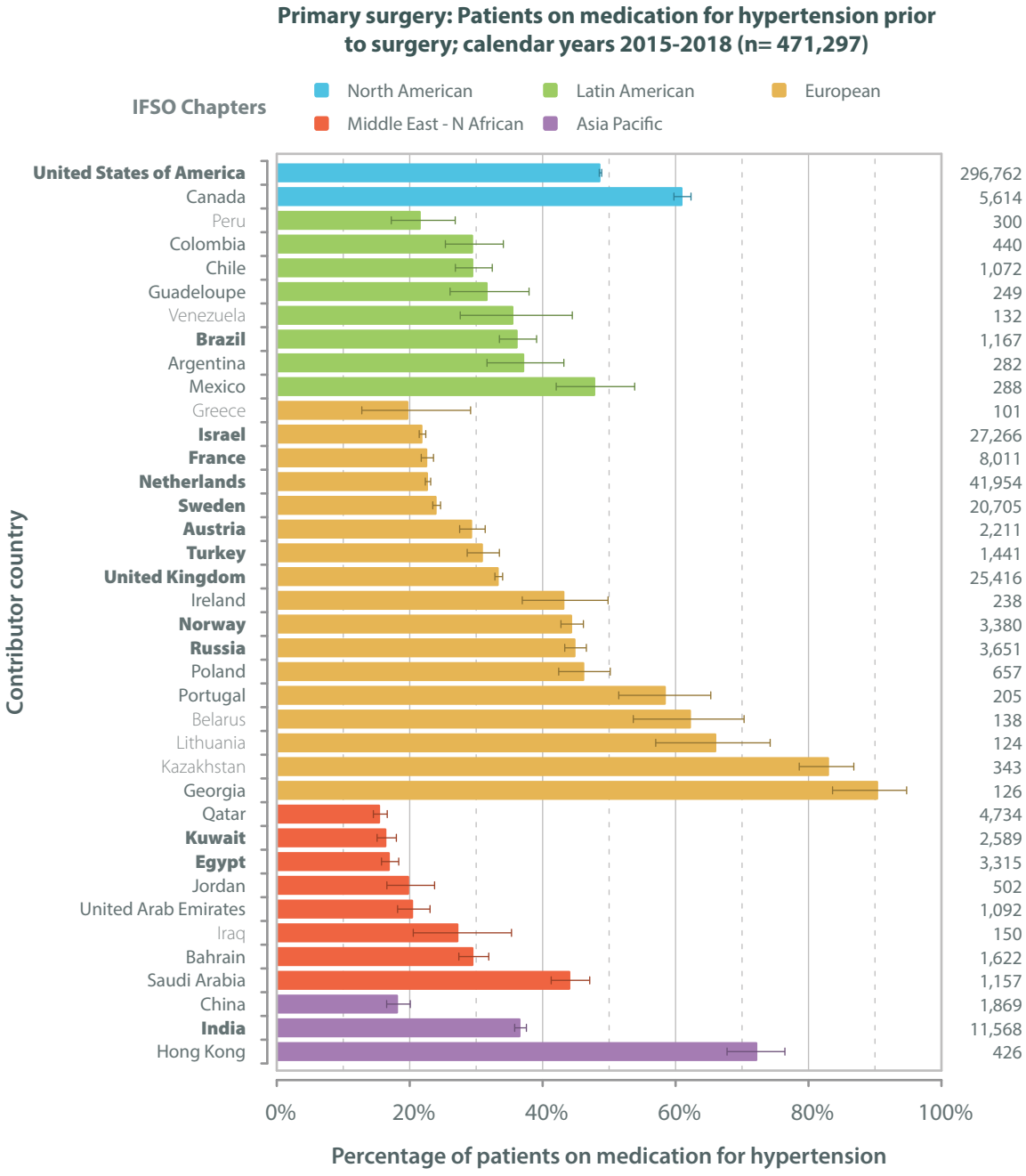
Primary surgery for male patients: Patients on medication for type 2 diabetes prior to surgery; selected contributor countries; calendar years 2015-2018



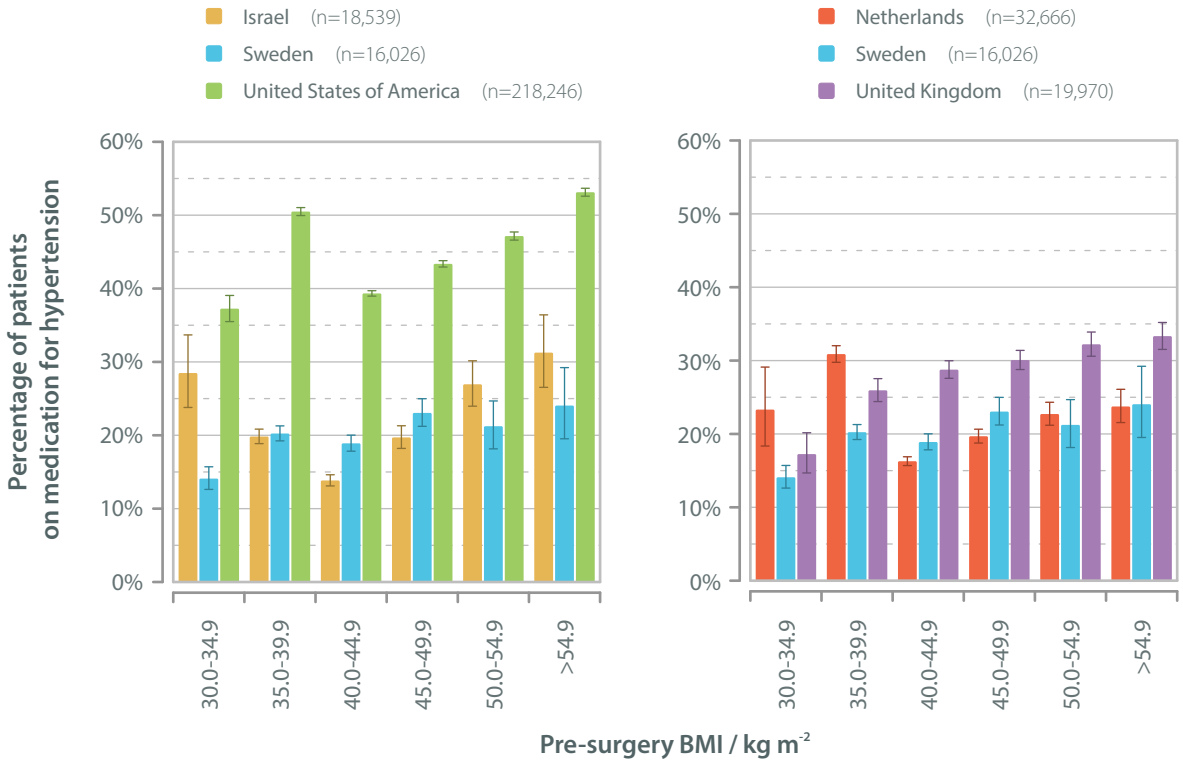
Hypertension

The graph below shows the rate of treatment for hypertension *per* country grouped according to the IFSO Chapter to which each country belongs. As with the data on diabetes treatment rates, there is widespread geographical variation in the prevalence of treatment for hypertension in bariatric surgery patient-populations. Hypertension is an established risk factor, together 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; it is one of the factors included in the Obesity Surgery Mortality Risk Score (OSMRS) shown in a following section.

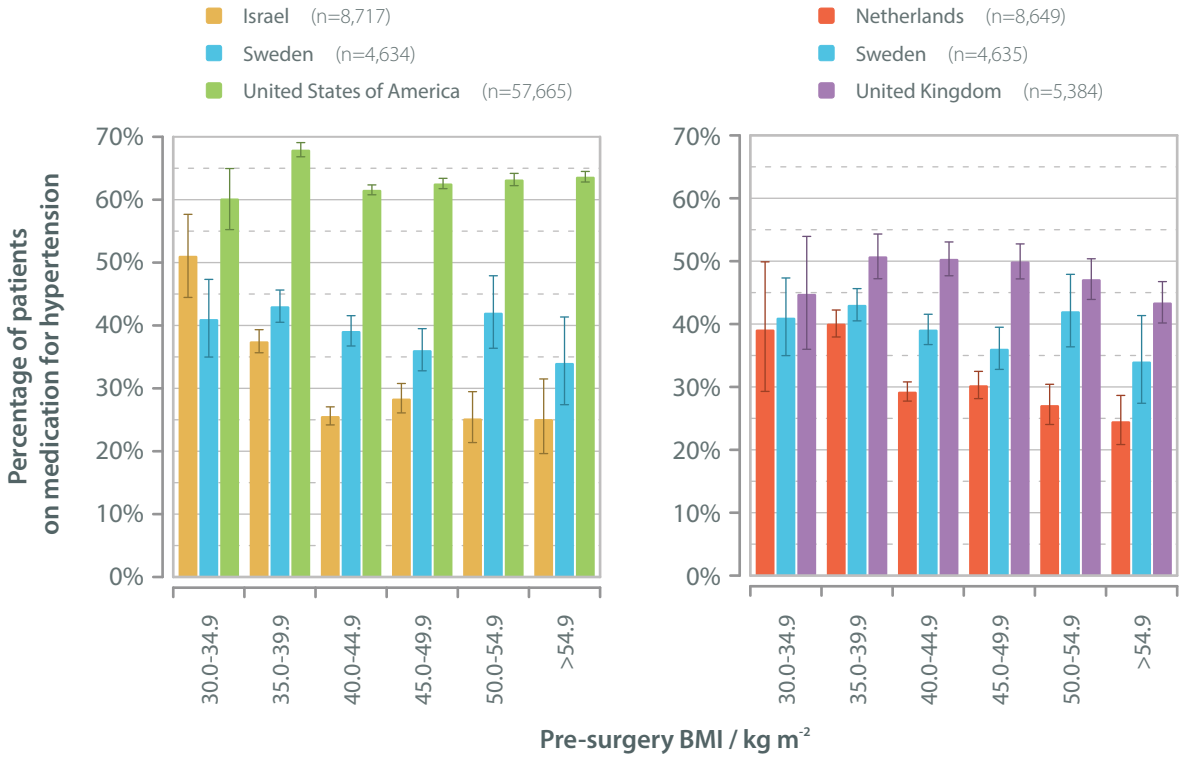
The analyses for this condition have also been further split according to gender and BMI group on the facing page. These data, taken from the same five national registries presented in the section on medication for type 2 diabetes above, show differences and similarities in treatment rates for hypertension both within one IFSO Chapter region, and across different continents. Again, the observations cannot be easily explained, but are of interest.



Primary surgery for female patients: Patients on medication for hypertension prior to surgery; selected contributor countries; calendar years 2015-2018



Primary surgery for male patients: Patients on medication for hypertension prior to surgery; selected contributor countries; calendar years 2015-2018

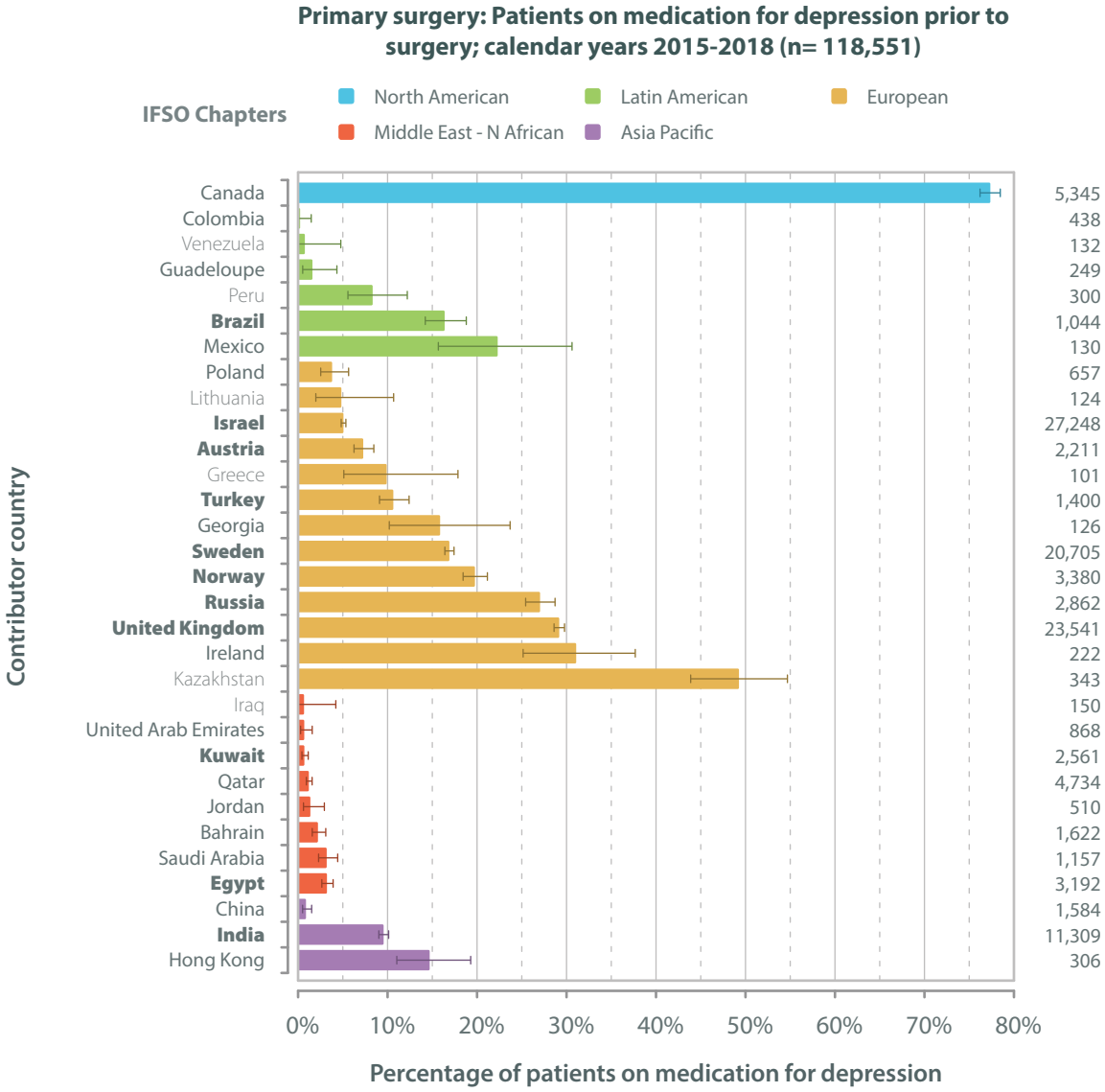


Depression

The graph below shows the rate of medication for depression *per* country grouped according to IFSO Chapter and by increasing prevalence in each Chapter. Just looking at the data from countries submitting large numbers (those with national registries) there are significant differences.

For the first time in this report there is a country with nearly an 80% reported rate of treatment for depression (Ontario Regional Registry, Canada, whose data are a new addition for the Global Registry). Again, in general, countries in the European Chapter report a higher prevalence of patients on medication for depression than in countries from the MENAC territories.

The reasons for all these differences are almost certainly multi-factorial, and are at least partly dependent on the approach to the diagnosis and treatment of this condition in primary practice.

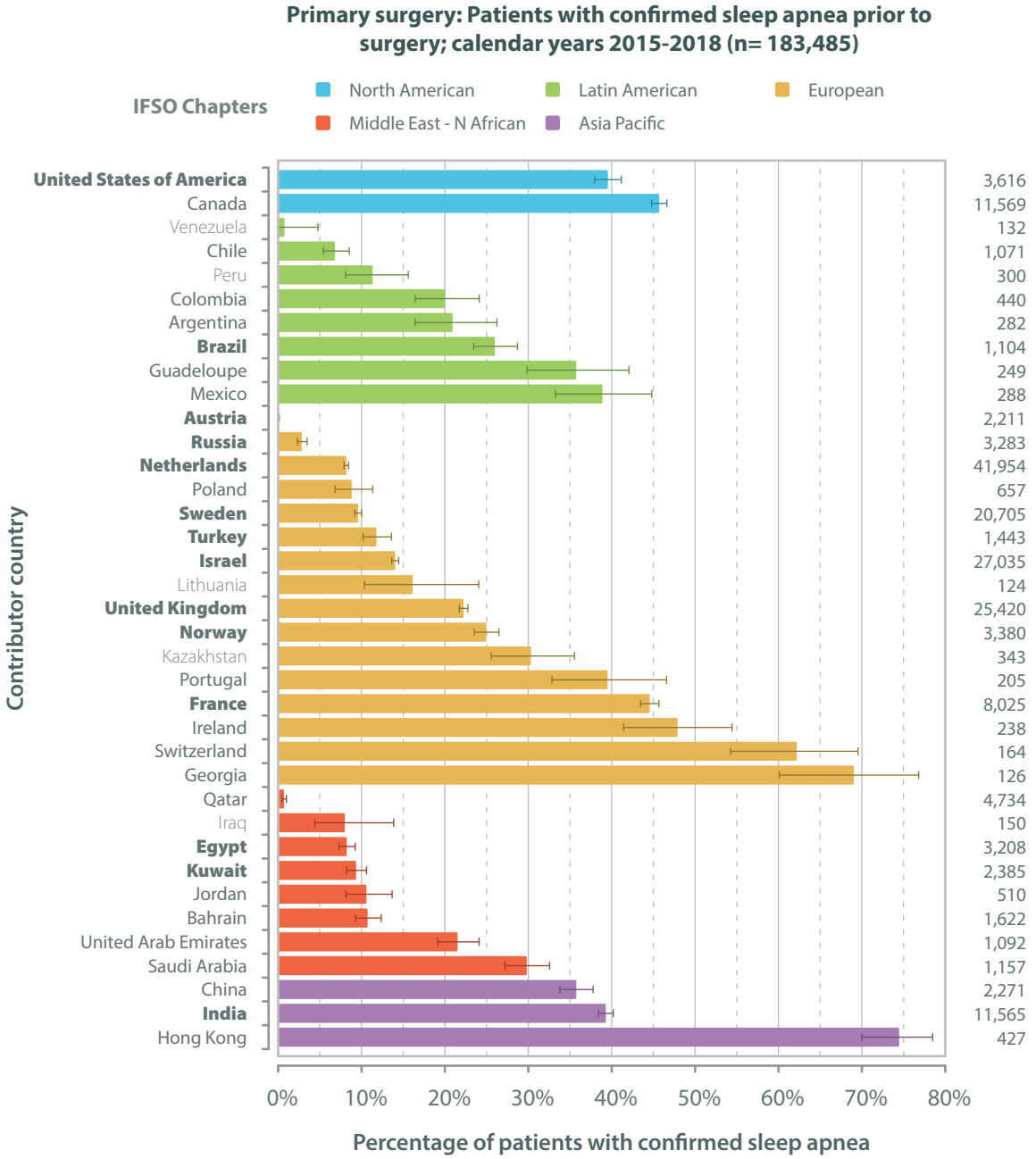


Sleep apnea

The graph below shows the recorded rates of sleep apnea *per* country grouped according to IFSO Chapter region and then ranked according to increasing prevalence in each Chapter. Sleep apnea is a major risk factor for post-operative complications after gastric bypass surgery.

The reason for this apparent inter-country disparity may depend to some extent on how many patients gain access to sleep studies. Some centres rarely perform sleep studies, whereas others do investigations for their whole bariatric surgical patient population.

Also some may have had the diagnosis based on sleep symptoms and not formal polysomnography. Symptoms are regarded by many as too non-specific for correctly diagnosing obstructive sleep apnea.



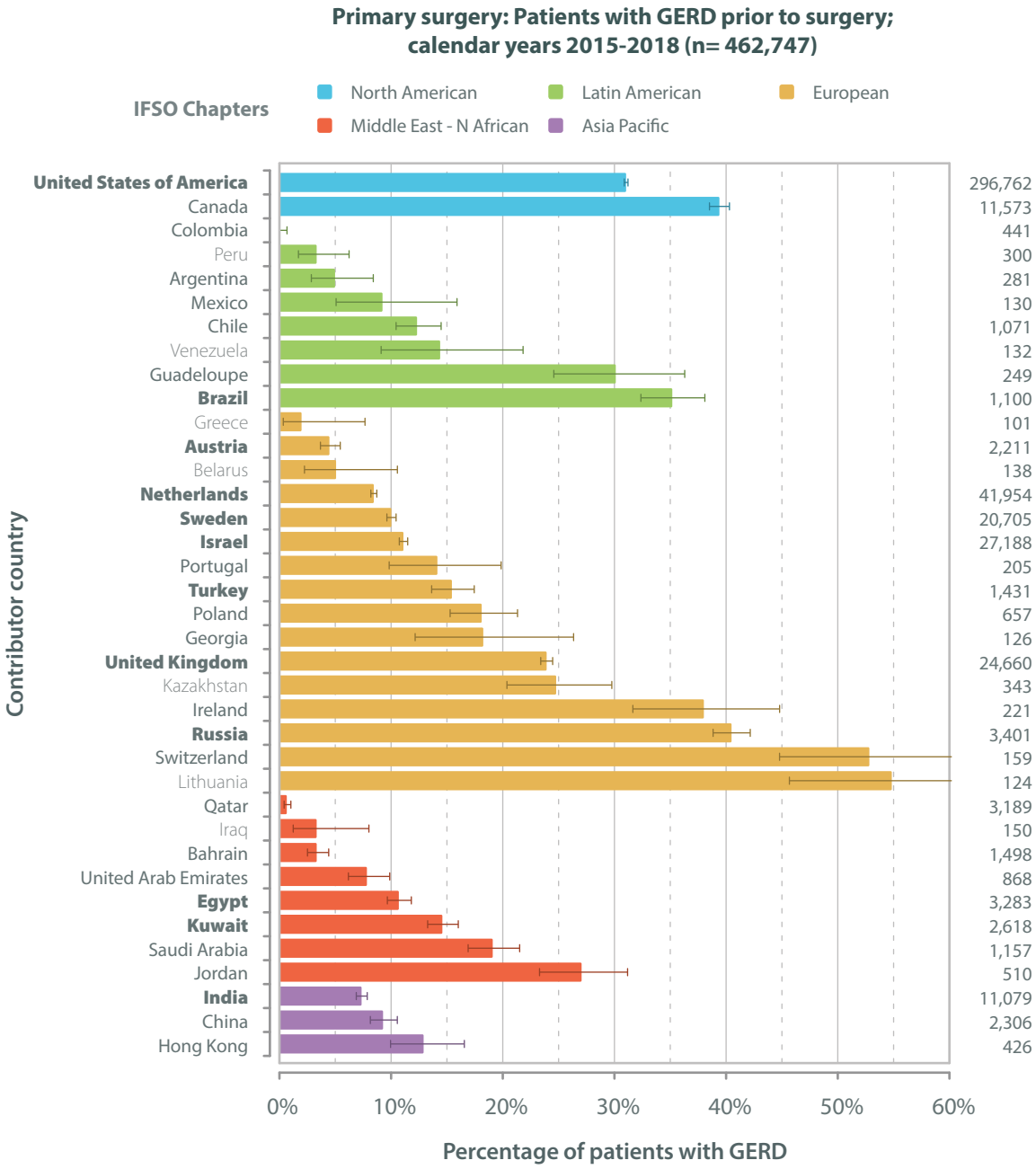
Analysis

GERD

The graph below shows the rate of gastro-esophageal reflux disease (GERD) *per* country within each IFSO Chapter ordered by increasing prevalence in each region.

As shown in previous reports, there is wide variation in the reported rates of GERD across the contributor countries.

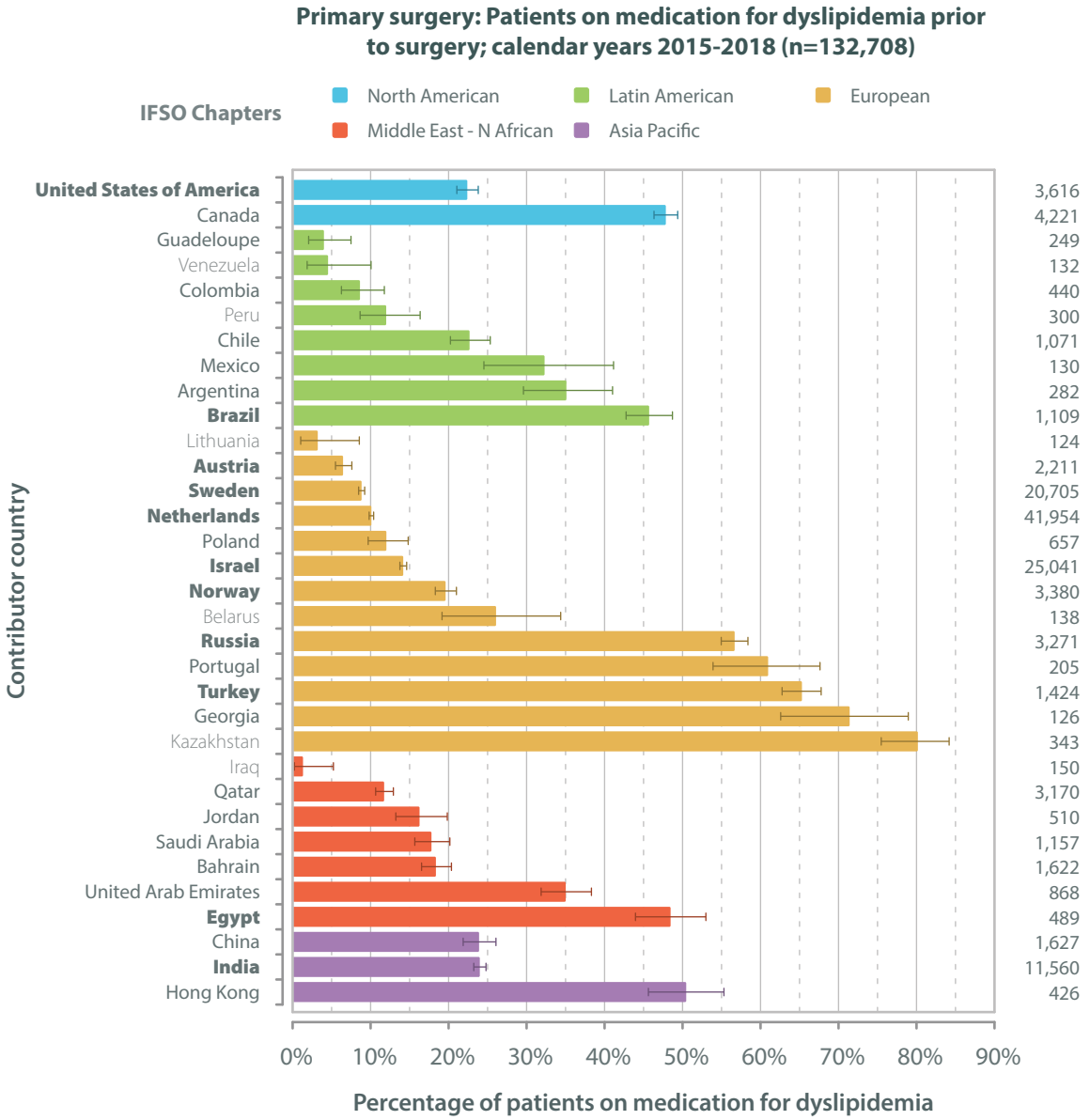
The fact that more than 20% of patients have GERD in several countries is interesting, given the fact that sleeve gastrectomy is the commonest operation currently in international practice, due to the debate about the safety of sleeve gastrectomy in these patients. In future it may be possible to describe accurately which operations patients with GERD are being offered internationally.



Dyslipidemia

The graph below shows the rate of medication for dyslipidemia in bariatric surgery patients on a country-by-country basis grouped according to IFSO Chapter and then ranked according to the prevalence within each Chapter.

Given its importance in the metabolic syndrome it would be interesting to know, what proportion of the patients with known dyslipidemia are actually receiving the appropriate medication for their condition. More fundamentally, the differences in the rates shown in the graph below may also affected by either failure or success of appropriate clinical investigations for dyslipidemia in the period prior to bariatric surgery.

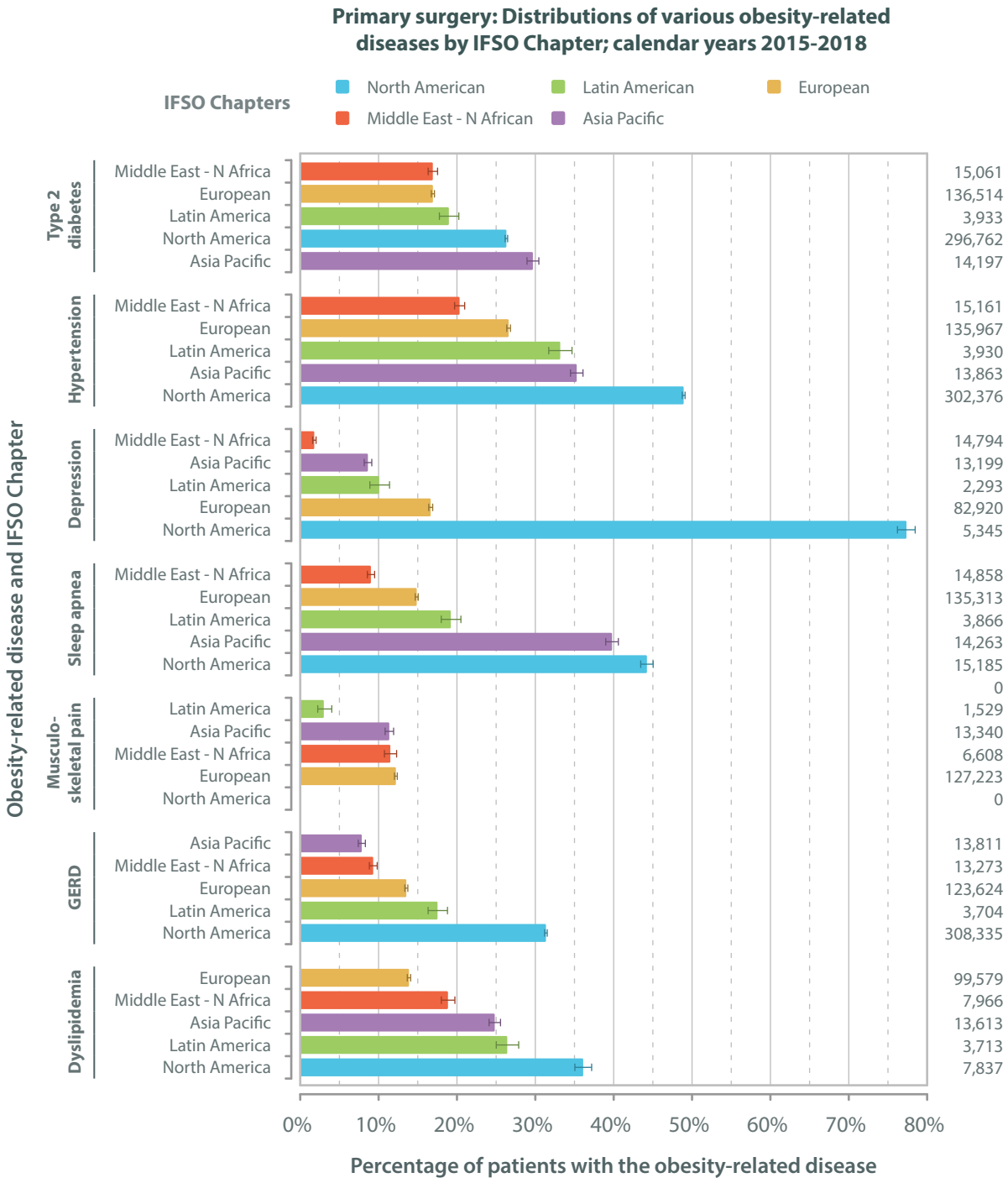


Inter-Chapter comparisons of obesity-related disease

This composite graph below shows the prevalence of each obesity-related disease for the patient populations in each IFSO Chapter, using a consistent colour-coding for each IFSO Chapter; for each obesity-related disease the Chapters are sorted according to increasing rate of that condition.

Most striking is the very high proportion of patients on medication for depression recorded in data received from the North American Chapter, which here is represented exclusively by data from Canada, as the national data from the United States did not supply information on their patients' medication for depression. Nevertheless, this is new information that is presented for the first time in this Fifth IFSO Global Registry Report.

Please note that the labels type 2 diabetes, hypertension, depression, musculoskeletal pain and dyslipidemia are short-hand for rates of being on medication for these conditions, not the condition *per se*.



Primary surgery: pre-operative obesity-related disease rates for countries **submitting >100 operations** with the data recorded; calendar years 2015-2018

Chapter and obesity-related disease		Pre-operative obesity-related disease status				
		Absent	Present	Unspecified	Disease rate	Missing rate
North American	Type 2 diabetes	218,683	78,079	0	26.3%	0.0%
	Hypertension	154,422	147,954	5,995	48.9%	1.9%
	Depression	1,210	4,135	6,264	77.4%	54.0%
	Sleep apnea	8,467	6,718	293,186	44.2%	95.1%
	Musculoskeletal pain	0	0	0	NA	NA
	GERD	211,644	96,691	36	31.4%	0.0%
	Dyslipidemia	5,007	2,830	300,534	36.1%	97.5%
Latin American	Type 2 diabetes	3,187	746	85	19.0%	2.1%
	Hypertension	2,626	1,304	88	33.2%	2.2%
	Depression	2,062	231	327	10.1%	12.5%
	Sleep apnea	3,123	743	152	19.2%	3.8%
	Musculoskeletal pain	1,483	46	168	3.0%	9.9%
	GERD	3,055	649	314	17.5%	7.8%
	Dyslipidemia	2,732	981	305	26.4%	7.6%
European	Type 2 diabetes	113,403	23,111	3,508	16.9%	2.5%
	Hypertension	99,809	36,158	4,055	26.6%	2.9%
	Depression	69,115	13,805	6,566	16.6%	7.3%
	Sleep apnea	115,199	20,114	4,637	14.9%	3.3%
	Musculoskeletal pain	111,692	15,531	4,422	12.2%	3.4%
	GERD	106,885	16,739	3,119	13.5%	2.5%
	Dyslipidemia	85,761	13,818	5,968	13.9%	5.7%
Middle East - N African	Type 2 diabetes	12,513	2,548	500	16.9%	3.2%
	Hypertension	12,078	3,083	400	20.3%	2.6%
	Depression	14,529	265	767	1.8%	4.9%
	Sleep apnea	13,518	1,340	703	9.0%	4.5%
	Musculoskeletal pain	5,848	760	4,950	11.5%	42.8%
	GERD	12,037	1,236	2,288	9.3%	14.7%
	Dyslipidemia	6,464	1,502	4,944	18.9%	38.3%
Asia Pacific	Type 2 diabetes	9,982	4,215	1,163	29.7%	7.6%
	Hypertension	8,972	4,891	1,213	35.3%	8.0%
	Depression	12,059	1,140	1,877	8.6%	12.5%
	Sleep apnea	8,588	5,675	813	39.8%	5.4%
	Musculoskeletal pain	11,824	1,516	1,736	11.4%	11.5%
	GERD	12,727	1,084	1,265	7.8%	8.4%
	Dyslipidemia	10,234	3,379	1,463	24.8%	9.7%

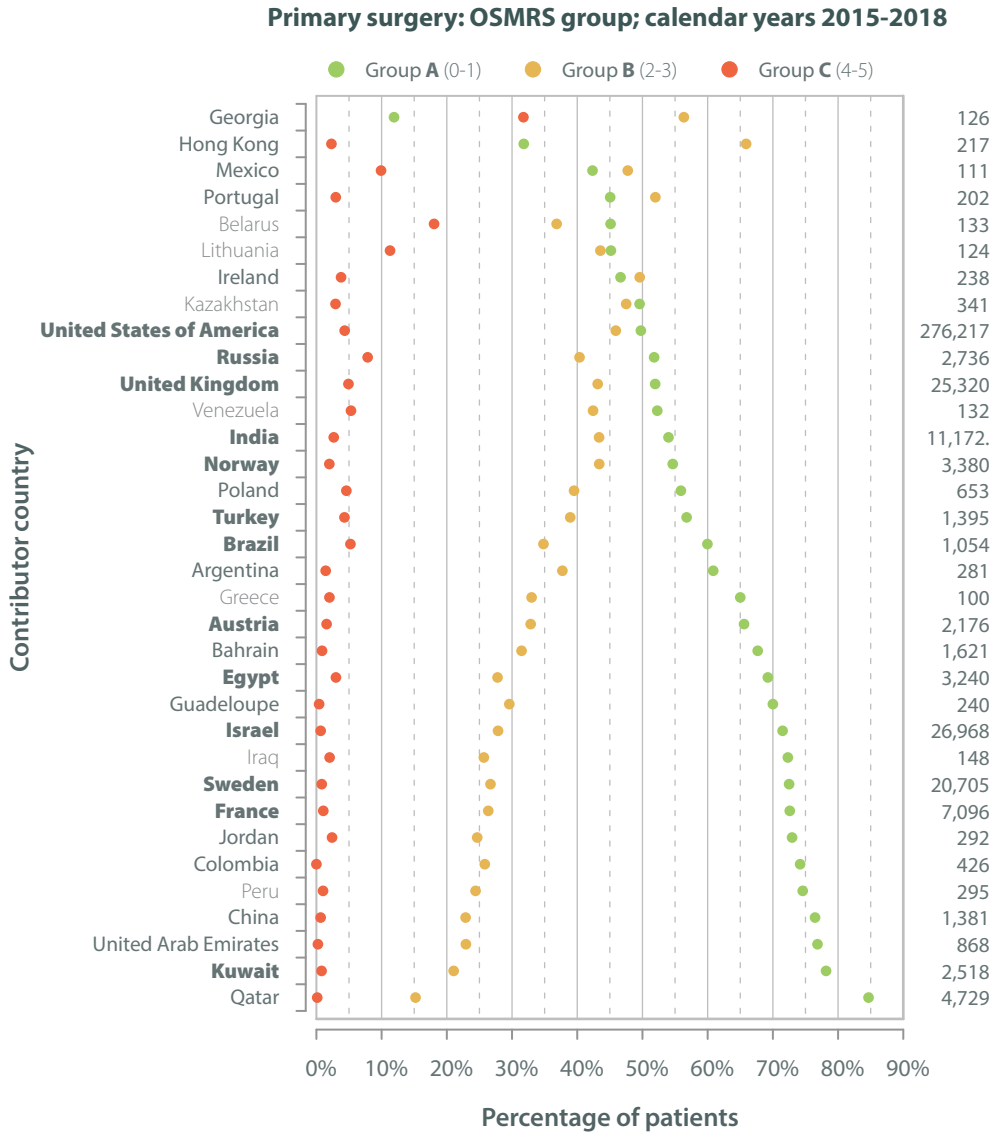
Obesity Surgery Mortality Risk Score

The Obesity Surgery Mortality Risk Score (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 ≥45 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 risk, medium risk and high risk respectively.

The utility of OSMRS risk scoring needs further assessment in the context of the practice of modern day laparoscopic bariatric-metabolic surgery, especially given the very low in-hospital mortality rates following these procedures. It may be that the score is useful to predict other composite outcomes, rather than mortality *per se*, but it is certainly useful to quickly stratify different patient populations into broad risk groups. The chart shows the countries ordered according to increasing rates of Group A patients.

It is clear there is widespread variation in risk between different countries, which should be adjusted for in any future inter-country comparison of outcomes.

In the ideal world, there is a need for the development of new, contemporary and robust risk models that can be used to guide patients and surgeons on peri-operative risk, for both long-term and short-term outcomes. This might be an ideal long-term goal for the IFSO Global Registry, once there are sufficient complete and accurate data from a large number of mature national registries.



Primary surgery: Obesity Surgery Mortality Risk Score; calendar years 2015-2018

Contributor country	OSMRS group				
	A (0-1)	**B** (2-3)	**C** (4-5)	Unspecified	Missing data rate
Argentina	171	106	4	1	0.4%
Australia	0	0	0	284	100.0%
Austria	1,427	715	34	35	1.6%
Bahrain	1,097	510	14	1	0.1%
Belarus	60	49	24	5	3.6%
Belgium	0	0	0	467	100.0%
Bolivia	71	19	1	0	0.0%
Brazil	632	367	55	151	12.5%
Bulgaria	12	23	20	0	0.0%
Canada	0	0	0	11,609	100.0%
Chile	0	0	0	1,116	100.0%
China	1,056	316	9	1,462	51.4%
Colombia	316	110		19	4.3%
Egypt	2,243	900	97	210	6.1%
France	5,151	1,870	75	1,143	13.9%
Georgia	15	71	40	0	0.0%
Greece	65	33	2	1	1.0%
Guadeloupe	168	71	1	9	3.6%
Guatemala	0	0	0	64	100.0%
Hong Kong	69	143	5	210	49.2%
Hungary	40	25	2	0	0.0%
Iceland	0	0	0	1,140	100.0%
India	6,032	4,843	297	634	5.4%
Iraq	107	38	3	2	1.3%
Ireland	111	118	9	0	0.0%
Israel	19,280	7,512	176	324	1.2%
Italy	0	0	0	35,473	100.0%
Jordan	213	72	7	218	42.7%
Kazakhstan	169	162	10	2	0.6%
Kuwait	1,968	530	20	133	5.0%
Lebanon	18	10	0	0	0.0%
Lithuania	56	54	14	0	0.0%
Mexico	47	53	11	177	61.5%
Netherlands	0	0	0	41,954	100.0%
Norway	1,847	1,466	67	1,827	35.1%
Pakistan	0	1	0	0	0.0%
Panama	19	7	0	1	3.7%
Peru	220	72	3	5	1.7%
Poland	365	258	30	4	0.6%
Portugal	91	105	6	3	1.5%
Qatar	4,004	719	6	5	0.1%
Russia	1,417	1,104	215	1,518	35.7%
Saudi Arabia	31	8	0	1,313	97.1%
South Korea	8	2	0	1	9.1%
Spain	12	9	5	0	0.0%
Sweden	15,009	5,527	169	12	0.1%
Switzerland	0	0	0	167	100.0%
Turkey	792	543	60	924	39.8%
Ukraine	0	0	0	34	100.0%
United Arab Emirates	667	199	2	224	20.5%
United Kingdom	13,154	10,922	1,244	577	2.2%
United States of America	137,433	126,815	11,969	20,545	6.9%
Venezuela	69	56	7	1	0.8%
All	**215,732**	**166,533**	**14,713**	**124,005**	**23.8%**

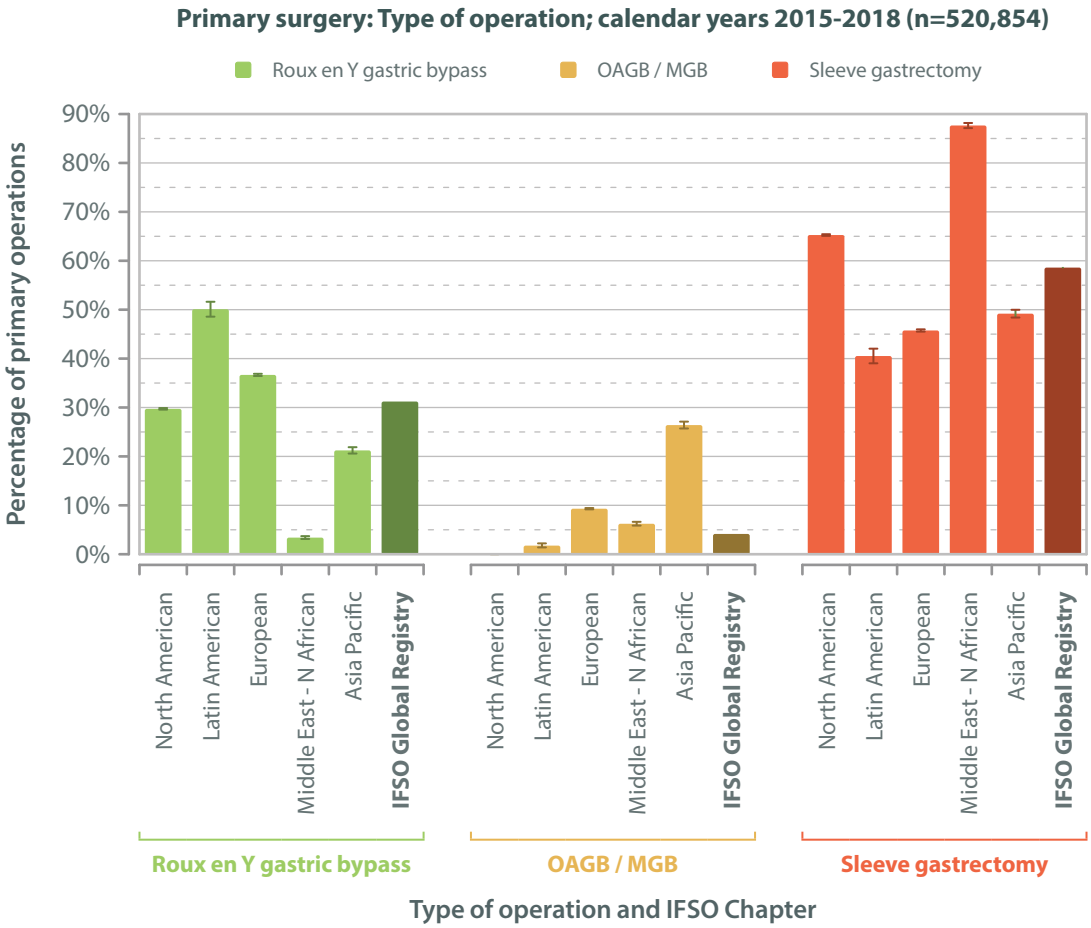
Surgery

Type of primary surgery

The majority of operations recorded in the registry are sleeve gastrectomies, followed in terms of volume by Roux en Y gastric bypass procedures. Other operations form a smaller proportion of the total, possibly reflecting current international practice. The graph below the table shows the data for the IFSO Regional Chapters.

Primary surgery: operations performed; calendar years 2015-2018

Operation	Count	Percentage
Sleeve gastrectomy	305,242	58.6%
Roux en Y gastric bypass	162,613	31.2%
OAGB / MGB	21,613	4.1%
Gastric band	19,255	3.7%
Other	8,665	1.7%
Duodenal switch with sleeve	2,554	0.5%
Bypass unspecified	634	0.1%
Bilio-pancreatic diversion	190	0.0%
Duodenal switch	88	0.0%
Unspecified	129	
All	**520,983**	



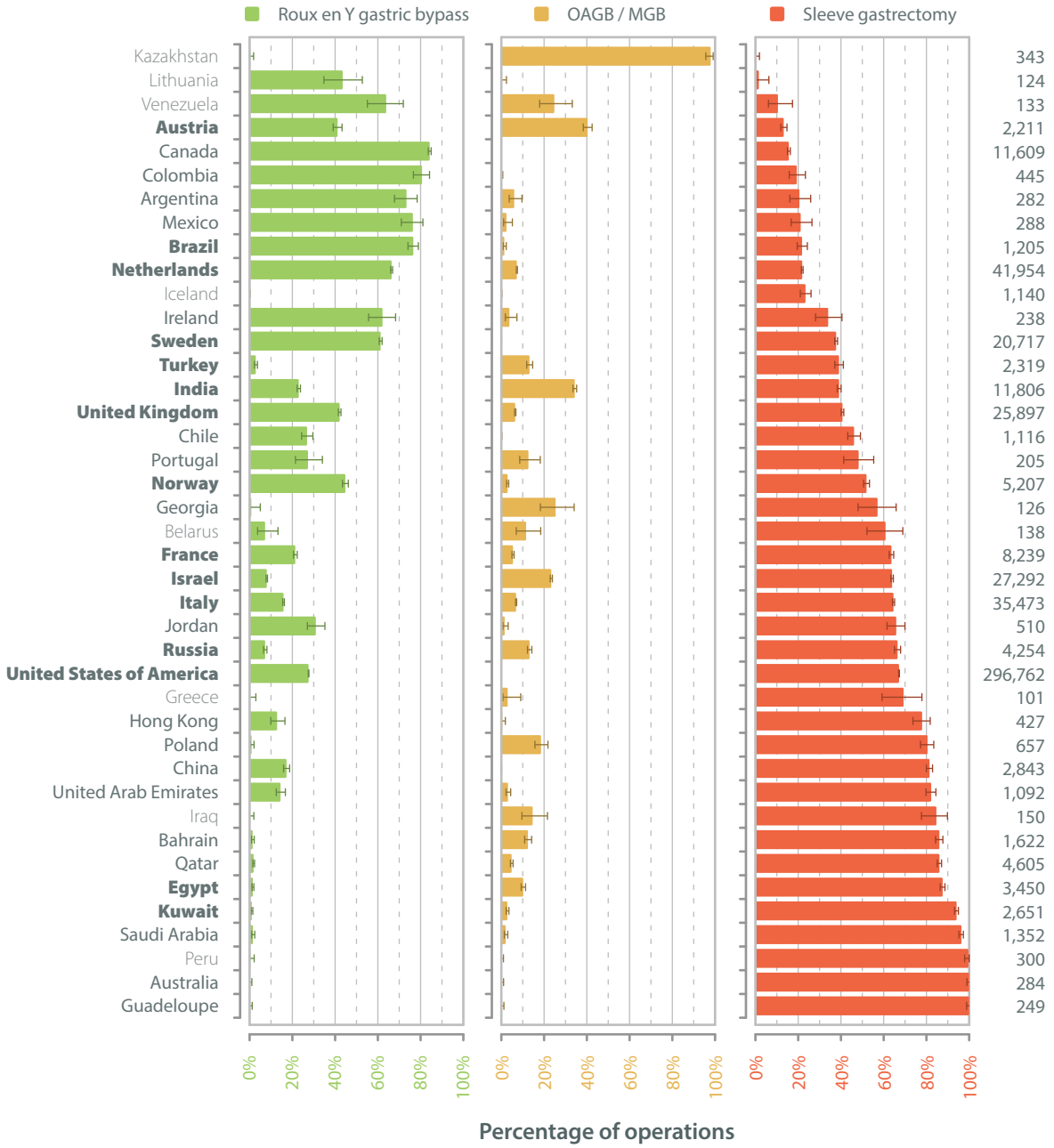
The chart below shows the proportions of the three most common operations *per* country, ordered according to ascending rates of sleeve gastrectomy; the total number of operations *per* country is shown to the right of the chart, and includes **all** kinds of operations performed in the data submission.

Sometimes the total for these three operation types for a given country will add up to less than 100%; the shortfall relates to all the other kinds of operations, as listed in the table opposite.

For example, Iceland reported almost entirely gastric banding and sleeve gastrectomy, with gastric banding predominating by a factor of around 3 to 1. Iceland's calculated rates of Roux en Y gastric bypass and OAGB / MGB are therefore 0.0%, and sleeve gastrectomy comprises 23.4%; the remainder is made up of gastric banding procedures and a handful of *other* procedures.

It is notable that across the board, sleeve gastrectomy predominates in this analysis.

Primary surgery: Type of operation; calendar years 2015-2018 (n=520,854)

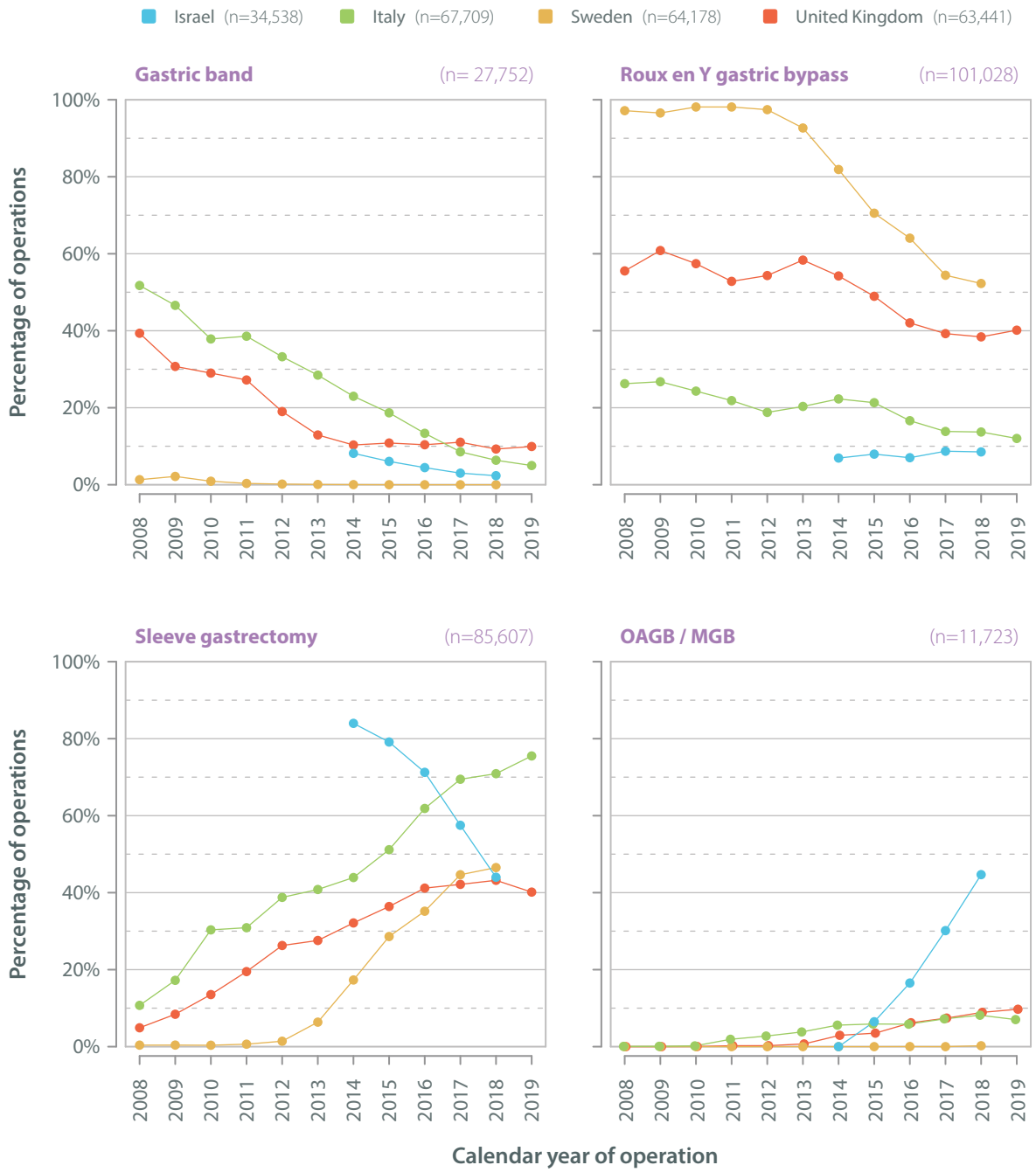


The data here, from four selected national registries, clearly show evolving trends in the kinds of operations being performed over time. The chart on the bottom left-hand side of the page shows an inexorable rise in rates of sleeve gastrectomy, with the one exception being Israel, where there has been a corresponding dramatic increase in OAGB / MGB rates, as shown in the chart on the bottom right-hand side of the page.

Globally, the general trend is for a reduction in the rates of gastric banding and of Roux en Y gastric bypass procedures being performed over the last 11 years. It is clear from the data from Sweden, where operations were traditionally almost exclusively Roux en y gastric bypass, there has been a steady switch towards sleeve gastrectomy. Whether or not these trends will be sustained over future years remains to be seen, but there is a suggestion that the uptake of OAGB / MGB is significantly increasing.

One thing that the IFSO Global Registry will be able to demonstrate in future years is the true global picture of bariatric surgical practice as trends continue to change in each country.

Primary surgery: Changes in the kinds of operations performed over time for four selected contributor countries



Operative approach

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

Over 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. To some extent it is surprising that any open operations are being performed in this current era.

Primary surgery: operative approach; calendar years 2015-2018

Operation	Approach				
	Laparoscopic	Laparoscopic converted to open	Endoscopic	Open	Unspecified
	Counts				
Gastric band	14,626	19	231	23	3,963
Roux en Y gastric bypass	153,773	338	59	805	5,877
OAGB / MGB	18,338	17	3	38	2,767
Sleeve gastrectomy	276,224	161	190	193	23,407
All operations	**471,372**	**603**	**1,817**	**1,646**	**38,174**
	Percentages				
Gastric band	98.2%	0.13%	1.55%	0.15%	
Roux en Y gastric bypass	99.2%	0.22%	0.04%	0.52%	
OAGB / MGB	99.7%	0.09%	0.02%	0.21%	
Sleeve gastrectomy	99.8%	0.06%	0.07%	0.07%	
All operations	**99.1%**	**0.13%**	**0.38%**	**0.35%**	

While it is clear from the submitted data that some of the combinations of operation and approach are not possible (endoscopic gastric banding or endoscopic Roux en Y gastric bypass), it may be that some endoscopic sleeve gastrectomies are mis-reported gastric plication procedures.

Outcomes

Post-operative stay

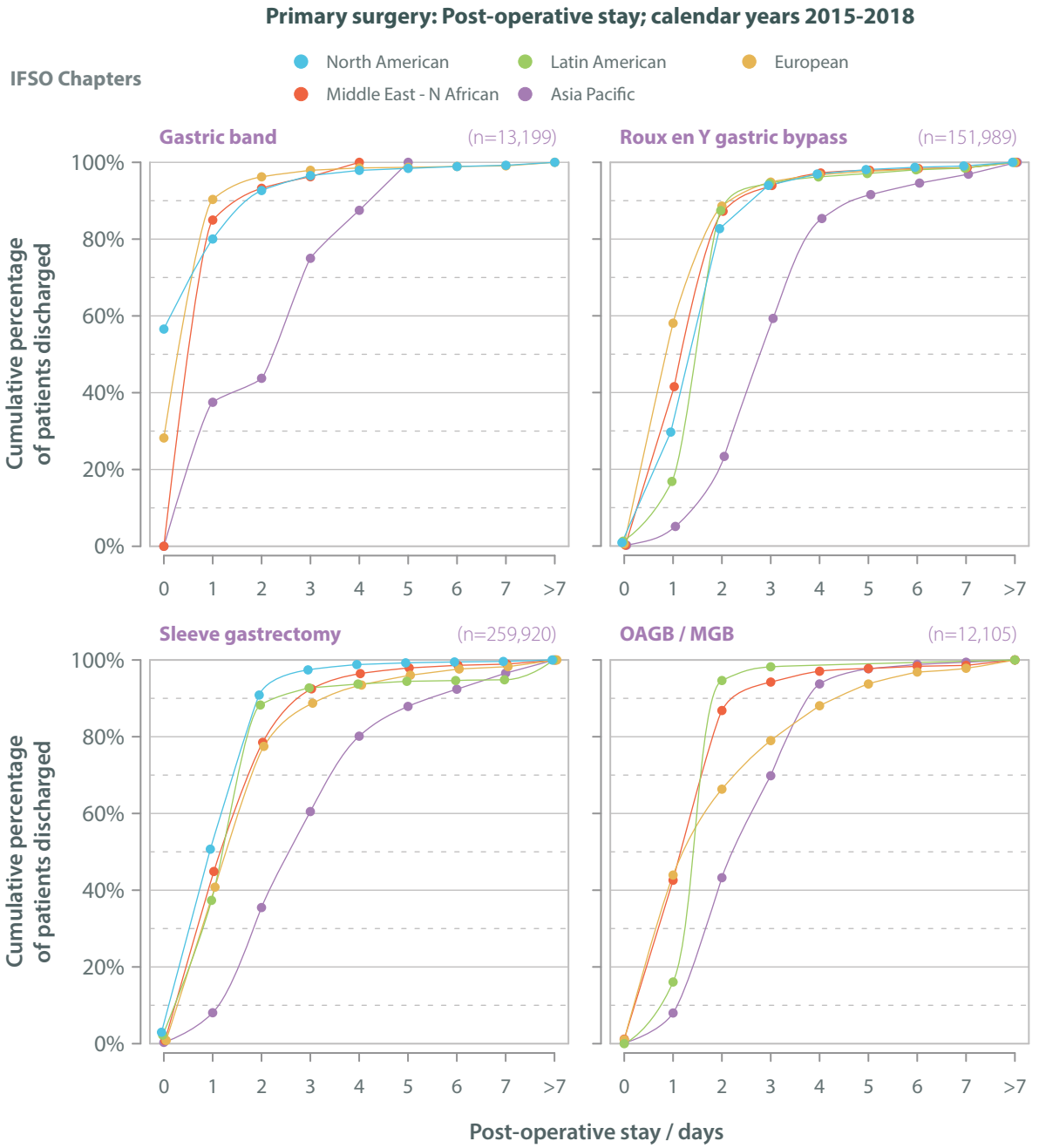
The tables and graphs on these two pages compare post-operative length-of-stay (for all cases recorded, and then by IFSO Chapter) for the four most common operations types recorded in the registry, namely: gastric banding, Roux en Y gastric bypass, one anastomosis gastric bypass (OAGB / MGB) and sleeve gastrectomy.

Primary surgery: post-operative stay for the most frequently-performed operations; calendar years 2015-2018

Operation and IFSO Chapter		Post-operative stay					
		0 days	1 day	2 days	3 days	>3 days	No data
Gastric band	North American	5,481	2,273	1,223	377	335	5
	Latin American	0	0	0	0	0	1
	European	948	2,088	198	57	70	6,033
	Middle East - N African	0	113	11	4	5	14
	Asia Pacific	0	6	1	5	4	3
	IFSO Global Registry	**6,429**	**4,480**	**1,433**	**443**	**414**	**6,056**
Roux en Y gastric bypass	North American	825	26,346	48,536	10,330	5,500	125
	Latin American	14	176	797	80	62	975
	European	310	32,034	17,002	3,478	2,873	9,362
	Middle East - N African	1	178	197	29	26	94
	Asia Pacific	7	156	583	1,149	1,300	68
	IFSO Global Registry	**1,157**	**58,890**	**67,115**	**15,066**	**9,761**	**10,624**
OAGB / MGB	North American	0	0	0	0	0	0
	Latin American	0	9	44	2	1	18
	European	76	3,135	1,636	925	1,536	9,209
	Middle East - N African	10	352	376	63	49	113
	Asia Pacific	6	305	1,372	1,034	1,174	168
	IFSO Global Registry	**92**	**3,801**	**3,428**	**2,024**	**2,760**	**9,508**
Sleeve gastrectomy	North American	5,982	95,984	80,795	13,185	5,205	97
	Latin American	22	347	503	44	72	714
	European	328	15,423	14,167	4,349	4,346	42,566
	Middle East - N African	101	5,428	4,146	1,718	928	1,231
	Asia Pacific	23	529	1,877	1,713	2,705	714
	IFSO Global Registry	**6,456**	**117,711**	**101,488**	**21,009**	**13,256**	**45,322**

These charts present cumulative discharge rates for the 4 most common operations side by side. Notably, the patients in the Asia Pacific Chapter region appear to have greater lengths-of-stay for each type of operation compared to the other chapters.

The actual patterns of length-of-stay for Roux en Y gastric bypass and sleeve gastrectomy are remarkably similar for all chapters other than the Asia Pacific Chapter.



Post-operative stay after Roux en Y gastric bypass

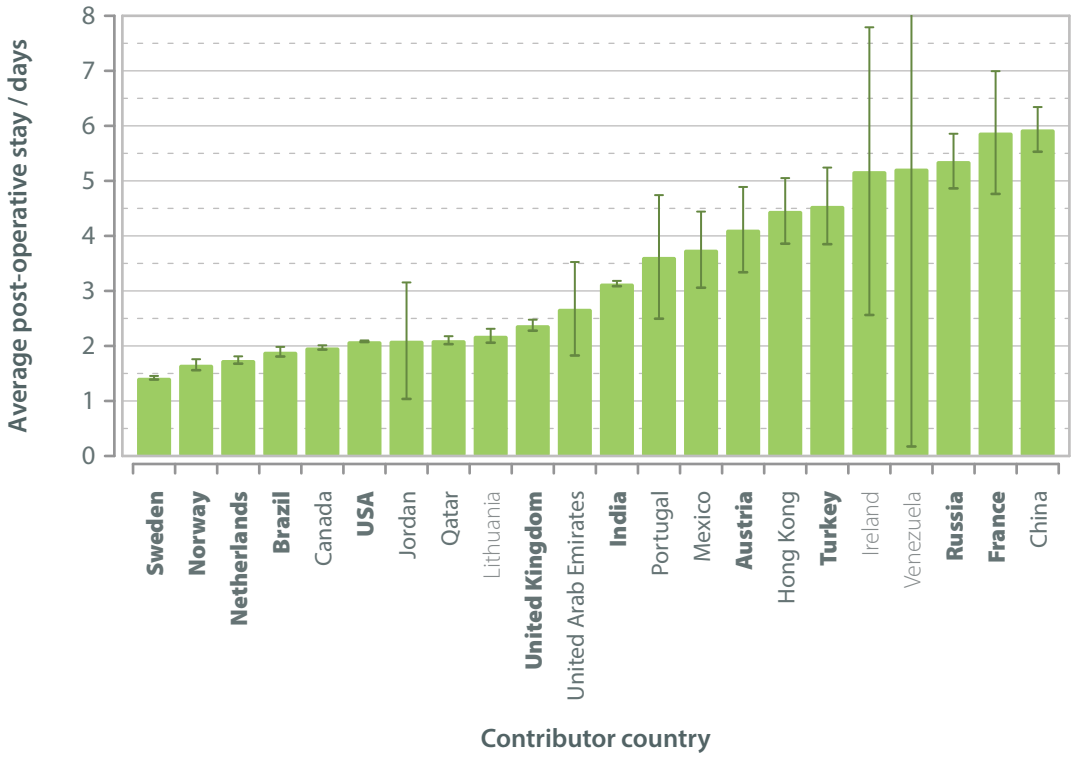
The table below and the charts on the opposite page show the average and median post-operative length-of-stay after Roux en Y gastric bypass for each country where more than 50 records have been submitted; the bars are arranged in ascending order of average stay. There are clear differences between countries.

For instance in Sweden, Norway, the Netherlands and Brazil the average stay is less than 2 days, whereas in some countries the average is more than 5 days.

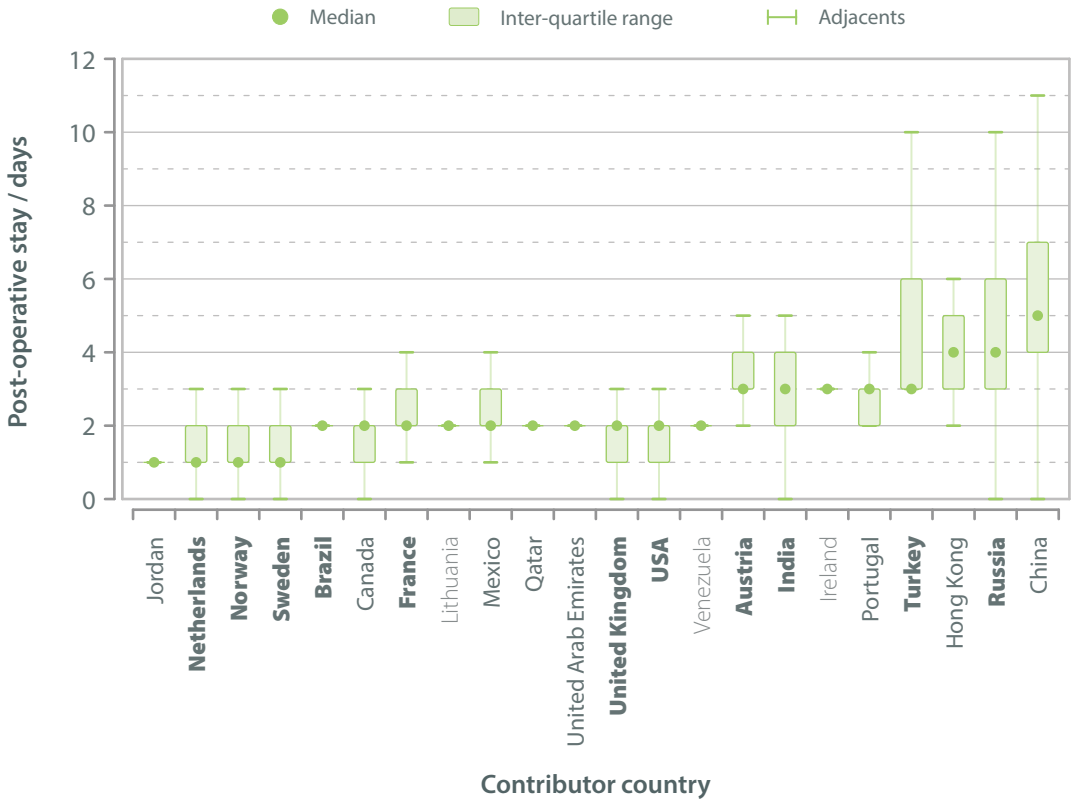
Primary Roux en Y gastric bypass: post-operative stay statistics; calendar years 2015-2018

Contributor country	Post-operative stay statistics		
	Count	Average / days (95% CI)	Median / days (IQR)
Austria	859	**4.1** (3.3-4.9)	**3.0** (3.0-4.0)
Brazil	802	**1.9** (1.8-2.0)	**2.0** (2.0-2.0)
Canada	9,734	**2.0** (1.9-2.0)	**2.0** (1.0-2.0)
China	450	**5.9** (5.5-6.3)	**5.0** (4.0-7.0)
France	1,709	**5.9** (4.8-7.0)	**2.0** (2.0-3.0)
Hong Kong	55	**4.5** (3.9-5.1)	**4.0** (3.0-5.0)
India	2,689	**3.1** (3.1-3.2)	**3.0** (2.0-4.0)
Ireland	147	**5.2** (2.6-7.8)	**3.0** (3.0-3.0)
Jordan	157	**2.1** (1.0-3.2)	**1.0** (1.0-1.0)
Lithuania	54	**2.2** (2.1-2.3)	**2.0** (2.0-2.0)
Mexico	216	**3.8** (3.1-4.4)	**2.0** (2.0-3.0)
Netherlands	27,817	**1.7** (1.7-1.8)	**1.0** (1.0-2.0)
Norway	2,296	**1.7** (1.6-1.8)	**1.0** (1.0-2.0)
Portugal	55	**3.6** (2.5-4.7)	**3.0** (2.0-3.0)
Qatar	86	**2.1** (2.0-2.2)	**2.0** (2.0-2.0)
Russia	264	**5.4** (4.9-5.9)	**4.0** (3.0-6.0)
Sweden	12,216	**1.4** (1.4-1.5)	**1.0** (1.0-2.0)
Turkey	55	**4.5** (3.8-5.2)	**3.0** (3.0-6.0)
United Arab Emirates	74	**2.7** (1.8-3.5)	**2.0** (2.0-2.0)
United Kingdom	10,127	**2.4** (2.3-2.5)	**2.0** (1.0-2.0)
United States of America	81,803	**2.1** (2.1-2.1)	**2.0** (1.0-2.0)
Venezuela	85	**5.2** (0.2-10.3)	**2.0** (2.0-2.0)

Primary Roux en Y gastric bypass: Average post-operative stay with 95% confidence interval; calendar years 2015-2018



Primary Roux en Y gastric bypass: Box and whisker plot for post-operative stay; calendar years 2015-2018



Post-operative stay after sleeve gastrectomy

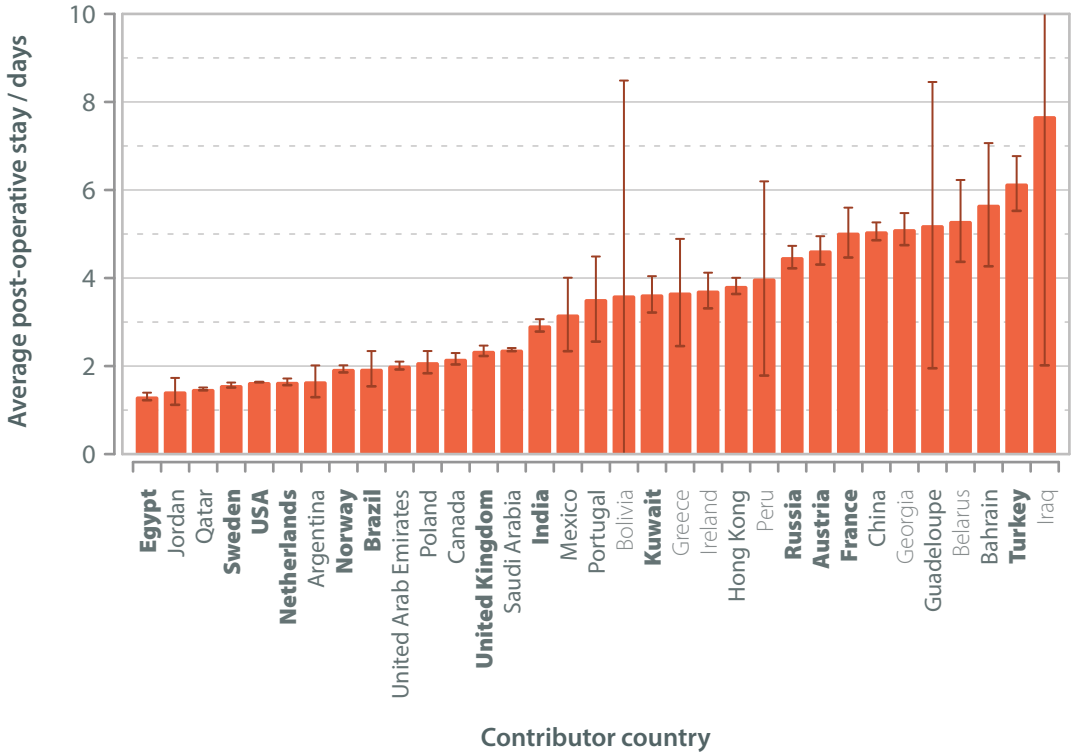
The table below and charts on the facing page now show the average and median post-operative length-of-stay after sleeve gastrectomy for each country where more than 50 records have been submitted, again arranged in order of ascending order of average stay. As with the data on Roux en Y gastric bypass, there are clear differences between countries; there are at least 8 countries where patients have an average post-operative stay of less than 2 days.

At the other end of the scale, 3 countries average over 6 days.

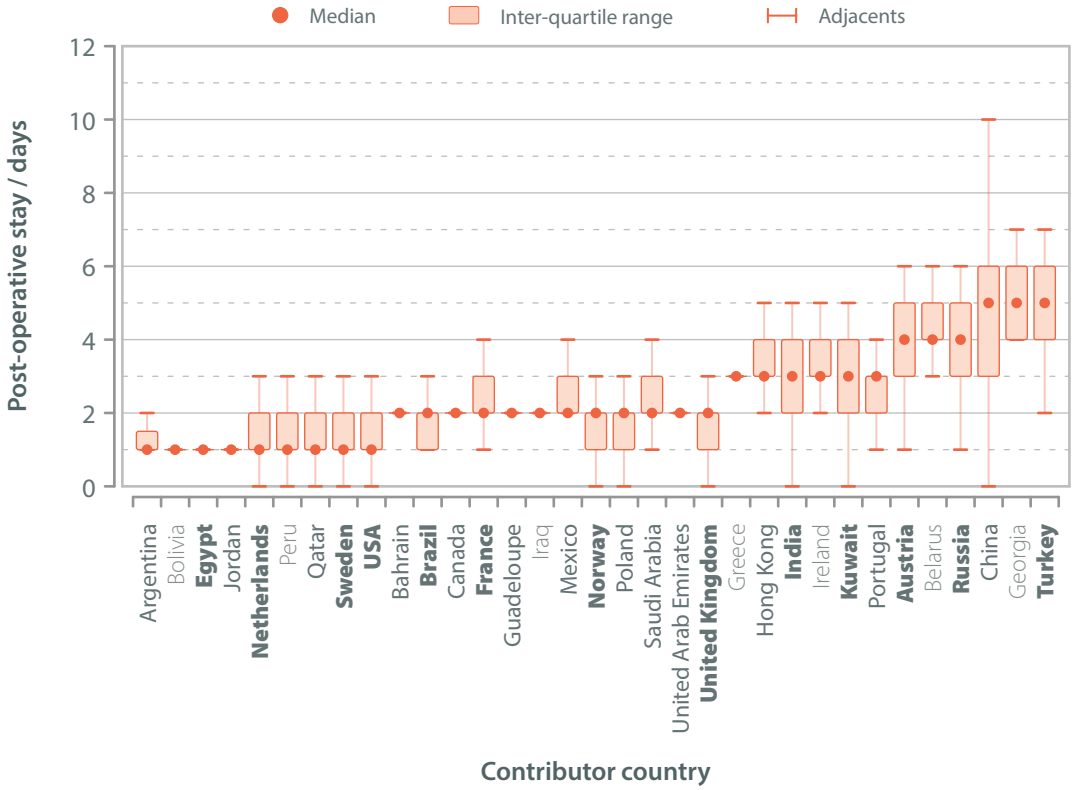
Primary sleeve gastrectomy: post-operative stay statistics; calendar years 2015-2018

Contributor country	Post-operative stay statistics		
	Count	**Average / days** (95% CI)	**Median / days** (IQR)
Argentina	52	**1.7** (1.3-2.0)	**1.0** (1.0-1.5)
Austria	285	**4.6** (4.3-5.0)	**4.0** (3.0-5.0)
Bahrain	1,341	**5.7** (4.3-7.1)	**2.0** (2.0-2.0)
Belarus	84	**5.3** (4.4-6.2)	**4.0** (4.0-5.0)
Bolivia	71	**3.6** (-1.3-8.5)	**1.0** (1.0-1.0)
Brazil	167	**1.9** (1.5-2.3)	**2.0** (1.0-2.0)
Canada	1,805	**2.2** (2.0-2.3)	**2.0** (2.0-2.0)
China	2,045	**5.1** (4.9-5.3)	**5.0** (3.0-6.0)
Egypt	2,413	**1.3** (1.2-1.4)	**1.0** (1.0-1.0)
France	5,122	**5.0** (4.5-5.6)	**2.0** (2.0-3.0)
Georgia	72	**5.1** (4.7-5.5)	**5.0** (4.0-6.0)
Greece	70	**3.7** (2.5-4.9)	**3.0** (3.0-3.0)
Guadeloupe	248	**5.2** (2.0-8.5)	**2.0** (2.0-2.0)
Guatemala	57	**31.0** (17.9-44.1)	**2.0** (2.0-61.0)
Hong Kong	330	**3.8** (3.6-4.0)	**3.0** (3.0-4.0)
India	4,467	**2.9** (2.8-3.1)	**3.0** (2.0-4.0)
Iraq	118	**7.7** (2.0-13.3)	**2.0** (2.0-2.0)
Ireland	81	**3.7** (3.3-4.1)	**3.0** (3.0-4.0)
Jordan	334	**1.4** (1.1-1.7)	**1.0** (1.0-1.0)
Kuwait	2,087	**3.6** (3.2-4.0)	**3.0** (2.0-4.0)
Mexico	58	**3.2** (2.3-4.0)	**2.0** (2.0-3.0)
Netherlands	9,161	**1.6** (1.6-1.7)	**1.0** (1.0-2.0)
Norway	2,658	**1.9** (1.9-2.0)	**2.0** (1.0-2.0)
Peru	298	**4.0** (1.8-6.2)	**1.0** (1.0-2.0)
Poland	528	**2.1** (1.8-2.3)	**2.0** (1.0-2.0)
Portugal	90	**3.5** (2.6-4.5)	**3.0** (2.0-3.0)
Qatar	3,958	**1.5** (1.4-1.5)	**1.0** (1.0-2.0)
Russia	2,445	**4.5** (4.2-4.7)	**4.0** (3.0-5.0)
Saudi Arabia	1,303	**2.4** (2.3-2.4)	**2.0** (2.0-3.0)
Sweden	7,393	**1.6** (1.5-1.6)	**1.0** (1.0-2.0)
Turkey	738	**6.1** (5.5-6.8)	**5.0** (4.0-6.0)
United Arab Emirates	757	**2.0** (1.9-2.1)	**2.0** (2.0-2.0)
United Kingdom	9,842	**2.3** (2.2-2.5)	**2.0** (1.0-2.0)
United States of America	199,346	**1.6** (1.6-1.6)	**1.0** (1.0-2.0)

Primary sleeve gastrectomy: Average post-operative stay with 95% confidence interval; calendar years 2015-2018



Primary sleeve gastrectomy: Box and whisker plot for post-operative stay; calendar years 2015-2018



Availability of one-year follow up data

The table below shows the availability of one-year follow up data for percentage weight loss (the upper half of the table) and treatment for type 2 diabetes (the lower half of the table). We have omitted patients operated in 2018 since not all of these patients were yet eligible for one-year follow up.

All of the patients treated between 2012 and 2017 were eligible for one-year follow up, but not every patient had these data recorded / submitted. The numbers of operations in the calendar years 2015 & 2016 are much higher than in the other years presented in the table below, and this represents the large data submission from the United States of America in these two years. The data from the USA did not include any follow up data, which explains the apparently low rates of one year follow up for these years (just for Roux en Y gastric bypass and sleeve gastrectomy, as the data submission from the United States of America did not include any OAGB / MGB operations).

The rates of one-year follow up seem to be considerably higher for the Roux en Y gastric bypass operations compared to that for the sleeve gastrectomy procedures, and this might be, at least in part, reflect the fact that, in general, follow up reporting is better in those countries in which Roux en Y gastric bypass predominates.

The same general patterns apply for the completeness of one-year follow up data on treatment status for type 2 diabetes, as presented in the second table below.

Primary surgery in the calendar years 2012-2017: availability of one-year follow up data for two parameters

		Operation and availability of weight loss data at one year					
		Roux en Y gastric bypass		OAGB / MGB		Sleeve gastrectomy	
		Operation records	Percent with 1-year data	Operation records	Percent with 1-year data	Operation records	Percent with 1-year data
Calendar year	2012	15,023	59.0%	330	47.3%	7,305	34.2%
	2013	16,042	56.4%	642	29.4%	9,385	30.2%
	2014	19,109	60.1%	1,430	29.4%	19,703	22.5%
	2015	60,681	19.9%	2,378	24.6%	113,364	5.4%
	2016	60,661	19.6%	4,500	23.2%	130,141	6.3%
	2017	20,859	46.6%	6,510	19.3%	28,795	27.9%
	All	**192,375**	**32.8%**	**15,790**	**23.1%**	**308,693**	**10.4%**

		Operation and availability of type 2 diabetes data at one year					
		Roux en Y gastric bypass		OAGB / MGB		Sleeve gastrectomy	
		Operation records	Percent with 1-year data	Operation records	Percent with 1-year data	Operation records	Percent with 1-year data
Calendar year	2012	15,023	44.2%	330	17.6%	7,305	13.6%
	2013	16,042	41.1%	642	4.7%	9,385	11.4%
	2014	19,109	47.8%	1,430	20.5%	19,703	12.3%
	2015	60,681	15.3%	2,378	13.3%	113,364	2.9%
	2016	60,661	15.1%	4,500	14.1%	130,141	3.3%
	2017	20,859	32.6%	6,510	12.1%	28,795	14.7%
	All	**192,375**	**24.8%**	**15,790**	**13.4%**	**308,693**	**5.3%**

One year weight loss

We present weight loss data here as percentage weight loss. Percentage weight loss (%PWL) has been defined as:

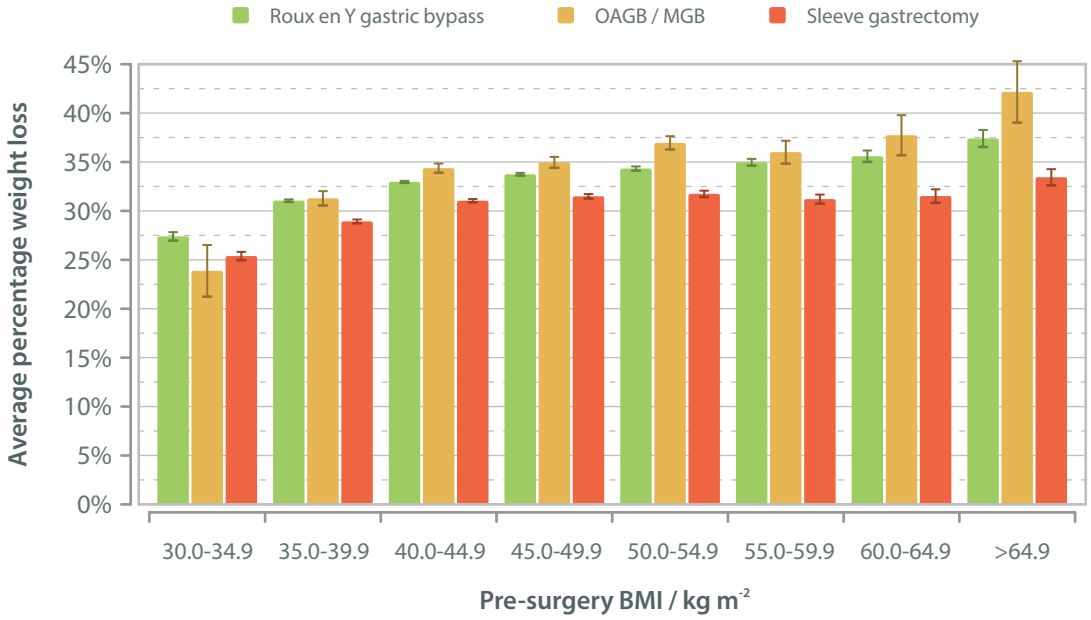
$$\text{Percentage weight loss} = \frac{\text{initial weight (kg)} - \text{current weight (kg)}}{\text{initial weight (kg)}} \times 100\%$$

The table and graph below show percentage weight loss one year after surgery for all patients undergoing primary Roux en Y gastric bypass, OAGB / MGB 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 after Roux en Y gastric bypass or OAGB / MGB is generally greater than for sleeve gastrectomy patients, with the obvious limitation that the follow up data are not complete and therefore may be subject to selection bias.

Primary surgery: average percentage weight loss one year after surgery according to pre-surgery BMI for the most frequently performed operations; surgery in calendar years 2012-2017

Pre-surgery BMI / kg m^{-2}	Average percentage weight loss one year after surgery (with count and 95% confidence interval)		
	Roux en Y gastric bypass	OAGB / MGB	Sleeve gastrectomy
30.0-34.9	**27.4%** (1,560; 27.0-5.9%)	**23.9%** (052; 21.2-25.4%)	**25.4%** (1,458; 25.0-18.0%)
35.0-39.9	**31.1%** (14,814; 30.9-27.8%)	**31.3%** (519; 30.6-26.5%)	**28.9%** (7,481; 28.7-25.8%)
40.0-44.9	**33.0%** (22,825; 32.9-31.2%)	**34.4%** (1,168; 33.9-32.0%)	**31.0%** (10,314; 30.9-29.1%)
45.0-49.9	**33.8%** (12,958; 33.6-33.1%)	**35.0%** (940; 34.4-34.8%)	**31.5%** (6,169; 31.3-31.2%)
50.0-54.9	**34.3%** (6,141; 34.1-33.9%)	**37.0%** (591; 36.3-35.5%)	**31.7%** (3,238; 31.4-31.7%)
55.0-59.9	**35.0%** (2,419; 34.6-34.5%)	**36.0%** (229; 34.8-37.6%)	**31.2%** (1,682; 30.7-32.1%)
60.0-64.9	**35.6%** (898; 35.0-35.3%)	**37.7%** (090; 35.7-37.2%)	**31.5%** (834; 30.8-31.7%)
>64.9	**37.4%** (514; 36.5-36.2%)	**42.2%** (046; 39.0-39.8%)	**33.4%** (668; 32.6-32.2%)

Primary surgery: Percentage weight loss at one year by pre-surgery BMI; operations in calendar years 2012-2017



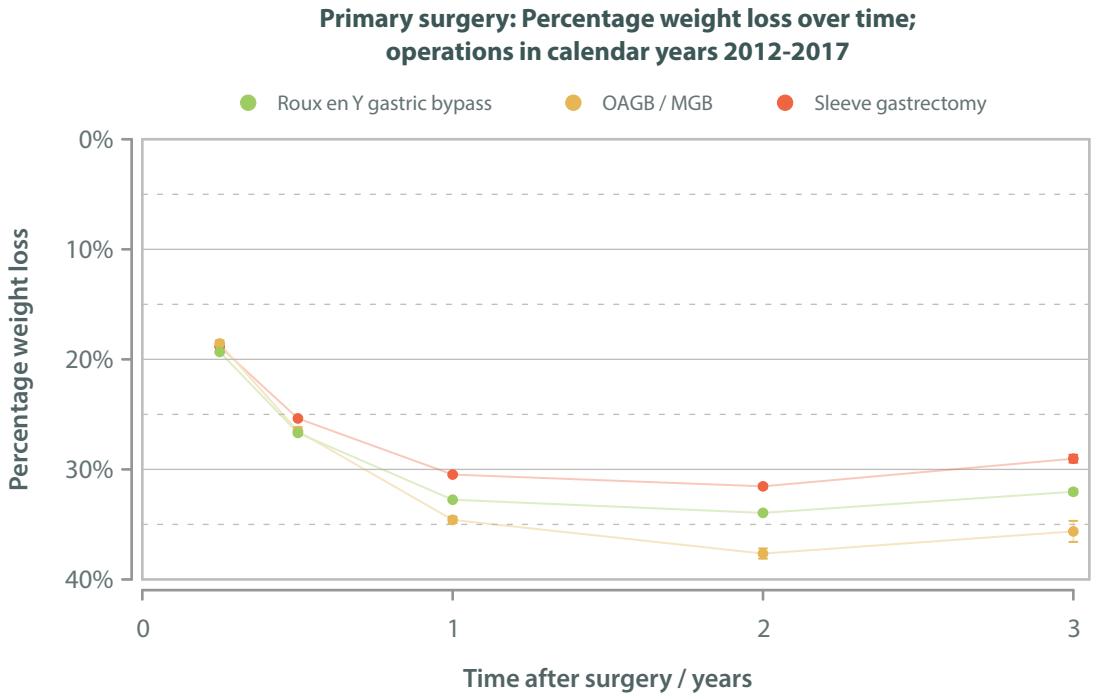
This chart shows, for the very first time in this series of IFSO Global Registry reports, the average percentage weight loss patients experience after the three most common types of operation, plotted at 3-month, 6-month, 1-year, 2-year and 3-year milestones.

While these data are gathered from around the world, it should be noted that follow up reporting rates vary dramatically across the countries that have submitted data, and hence the validity of the longitudinal analysis may be questionable.

Nevertheless, and not surprisingly, the general shapes of these curves are highly similar to those presented elsewhere in national database reports or peer-reviewed publications.

This analysis is presented here in an attempt to show the very beginnings of what would be possible if the registry succeeds in accumulating complete and accurate data at each of these milestones from every country that submits data.

If this were achieved, the simple view of weight loss over time would turn out to be just scratching the surface of what could be gleaned from the IFSO Global Registry, in terms of the similarities and differences in weight loss, not only by procedure type but also for many other sub-groups of patients. For example, the analysis might be repeated according to initial BMI, according to gender, or grouped by any of the other key patient-related data in the registry, such as the patient's age, obesity-related disease status and so on.



Obesity-related disease one year after surgery

The data presented here show the prevalence of obesity-related disease before surgery and 12 months after surgery in patient-groups for which this information was recorded both in the baseline (operation) record and at one year after surgery in the follow up section of the database.

In the 6-year period 2012-2017, there were 192,375 Roux en Y gastric bypass operation records submitted to the registry, along with 308,693 records for sleeve gastrectomy procedures, and 15,790 records for OAGB / MGB.

Notably only a small percentage of these cases include pre-operative and one-year follow up data of the listed obesity-related conditions. Nevertheless, it is striking that there is generally an improvement across-the-board in these conditions after weight loss surgery, with two major exceptions: GERD rates following sleeve gastrectomy and medication usage for musculo-skeletal pain after OAGB / MGB where the pattern apparently reverses.

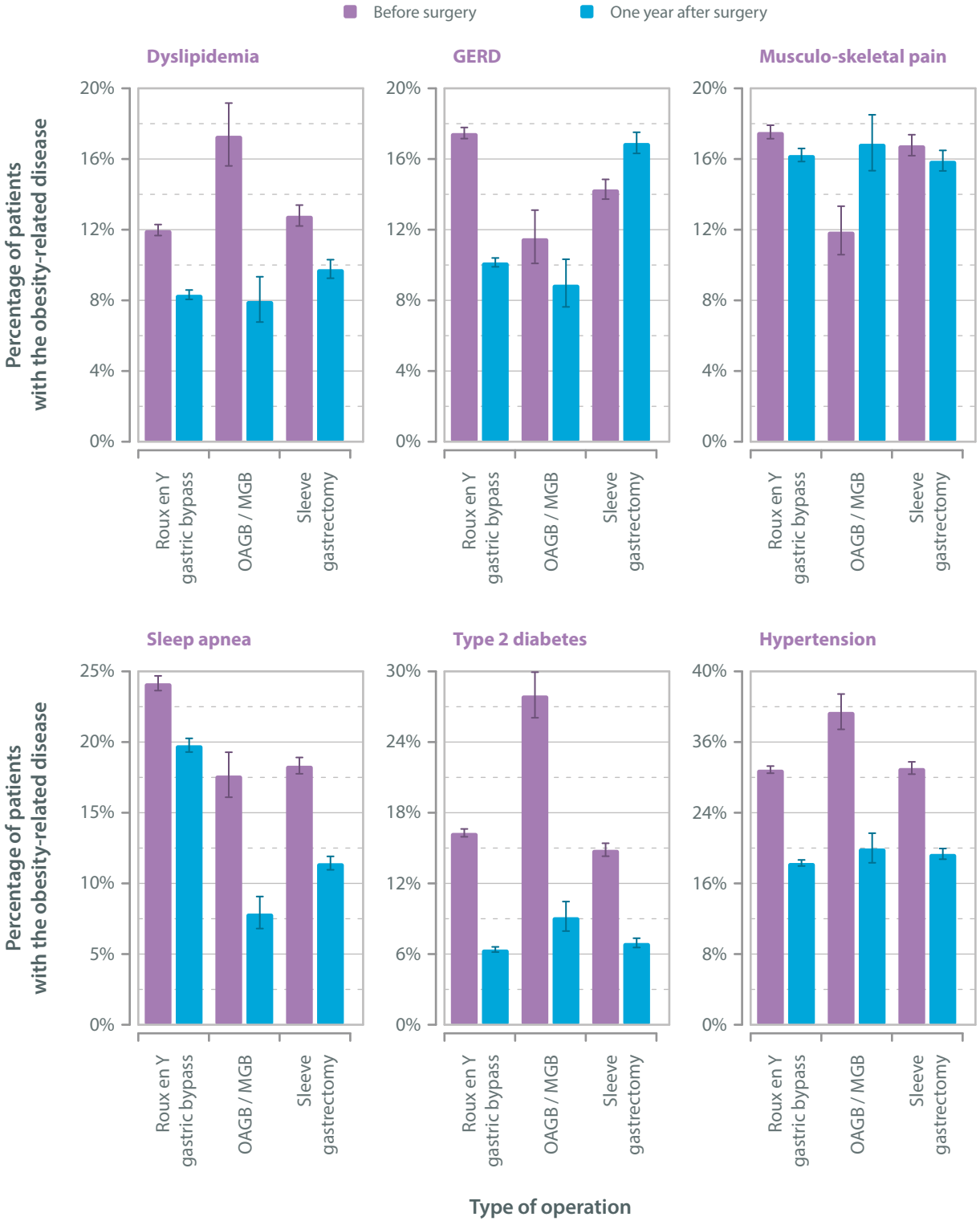
Primary surgery: obesity related disease before and 12 months after surgery; records with complete data at both time-points; surgery in calendar years 2012-2017

Type of operation and obesity-related disease		Before surgery			One year after surgery		
		No	Yes	Rate	No	Yes	Rate
Roux en Y gastric bypass	Type 2 diabetes	39,746	7,733	16.3%	44,447	3,032	6.4%
	Hypertension	34,742	14,104	28.9%	39,902	8,944	18.3%
	Depression	41,752	9,496	18.5%	46,371	4,877	9.5%
	Sleep	19,854	6,324	24.2%	21,002	5,176	19.8%
	GERD	46,564	9,855	17.5%	50,695	5,724	10.1%
	Musculo-skeletal pain	31,625	6,721	17.5%	32,125	6,221	16.2%
	Dyslipidemia	36,951	5,027	12.0%	38,487	3,491	8.3%
OAGB / MGB	Type 2 diabetes	1,523	591	28.0%	1,921	193	9.1%
	Hypertension	1,450	795	35.4%	1,797	448	20.0%
	Depression	94	13	12.1%	98	9	8.4%
	Sleep	1,864	399	17.6%	2,085	178	7.9%
	GERD	1,583	206	11.5%	1,630	159	8.9%
	Musculo-skeletal pain	1,949	263	11.9%	1,839	373	16.9%
	Dyslipidemia	1,485	311	17.3%	1,653	143	8.0%
Sleeve gastrectomy	Type 2 diabetes	13,802	2,407	14.8%	15,084	1,125	6.9%
	Hypertension	11,726	4,803	29.1%	13,333	3,196	19.3%
	Depression	5,594	1,397	20.0%	5,796	1,195	17.1%
	Sleep	14,244	3,196	18.3%	15,447	1,993	11.4%
	GERD	13,081	2,179	14.3%	12,680	2,580	16.9%
	Musculo-skeletal pain	12,836	2,587	16.8%	12,971	2,452	15.9%
	Dyslipidemia	10,843	1,590	12.8%	11,219	1,214	9.8%

Please note that the labels type 2 diabetes, hypertension, depression, musculoskeletal pain and dyslipidemia are short-hand for being on medication for these conditions, not the condition *per se*.

As previously noted, each condition improves one year after surgery for each of the operation types, with two exceptions: GERD appears to worsen after sleeve gastrectomy, and medication rates for musculo-skeletal pain after OAGB / MGB seem to increase. A limitation of these data is the relatively low rates of recorded follow up, which hampers further interpretation.

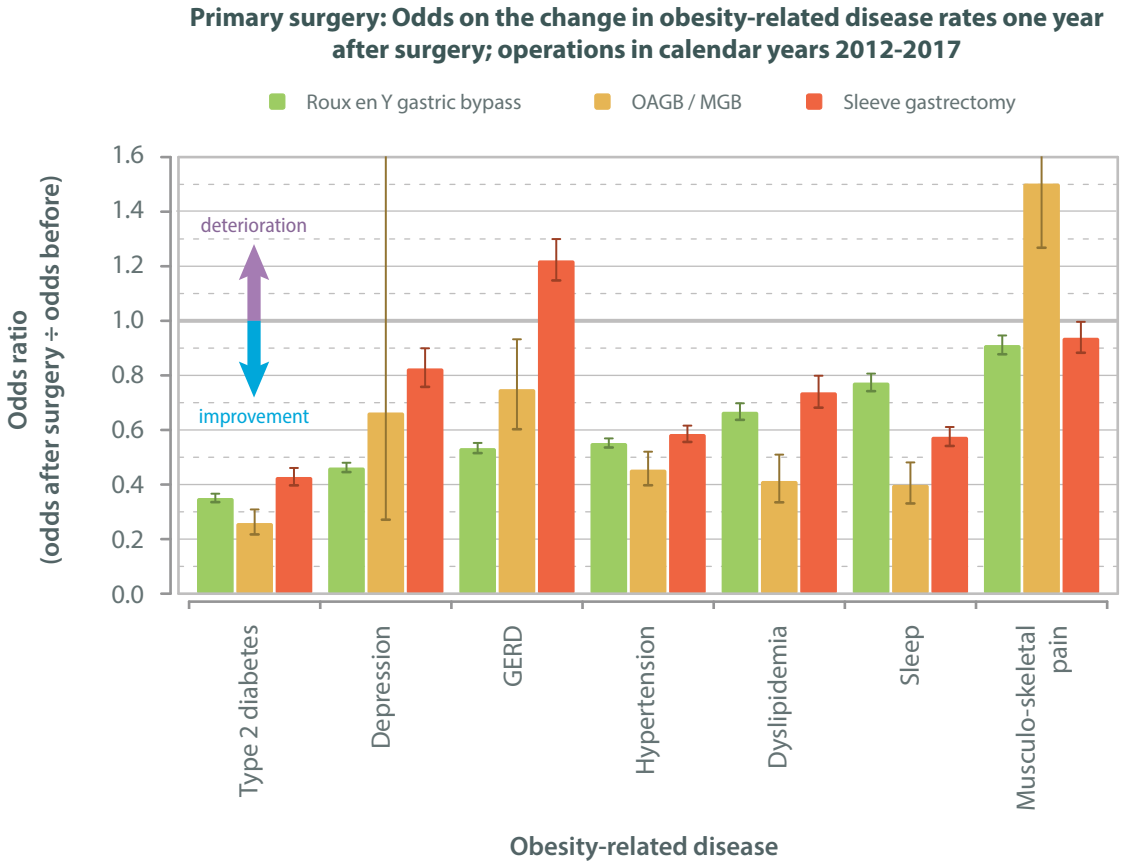
Primary surgery: Obesity-related disease before and one year after surgery; patients with complete data at both time-points; operations in calendar years 2012-2017



The data in the graph below show statistical odds ratios for improvement or deterioration of each obesity-related disease one year after each operation. This chart repeats the message from the table of data on the previous page, that, on the whole, patients see improvement in obesity-related disease rates after their operation.

A secondary important observation is that there are two bars (GERD following sleeve gastrectomy and medication for musculo-skeletal pain following OAGB / MGB) that lie well above the odds ratio line of 1, and the lower confidence limits for these bars are also above this line, suggesting there is a worsening in the rates of these conditions.

Of course, the validity of these observations is limited by the relatively low follow up rates as noted previously.



This information, alongside the data on medium-term to long-term weight loss, is clearly very valuable to patients, especially where they are involved in the process of decision-making around their choice of treatment.

Please note that the labels type 2 diabetes, hypertension, depression, musculoskeletal pain and dyslipidemia are short-hand for being on medication for these conditions, not the condition *per se*.

Type 2 diabetes and weight loss at one year

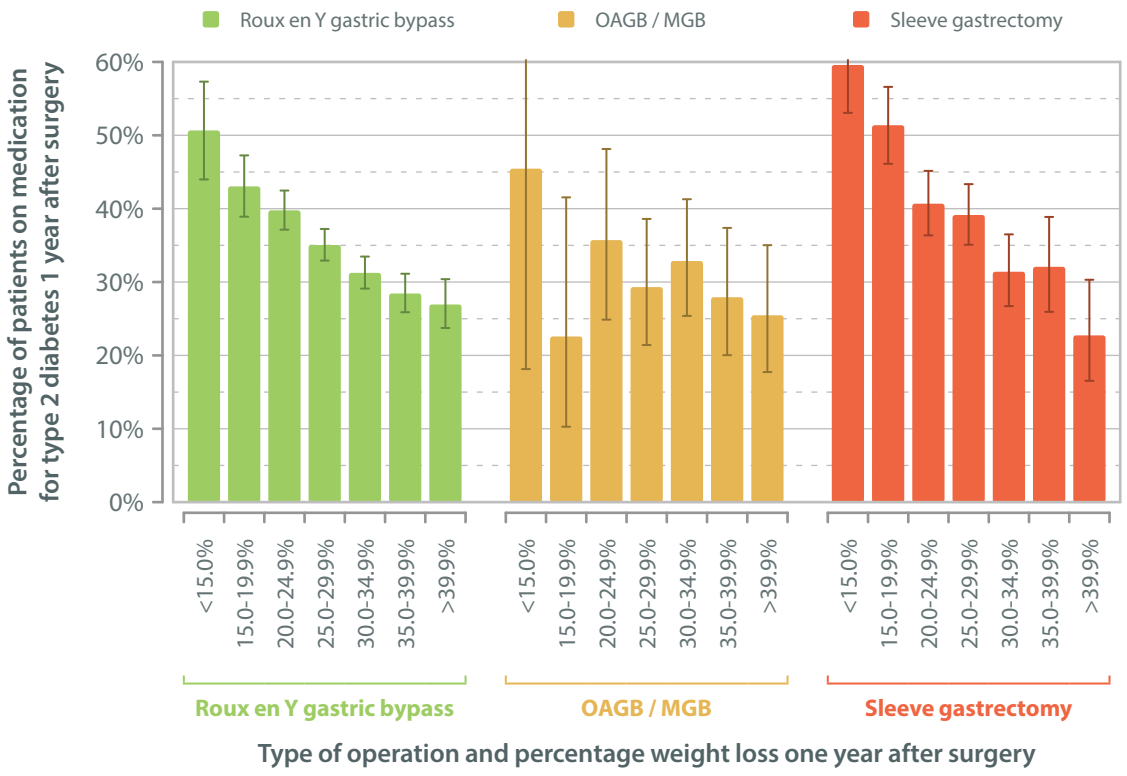
The graph below and the table opposite show the rates of medication for type 2 diabetes at the one-year follow up time-point for patients who were on medication for type 2 diabetes at the time of their primary operation, according to the percentage weight loss at the same follow up time-point.

For the first time we present data for OAGB / MGB as well as for Roux en Y gastric bypass and sleeve gastrectomy.

Greater improvement in diabetes status appears to be associated with greater weight loss; this is certainly the case for Roux en Y gastric bypass and sleeve gastrectomy, where there is a consistent downward trend and the confidence limits are relatively tight; the data for OAGB / MGB are suggestive of a similar trend, but it will need the accumulation of a lot more follow up data after this kind of surgery before the relationship becomes substantiated.

On a cautionary note, it is worth emphasising that interpretation of this information is limited by the incompleteness of the follow up data.

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 2012-2017



Primary surgery for patients on medication for type 2 diabetes pre-operatively: medication for type 2 diabetes one year after surgery; operations in the calendar years 2012-2017

Type of operation and percentage weight loss at one year		Medication for type 2 diabetes one year after surgery				
			No	Yes	Unspecified	Rate
	Roux en Y gastric bypass	<15.0	112	115	38	50.7%
		15.0-19.9	319	241	34	43.0%
		20.0-24.9	801	529	87	39.8%
		25.0-29.9	1,249	674	124	35.0%
		30.0-34.9	1,221	555	127	31.3%
		35.0-39.9	838	333	85	28.4%
		>39.9	518	191	64	26.9%
	OAGB / MGB	<15.0	6	5	6	45.5%
		15.0-19.9	24	7	5	22.6%
		20.0-24.9	45	25	9	35.7%
		25.0-29.9	82	34	15	29.3%
		30.0-34.9	96	47	18	32.9%
		35.0-39.9	80	31	9	27.9%
		>39.9	79	27	14	25.5%
	Sleeve gastrectomy	<15.0	97	143	34	59.6%
		15.0-19.9	177	187	32	51.4%
		20.0-24.9	296	203	57	40.7%
		25.0-29.9	339	218	46	39.1%
		30.0-34.9	249	114	42	31.4%
		35.0-39.9	144	68	21	32.1%
		>39.9	119	35	28	22.7%

Hypertension and weight loss at one year

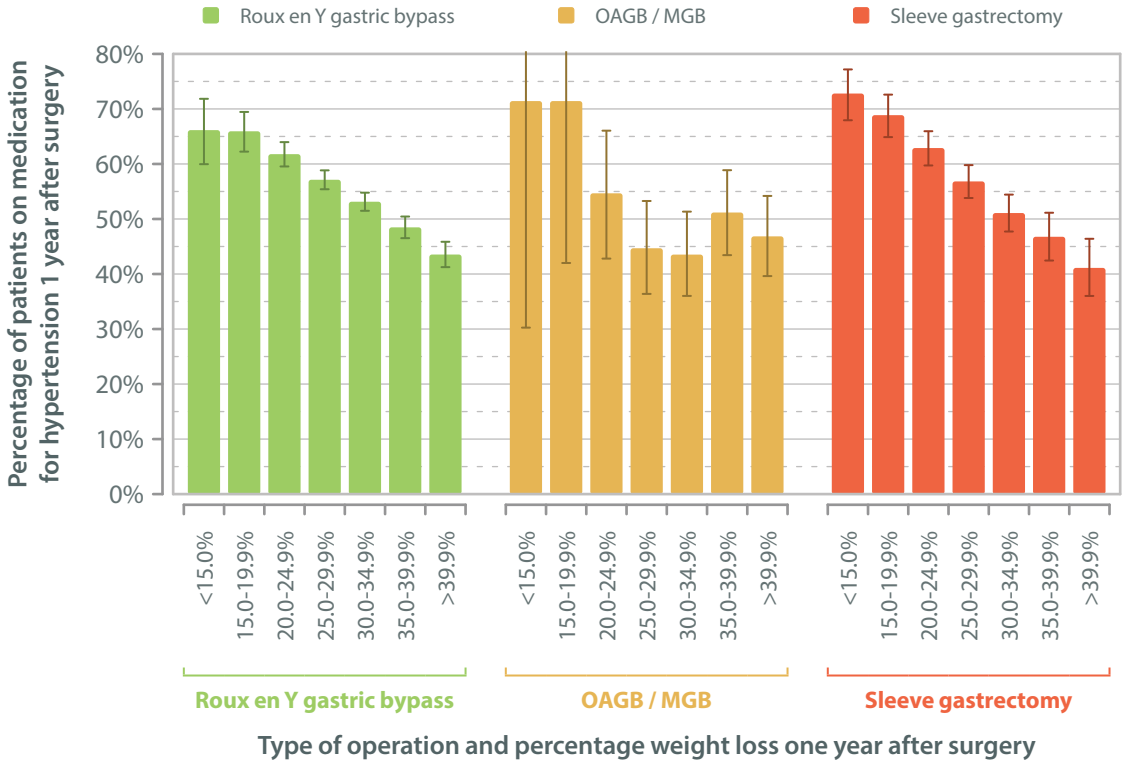
The chart below and the table opposite show the rates of medication for hypertension at the one-year follow up time-point for patients who were recorded as being on medication for hypertension at the time of their primary operation.

For the first time we present data for OAGB / MGB in addition to that for Roux en Y gastric bypass and sleeve gastrectomy.

As with the data on changes in rates of medication for type 2 diabetes, there is an association between medication rates for hypertension and percentage weight loss: greater weight loss correlates with greater reduction in the need for medication.

The relationship looks clear and consistent after Roux en Y gastric bypass and sleeve gastrectomy, whereas the data for patients who had an OAGB / MGB are much less certain. Any association between weight loss and the resolution of obesity-related diseases will need much more longitudinal data for this latter group of patients.

Primary surgery for patients on medication for hypertension pre-operatively: Medication for hypertension one year after surgery; operations in calendar years 2012-2017



Primary surgery for patients on medication for hypertension pre-operatively: medication for hypertension one year after surgery; operations in the calendar years 2012-2017

Type of operation and percentage weight loss at one year		Medication for hypertension one year after surgery				
			No	Yes	Unspecified	Rate
Roux en Y gastric bypass	<15.0		87	170	32	66.1%
	15.0-19.9		234	453	106	65.9%
	20.0-24.9		725	1,172	262	61.8%
	25.0-29.9		1,392	1,855	438	57.1%
	30.0-34.9		1,680	1,905	569	53.1%
	35.0-39.9		1,304	1,227	478	48.5%
	>39.9		1,027	792	430	43.5%
OAGB / MGB	<15.0		2	5	4	71.4%
	15.0-19.9		4	10	1	71.4%
	20.0-24.9		34	41	3	54.7%
	25.0-29.9		78	63	9	44.7%
	30.0-34.9		96	74	19	43.5%
	35.0-39.9		83	87	17	51.2%
	>39.9		101	89	12	46.8%
Sleeve gastrectomy	<15.0		102	273	46	72.8%
	15.0-19.9		179	396	64	68.9%
	20.0-24.9		354	600	127	62.9%
	25.0-29.9		468	616	142	56.8%
	30.0-34.9		430	449	180	51.1%
	35.0-39.9		280	246	75	46.8%
	>39.9		212	148	78	41.1%

Appendix

Contributor hospitals by country

Argentina

- Hospital Dr Cosme Argerich, Buenos Aires
- Hospital Universitario Austral, Buenos Aires
- Institutional Hospital Neuqèn Provincial Hospital, Neuqèun
- Nuevo Hospital San Roque, Cordoba
- Sanatori Güemes, Buenos Aires

Australia

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

Austria

Österreichische Gesellschaft für Adipositaschirurgie

- Allgemeines Krankenhaus der Stadt Wien, Universitätskliniken, Wien
- Bezirkskrankenhaus St Johann in Tirol, St Johann in Tirol
- Klinikum Klagenfurt KABEG, Klagenfurt
- Klinikum Wels-Grieskirchen, Wels
- Krankenhaus der Barmherzigen Brüder, Salzburg
- Krankenhaus der Barmherzigen Schwestern, Wien
- Krankenhaus der Elisabethinen, Graz
- Krankenhaus Göttlicher Heiland, Wien
- Krankenhaus Hietzing, Wien
- Landesklinikum Hollabrunn
- Landeskrankenhaus Villach KABEG, Villach
- Landeskrankenhaus Wolfsberg KABEG, Wolfsberg
- Ordensklinikum Linz, Linz
- Universitätsklinik für Kinder- und Jugendchirurgie, Salzburg

Bahrain

- King Hamad University Hospital, Al Sayh
- Bahrain Defence Force Royal Medical Service

Belarus

- The 9th City Hospital, Minsk

Belgium

Belgian Society of Obesity & Metabolic Surgery

- AZ Jan Palfijn, Gent
- AZ Klina, Brasschaat
- AZ Sint-Blasius, Dendermonde
- AZ Sint-Lucas, Gent
- Centre Hôspitalier de l'Ardenne , Libramont-Chevigny
- Centre Hôspitalier EpiCura, Hornu
- Centre Hôspitalier Régional de Huy
- Centre Hôspitalier Régional de la Citadelle, Liege
- Centre Hôspitalier Régional Mons-Hainaut, Bergen
- Centre Hôspitalier Régional Verviers, Luik
- Centre Hôspitalier Universitaire de Charleroi
- Clinique Saint-Pierre, Ottignies
- Clinique Sainte-Anne Saint-Remi
- Cliniques Universitaires Saint-Luc, UCL
- Hasselt Jessa Ziekenhuis, Hasselt
- Hôpital Erasme, Bruxelles
- Sint-Dimpna Ziekenhuis Geel
- Sint-Franciscus Ziekenhuis, Limburg, Flanders
- The Obesitas Center, Cavell
- ZNA Antwerpen

Bolivia

- Clínica Los Olivos, Cochabamba

Brazil

Sociedade Brasileira de Cirurgia Bariátrica e Metabólica

- Albert Einstein Sociedade Beneficente Israelita Brasileira
- Clinica Sugisawa - PR
- Fàbio Viegas Institute, Botafogo, Rio de Janeiro
- Hospital Beneficência Portuguesa de São Paulo
- Hospital Beneficência Portuguesa SJRP
- Hospital BP Mirante, São Paulo
- Hospital Hope, Recife
- Hospital Jayme da Fonte, Recife
- Hospital Marcelino Champagnat – PR
- Hospital Meridional, Cariacica
- Hospital Nove de Julho, São Paulo
- Hospital Ophir Loyola, Belém, Pará
- Hospital Oswaldo Cruz Almeão, São Paulo
- Hospital Oswaldo Cruz Vergueiro, São Paulo
- Hospital Porto Dias, Porto Dias
- Hospital SAHA, São Paulo
- Hospital Santa Cruz - PR
- Hospital Santa Joana, Recife
- Hospital Santa Rita, São Paulo
- Hospital São Camilo, São Paulo
- Hospital São Luiz, Jabaquara Unit, Sao Paulo
- Hospital São Luiz Unidade Itaim, São Paulo
- Hospital Sírio-Libanês, São Paulo
- Hospital Unimed, Recife
- Hospital Vitória, São Paulo
- Real Hospital Português de Beneficência, Recife
- Santa Casa de Misericórdia de São José do Rio Preto
- University Hospital, Recife

Bulgaria

- Alexandrovska University Hospital
- Hospital Vita, Sophia

Canada

- Guelph General Hospital, Guelph, Ontario
- Health Sciences North, Sudbury, Ontario
- Hotel-Dieu Grace Healthcare, Windsor, Ontario
- Humber River Hospital, Toronto, Ontario
- Hôpital du Sacré-Coeur de Montréal, Quebec
- Kingston Health Sciences (Hotel Dieu Hospital), Kingston, Ontario
- London Health Sciences Centre, London, Ontario
- St Joseph's Healthcare Hamilton, Hamilton, Ontario
- The Ottawa Hospital, Ottawa, Ontario
- Thunder Bay Regional Health Sciences Centre, Thunderbay, Ontario
- Toronto Western Hospital - University Health Network, Toronto, Ontario

Chile

- Center for the Treatment of Obesity and Metabolic Diseases, Pontificia Universidad Catolica de Chile, Santiago
- Centro Clinico de La Obesidad, Santiago
- Hospital Dipreca, Santiago

China

- Affiliated First Hospital of Hunan Traditional Chinese Medical College
- Beijing Friendship Hospital, Capital Medical University
- Beijing Shijitan Hospital, China Capital Medical University
- Beijing Tiantan Hospital, Capital Medical University
- China-Japan Union Hospital of Jilin University
- East Hospital, Tongi University School of Medicine
- First affiliated hospital of Nanjing Medical University
- Henan Provincial People's Hospital
- Hospital Affiliated Xuzhou Medical University
- Jiahe Surgical Hospital, Changchun
- Pekig Union Medical College Hospital, Beijing
- Shanghai 10th People's Hospital, Tongji University School of Medicine
- Shanxi Dayi Hospital
- Tangshan Gongren Hospital, Hebei Medical University
- The Affililiated Drum Tower Hospital of Nanjing University Medical School
- The First Affiliated Hospital of Jinan University
- The First Affiliated Hospital of Xian Jiaotong University
- The First Hospital of Harbin
- The Second Hospital of Hebei Medical University
- The Second People Hospital of Xinxiang Henan Province
- Tianjin Medical University General Hospital
- Tianjin Nankai Hospital
- Zibo Central Hospital Shandong

Colombia

- Centro Médico Imbanaco, Cali
- Clinica La Colina, Bogotá
- Clínica del Country, Bogotá
- Clínica Esensa, Cali
- Clínica La Colina, Bogotá
- Clínica Nuestra Señora de los Remedios, Cali
- Clínica Reina Sofía, Bogotá
- Clínica SOMA, Medellin
- Fundación Santa Fé de Bogotá

Czech Republic

- OB Klinika Mediczech, Prague

Egypt

- Ain Shams University Bariatric Unit, Cairo
- Air Force Specialised Hospital, Cairo
- Al Asema Hospital, Giza
- Alexandria Specialized Hospital, Alexandria
- Al Hayah Hospital
- Al Hyatt Palace Hospital, Heliopolis
- Al Kemma Hospital, Mansoura
- Al Safwa Hospital, Cairo
- Al Tayseer International Hospital, Zagazig
- Alzohar Hospital, Cairo
- Cairo University Hospital, Kasr Al Ainy
- Dar Elhekma Hospital, Cairo
- Dr Yousry Gohar Hospital, Cairo
- El Asema Hospital, Cairo
- El Ekbal Hospital, Alexandria
- El Eman Complex Hospital, Mansoura
- El Khair Hospital, Mansoura
- El Madina El Dawly Hospital, Alexandria
- El Nahar Specialized Hospital, Cairo
- El Safa Hospital, Dumyatt
- El Salam Hospital, Giza
- El Sherouk Hospital, Glim, Alexandria
- El Zohour Hospital, Giza
- Esthetica Hospital, Giza
- Global Care Hospital, Cairo
- Golf Hospital, Cairo
- Ibn Sina Specialized Hospital, Tanta
- Louran Hospital, Alexandria
- Maadi Clinic, Cairo
- Madina Hospital, Alexandria
- Mansoura Military Hospital, Cairo
- Mansoura University Hospital
- Misr International Hospital, Cairo
- Mothercare Clinical Hospital, Cairo
- Mowash Hospital, Alexandria
- New Dumyatt Military Hospital, Dumyatt
- Om El-Masryeen Hospital, Cairo
- Queens Royal Hospital, Cairo
- Rofayda Health Park Hospital, Cairo
- Royal Hospital, Cairo
- Sama Smoha, Alexandria
- The Coptic Hospital, Cairo
- The Woman Hospital, Cairo
- Tiba Royal Hospital, Sohag
- Zamzam Hospital, Alexandria

France

- Central Hospitalier Universitaire de Nantes
- Centre Hospitalier Bretagne Atlantique de Vannes
- Centre Hospitalier de Cambrai
- Centre Hospitalier de Denain
- Centre Hospitalier de Mont St Martin
- Centre Hospitalier de Saint Denis
- Centre Hospitalier de Salon de Provence
- Centre Hospitalier de Sens
- Centre Hospitalier d'Arcachon
- Centre Hospitalier Intercommunal de Creteil
- Centre Hospitalier Marie Madeleine, Forbach
- Centre Hospitalier Privè Saint Grègoire, Rennes
- Centre Hospitalier Privè Sainte Marie, Osny
- Centre Hospitalier Universitaire de Nîmes
- Centre Hospitalier, Le Mans
- Centre Medico-Chirurgical du Mans
- Clinique Ambroise Parè, Beuvry
- Clinique Axium, Aix-en-Provence
- Clinique Chirurgicale de Martigues
- Clinique Claude Bernard, Ermont
- Clinique Conti, l'Isle Adam
- Clinique de la Sauvegarde, Lyon
- Clinique de l'Abbaye Fecamp
- Clinique de l'Anjou, Angers
- Clinique de l'Estree, Stains
- Clinique de l'Europe, Rouen
- Clinique de l'Yvette, Longjumeau
- Clinique des Cèdres, Blagnac
- Clinique des Landes, Mont de Marsan
- Clinique du Mail, La Rochelle
- Clinique du Parc Lyon
- Clinique Geoffroy Saint Hilaire, Paris
- Clinique Gènèrale, Annecy
- Clinique Internationale du Parc Monceau, Paris
- Clinique Jules Verne, Nantes
- Clinique Les Orchidèes, La Réunion
- Clinique Mutualiste Bénigne Joly, Dijon
- Clinique Mutualiste de l'Estuaire, Saint Nazaire
- Clinique Mutualiste Saint Etienne
- Clinique Rhéna de Strasbourg
- Clinique Saint Charles, La Roche-sur-Yon
- Clinique Saint George, Nice
- Clinique Saint Hilaire Rouen
- Clinique Saint Michel, Toulon
- Clinique Tivoli-Ducos, Bordeaux
- Clinique Turin, Paris
- Elsan Pole Santé Sud, Le Mans
- Grand Hôpital de l'Est Francilien, Marne la Vallée
- Hôpital de la Conception, Marseille
- Hôpital Edouard Herriot, Lyon
- Hôpital Européen Georges-Pompidou, Paris
- Hôpital Privé Claude Galien, Quincy-sous-Senart
- Hôpital Privé de l'Est Lyonnais, Saint Pries
- Hôpital Privé de l'Estuaire, Le Havre
- Hôpital Privé Dijon Bourgogne
- Hôpital Privé Jean Mermoz, Lyon
- Hôpital Privé La Louviére, Lille
- Hôpital Privé Médipôle de Savoie, Challes les Eaux
- Hôpital Privé Toulon Hyères Saint Jean, Toulon
- Hôpitaux Civils de Colmar
- Institut Arnault Tzanck, Saint-Laurent-du-Var
- Polyclinique de Bordeaux-Tondu
- Polyclinique de Gentilly, Nancy
- Polyclinique de Keraudren, Brest
- Polyclinique de Limoges
- Polyclinique de l'Atlantique, Saint-Herblain
- Polyclinique du Beaujolais, Amas
- Polyclinique du Parc Rambot, Aix-en-Provence
- Polyclinique du Pays de Rance, Dinan
- Polyclinique du Val de Saone, Mâcon
- Polyclinique Jean Villar, Bruges
- Polyclinique la Residence Maymard, Bastia
- Polyclinique Lyon-Nord, Rillieux-la-Pape
- Polyclinique Reims-Bezannes
- Polyclinique Saint Côme, Compiègne
- Polyclinique Sainte-Marguerite, Auxerre
- Pôle de Santé du Villeneuvois, Villeneuve-sur-Lot
- Centre Hospitalier Universitaire de Lille
- Centre Hospitalier Universitaire de Nice
- Centre Hospitalier Universitaire deNancy

Georgia

- Caraps Medline, Tbilisi
- Health House, Tbilisi
- Innova Medical Center, Tbilisi
- Tbilisi Central Hospital, Tbilisi
- JSCK Eristavi National Center of Experimental and Clinical Surgery, Tbilisi

Germany

- Adipositaszentrum Nordhessen, Kassel
- Marienkrankenhaus Kassel Chirurgische Klinik

Greece

- Evangelismos General Hospital, Athens

Guadeloupe

- Clinique des Eaux Claires

Guatemala

- Centro de Tratamiento Intergral del Metabolism y la Obesidad, New Life Center, Guatemala City

Hong Kong

- Prince of Wales Hospital, Shatin
- The University of Hong Kong
- United Christian Hospital, Kowloon
- Yan Chai Hospital

Hungary

- Duna Medical Center, Budapest

Iceland

- Domus Medica, Reykjavik

India

Obesity Surgery Society of India

- Apollo Hospital, Chennai
- Apollo Hospital, Indraprastha, New Delhi
- Apollo Hospital, Kakinada
- Apollo Hospital, Mumbai
- Apollo Spectra Hospitals, Mumbai
- Asian Bariatrics, Ahmedabad
- Asian Bariatrics, Hyderabad
- Asian Institute of Gastroenterology, Hyderabad
- Aster CMI Hospital, Bangalore
- A V Da'Costa Hospital, Goa
- 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 Kuni
- Fortis Hospital, Shalimar Bagh
- GEM Hospitals, Coimbatore
- Gunasheela Surgical & Maternity Hospital, Bangalore
- Hindija Healthcare Speciality, Mumbai
- ILS Hospital, Kolkata

India continued ...

- Jammu Hospital, Jalandhar
- Jeewan Mala Hospital, New Delhi
- Kokilaben Dhirubhai Hospitals, Mumbai
- Kular Hospital, Ludhiana
- Lilavati Hospital, Mumbai
- LivLife Hospitals, Hyderbad
- Manipal Hospitals, New Delhi
- Max Hospital, Shalimarbagh, New Delhi
- Max Super Speciality Hospital, Saket, New Delhi
- Mohak Hitech Specialty Hospital, Indore
- National Hospital, Mumbai
- KD Hospital, Ahmedabad
- Kirloskar Hospital, Hyderbad
- 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

Iraq

- Al-Imamein Al-Kadhimiyain Medical City, Baghdad

Ireland

- Bon Secours Hospital, Cork
- St Vincent's University Hospital, Dublin

Israel

The Israel National Bariatric Surgery Registry

- Assaf Harofeh Medical Center
- Assuta Medical Center, Ashdod
- Assuta Medical Center, Tel Aviv
- Assuta Medical Center Haifa
- Assuta Medical Center Rishon Lezion
- Assuta Medical Centers Beer-Sheva
- 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
- Laniado Hospital, Nentanya
- Mayanei Hayeshua Medical Center, Bnei Brak
- Meir Medical Center
- Merav Medical Center
- Rabin Medical Center – Belinson & Hasharon Hospitals
- Rambam Health Care Campus
- Sanz Medical Center-Laniado Hospital
- 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, Tel Aviv
- Ziv Medical Center, Safed

Italy

Società Italiana di Chirurgia dell'Obesità e delle malattie metaboliche

- Azienda Ospedaliera ASST Setteleghi-Ospedale di Circolo Varese
- Azienda Ospedaliera Brotzu, Cagliari
- Azienda Ospedaliera Garibaldi, Catania
- Azienda Ospedaliera Luigi Sacco, Milano
- Azienda Ospedaliera Regionale San Carlo, Vila d'Agri, Marsicovetere
- Azienda Ospedaliera San Giovanni Addolorata, Roma
- Azienda Ospedaliera Santa Maria di Terni
- Azienda Ospedaliera Sant'Anna Como
- Azienda Ospedaliera Universitaria Gaetano Martino, Messina
- Azienda Ospedaliera Universitaria San Giovanni di Dio e Ruggi d'Aragona, Salerno
- Azienda Ospedaliera Universitaria Senese, Siena
- Azienda Ospedaliero di Rilievo Nazionale Ospedale dei colli, Napoli
- Azienda Ospedaliero Universitaria Ospedali Riuniti - Ospedale Di Cattinara, Trieste
- Azienda Sanitaria Universitaria Integrata di Udine
- Azienda Socio Sanitaria Territoriale del Garda, Desenzano del Garda
- Azienda Unità Sanitaria Locale di Bologna
- Casa di Cuar Privata, Morciano di Romagna
- Casa di Cura Accreditata Policlinico di Monza
- Casa di Cura Candela SpA, Palermo
- Casa di Cura Città di Parma,
- Casa di Cura Macchiarella SpA Palermo
- Casa di Cura Montanari, Morciano di Romagna
- Casa di Cura Policilinio Multimedica, Sesto San Giovanni
- Casa di Cura Privata Salus SpA, Battipaglia
- Casa di Cura Privata San Lorenzino Spa, Cesena
- Casa di Cura Privata Villa Serena, Citta San Angelo
- Casa di Cura Prof Petrucciani, Lecce
- Casa di Cura Tricarico Rosano srl, Belvedere Marittimo
- Centro Chirurgia Obesita' Ospedale San Jacopo Pistoia
- Centro per il trattamento della Grande Obesità dell'Ospedale di Bolzano
- Centro per la Cura dell'Obesità - EO Ospedali Galliera, Genova
- Chirurgia Apparato Digerente SUN Seconda Università Napoli
- Chirurgia del Paziente Obeso, Dipartimento P Stefanini, Roma
- Chirurgia Generale e Trapianto di Fegato DETO, Bari
- Chirurgica Leonardo, Sovigliana-Vinci
- Clinica Sanatrix, Napoli
- Fatebenefratelli Milano
- Fondazione IRCCS Ca' Granda, Milano
- Fondazione IRCCS Policlinico San Matteo Pavia, Pavia
- Fondazione Poliambulanza, Brescia
- Fondazione Salus, Avezzano
- Fornaca di Sessant, Torino
- Humanitas Gavazzeni di Bergamo
- Humanitas San Pio X, Milano
- INCO Istituto Nazionale per la Cura dell'Obesità, Milano
- IRCCS Cà Granda Ospedale Maggiore Policlinico di Milano

Italy continued ...

- Istituti Clinici Zucchi di Monza
- Istituto Clinico Beato Matteo, Vigevano
- Istituto Clinico Città Studi, Milano
- Istituto Clinico Humanitas, Rozzano
- Istituto Clinico San Rocco, Ome Brescia
- Istituto Clinico Sant'Anna, Brescia
- l'Istituto di Cura Città di Pavia,
- Madonna della Salute di Porto Viro
- Malatesta Novello, Cesena
- Marrelli Hospital di Marrelli Health srl, Crotone
- Nuovo Ospedale San Agostino-Estense, Baggiovara
- Ospedale Bambino Gesu', Palidoro, Roma
- Ospedale Belcolle di Viterbo
- Ospedale Buccheri La Ferla, Palermo
- Ospedale Buon Consiglio Fatebenefratelli, Napoli
- Ospedale Civico Partinico-Asp Palermo
- Ospedale Civile San Andrea, La Spezia
- Ospedale Civile San Timoteo, Termoli
- Ospedale del Mare, Napoli
- Ospedale Desio
- Ospedale di Dolo Venezia
- Ospedale Evangelico Betania, Napoli
- Ospedale Giovanni Paolo II
- Ospedale Guglielmo da Saliceto, Piacenza
- Ospedale Maggiore di Parma
- Ospedale Maggiore Verona
- Ospedale Niguarda Milano
- Ospedale Regionale San Bortolo di Vicenza
- Ospedale Regionale Umberto Parini, Aosta
- Ospedale San Carlo Borromeo, Milano
- Ospedale San Gerardo, Monza
- Ospedale San Giovanni Decollato Andosilla
- Ospedale San Giovanni di Dio, Gorizia
- Ospedale San Pellegrino, Castiglione delle Stiviere
- Ospedale San Pietro Fatebenefratelli, Roma
- Ospedale San Raffaele, Milano
- Ospedale San Tommaso dei Battuti, Portogruaro
- Ospedale San Valentino, Montebelluna
- Ospedale Sandro Pertini, Roma
- Ospedale Santa Chiara APSS, Trento
- Ospedale Santa Corona, Pietra Liguere
- Ospedale SS Filippo e Nicola, Avezzano
- Ospedali Riuniti Ancona, Torrette, Ancona
- Ospedaliero Santa Maria Nuova, Firenze
- Pavia Ospedale di Mortara
- Pineta Grande Hospital, Castel Volturno
- PO Edoardo Bassini, Cinisello Balsamo
- Policlinico Madonna della Consolazione, Reggio Calabria
- Policlinico Ospedale San Martino, Genova
- Policlinico San Marco di Osio Sotto
- Policlinico San Orsola Malpighi, Bologna
- Policlinico San Pietro, Ponte San Pietro
- Policlinico Universitario Agostino Gemelli, Roma
- Policlinico Universitario Campus Biomedico, Roma
- Policlinico Universitario di Padova
- Policlinico Universitario Paulo Giaccone Palermo
- Presidio Ospedaliero di Foligno
- Presidio Ospedaliero di Venere, Bari
- Presidio Ospedaliero Magenta, Abbiategrasso
- Presidio Ospedaliero San Giovanni Bosco, Napoli
- Presidio Ospedaliero San Maria della Pietà, Casoria
- Santa Maria degli Angeli, Pordenone
- Seconda Università di Napoli
- Seconda Università Federico II, Napoli
- Stella Maris srl San Benedetto del Tronto
- Unità Operativa Complessa Chirurgia, Roma
- Universita degli Studi di Napoli
- Università degli Studi di Milano
- Università degli Studi di Napoli Federico II, Napoli
- Università degli Studi di Roma
- Università Degli Studi di Roma Tor Vergata
- Università degli Studi di Torino, Toringo
- Università di Pisa
- Università la Sapienza - Segreteria Polo Pontino, Latina
- UOSC Chirurgia Generale ad Indirizzo Endocrinologico, Napoli
- Villa delle Querce, Napoli
- Villa Lucia Hospital, Conversano

Japan

Japanese Society for the Study of Obesity

- Chibune General Hospital
- 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, University of Osaka
- 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
- Kakogawa Central City Hospital
- Kansai Medical University Hospital
- Kusatsu General Hospital
- Minami Osaka Hospital
- Morioka Munincipal Hospital
- Ohama Daiichi Hospital
- Okazaki City Hospital
- Takeda General Hospital
- The Hospital of Hyogo College of Medicine
- Tochigi Medical Center, Shimotsuga
- Tohoku University Graduate School of Medicine, Department of Surgery
- Toho University Sakura Medical Center
- Tokyo Metropolitan Tama Medical Center
- Yotsuya Medical Cube

Jordan

- Dr Hamzeh Halawani Clinic for Bariatric, Endoscopic and Robotic Surgery, Amman
- Gastrointestinal Bariatric & Metabolic Center, Jordan Hospital, Amman
- SGBC, Dr Osama Hamed, Amman

Kazakhstan

- Astana Medical University

Kingdom of Saudi Arabia

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

Kuwait

- Al-Amiri Hospital, Kuwait City
- Al Salam International Hospital, Kuwait City
- Farwaniya Hospital, Kuwait City
- Jahra Hospital, Al Jahra
- Mubarak Al-Kabeer Hospital, Kuwait City
- Sabah Hospital, Kuwait City

Lebanon

- Khoory Hospital, Beirut

Libya

- Misurata Medical Center

Lithuania

- Lithuanian University of Health Sciences Hospital, Kanaus

Mexico

- Centro Médico ABC, Mexico City
- Centro Médico de Colima
- Group Hospitales Star Médica
- Grupo Hospitales Angeles
- Instituto Nacional de Ciencias Médicas y Nutricion, Mexico City
- My New Life Obesity Center

Netherlands

DATO
DUTCH AUDIT FOR TREATMENT OF OBESITY

Dutch Audit for Treatment of Obesity

- Albert Schweitzer Ziekenhuis, Dordrecht
- Bariatrisch Centrum Zuid-West Nederland, Bergen op Zoom
- Catharina Ziekenhuis, Eindhoven
- Centrum Obesitas Noord-Nederland / MCL, Leeuwarden
- Elisabeth-TweeSteden Ziekenhuis, Tilburg
- Flevo Ziekenhuis, Almere
- Franciscus Gasthuis & Vlietland, Rotterdam
- Groene Hart Ziekenhuis, Gouda (Nederlandse Obesitas Kliniek West)
- Haaglanden Medisch Centrum, Den Haag (Nederlandse Obesitas Kliniek West)
- Maasstad Ziekenhuis, Rotterdam
- Maxima Medisch Centrum, Eindhoven / Veldhoven
- Obesitas Centrum Amsterdam / OLVG, Amsterdam
- RKZ Obesitascentrum / Rode Kruis Ziekenhuis, Beverwijk
- Spaarne Gasthuis, Hoofddorp
- St. Antonius Ziekenhuis, Nieuwegein
- Vitalys / Rijnstate Ziekenhuis, Arnhem
- Ziekenhuisgroep Twente (ZGT), Hengelo
- ZorgSaam Ziekenhuis, Terneuzen
- Zuyderland Medisch Centrum, Heerlen (Nederlandse Obesitas Kliniek Zuid)

Norway

- Ålesund Hospital, Ålesund
- Bærum Hospital, Bærum
- Førde Hospital, Førde
- Haugesund Hospital, Haugesund
- Haugesund Private Hospital, Haugesund
- Ibsen Hospital, Gjøvik
- Innlandet Hospital, Gjøvik
- Namsos Hospital, Namsos
- Nordland Hospital, Bodø
- Oslo University Hospital, Oslo
- St Olavs Hospital, Trondheim
- Stavanger University Hospital, Stravanger
- Sørlandet Hospital, Arendal
- Vestfold Hospital, Tønsberg
- Volvat Medical Centre, Bergen
- Volvat Medical Centre, Oslo
- Voss Hospital, Voss

Oman

- Royal Hospital of Oman, Muscat

Pakistan

- Pakistan Institute for Medical Sciences, Islamabad

Panama

- Cirugia General y Laparoscopica Avanzada
- Hospital Punta Pacifica, Panama City

Peru

- Clinica de dia Avendana, Lima

Poland

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

Portugal

- Hospital Curry Cabral, Lisbon
- Hospital Distrital de Santarém
- Centro Hospitalar de Setúbal, EPE

Qatar

- Al Emadi Hospital, Doha
- Hamad General Hospital, Hamad Medical Corporation, Doha

Russia

Russian National Bariatric Surgery Registry

- Clinic of Endoscopic & Minimal Invasive Surgery, Stavropol State Medical University, Stavropol
- 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 No 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
- Non-State Public Health Institution "Railway clinical hospital on station Samara" of JSC Russian Railways
- Pavlov First Saint Petersburg State Medical University, St Petersburg
- Regional Clinical Hospital No 2, Krasnodar
- Regional Clinical Hospital, Khanty-Mansiysk
- Republic Clinical Hospital, Grozny
- Samara Regional Hospital, Samara
- State Clinical Hospital of First Aid No 2, Omsk
- State Clinical Hospital, South Regional Medical Center of Federal Medical Biological Agency, Rostov-on-Don
- State Hospital of First Aid, Ufa State Hospital No 5, Nizhny Novgorod
- State Regional Clinical Hospital, Ryazan
- The Center of Endosurgery and Lithotripsy (CELT-clinic), 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

South Africa

- Netcare Waterfall City Hospital, Midrand

South Korea

- Chung-Ang University Hospital, Seoul
- Daejeon Wellness Hospital
- Hanyang University Medical Center, Seoul
- Keimyung University Dongsan Medical Center
- Korea University Anam Hospital
- Korea University Guro Hospital
- Kyungpook National University Chilgok Hospital
- The Catholic University of Korea, Incheon St Mary's Hospital
- The Catholic University of Korea, Seoul St Mary's Hospital
- The Catholic University of Korea, St Vincent's Hospital

Spain

- Hospital Clinico San Carlos, Universidad Complutense de Madrid
- Hospital de Torrevieja, Alicante
- Hospital Germans Trias i Pujol, Barcelona

Sweden

Scandinavian Obesity Surgery Registry

- Aleris Motala
- Aleris Skane
- Axcess Medica Simrishamn
- Bariatric Center Skane
- Bariatric Center Sophiahemmet
- Blekinge Hospital
- Boras Hospital
- Capio St Goran Hospital
- Carlanderska Hospital
- Centrum for titthalskirurgi
- Danderyd Hospital
- Eksjo Hospital
- Ersta Hospital
- Falun Hospital
- Gavle Hospital
- Hudiksvall Hospital
- Kalmar Hospital
- Ljungby Hospital
- Lund University Hospital
- Lycksele Hospital
- Mora Hospital
- Norrkoping Hospital
- Norrtalje Hospital
- Nykoping Hospital
- Orebro/Lindesberg University Hospital
- Osterlenkirurgin Simrishamn
- Ostersund Hospital
- Sahlgrenska University Hospital
- Skovde Hospital
- Sodersjukhuset Hospital
- Sodertalje Hospital
- Sunderbyn Hospital
- Sundsvall Hospital
- Torsby Hospital
- Trollhattan Hospital
- Uppsala University Hospital
- Varberg Hospital
- Varnamo Hospital
- Vasteras Hospital
- Vastervik Hospital
- Vastra Frolunda Hospital
- Vaxjo Hospital

Switzerland

- Hirslanden Klinik, Bern
- Hôpital Riviera-Chablais, Aigle

Taiwan

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

Turkey

ULUSAL OBEZİTE VERİTABANI

Turkish National Obesity Database

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

Ukraine

- Bogomolets National Medical University, Department of General Surgery #2 Kyiv
- Shalimov National Institute of Surgery and Transplantology, Kyiv
- State Scientific Institution Center for Innovative Medical Technologies of the National Academy of Sciences
- Surgical Clinic Garvis, Dnipro

United Arab Emirates

- Bariatric & Metabolic Institute, Abu Dhabi
- Healthpoint Hospital, Abu Dhabi
- Mediclinic Dubai Mall
- NMC Specialty Hospital, Dubai
- Seha Emirates Hospital, Abu Dhabi
- Sheikh Khalifa Medical City, Abu Dhabi

United Kingdom

NBSR NATIONAL BARIATRIC SURGERY REGISTRY

The UK National Bariatric Surgery Registry

- Aberdeen Royal Infirmary
- 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 Blackheath Hospital, London
- 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 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

United Kingdom continued ...

- Claremont Hospital, Sheffield
- Countess of Chester Hospital
- Cromwell Hospital, London
- Darlington Memorial Hospital
- Derriford Hospital, Plymouth
- Dewsbury & District Hospital, West Yorkshire
- Dolan Park Hospital, Birmingham
- 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
- Kent Institute of Medicine & Surgery, Maidstone
- King Edward VII's Hospital, London
- King's College Hospital, London
- Kingsbridge Hospital, Belfast
- Lanarkshire University Hospital
- Leeds General Infirmary
- 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
- North Tyneside General Hospital, North Shields
- Nuffield Health Leeds Hospital
- 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 Leicester 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 Hospital York
- Nuffield Hospital, Wolverhampton
- One Ashford Hospital, Ashford
- Orpington Treatment Centre
- Park Hill Hospital, Doncaster
- Parkside Hospital, London
- Poole Hospital, Dorset
- Princess Elizabeth Hospital, Guernsey
- Princess Royal Hospital, Telford
- Princess Royal University Hospital, Orpington
- Queen Alexandra Hospital, Portsmouth
- Queen Elizabeth University Hospital, Glasgow
- 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
- Sheffield Children's Hospital
- South Tees University Hospitals, Middlesbrough
- Southampton General Hospital
- Southmead Hospital, Bristol
- Spingfield Hospital, Chelmsford
- Spire Bristol Hospital
- Spire Bushey Hospital, Watford
- Spire Cardiff Hospital
- Spire Cheshire Hospital
- Spire Clare Park Hospital, Farnham
- Spire Dunedin Hospital, Reading
- Spire Elland Hospital, West Yorkshire
- Spire Fylde Coast Hospital, Blackpool
- Spire Gatwick Park Hospital, Horley
- Spire Harpenden Hospital
- Spire Hartswood Hospital, Brentwood, Essex
- Spire Hull & East Riding Hospital, Anlaby
- Spire Leeds Hospital
- Spire Leicester Hospital
- Spire Little Aston Hospital, Sutton Coldfield
- Spire Manchester Hospital
- Spire Montefiore, Hove

United Kingdom continued ...

- Spire Murrayfield Hospital Wirral
- Spire Murrayfield Hospital, Edinburgh
- Spire Norwich Hospital
- Spire Parkway Hospital, Solihull
- Spire Portsmouth Hospital
- Spire Regency Hospital, Macclesfield
- Spire Roding Hospital, Redbridge
- Spire South Bank Hospital, Worcester
- Spire Southampton Hospital
- Spire Thames Valley Hospital, Slough
- Spire Washington Hospital, Tyne & Wear
- Spire Wellesley Hospital, Southend-on-Sea
- 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
- St Peter's Hospital, Chertsey
- St Richard's Hospital, Chichester
- St Thomas's Hospital, London
- Stobbhill Hospital, Glasgow
- 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 Aintree
- University Hospital Coventry
- University Hospital of North Staffordshire
- University Hospital of North Tees, Stockton-on-Tees
- University Hospital, Ayr
- University Hospital, Lewisham
- Walsall Manor Hospital
- Wansbeck Hospital
- Wellington Hospital, London
- Whittington Hospital, London
- Worcestershire Royal Hospital
- York Hospital
- Yorkshire Surgicentre, Rotherham

United States of America

- Fresno Heart & Surgical Hospital, California

  Hospital and clinics contributor names for the uploaded data from the AMSBS registry have not been provided, but their contribution is highly valued

Uzbekistan

- First Clinica of Tashkent

Venezuela

- Sagrada Familia Hospital Maracaibo

The database form

International Federation for the Surgery of Obesity and metabolic disorders

IFSO Global Registry

Baseline section; Page 18; Version **5.0** (**7 Nov 2018**)

Basic demographic data

All baseline data refer to the condition of the patient when they were originally diagnosed. The titles of mandatory questions are highlighted in **pink**.

Unique patient identifier	
Date of birth	dd / mm / yyyy
Gender	○ Male ○ Female ○ Unknown

Baseline data

Basic patient details

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 apnoea	○ No ○ Yes
Dyslipidaemia on medication	○ No ○ Yes
GERD / GORD	○ No ○ Yes

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IFSO GLOBAL REGISTRY

Appendix

International Federation for the Surgery of Obesity and metabolic disorders

IFSO Global Registry

Baseline section; Page 19; Version **5.0** (**7 Nov 2018**)

Unique patient identifier	
Date of operation	dd / mm / yyyy

Surgery

Date of operation	dd / mm / yyyy
Weight at surgery	kg
Has the patient had bariatric surgery before	○ No ○ Yes
Operative approach	○ Laparoscopic ○ Endoscopic ○ Lap converted to open ○ Open
Type of operation	○ Gastric band ○ Duodenal switch ○ Roux en Y gastric bypass ○ Duodenal switch with sleeve ○ OAGB / MGB ○ Bilio-pancreatic diversion ○ Sleeve gastrectomy ○ Other
Banded procedure	○ No ○ Yes
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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IFSO GLOBAL REGISTRY

International Federation for the Surgery of Obesity and metabolic disorders

IFSO Global Registry

Follow up section; Page 20; Version **5.0** (**7 Nov 2018**)

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
Increased risk of DVT or PE	○ No	○ Yes
Musculo-skeletal pain on medication	○ No	○ Yes
Confirmed sleep apnoea	○ No	○ Yes
Dyslipidaemia on medication	○ No	○ Yes
GERD / GORD	○ No	○ Yes
Clinical evidence of malnutrition	○ No	○ Yes
Patient status	○ Alive	○ Deceased

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IFSO GLOBAL REGISTRY

The Fifth IFSO Global Registry Report 2019

This is the fifth 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).

We believe that this Registry initiative is an important part of the IFSO global response to the adiposity epidemic, and we would like to encourage all our members and national societies to actively participate and join us in the next edition. If we don't make our numbers known, we simply don't exist!

Almino Ramos

This fifth edition of the IFSO Global registry will be a landmark publication with the highest number of cases performed around the world. … it is the purpose of the IFSO Global Registry to try to work towards providing the most credible and transparent information available on bariatric and metabolic surgery within our international federation.

Lilian Kow

The IFSO Global Registry has achieved an enormous amount already. We are now poised to learn from this experience and move forward to provide not only the most accurate data available, but also support those Societies seeking to start their own Registry.

Wendy Brown

Special credit must go to all those surgeons who have committed their data for inclusion in this fifth report, your contribution is very much appreciated. We intend in the future for the Registry data to become an increasingly authoritative reference work as metabolic and bariatric surgeons worldwide strive to increase the availability of this powerful tool to potential patients.

Richard Welbourn

This year we have thought carefully about the future role of the IFSO international registry as it rapidly expands. Researchers naturally want a focus on quality research and scientific outputs in their (our) incrementally slow moving carefully managed world. The registry report can provide a more immediate impact on key stakeholders by normalising bariatric-metabolic surgery as totally acceptable non-stigmatised therapy.

John Dixon

IFSO
GLOBAL REGISTRY

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