The IFSO Global Registry

GLOBAL REGISTRY

6th IFSO Global Registry Report

2021

Prepared by

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IFSO & Dendrite Clinical Systems

The International Federation for the Surgery of Obesity and Metabolic Disorders

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

- building, maintaining & hosting the web registry
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Preface

It is my pleasure as IFSO President to introduce the Sixth IFSO Global Registry Report 2021 with data on 507,298 operations from 50 contributor countries with 5 being mature national registries. These numbers are lower than the Fifth Global registry 2019 report. Changes to laws governing data management and sharing through the General Data Protection Regulation (GDPR) as well as more stringent interpretation of national privacy laws has made it more challenging for some countries to share data outside of their home jurisdiction. In addition, there have undoubtedly been challenges relating to the loss of connection and competing priorities that have come with the current COVID-19 global pandemic. Many bariatric units had to divert their resources towards the challenges of the COVID-19 infections in their hospitals and cities. During the waves of the various strains of COVID-19 across different countries and regions, elective surgery had to be abandoned in various forms, and resumed only to be cut back with the next wave. These are the challenges that the Committee continue to strive to address and overcome. My congratulations to the Registry Committee for their persistence in overcoming all the unprecedented challenges over the last 2 years, led by Wendy Brown (Australia-APC), Richard Welbourn (UK-EC), John Dixon (Australia-APC), Ronald Liem (Netherlands-EC), Scott Shikora (USA-NAC), the Dendrite Clinical Systems partnership with Peter Walton and Robin Kinsman (United Kingdom).

It is appropriate to acknowledge the work of the other IFSO Registry Committee members (in alphabetical order):

- Salman Al Sabah (MENAC)
- Mehran Anvari (NAC)
- Ricardo Cohen (LAC)
- Amir Ghaferi (NAC)
- Jacques Himpens (EC)
- John Morton (NAC)
- Johan Ottosson (EC)
- Francois Pattou (EC)
- Villy Våge (EC)

Each member comes with their unique knowledge of their own national registry and have contributed enormously to the development of this IFSO project, and this will help develop the IFSO Registry for the future. My sincerest thank you to all involved.

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. As we emerge from the COVID-19 pandemic to resume our lives as normal as we can, we will start seeing bariatric and metabolic surgery resuming across our member societies. Hence, whilst we are overcoming the COVID-19 pandemic, it is appropriate timing that I take this opportunity to reach out to all National Presidents and Chapter Presidents to assist in this IFSO Global Registry initiative. I would like to encourage countries that are establishing their bariatric and metabolic programs to set up a national registry and to encourage countries that have registries to aim to cover as many if not all of the procedures performed.

By having as many national registries contributing towards the IFSO global registry, IFSO will in return provide the key aspects of quality assurance and global trends that will be essential to guide us in our mission to optimise the control of adiposity-based chronic diseases and to provide us with the tools in our mission to unify the global scientific, surgical and integrated health communities, for the purpose of dissemination of knowledge, collaboration and establishing universal standards of care for the treatment of individuals with adiposity-based chronic disease.

Looking towards the future, IFSO is committed towards 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. For a successful, meaningful Global Registry for the future, the IFSO registry committee members have been working on identifying the core outcome measures that can be reliably defined, measured, provided, and compared internationally by all contributors. This core dataset will be developed through a Delphi process over the coming months. This important core dataset will enable national registries to adapt to and be able to provide the core elements required for the inclusion of as many national datasets as possible. I look forward to this initiative and the inclusion of many more national registries in our future IFSO Global registry reports.

Lilian Kow

IFSO President 2019-2022

Foreword

Why should we support a registry?

A registry is defined as *a place or office where registers or records are kept* (Google Dictionary). Now imagine that an entity such as the International Federation for the Surgery of Obesity and Metabolic Disorders (IFS0) could have access to all of the data generated worldwide about bariatric / metabolic surgery (BMS), including patient care, the current operative procedures, their efficacy and complications, and the physiology behind it all. IFSO could use the data to:

1. Understand the practice patterns in countries that perform BMS.
2. Be able to compare the results of programs operating in the same country, and obtain the outcomes of surgery for each country compared to the others.
3. Evaluate the efficacy and complication rates of one operation *versus* others.
4. Understand the penetrance of surgery in each country.
5. Follow the trends in procedure and patient care over time.
6. Use the registry as the ultimate source of data for researchers to help unravel the pathophysiology of obesity and the mechanisms of action of the operative procedures.

The data obtained from a registry can be used for a variety of functions and are invaluable (see above). The pooling of datasets of all sizes creates larger datasets full of usable data. This increases the strength and diversity of the data, reducing the likelihood that an analysis would suffer from being underpowered. The larger the registry, the richer the collected data. Large entities, such as an international BMS federation, can create extremely large datasets by combining the data from a large number of smaller data sources. The data can be collected and segregated by desired characteristics such as procedure type, geography, gender, age, disease burden, race, and socioeconomic status, to name but a few. BMS programs can use these data to determine how they compare to similar sized programs internationally. They can also be used for quality improvement initiatives. Researchers could use the data for clinical research; they too benefit from having access to the large datasets.

After the analysis of the data is completed, it is organized and published. The information is quite comprehensive and smartly presented using a combination of graphs, tables, and prose.

The International Federation for the Surgery of Obesity and Metabolic Disorders (IFS0) is a federation of 72 official national societies (as well as some individual country members.).

IFSO, formed in 1995 (www.ifso.com), has as its mission: *to unify the global scientific, surgical, and integrated health communities for the purpose of dissemination of knowledge, collaboration, and establishing universal standards of care for the treatment of individuals with adiposity-based chronic disease.* IFSO presently has about 10,000 members. As the only international BMS society, the leaders of the federation recognized the need and benefits of having a registry. The ability to collect, store, combine, and merge data from bariatric surgery societies around the world is invaluable for satisfying the mission.

The IFSO Global Registry also enables us to identify trends in the practice of metabolic and bariatric surgery. These trends can be national, but often, and more significantly, the trends are international. Understanding these trends is useful to prepare for the future.

In summary, the IFSO Global Registry collects data concerning BMS from participating countries across the globe, and annually creates a comprehensive report. Maintaining a high-quality registry is expensive, and the attempt to collect as much data is labor-intensive. However, on balance, the registry is extremely beneficial to an organization such as IFSO.

We therefore need to support and utilize a Global Registry.

Scott A Shikora

President-Elect, IFSO

Introduction

The Agency for Healthcare Research and Quality recognizes a registry as *an organized system that uses observational study methods to collect uniform data (clinical and other) to evaluate specified outcomes for a population defined by a particular disease, condition, or exposure and that serves predetermined scientific, clinical, or policy purpose(s)* [1]. Data that is reliably, prospectively collected, collated and analysed provides us with a unique opportunity to better understand patterns of disease and the effect of treatments or interventions.

The stated mission of the IFSO Global Registry is: *to aspire to provide the most credible and transparent information available on bariatric / metabolic surgery*. To achieve this mission 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.

The word *aspire* is carefully chosen as we recognise the current limitations of our dataset, with not all countries contributing at a national level, varying data elements being collected by different contributors and a lack of harmonised definitions for common data elements. These factors mean that it is difficult to reliably compare information between countries at this time.

As a first step to harmonising data collection across countries, IFSO have supported a collaboration with Bristol University. Using a Delphi process, and drawing upon the multi-disciplinary expertise of our Society, we are aiming to define a minimum dataset for bariatric registries. Once these definitions are complete, we hope to develop a protocol, or template, for a bariatric surgery registry, which could be used as the framework for new national registries.

This sixth report has fewer contributions than our fifth report. This partly reflects the challenges that the world has faced during the ongoing COVID-19 pandemic, with less connectivity and fewer opportunities for knowledge exchange. It also reflects the challenges all registries face with the tightening of laws protecting individual privacy.

IFSO has worked hard in the last 12 months to ensure we are compliant with GDPR, the laws that govern data in Europe where we are registered as a Society. We have worked with individual contributors to provide them with consent forms for patients, and a framework for ethical approval. We have worked with national societies to understand what barriers exist that could prevent them from sharing data. I am very grateful to Manuela Mazzarella, COO of IFSO, our legal team and our Data Processor Dendrite for their support working through these, at times, complex issues.

By ensuring the groundwork is correct, with reliable and consistent data definitions, data collection and data governance, we hope that the reports in the years ahead will fulfil our important mission.

I would be remiss not to acknowledge the hard work and dedication of all the members of the IFSO Global Registry Committee, the leaders of all the national registries, the team at Dendrite and most importantly our contributors. Without your support, we would not have a report.

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 to 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 achieving our mission of providing the *most credible and transparent information available on metabolic / bariatric surgery* in the years to come.

Wendy Brown

Chair, IFSO Global Registry Committee

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Executive summary

This is the Sixth Report of the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) Global Registry, a collaboration with Dendrite Clinical Systems.

This year's report contains information from 507,298 operations from 50 contributor countries. Data for this report has been submitted by national registries, regional registries and single-centres. When reviewing the graphs you will note that not every contributor country appears in every graph. This is because sometimes the data are unavailable or because there are fewer than 100 operation records submitted from that country, making the data prone to bias.

Throughout this report, we have sought to highlight data from national / regional registries that we believe capture at least 80% of the patients undergoing metabolic / bariatric surgery in their country. We have chosen to highlight their outcomes as these data are likely to be less prone to bias, and more likely to reflect the activity in their country than national registries with a lower rate of data acquisition and single centres.

Key outcomes in this report

- There were 507,298 operations submitted by 50 contributor countries. The fifth report contained information on 833,687 operations from 61 countries. The reduction in the number of contributions mainly reflects the effect of changes to privacy laws that govern the sharing of potentially re-identifiable data, and the process that IFSO has undertaken to ensure compliance with these laws. There is also possibly an effect from the COVID-19 pandemic.
- There are 10 countries represented in the current database where the data have been submitted by a National Registry. We are highlighting the outcomes from 7 national / regional registries where we believe they have captured data for >80% of their eligible population.
- The average BMI of participants in the Registry ranged from 38.9 kg m^2 in the Asia Pacific region to 46.3 kg m^2 in North America.
    - Patients who were enrolled in Asia-Pacific centres were more likely to have type 2 diabetes, hypertension and dyslipidemia, all components of the metabolic syndrome, when compared to other regions.
- The average age of participants in the registry ranged from 33.1 years in the Middle East - North African IFSO Chapter to 44.3 years in North America.
    - In Europe and North America, regions with a lower 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 a comparable age to women.
- The majority of operations recorded in the registry are sleeve gastrectomies, followed, in terms of volume, by Roux en Y gastric bypass procedures.
- The majority of operations are performed laparoscopically, although it is noted that robotic surgery is an emerging trend that could be documented more clearly in future reports.
- The length-of-stay following most procedures is remarkably consistent across IFSO Chapters with most patients discharged on day 1 or day 2. There are few situations where the length-of-stay is beyond 5 days. Measuring length-of-stay has the potential to be a marker, or flag, of post-operative complications that could be easily and reliably measured in large repositories of data such as this registry.
- Follow-up after metabolic / bariatric procedure is difficult, with only Hong Kong, Norway, Sweden and the Netherlands achieving >70% follow up at one year for the patient's weight data-field.
- This report confirms that metabolic / bariatric surgery is effective, not just for weight loss, but also as part of the treatment paradigm for obesity related diseases. Despite the limitations of poor follow up and incomplete baseline capture, the registry shows clearly that all bariatric procedures lead to significant weight loss and health benefits at 12 months.

- This report documents important reductions in the need for treatment for most obesity-related diseases after surgery, including: diabetes, hypertension and sleep apnoea. There are two notable exceptions in this dataset:
    - Gastroesophageal Reflux Disease (GERD) is seen to increase after sleeve gastrectomy.
    - Musculo-skeletal pain is seen to increase after OAGB.

This report also documents the impact of the COVID-19 pandemic on metabolic / bariatric surgical activity across the IFSO Chapters. The only country that did not have a near complete cessation of bariatric surgery during the first wave was South Korea. This probably reflects this county's relative success in controlling the spread of COVID-19 amongst their population. At the time that data submission was completed for this report, only South Korea and Saudi Arabia were reporting a return to pre-pandemic metabolic / bariatric surgical activity.

Implications for bariatric surgery

- A relatively simple dataset and a great deal of willing engagement from many centres across 50 countries has yielded a large resource of data on bariatric surgery which can identify differences in patterns of disease and access to care. These are issues and questions that are ripe for further investigation through dedicated research projects.
- Despite the limitations noted of incomplete data acquisition, differing data definitions between contributors and the challenges of incomplete follow-up, this report again demonstrates the profound positive treatment-effects of bariatric and metabolic surgery.
- The ongoing work of the IFSO Global Registry Committee to harmonise the definition of data elements, to support national registry development, to facilitate proper data governance and overcome barriers to data sharing will build from this strong foundation in future reports.

Contents

Data analysis

Reflections on registry growth and changes over the last 10 years

An overarching goal of the IFSO Global Registry project, since its inception, is to provide a data atlas or reference work for the international efforts to treat the pandemic of severe and complex obesity. The Non-Communicable Disease Risk Factor Collaboration (NCD-RisC) and Global Burden of Disease endeavours are ongoing, major international projects that already provide detailed, comprehensive descriptions of region- and country-specific rates of obesity [1,2]. Until the IFSO Global Registry came into being there was no equivalent for bariatric-metabolic surgery, but it was apparent that a large-scale description of the characteristics of patients having surgery was needed. The IFSO Global Registry has made great strides in this direction.

The IFSO Global Registry builds on the ground-breaking IFSO worldwide surveys, initiated by Dr Nicola Scopinaro in 1998, that gave us knowledge of operations performed and their estimated volumes in participating member countries [3-9]. The IFSO Global Registry has added detail to these reports. We have learnt on many fronts: using elements common to local and national registry datasets we are now able to compare the baseline demographic characteristics of patients having bariatric-metabolic surgery on an international basis. These include age, body mass index, proportions of men and women having surgery, and rates of obesity-related diseases. We have also been able to relate these factors to details on the operations performed using individual anonymised patient records. Novel data also include regional post-operative length-of-stay for each operation that can provide benchmarks for individual unit practice, and comparisons between geographical regions.

For the first time we have also been able to present international follow up data that includes weight loss and changes in rates of obesity-related disease. The data have revealed striking differences and variation between countries that were not characterised previously. We have also learnt that there are differences in definitions of variables collected, and that there is variation in what is collected. Future work by IFSO aims to standardise a core dataset that can be embedded into each national registry in the long term.

From an initial pilot project, the registry has grown impressively over the years, as shown here [10-14].

Report ordinal	Operations submitted	Countries	National registries	Continents	Time-focus for analysis	Operations analysed for the report
• **First**	100,092	18	3	5	2011-2013	53,197
• **Second**	141,748	31	7	5	2013-2015	54,490
• **Third**	196,188	42	8	5	2013-2017	102,157
• **Fourth**	394,431	51	14	5	2014-2018	220,348
• **Fifth** [i]	833,687	61	17	5	2015-2018	594,235
• **Sixth**	507,298	50	7	5	2016-2019	255,620

A very encouraging development is the increasing number of national society registries that have been willing to share their data, with constant growth until the sixth report. For some registries, *e.g.,* Sweden, Norway, Netherlands and USA, data are robustly validated, and this has led to confidence in the secondary analysis of the data even though follow up records are far from complete. A drawback and challenge is that, due to GDPR and regional rules, data have to be destroyed annually after each report. It would be beneficial to find allowable ways to keep the data so that individual records can be linked for long-term annual follow up. There are many challenges, including inconsistent completion rates for each baseline variable and the consistently poor acquisition of follow up data.

An indication of the degree to which bariatric-metabolic researchers have bought into the project is the reception to the publication of peer-reviewed papers describing overall findings in IFSO's journal *Obesity Surgery*. Since the first paper describing data from the second report, in 2018, the papers have attracted over 370 citations (up until September 2021), which suggests wide acceptance of the project [15-17].

A strength of the IFSO registry is that it has already been possible to make novel observations from secondary analysis of the data. For instance, we are now able to describe the worldwide characteristics of the patients with type 2 diabetes who are having surgery, and for the first time answer the question 'what operations are being done for patients with type 2 diabetes'? It has also been possible to compare the likelihood that an operated patient will have type 2 diabetes compared to the prevalence of the disease in each country [17].

These data add to the known discrepancies on provision of surgical treatments for patients with severe obesity and type 2 diabetes [18]. As this literature builds it will provide a basis to inform healthcare systems designing treatment pathways for this disease.

i. Including 335,000 operation records from the United States of America.

I thank the current and past international members of the Global Registry Committee for their freely given time and continuing enthusiasm for the project: John Dixon (Australia), Ricardo Cohen (Brazil), John Morton (USA), Amir Ghaferi (USA), Kelvin Higa (USA), Johan Ottosson (Sweden), Francois Pattou (France), Salman Al-Sabah (Kuwait), Mehran Anvari (Canada), Jacques Himpens (Belgium), Ronald Liem (Netherlands), Villy Våge (Norway), Wendy Brown (Chair of Global Registry committee, Australia) and Lilian Kow (IFSO President, Australia).

Thanks also go to Peter Walton and his team at Dendrite Clinical Systems (UK), the software partner for the registry.

Thank you also to all those surgeons who have submitted their data for inclusion in this reports over the years, your contribution has been invaluable in building this important knowledge base. The bariatric-metabolic community looks forward to continuing future success.

Richard Welbourn

Richard Welbourn

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A tale of two pandemics

Two pandemics have challenged global health in extraordinary ways: COVID-19 during 2020-2021 and obesity from 1970-2021. Of course, they have also interacted dangerously with one-another in numerous ways over the last 18 months. These pandemics, and their consequences are considered preventable allowing us to consider and compare the global response to prevention and management. The contrast is stunning.

Covid-19 has been met with a global explosion in commitment to explore every aspect of the pandemic with no stone left unturned [1]. In the absence of vaccines, the public health response was to prevent transmission, and this evolved rapidly to selecting a range of measures that together reduced, and at times stopped, community transmission. A systems-environmental health approach was needed, adjusted, and delivered. Every aspect of our lives, and the environment we interact with were examined, and experts for all sectors of society were engaged [2]. Specific research focused on both vaccine development and on managing patients who were infected with the virus effectively and safely [3,4]. The epidemic is far from over, but we have achieved so much against a formidable foe. There is a global commitment to move forward, yet nothing has been easy, and we have numerous challenges ahead. There is, however, a real sense that we can, and will, win.

Meanwhile the obesity pandemic, along with its complications, has inexorably progressed over decades. There has been little, or no, global sense of urgency, commitment, or success. The suggestion that early life interventions would be best for obesity prevention is biologically attractive but limited by hard evidence of success at a population level, and of questionable clinical significance at an individual level. Much is known about the epidemiology and numerous risk factors associated with childhood obesity. Many models for prevention have been proposed, all are complex and common elements include age appropriate biopsychosocial, behavioral, environmental, and societal interventions [5]. However, broad societal enthusiasm for action is tepid, barriers abound, and individual family choices and behaviors are blamed, and the parents shamed. The responsibility for preventing obesity must shift from that of a personal level to a whole of society level. Commentators regularly voice that the need for obesity prevention requires urgent action, but decades of global inertia against this formidable foe have landed on deaf ears [6]. Given our current approach and results can we really consider obesity a preventable disease?

We experience the sharp end of this pandemic. We provide the very best care for individuals living with the more severe forms of obesity and its complications. This chronic progressive disease generates biopsychosocial dysfunction, disability, morbidity and mortality. Our role is the management of obesity and its array of complications. Current evidence suggests we are broadly very successful [7]. IFSO is committed to quality assurance and improvement, the development of safer more effective interventions, professional training, and integrated chronic disease management to optimise patient outcomes. IFSO promotes and supports bariatric-metabolic surgical registries as key aspect of quality assurance. Individual service, regional and national registries have varied aims and roles in quality assurance, but a global registry has a more limited role and requires a core dataset so that global trends can be followed. IFSO has commissioned, through the IFSO registry committee and outside expertise, the development of this CORE dataset through a Delphi process. This important initiative needs to be complimented by adapting registries to provide these CORE elements where possible, and the inclusion of as many national registries as possible.

While bariatric metabolic-surgery is a shining light in effectively managing obesity, there are important non-surgical developments beyond just lifestyle-behavioral management of obesity and its complications. We now have a greater range of effective pharmacotherapy options, and newer agents that better bridge the gap between that of established agents and those of surgical interventions [8] In addition, we have clear confirmation of the value and efficacy of meal replacements and very low energy diets in managing obesity well beyond the very-short term timeframe [9.] As for many other common chronic conditions the combinations, when needed, of behavioral-lifestyle, medical, and surgical interventions provide a greater opportunity to optimize health outcomes and individualize care. We now have a range of effective therapies, and yes, we need more, but the uptake at a population level of anything beyond lifestyle behavioral interventions is trivial. Bariatric-metabolic surgery is not alone. Effective therapies are subject to intense scrutiny with a presumption that they are usually ineffective in the long term, and unsafe. The implicit bias in such statements suggest the cause of the pandemic is one of failed personal responsibility.

Clinical inertia, the failure to initiate or intensify therapy according to evidence-based guidelines, is the enemy of success in managing chronic disease. Have you considered clinical inertia in the management of obesity? The overestimation of the efficacy of obesity management based solely on patient education and lifestyle interventions has generated extreme clinical inertia verging on clinical neglect. The gap in providing effective medical (including surgical) care would not be tolerated for any other chronic progressive disease. There would be an outcry based on the issues of human rights and equity [10].

The strongest, and most relevant voice, for action on obesity comes from those who experience directly or indirectly the lived experience of the condition. Until recently, the voice for obesity advocacy has been hijacked by naïve beliefs and perceptions about the over simplistic causes, and therefore solutions, needed to address the pandemic. Unfortunately, these beliefs and perceptions are ubiquitous throughout society, and usually endorsed by public health authorities and health service providers to the extent that those with the lived experience of obesity internalize the weight bias, stigma, and blame, that they remain ashamed, unworthy, and silent [11]. A loud outcry from an informed organisation representing the lived experience of obesity is a critical step forward.

The Global Obesity Patient Alliance (GOPA) represents patient key advocacy organisations from Canada, USA, Europe, United Kingdom, Denmark, and Germany. GOPA stresses that obesity is a chronic disease; that weight bias and stigma still exist and need to end, and that negative perceptions of people with obesity must change. As informed health care providers, please support your local organisation, or, if there isn't one, actively support the development of one.

The persistent and wrong narrative describing obesity as a self-induced easily reversible condition has a profound effect on our global approach to preventing and managing this pandemic [10]. In the tale of two pandemics, sadly, only one appears to matter.

John Dixon

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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 6.1):

- 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 98-100.
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.

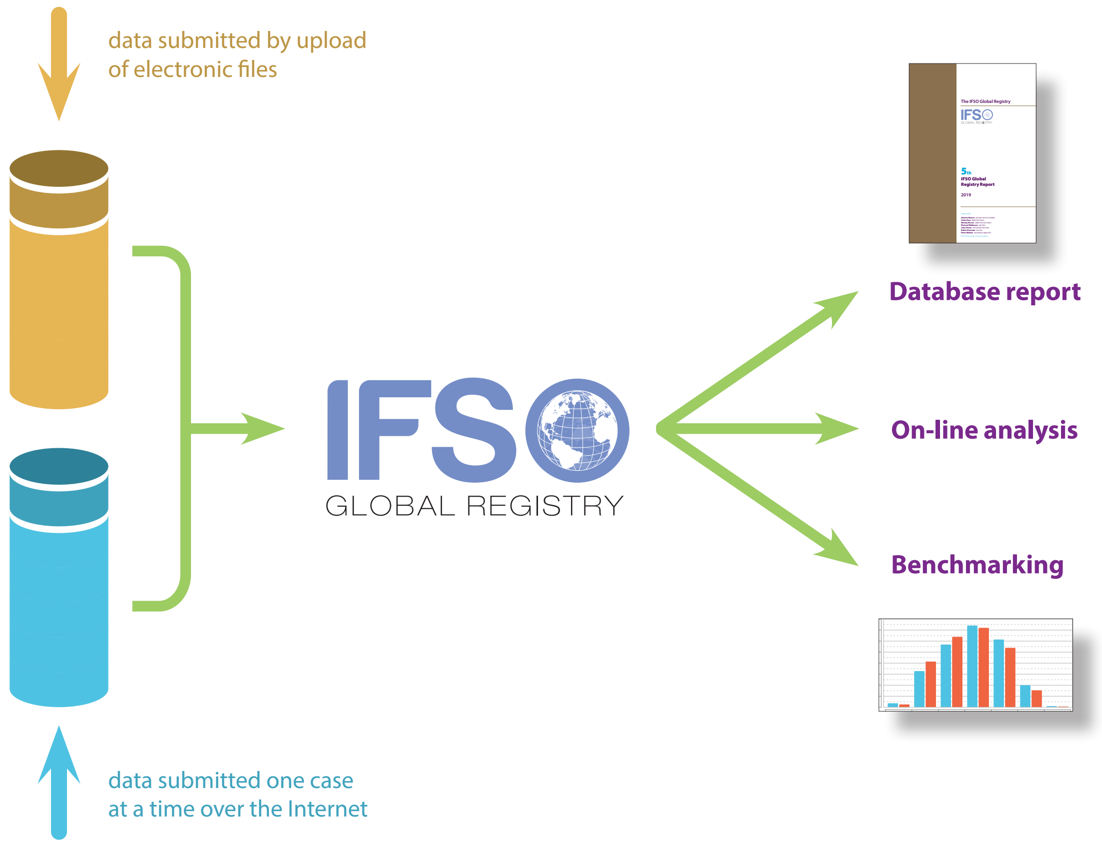
The diagram opposite illustrates which submissions came through which route, and shows that most countries (and all national databases) were successfully able to upload data electronically through the Upload-My-Data web portal. Data from some countries came in *via* both routes *e.g.,* India, Saudi Arabia 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 50 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

- Austria
- Azerbaijan
- Bahrain
- Belarus
- Belgium
- Brazil
- Canada
- China
- Colombia
- Dominican Republic
- Egypt
- France
- Greece
- Guatemala
- Hong Kong
- Hungary
- India
- Ireland
- Italy
- Japan
- Jordan
- Kazakhstan
- Kuwait
- Mexico
- Netherlands
- Norway
- Portugal
- Qatar
- Russia
- Saudi Arabia
- South Africa
- South Korea
- Spain
- Sweden
- Taiwan
- Tunisia
- Turkey
- Ukraine
- United Kingdom
- United States of America



Dendrite Direct-Data-Entry contributors

- Belgium
- Bolivia
- Bulgaria
- Colombia
- El Salvador
- Georgia
- Guadeloupe
- Jordan
- Kazakhstan
- Lebanon
- Morocco
- Peru
- Poland
- South Korea
- Turkey
- United Arab Emirates

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 at surgery and gender; calendar years 2016-2020

Age at surgery / years	Gender: Male	Female	Unknown	All
<19	871	2,012	4	**2,887**
19-29	7,833	32,388	49	**40,270**
30-39	13,587	49,923	42	**63,552**
40-49	17,708	56,278	58	**74,044**
50-59	14,672	42,102	38	**56,812**
60-69	4,780	12,029	17	**16,826**
>69	246	531	5	**782**
Unspecified	109	334	4	**447**
All	**59,806**	**195,597**	**217**	**255,620**

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

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

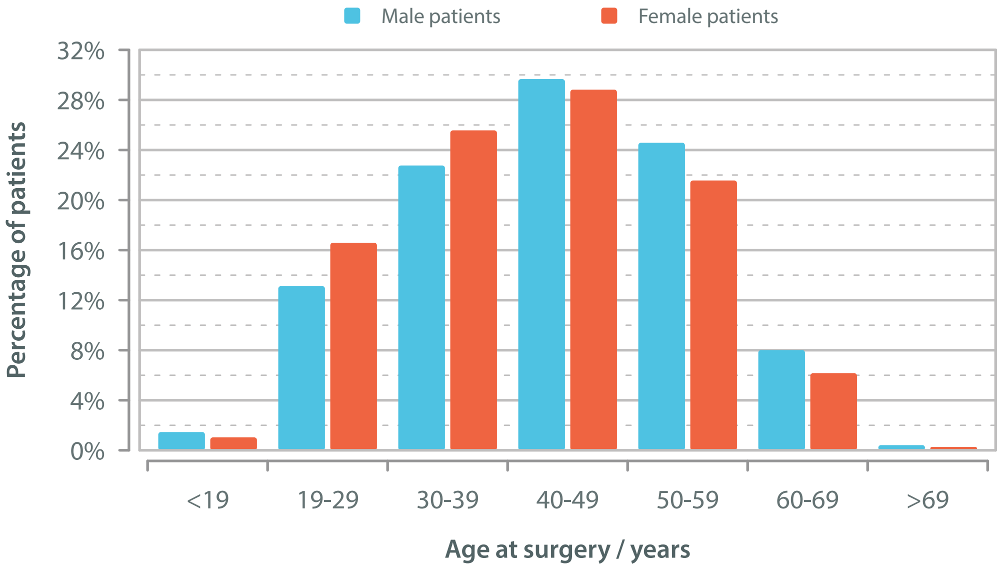
The basic principles applied when preparing graphs for this Sixth IFSO Global Registry Report were based, as far as possible, upon William S Cleveland's book *The elements of graphing data* [1]. This book details both best practice and the theoretical bases that underlie these practices, demonstrating 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 primary surgery. This clearly restricts the total number of database-entries available for any such analysis.

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

For example, in the graph below, only the database entries where the patient is having primary surgery and both the patient's age and gender are known are included in the analysis; this comes to 254,960 patient-entries (871 + 7,833 + 13,587 + 17,708 + 14,672 + 4,780 + 246 + 2,012 + 32,388 + 49,923 + 56,278 + 42,102 + 12,029 + 531; the 660 entries with **unspecified** data are excluded from the chart).

Primary surgery: Age and gender; calendar years 2016-2020 (n=254,960)



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.

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Data analysis

Submissions to the IFSO Global Registry

Around the world there is growing interest in registries and their potential for both quality improvement and research. Many national societies have registries, and this is the sixth report of the IFSO Global Registry combining data submitted both from national registries, regional registries and single centers.

The Executive Board of IFSO sees the IFSO Global Registry as a key initiative of the Society, as a tool for gathering descriptive information about the penetrance of bariatric surgery around the world, as well as potentially improving the quality and safety of bariatric surgery. They also recognise the opportunity the registry provides in terms of international collaboration and sharing of information, enabling smaller societies to establish registries.

In the Fifth Report, the merged database held data on 833,687 operations reported from 17 national registries, 25 multi-centre collaborations and 19 single centres. This year's report contains information on 507,298 operations from 50 contributor countries. There are 10 national registries included in these contributions, with 7 registries that we have identified as having data that are more complete and less likely prone to bias.

Changes to laws governing data management and sharing through the General Data Protection Regulation (GDPR), as well as more stringent interpretation of national privacy laws, has made it more challenging for some countries to share data outside of their home jurisdiction. In addition, there have undoubtedly been challenges relating to the loss of connection and competing priorities that have come with the current COVID-19 global pandemic. These are challenges that the Society and the IFSO Global Registry Committee continue to strive to overcome.

2021 data merge

507,298
operations

50 contributor countries
7 mature registries
43 other contributors

Whilst the numbers maybe down in the current report, the IFSO Global Registry Committee has worked hard to improve data accuracy as well as transparent and consistent reporting of important variables. We hope that this means that the data will be more reliably interpreted.

In this report we have highlighted data from national / regional registries that are known to have the support of their local society, and where we believe data has been captured from as many of the eligible participants as possible (ideally >80%). These registries are highlighted as their data capture is more complete, and therefore less prone to bias. This means that their data are more likely to accurately reflect the activities and outcomes of their country / region than those national registries where data capture is less complete, or countries who are represented by only a few centres. The registries that are known to IFSO as national registries with data acquisition rates approaching or bettering 80% include:

- Italy
- Kuwait
- Norway
- Sweden
- the Netherlands
- United Kingdom

The regional registry of Ontario, Canada, is included as it collects data from the whole of that region. Whilst it is nominated as *Canada* through out the report it must be kept in mind that these data only accurately reflect the practice in the region of *Ontario*. This Country's data will be flagged as Canada † throughout as a reminder of this fact.

These highlighted registries vary in their data completeness as well as what data elements are collected. For example, Italy does not collect data on obesity related diseases either at initial presentation nor in follow up. They also vary in the way they define common data elements with very limited commonality of their data dictionaries [1]. These are important limitations; however, the Committee believes the data from these registries is sufficiently robust to enable meaningful comparisons as well as identification of important trends and outcomes. Future reports will benefit from our ongoing project with Bristol University that is seeking to define a consistent minimum dataset for use in bariatric / metabolic registries.

Submissions to the IFSO Global Registry over the years

Within this report there are also data from registries that collect data at a national level, but their data is not yet at the point where it is being collected from a sufficient proportion of the population to minimise the risk of bias. These countries include France, Taiwan and Russia. As these registries mature, we look forward to highlighting their achievements. A few other countries have launched their national bariatric surgery registries in 2021, and we look forward to their contribution to the IFSO Global Registry in future.

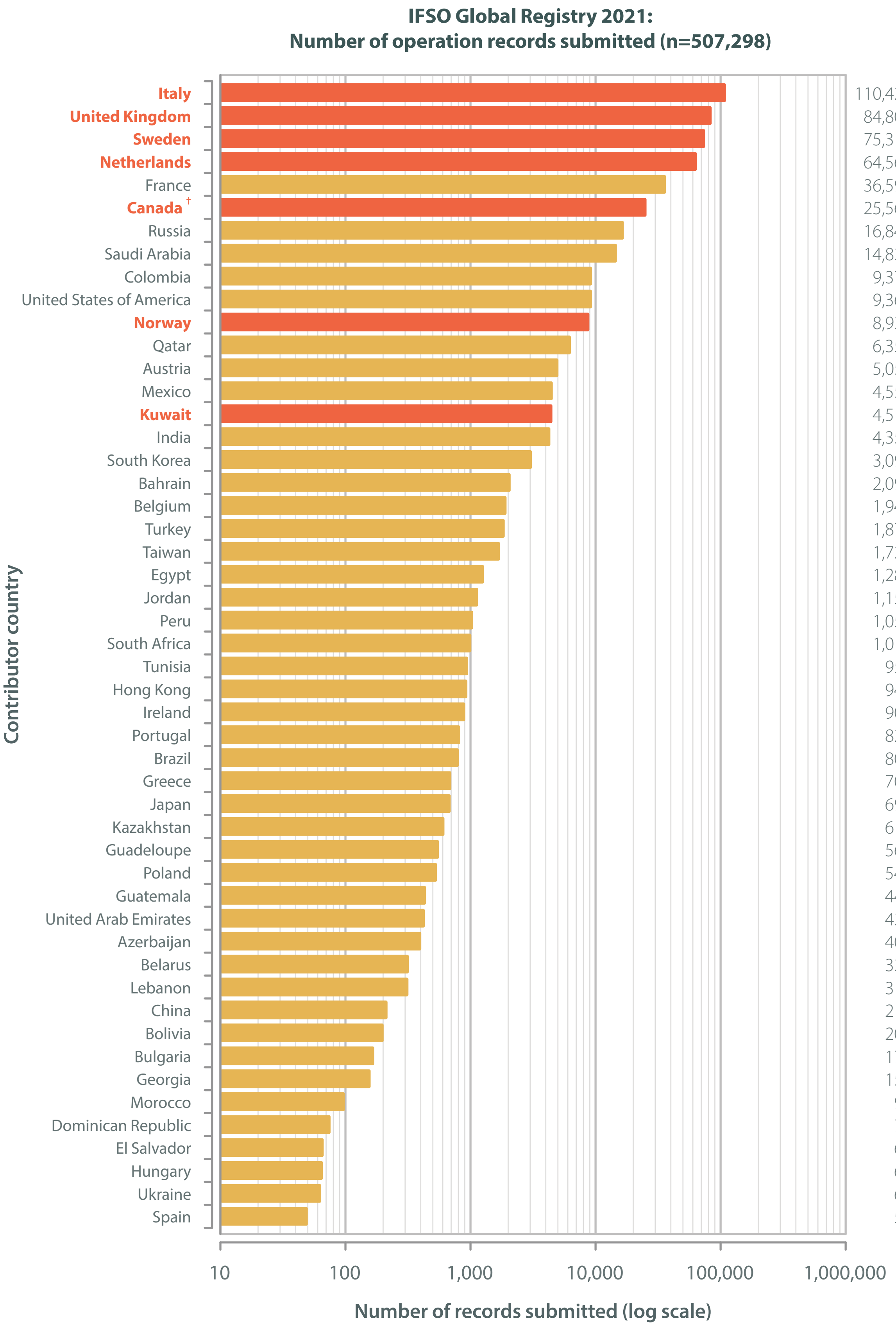
There are several national registries known to IFSO that have not contributed to this report. The Committee has been working with these registries to enable future contributions. These registries have flagged a desire to contribute in the future if barriers can be overcome:

- Australia — GDPR regulations and provision of potentially re-identifiable data
- Belgium — unable to provide any data that is potentially re-identifiable.
- New Zealand — permission from Maori and Pacific People ethics committee
- United States of America — provision of aggregated data in preference to raw data.

The IFSO Global Registry Committee will continue to work with national societies to understand and overcome the challenges of data sharing. Expanding the membership of the Committee to more completely represent all Chapters will be an important step towards achieving this goal.

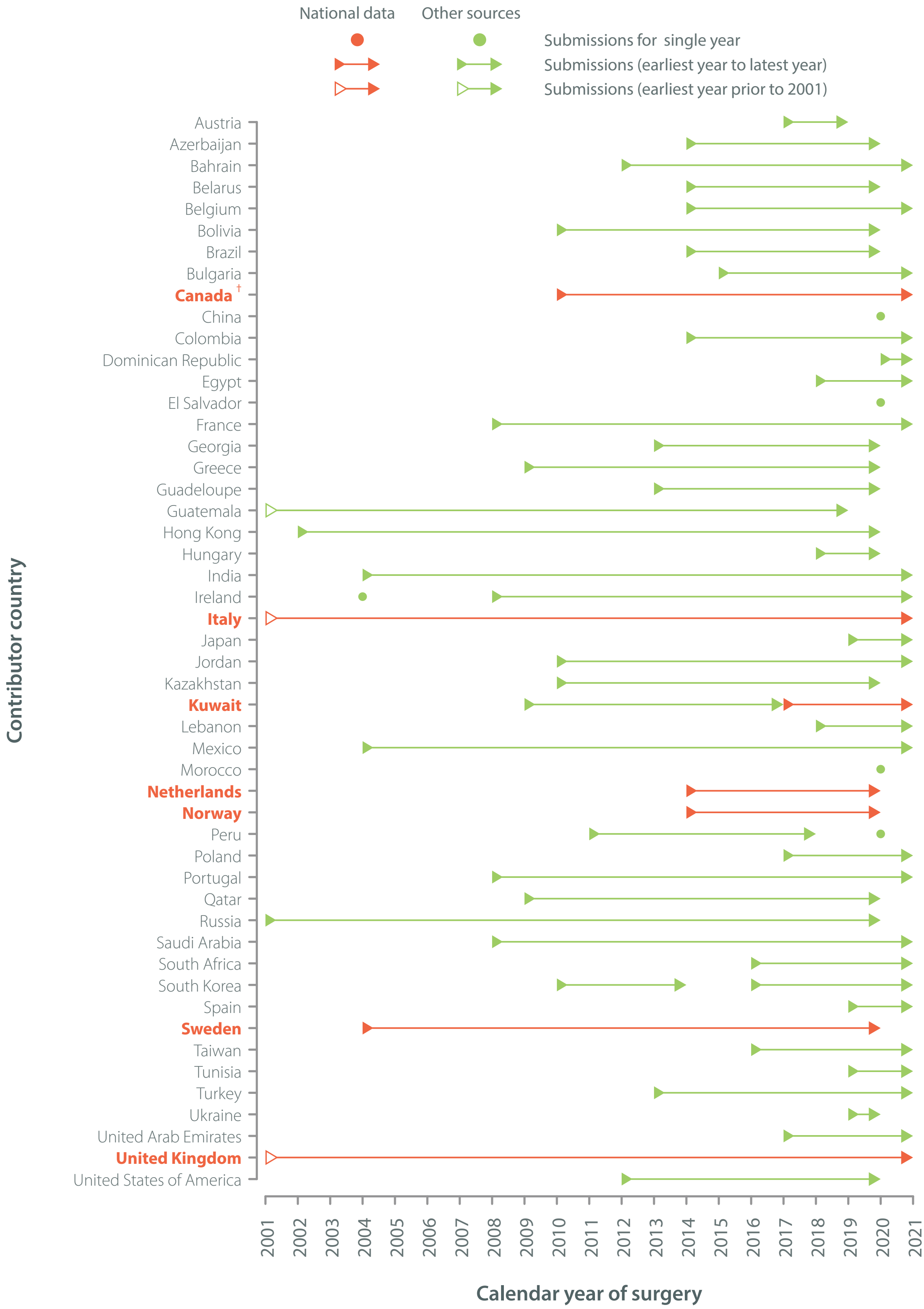
1. Akpinar EO, Marang-van de Mheen PJ, Nienhuijs SW, Greve JWM, Liem RSL. National Bariatric Surgery Registries: an International Comparison. Obesity Surgery. 2021; **31(7)**: 3031-3039. doi: 10.1007/s11695-021-05359-0. Epub 2021 Mar 30. PMID: 33786743; PMCID: PMC8175300.

Each contributor has ensured they are providing data in a way that is compliant with GDPR. This means that they have attested to the fact that they are appropriately consenting their patients to store and share their data; that they have ethical oversight of data sharing according to their local laws and they have signed a data sharing agreement with IFSO.



This graph indicates the period of time that each contributor has been providing data to the IFSO Global Registry.

IFSO Global Registry 2021: Date-range of the data submitted



Analysis

Data completeness

This table indicates the data elements collected by each registry and how often each field was completed. When interpreting these data it is important to recognise that each registry uses their own definition for each field. For example, the definition of diabetes varies widely.

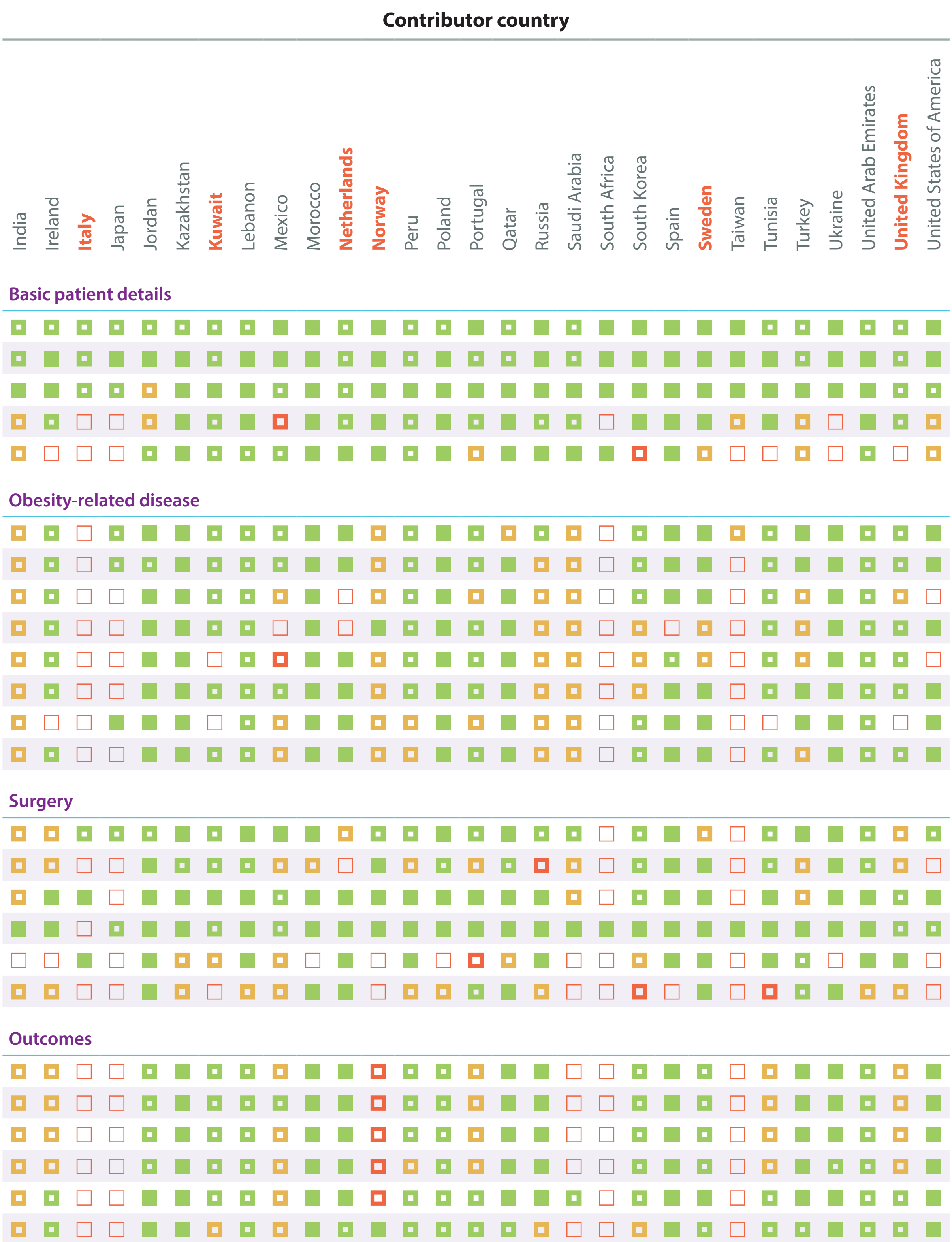
Data completeness for selected fields in the merged IFSO Global Registry

	Austria	Azerbaijan	Bahrain	Belarus	Belgium	Bolivia	Brazil	Bulgaria	Canada †	China	Colombia	Dominican Republic	Egypt	El Salvador	France	Georgia	Greece	Guadeloupe	Guatemala	Hong Kong	Hungary
Basic patient details																					
Age	90.0-99.9%	100%	100%	100%	90.0-99.9%	90.0-99.9%	100%	100%	100%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	90.0-99.9%	100%	100%	90.0-99.9%	100%	100%	100%
Gender	90.0-99.9%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	90.0-99.9%	100%	90.0-99.9%	90.0-99.9%	100%	90.0-99.9%	100%
Height	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	90.0-99.9%	100%	10.0-89.9%	100%
Initial weight	90.0-99.9%	0%	90.0-99.9%	90.0-99.9%	100%	100%	100%	100%	90.0-99.9%	90.0-99.9%	0.1-10.0%	90.0-99.9%	90.0-99.9%	100%	0%	100%	100%	90.0-99.9%	0%	90.0-99.9%	100%
Funding	0.1-10.0%	100%	90.0-99.9%	100%	10.0-89.9%	100%	90.0-99.9%	100%	100%	10.0-89.9%	90.0-99.9%	0%	90.0-99.9%	100%	0%	100%	100%	100%	100%	100%	100%
Obesity-related disease																					
Diabetes	100%	100%	100%	100%	90.0-99.9%	100%	10.0-89.9%	100%	0%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	90.0-99.9%	100%	100%	100%	0%	90.0-99.9%	100%
Hypertension	100%	90.0-99.9%	90.0-99.9%	100%	90.0-99.9%	100%	10.0-89.9%	100%	90.0-99.9%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	90.0-99.9%	100%	100%	100%	0%	90.0-99.9%	100%
Depression	100%	100%	90.0-99.9%	0%	10.0-89.9%	100%	10.0-89.9%	100%	10.0-89.9%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	0%	100%	100%	100%	0%	100%	100%
DVT risk	100%	90.0-99.9%	100%	100%	10.0-89.9%	100%	0%	100%	0%	100%	0.1-10.0%	90.0-99.9%	90.0-99.9%	100%	10.0-89.9%	100%	100%	100%	0%	10.0-89.9%	100%
Musculo-skeletal pain	100%	90.0-99.9%	100%	0%	90.0-99.9%	100%	10.0-89.9%	100%	0%	100%	90.0-99.9%	90.0-99.9%	0%	100%	0%	100%	100%	100%	0%	90.0-99.9%	100%
Sleep apnea	100%	100%	90.0-99.9%	100%	10.0-89.9%	100%	10.0-89.9%	100%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	90.0-99.9%	100%	100%	100%	0%	100%	10.0-89.9%
Dyslipidemia	100%	90.0-99.9%	90.0-99.9%	100%	10.0-89.9%	100%	10.0-89.9%	100%	90.0-99.9%	100%	90.0-99.9%	0%	0%	100%	0%	100%	100%	100%	0%	90.0-99.9%	100%
GERD	100%	0.1-10.0%	90.0-99.9%	100%	10.0-89.9%	100%	10.0-89.9%	100%	90.0-99.9%	100%	10.0-89.9%	90.0-99.9%	90.0-99.9%	100%	0%	100%	100%	100%	0%	90.0-99.9%	100%
Surgery																					
Weight at operation	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	90.0-99.9%	100%	10.0-89.9%	100%	90.0-99.9%	0%	90.0-99.9%	90.0-99.9%	10.0-89.9%	100%	90.0-99.9%	100%	100%	100%	90.0-99.9%	100%	100%
Previous balloon	100%	100%	100%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	90.0-99.9%	0%	100%	0.1-10.0%	90.0-99.9%	0%	90.0-99.9%	0%	90.0-99.9%	90.0-99.9%	90.0-99.9%	0%	90.0-99.9%	0%
Prior bariatric surgery	100%	90.0-99.9%	100%	100%	100%	100%	0.1-10.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	90.0-99.9%	100%	0%	100%	100%
Approach	100%	100%	90.0-99.9%	100%	90.0-99.9%	100%	100%	100%	90.0-99.9%	100%	100%	100%	90.0-99.9%	100%	90.0-99.9%	100%	100%	100%	100%	100%	100%
Other operation	100%	0%	10.0-89.9%	100%	100%	100%	0%	100%	0%	100%	0.1-10.0%	100%	0%	100%	100%	100%	100%	0%	0%	90.0-99.9%	0%
Banded procedure	100%	100%	10.0-89.9%	100%	10.0-89.9%	100%	0%	10.0-89.9%	0%	100%	0.1-10.0%	0.1-10.0%	0%	100%	0%	10.0-89.9%	100%	90.0-99.9%	0%	0.1-10.0%	0%
Outcomes																					
Leak	100%	90.0-99.9%	100%	100%	10.0-89.9%	100%	0.1-10.0%	100%	10.0-89.9%	100%	10.0-89.9%	90.0-99.9%	0%	100%	0%	100%	90.0-99.9%	100%	100%	100%	100%
Bleed	100%	100%	100%	100%	10.0-89.9%	100%	0.1-10.0%	100%	10.0-89.9%	100%	90.0-99.9%	90.0-99.9%	0%	100%	10.0-89.9%	100%	100%	100%	100%	100%	100%
Obstruction	100%	90.0-99.9%	100%	100%	10.0-89.9%	100%	0%	100%	10.0-89.9%	100%	10.0-89.9%	90.0-99.9%	0%	100%	0%	100%	90.0-99.9%	100%	100%	100%	100%
Re-operation	100%	90.0-99.9%	100%	100%	10.0-89.9%	100%	0.1-10.0%	100%	0%	100%	0.1-10.0%	90.0-99.9%	0%	100%	10.0-89.9%	100%	90.0-99.9%	100%	0%	100%	100%
Status at discharge	90.0-99.9%	100%	100%	100%	10.0-89.9%	100%	10.0-89.9%	100%	100%	100%	10.0-89.9%	90.0-99.9%	10.0-89.9%	100%	10.0-89.9%	100%	90.0-99.9%	100%	0%	100%	100%
Date of discharge	90.0-99.9%	0%	90.0-99.9%	100%	10.0-89.9%	100%	10.0-89.9%	100%	90.0-99.9%	100%	0.1-10.0%	90.0-99.9%	10.0-89.9%	100%	10.0-89.9%	100%	100%	100%	100%	90.0-99.9%	0%

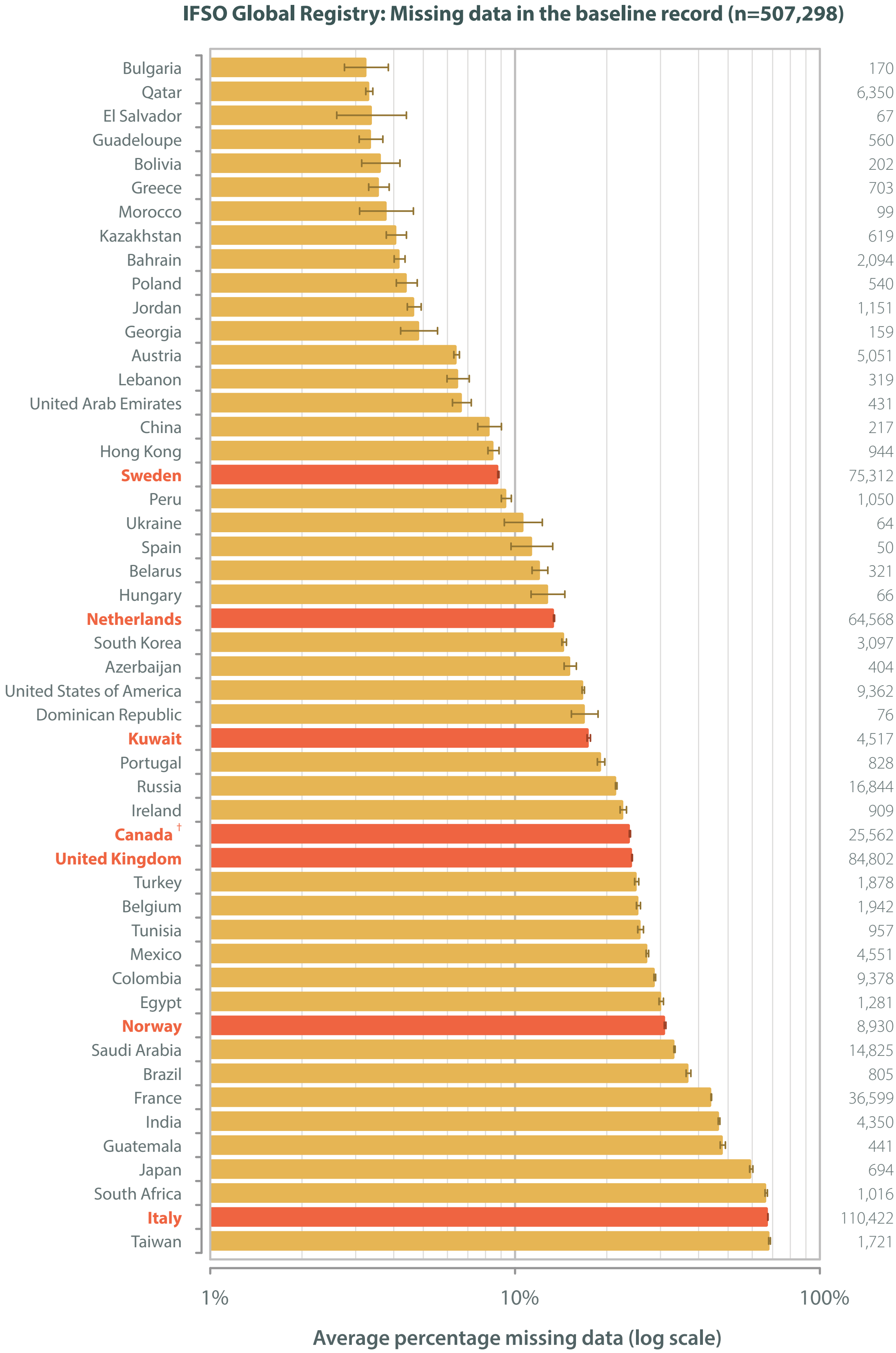
Completeness key 100% | 90.0-99.9% | 10.0-89.9% | 0.1-10.0% | 0% complete

The lack of a common, harmonised, data dictionary defining our data elements makes meaningful comparisons difficult. This is the reason that IFSO is supporting the development of a common data dictionary through a collaboration with Bristol University.

Data completeness for selected fields in the merged IFSO Global Registry



This graph demonstrates how many of the contributing countries collect all of the potentially included data elements. The variance in data elements collected may reflect the interests of each local society, or resources available for data collection. It seems that data transfer from the Norwegian Registry was not entirely faithful to what is held in the national registry. This was only identified after the all submitted data had been merged and the main body of this report assembled. In future we will try to provide the contributors with additional tools to verify their uploads prior to any data analysis taking place.

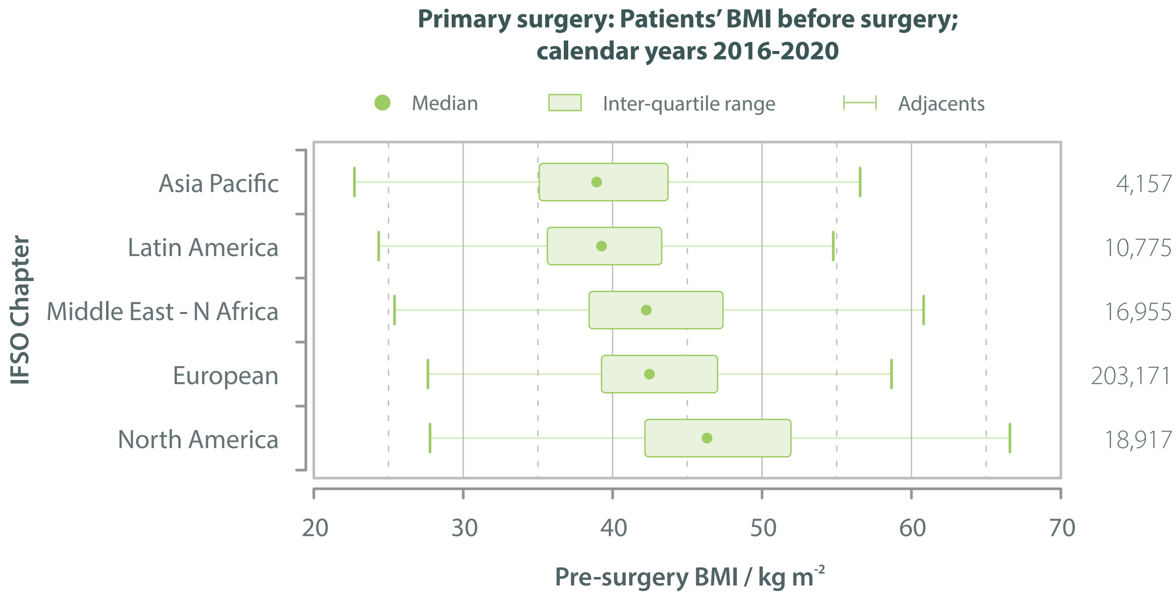


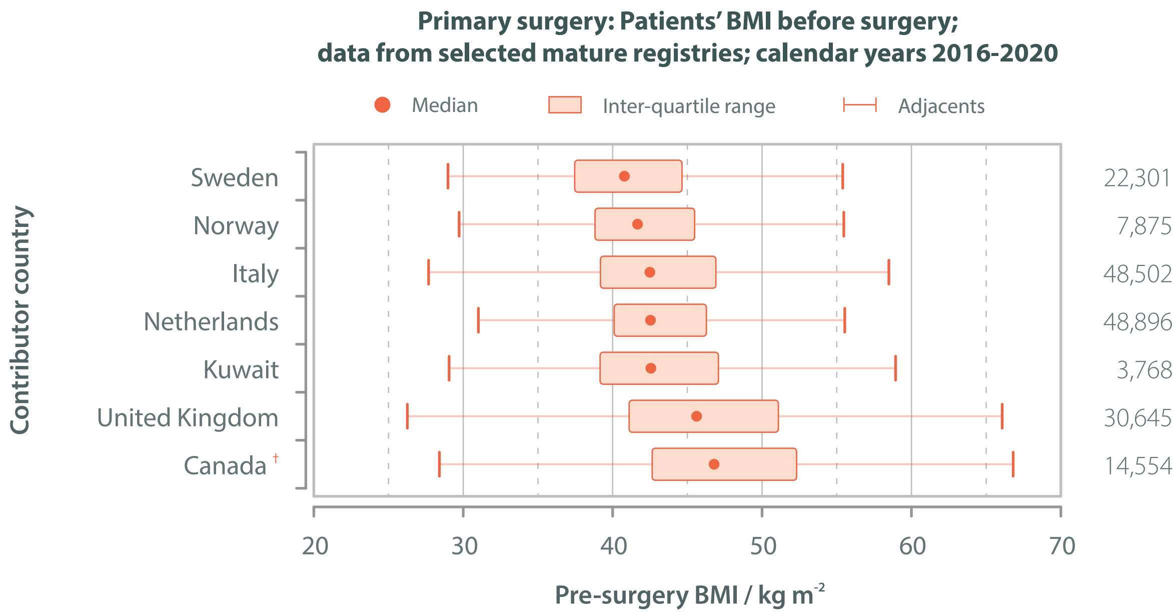
IFSO Global Registry: data completeness for the baseline record

Contributor country	Operation record	Missing data items	Data items required	Missing data rate
	Data completeness information			
Austria	5,051	8,157	126,814	6.4%
Azerbaijan	404	1,548	10,201	15.2%
Bahrain	2,094	2,202	52,666	4.2%
Belarus	321	969	8,027	12.1%
Belgium	1,942	12,396	48,796	25.4%
Bolivia	202	184	5,069	3.6%
Brazil	805	7,522	20,289	37.1%
Bulgaria	170	141	4,331	3.3%
Canada †	25,562	152,171	639,018	23.8%
China	217	452	5,476	8.3%
Colombia	9,378	67,753	235,758	28.7%
Dominican Republic	76	324	1,912	16.9%
Egypt	1,281	9,709	32,173	30.2%
El Salvador	67	57	1,681	3.4%
France	36,599	403,700	916,849	44.0%
Georgia	159	195	4,023	4.8%
Greece	703	632	17,670	3.6%
Guadeloupe	560	475	14,098	3.4%
Guatemala	441	5,269	10,966	48.0%
Hong Kong	944	2,034	23,936	8.5%
Hungary	66	213	1,659	12.8%
India	4,350	50,996	109,197	46.7%
Ireland	909	5,190	22,908	22.7%
Italy	110,422	1,844,881	2,731,452	67.5%
Japan	694	10,495	17,618	59.6%
Jordan	1,151	1,355	29,016	4.7%
Kazakhstan	619	649	15,906	4.1%
Kuwait	4,517	19,776	113,313	17.5%
Lebanon	319	521	8,006	6.5%
Mexico	4,551	31,066	114,329	27.2%
Morocco	99	94	2,479	3.8%
Netherlands	64,568	217,786	1,622,280	13.4%
Norway	8,930	69,721	224,405	31.1%
Peru	1,050	2,472	26,402	9.4%
Poland	540	601	13,614	4.4%
Portugal	828	3,981	20,782	19.2%
Qatar	6,350	5,298	159,311	3.3%
Russia	16,844	90,214	420,035	21.5%
Saudi Arabia	14,825	123,893	371,484	33.4%
South Africa	1,016	16,275	24,403	66.7%
South Korea	3,097	11,338	78,232	14.5%
Spain	50	143	1,257	11.4%
Sweden	75,312	166,814	1,891,976	8.8%
Taiwan	1,721	29,481	43,117	68.4%
Tunisia	957	6,204	24,025	25.8%
Turkey	1,878	11,855	47,296	25.1%
Ukraine	64	173	1,623	10.7%
United Arab Emirates	431	725	10,832	6.7%
United Kingdom	84,802	513,909	2,123,359	24.2%
United States of America	9,362	39,429	235,544	16.7%

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 38.9 m^{-2} in Asia pacific to 46.3 kg m^{-2} in North America.



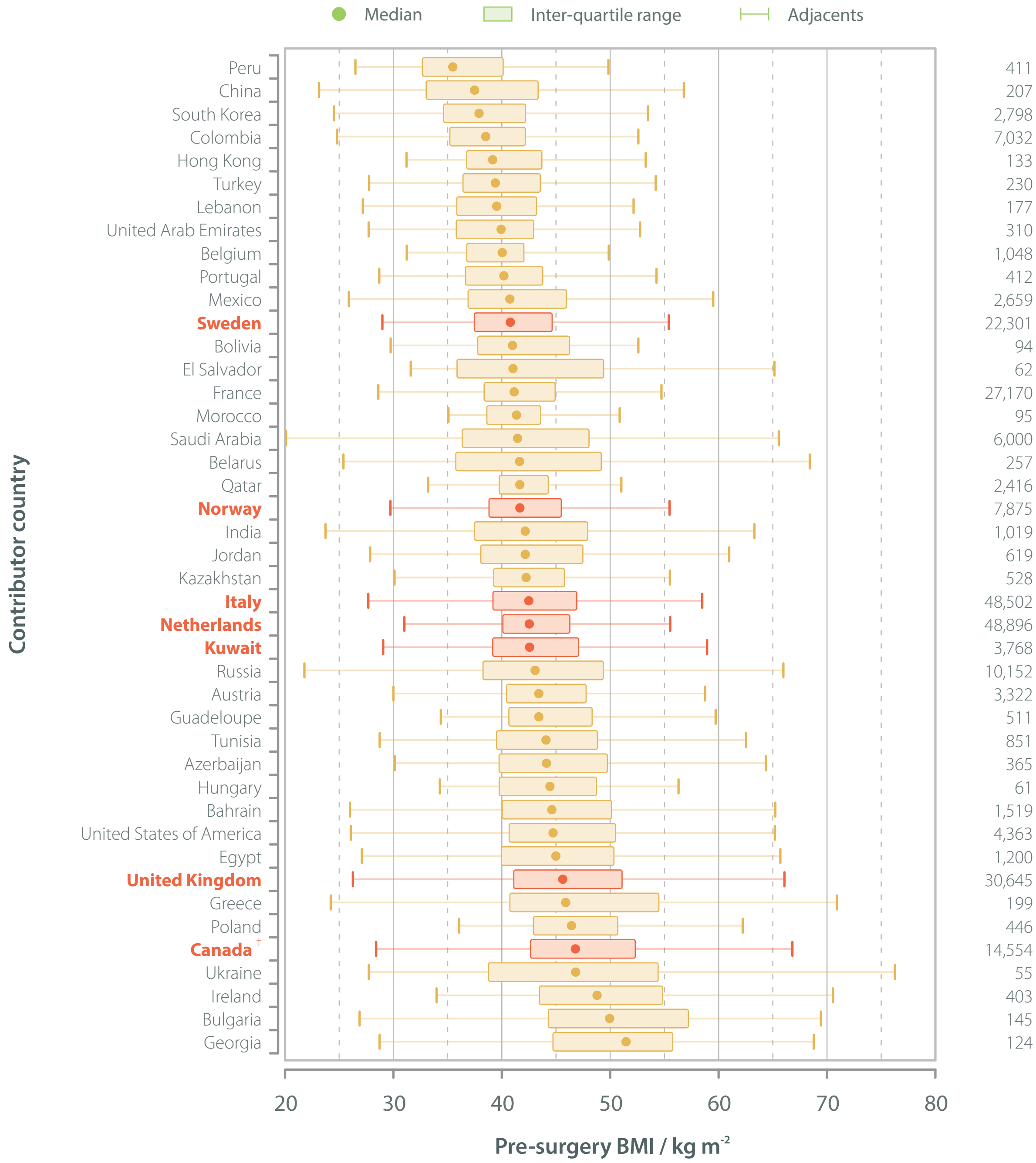


The graph below shows that there is a wide variation in the distribution of pre-surgery BMI for patients from different countries, ranked in order of increasing median BMI.

This chart demonstrates that metabolic / bariatric surgery is indicated at different BMI's in different populations probably reflecting the fact that diseases relating to obesity are experienced at lower BMI's in some populations.

It may also reflect the difficulty accessing bariatric surgery in different countries.

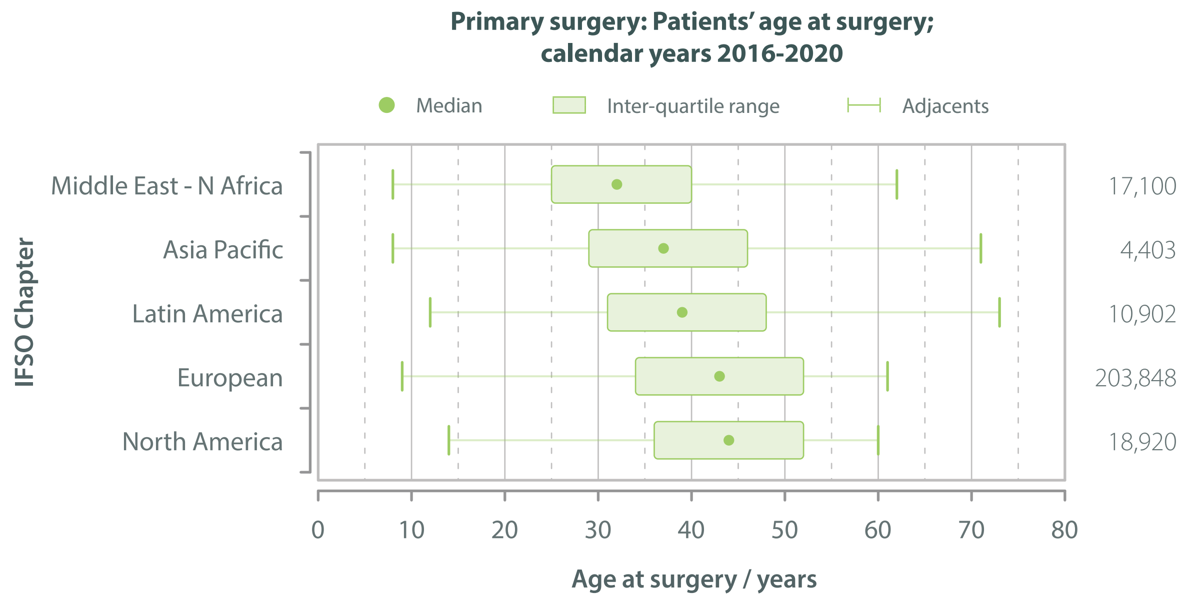
Primary surgery: Patients' BMI before surgery; calendar years 2016-2020 (n=253,934)

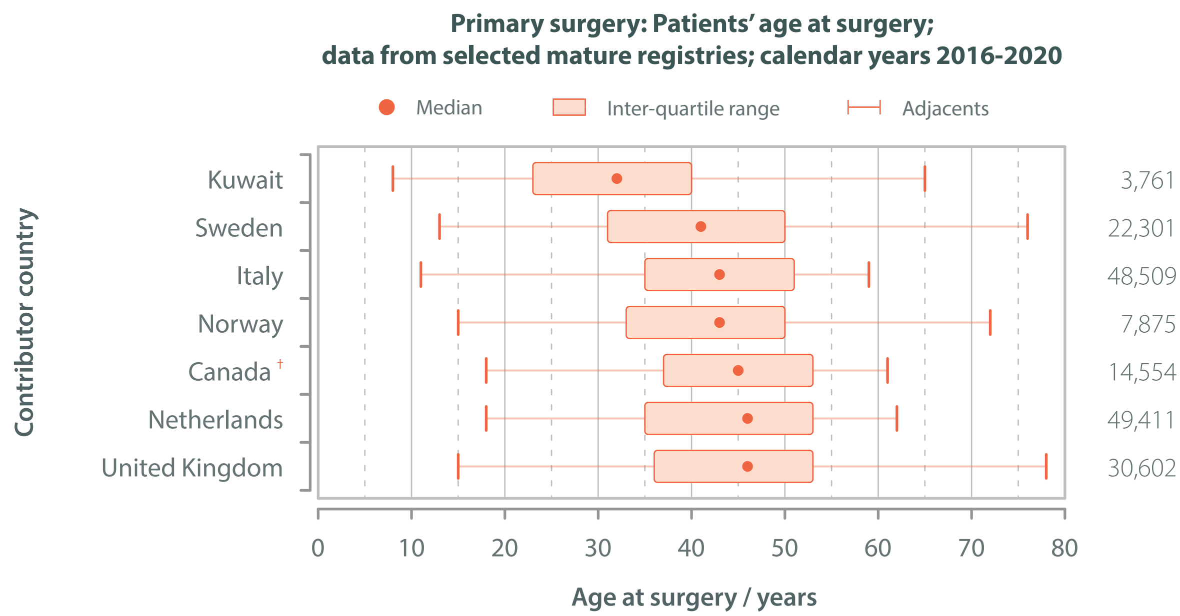


Analysis

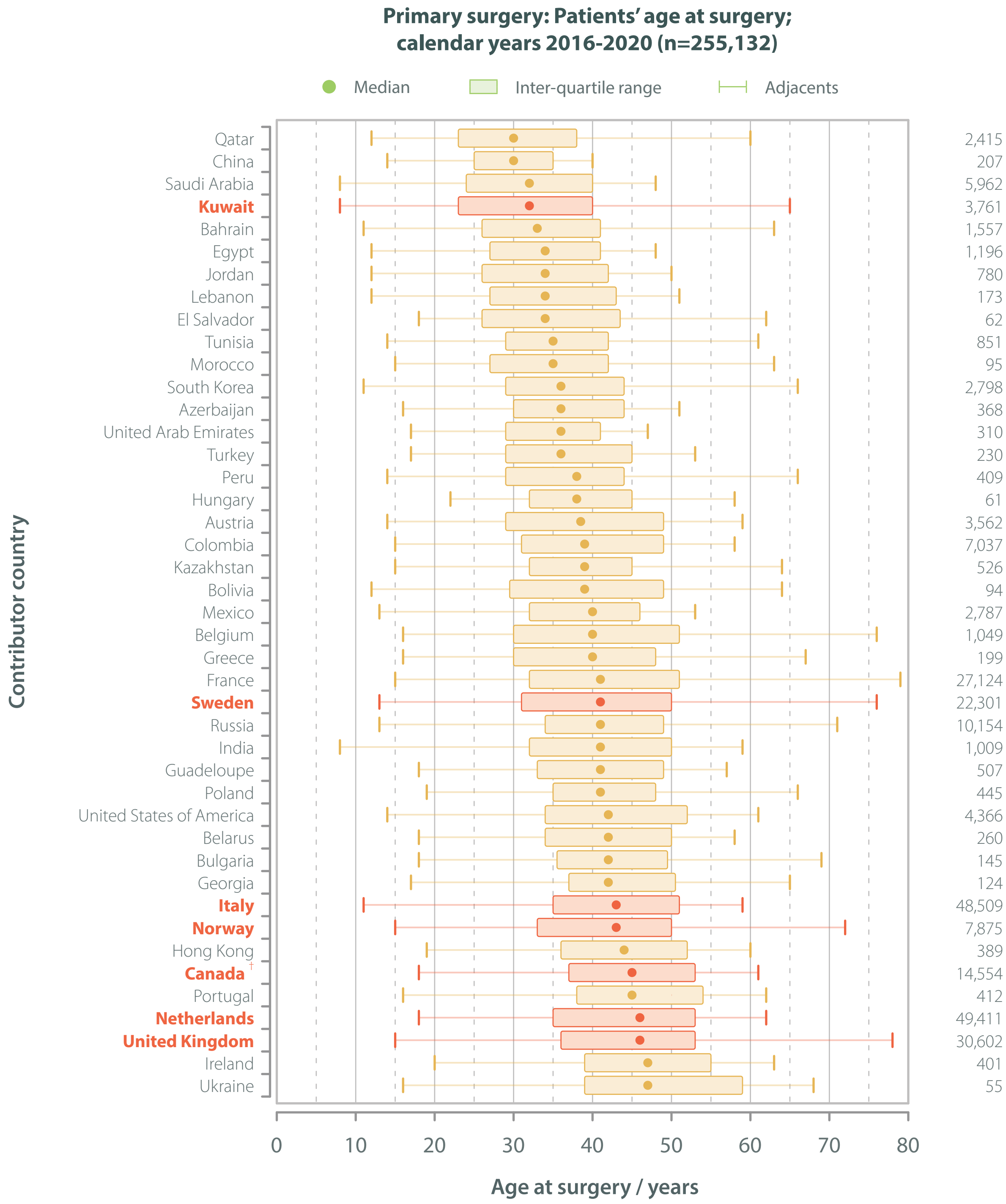
Age at surgery

The graphs below show the distributions of age at the time of primary bariatric surgery, firstly according to IFSO Chapter, and then for seven selected contributor countries. The patient's age is an important factor, as it has been proven to have an impact on many surgical outcomes.





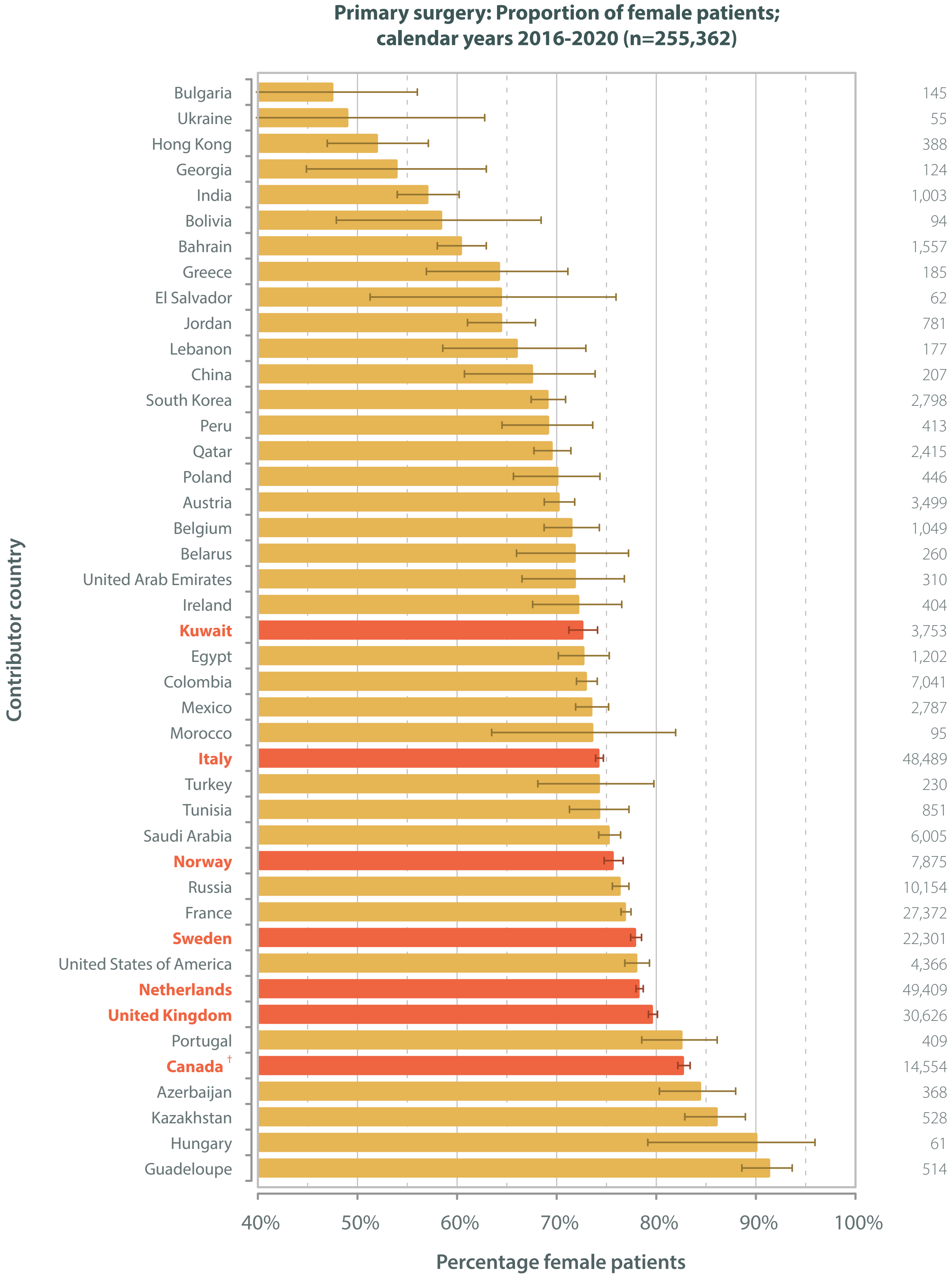
As with the last report, it appears that patients undergoing bariatric surgery in MENAC countries are likely to be younger than those patients in countries affiliated with other Chapters.



Gender

In this sixth report, yet again, it is evident that it is predominantly females who are undergoing metabolic / bariatric surgery, although there is variance from country to country and from one IFSO Chapter to another.

For the 7 more mature national / regional registries with better data acquisition at baseline, the percent of females ranges from 72.7% in Kuwait to 82.8% in Canada (Ontario).



The observed inter-country variations in the proportions of patients who are female may represent differences in the relative rates of obesity for men and women in each country, but may also be affected by cultural differences that impact on the acceptability of surgery as a treatment for obesity. For those countries represented by single-clinician practices, the proportion of women treated will certainly reflect the practice of that surgeon.

The interaction between gender and age in those seeking surgery also varies regionally and are statistically significantly different (Mann Whitney-U $p<0.001$). In Europe and North 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 a comparable age to women.

Primary surgery: statistics on patients' age at surgery; calendar years 2016-2020

Gender and IFSO Chapter			Count	Average (95% CI)	Median (IQR)
	All regions	All patients	255,173	**42.1** (42.0-42.1)	**42.0** (33.0-51.0)
		Female patients	195,263	**41.7** (41.7-41.8)	**42.0** (33.0-51.0)
		Male patients	59,697	**43.3** (43.2-43.4)	**44.0** (35.0-52.0)
	Female patients	North America	15,459	**43.8** (43.6-44.0)	**44.0** (36.0-52.0)
		Latin America	8,036	**39.7** (39.5-40.0)	**39.0** (31.0-48.0)
		European	156,673	**42.3** (42.3-42.4)	**43.0** (33.0-51.0)
		Middle East - N Africa	12,252	**33.3** (33.1-33.5)	**32.0** (25.0-40.0)
		Asia Pacific	2,843	**38.4** (38.0-38.8)	**37.0** (30.0-46.0)
	Male patients	North America	3,461	**46.4** (46.0-46.7)	**47.0** (39.0-54.0)
		Latin America	2,865	**40.2** (39.8-40.6)	**40.0** (32.0-47.0)
		European	47,000	**44.6** (44.4-44.7)	**45.0** (36.0-53.0)
		Middle East - N Africa	4,829	**32.4** (32.1-32.7)	**31.0** (24.0-40.0)
		Asia Pacific	1,542	**38.0** (37.5-38.6)	**36.0** (29.0-46.0)

Obesity-related disease

Type 2 diabetes

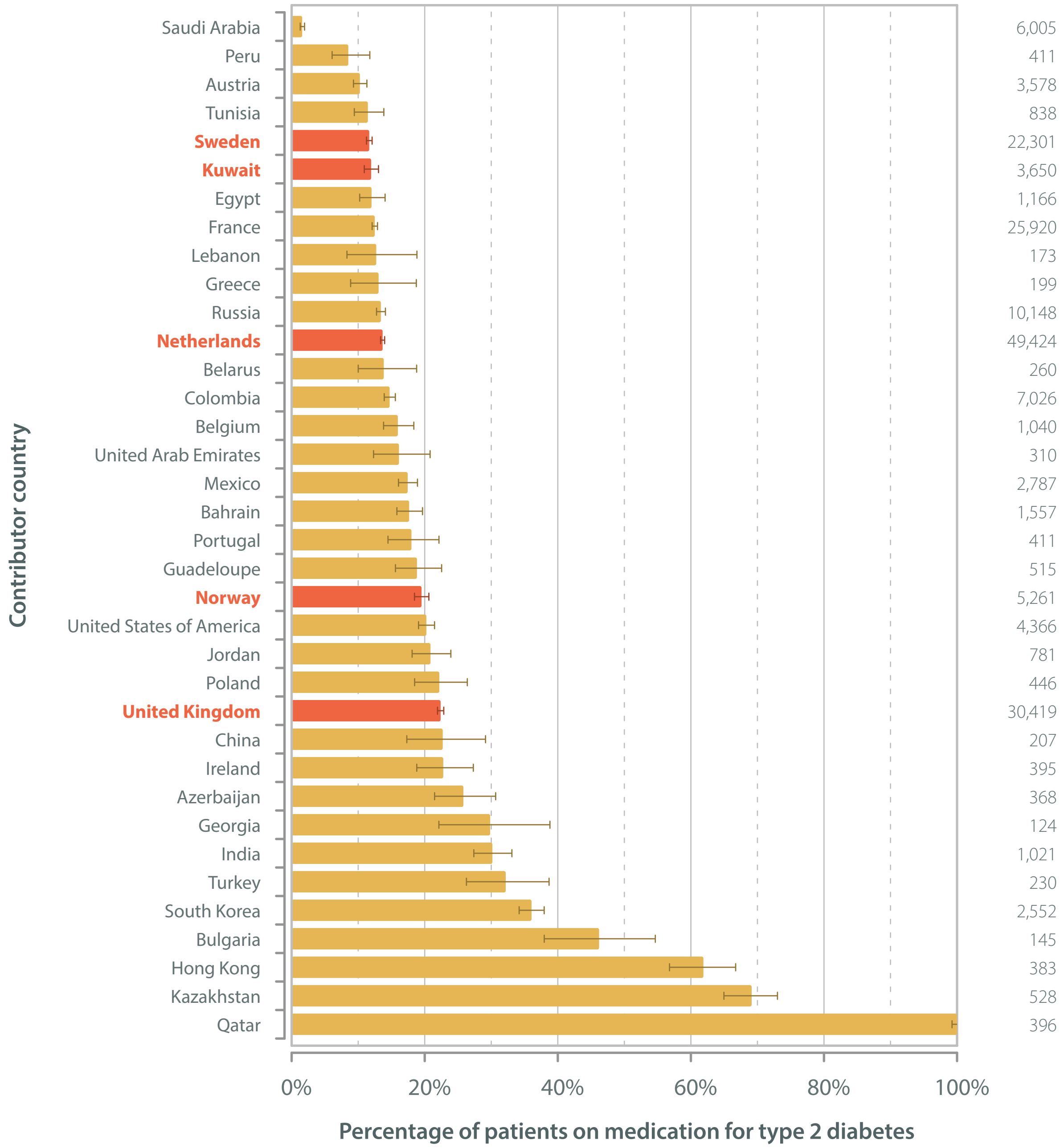
Since the 1990s it has been recognised that bariatric surgery has a powerful impact on diabetes, meaning that in many cases the only treatment needed for diabetes is bariatric surgery. This has lead to a general agreement that procedures should be recognised, not just as bariatric surgery but also as metabolic surgery.

Decreasing the need for anti-diabetic medication is an important benefit of metabolic / bariatric 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.

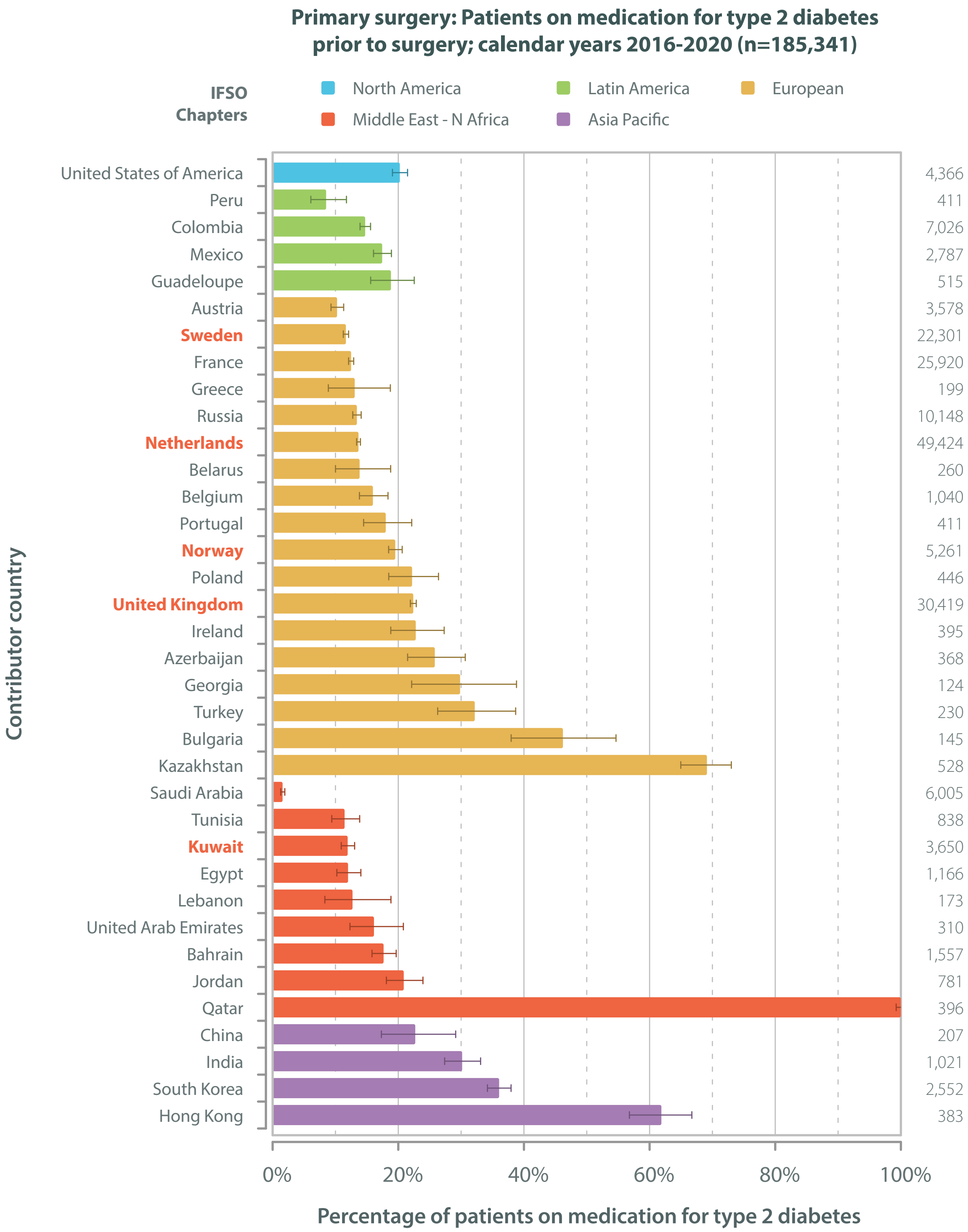
However, despite the significant scientific interest in metabolic surgery for diabetes, only around 20% of patients that present for surgery are on medication for type 2 diabetes. It is probable that there is a large unmet need in the general population for metabolic surgery. In public healthcare systems this means that people with obesity who have type 2 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 >30%. It should be noted that these countries are also countries where bariatric surgery was more frequently performed in people with a lower BMI (South Korea, Turkey and Hong Kong). All of the participants from Qatar had diabetes at baseline. These differences may reflect the incidence of metabolic ill health in different regions associated with obesity, but may also reflect local indications for surgery needing to include not just obesity but also metabolic disease.

Primary surgery: Patients on medication for type 2 diabetes prior to surgery; calendar years 2016-2020 (n=185,341)



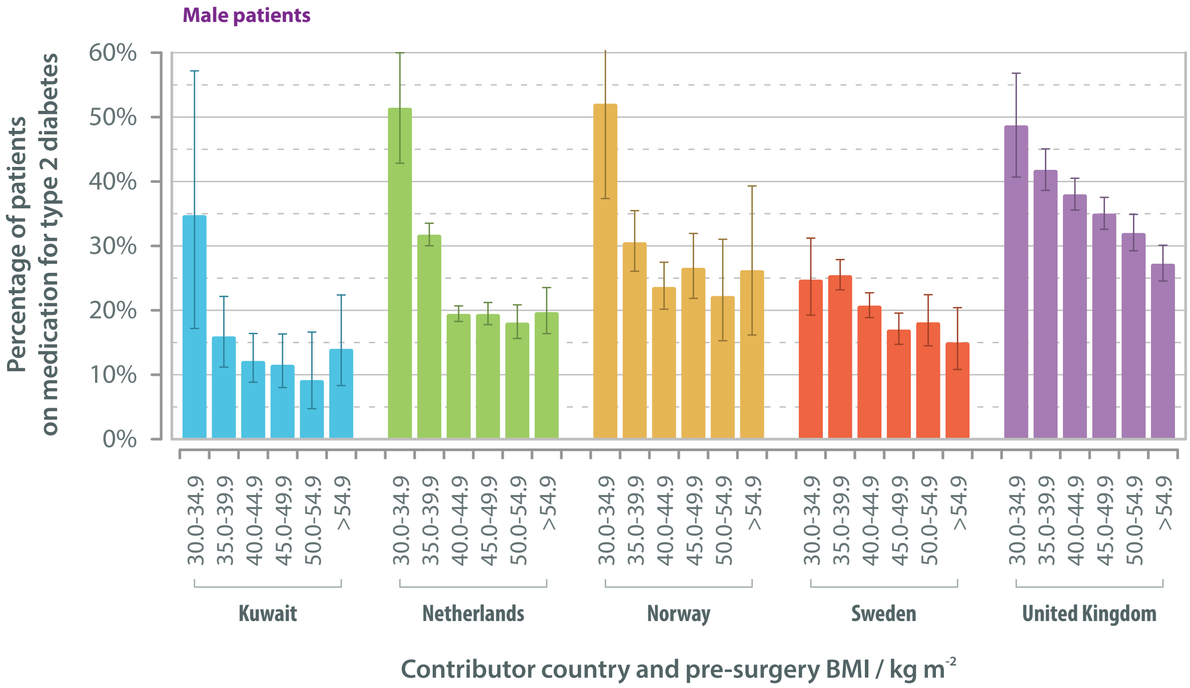
This graph helps to demonstrate the differences between and within Chapters. It is likely that there are local differences in the indications for surgery; however, there maybe other factors such as the increased prevalence of metabolic disease at lower BMI in some Asian populations. It is important to note the limitations of small numbers in some countries, and the representation of North America by a single-centre.



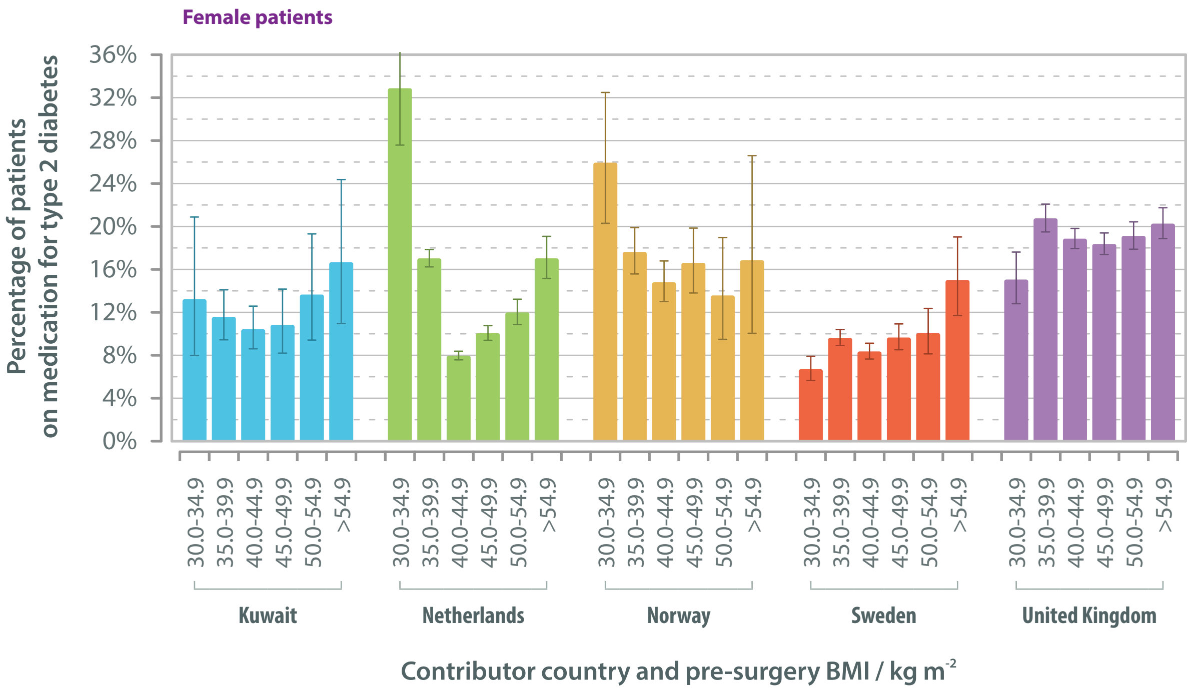
Considering the data from our highlighted national / regional registries, as shown in the charts opposite, its is apparent that men with lower BMI are more likely to be on treatment for type 2 diabetes prior to surgery than their compatriots with much higher BMI. This suggests that the motivator for surgery at lower BMIs in men may be health improvement, or the data may reflect the particular indications for surgery in different jurisdictions.

This pattern is not evident in the female patient-populations, apart from in the Netherlands and Norway. Interestingly in Sweden, the proportion on treatment for type 2 diabetes goes up as BMI increases, reflecting a more usual correlation between increasing weight and diabetes incidence, and perhaps suggesting weight alone is a driver of surgical uptake in that country for women.

Primary surgery for male patients: Patients on medication for type 2 diabetes prior to surgery; mature registry data; calendar years 2016-2020



Primary surgery for female patients: Patients on medication for type 2 diabetes prior to surgery; mature registry data; calendar years 2016-2020

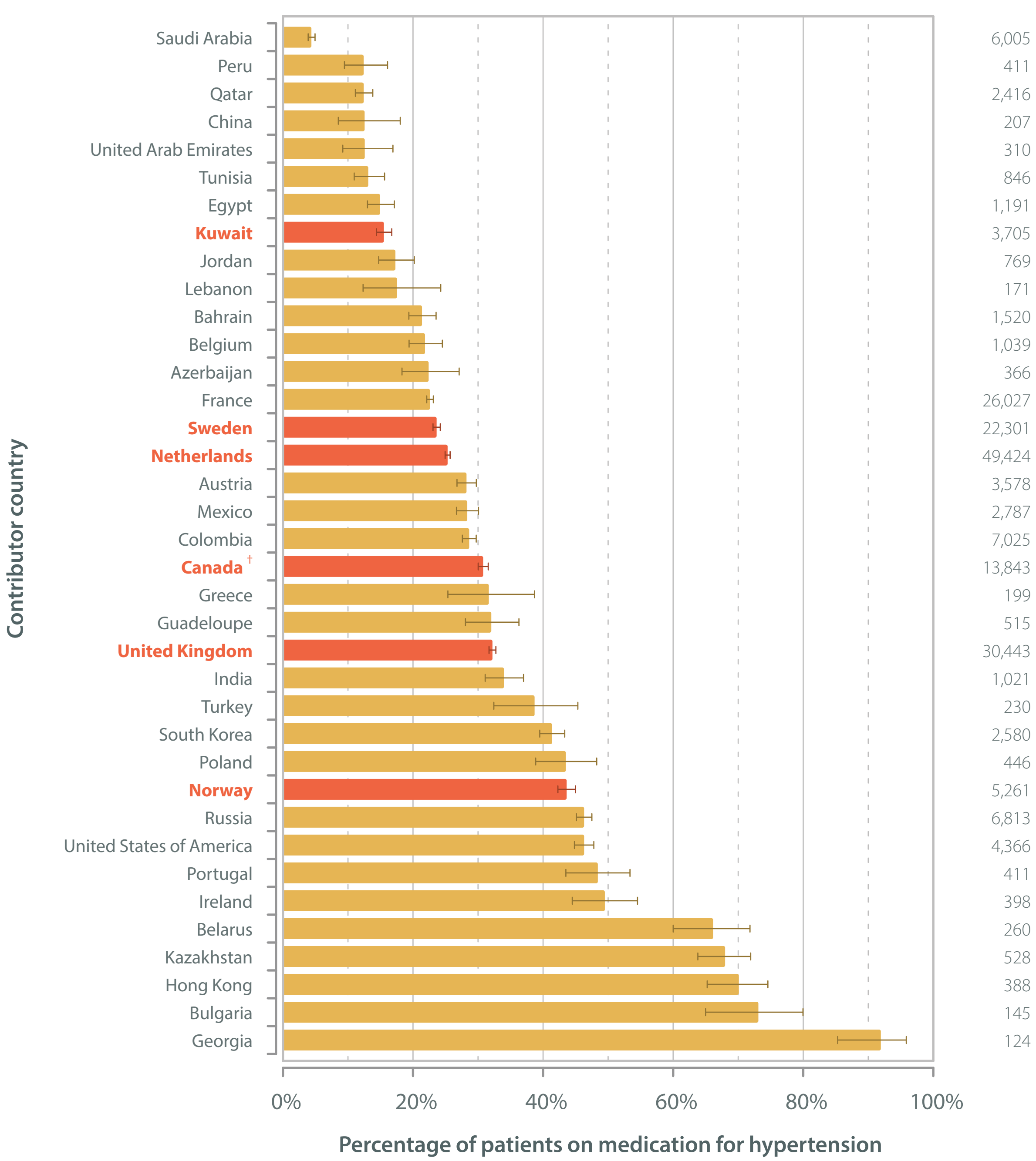


Hypertension

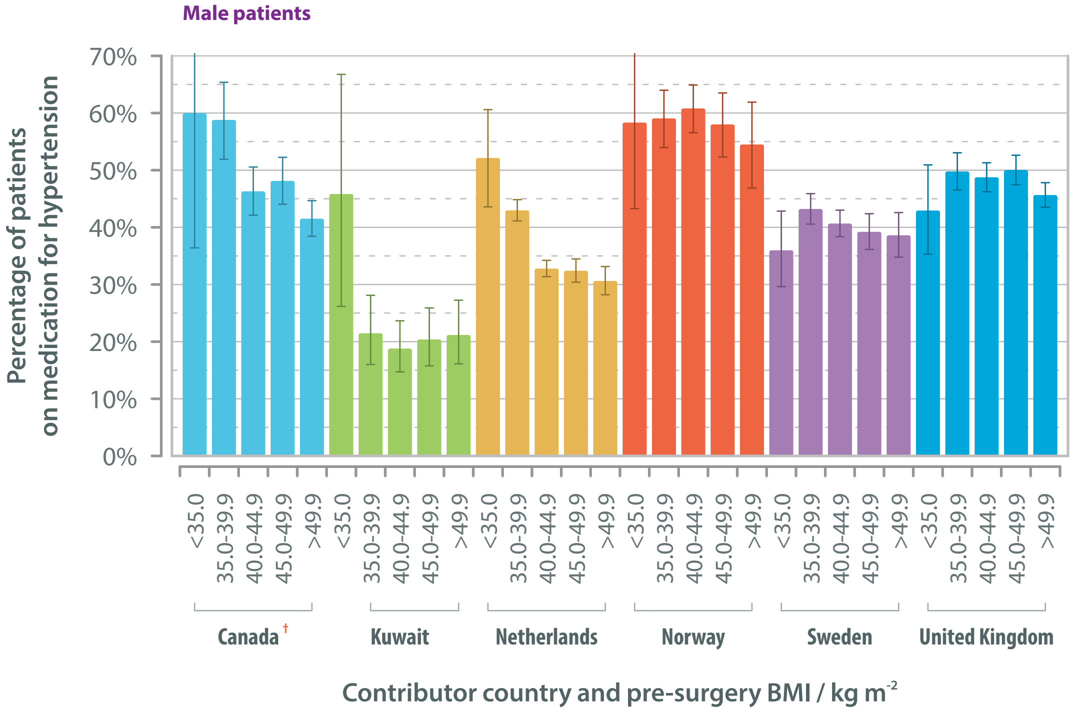
The graph below shows the rate of treatment for hypertension *per* country. As with the data on diabetes treatment rates, there is widespread geographical variation in the prevalence of treatment for hypertension in bariatric surgery patient-populations. Hypertension is an established risk factor, together 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).

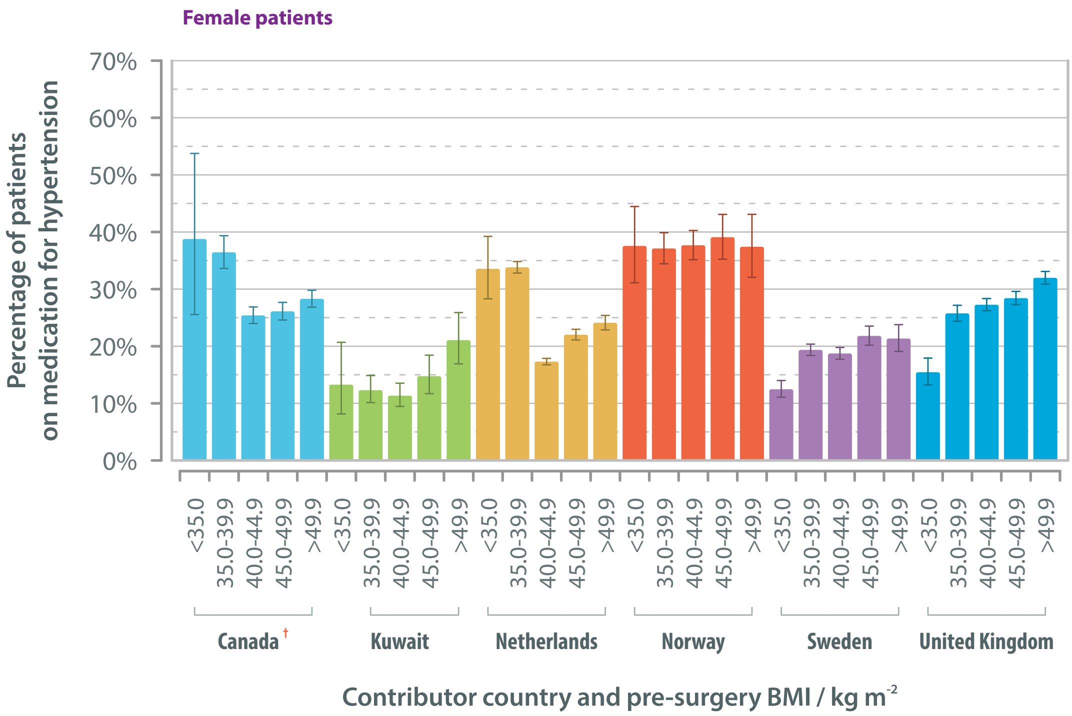
The analyses for this condition have also been further split according to gender and BMI group on the facing page. These data, taken from the same seven national registries, show differences and similarities in treatment rates for hypertension both within one IFSO Chapter region, and across different continents. Again, the observations cannot be easily explained, but are of interest and may be worth further more detailed investigation through focused research projects.

Primary surgery: Patients on medication for hypertension prior to surgery; calendar years 2016-2020 (n=198,069)



Primary surgery: Patients on medication for hypertension prior to surgery according to pre-surgery BMI and gender; calendar years 2016-2020





Musculo-skeletal pain

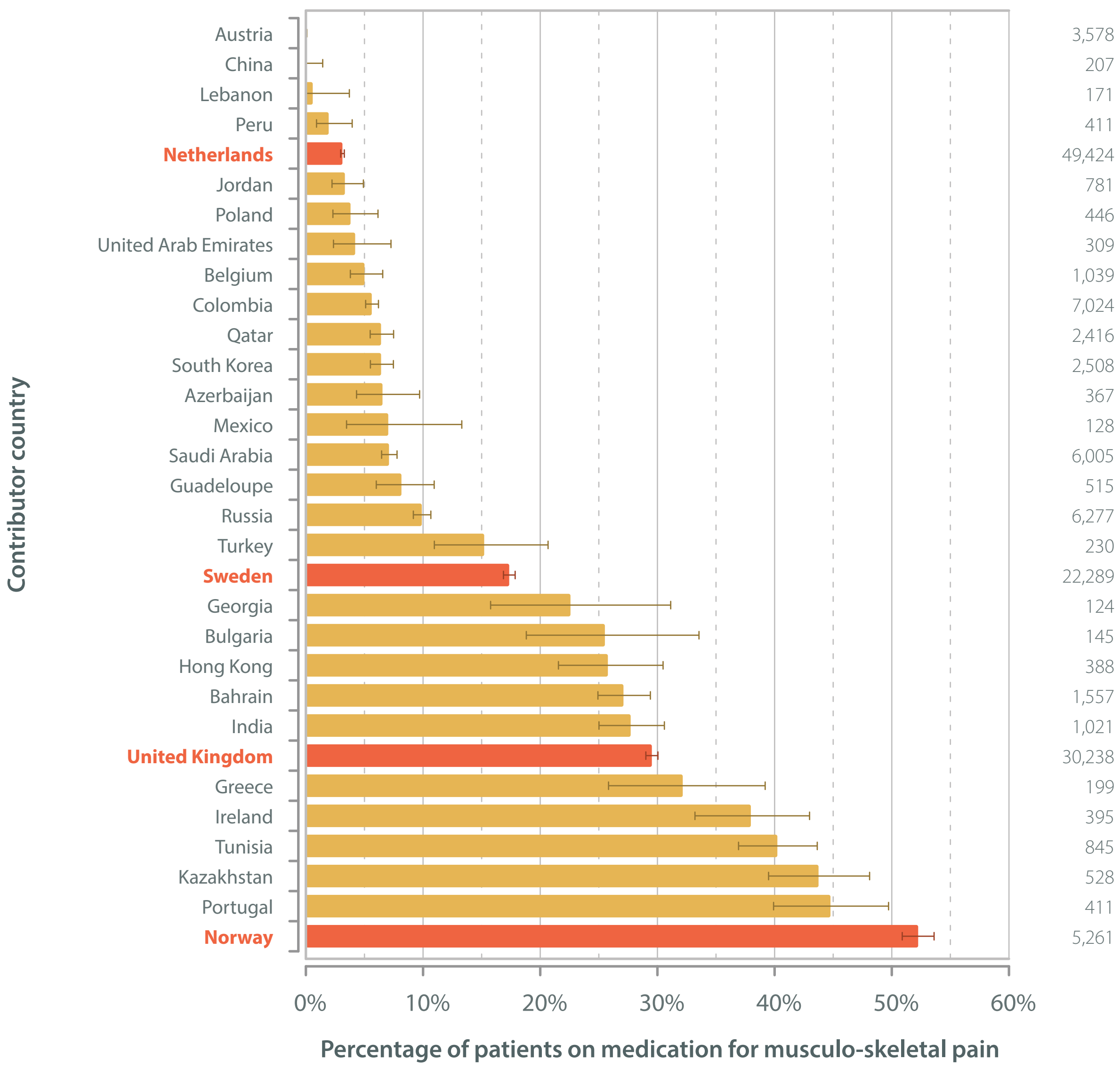
Musculo-skeletal pain is a common concern of people with obesity. Not all contributors collect these data, although four of our highlighted national / regional registries do have data from large cohorts of patients.

In these national registries, the rates of treatment for musculo-skeletal pain range from 4% in the Netherlands to 52% in Norway.

These broad differences may reflect different patterns of care for musculo-skeletal pain as well as ease of access to various medications. It may also reflect differences in recording over the counter *versus* prescribed medications. It is also possible that those countries with higher rates of Roux en Y gastric bypass / one anastomosis gastric bypass require patients to be off NSAIDs before surgery due to the risk of stomal ulceration.

This will be an interesting area to explore in the future.

Primary surgery: Patients on medication for musculo-skeletal pain prior to surgery; calendar years 2016-2020 (n=145,237)

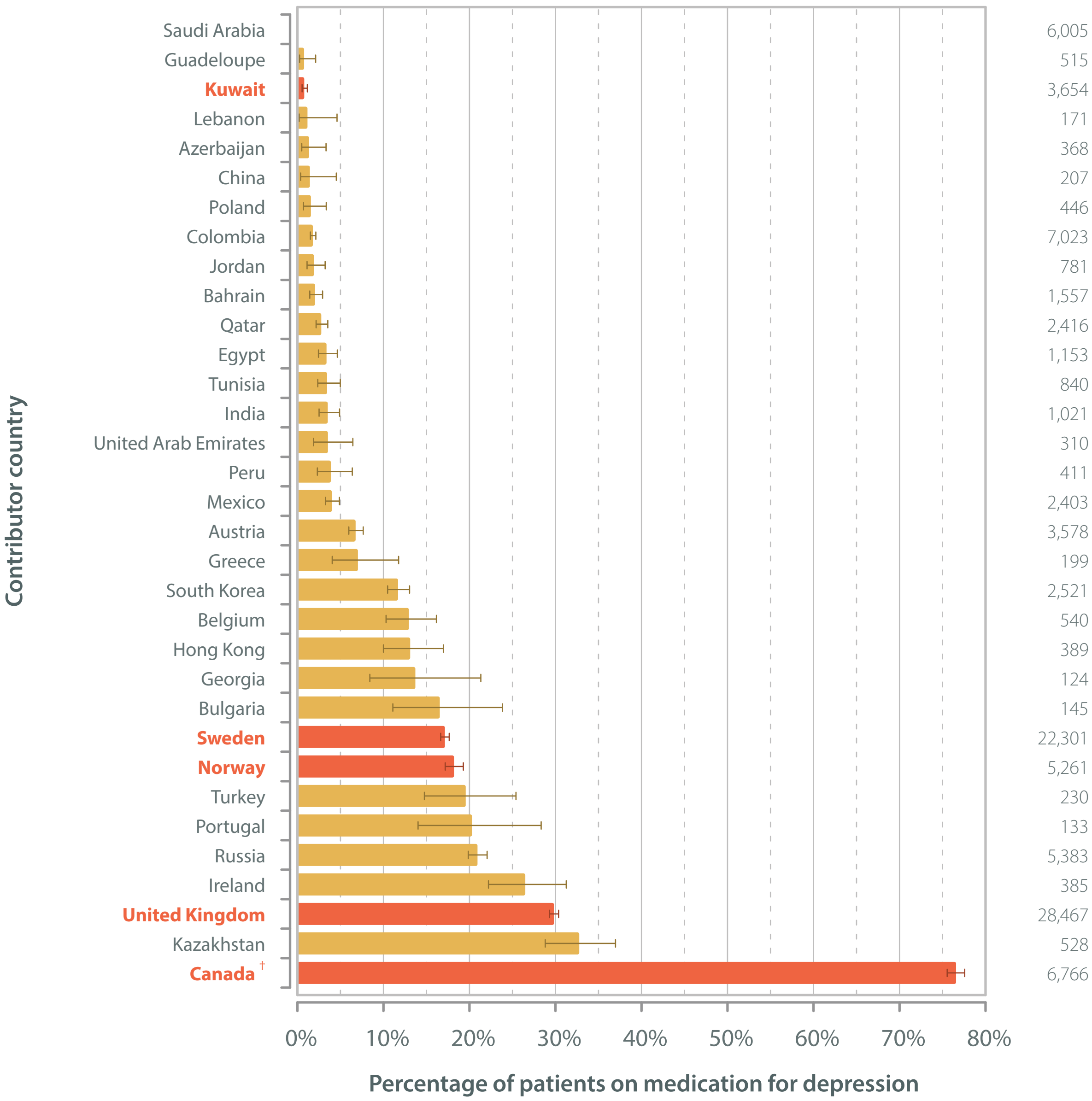


Depression

The graph below shows the rate of medication for depression *per* country and by increasing prevalence. Just looking at the data from countries submitting large numbers (those with mature registries) there are significant differences. The Ontario Regional Registry, Canada, again reports nearly 80% of their participants as being treated for depression. In general, countries in the European Chapter report a higher prevalence of patients on medication for depression than in countries from the MENAC territories.

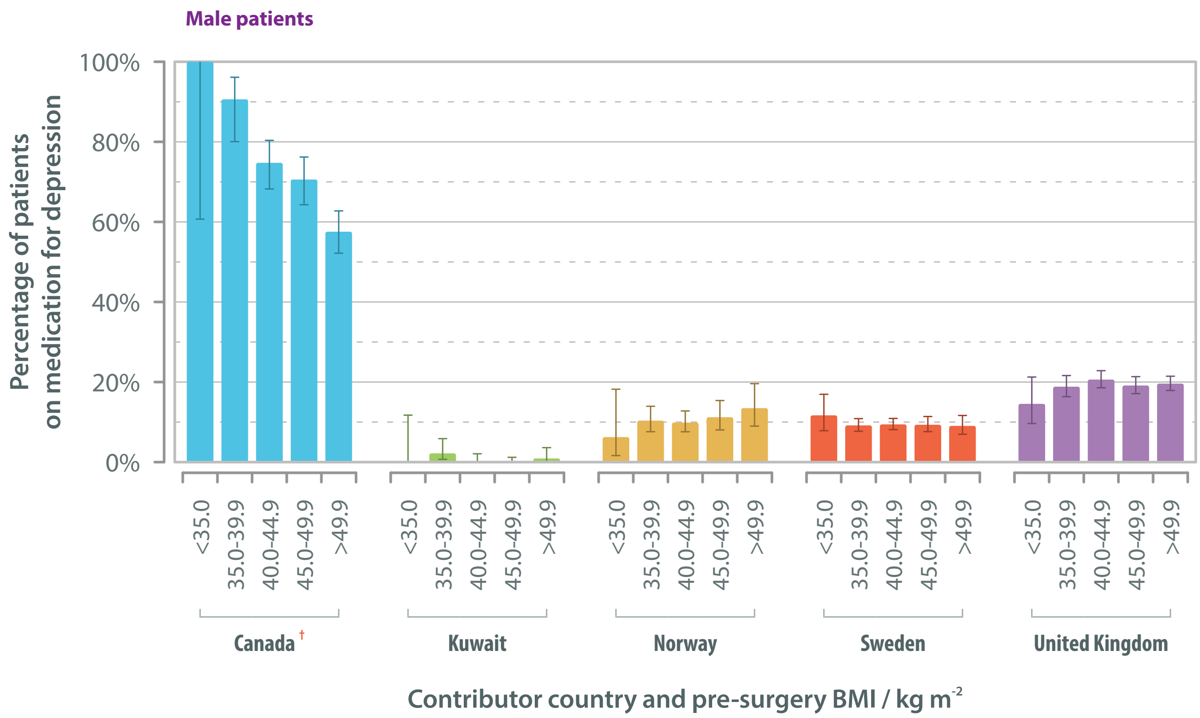
The reasons for all these differences are almost certainly multi-factorial, and are at least partly dependent on the approach to the diagnosis and treatment of this condition in primary practice.

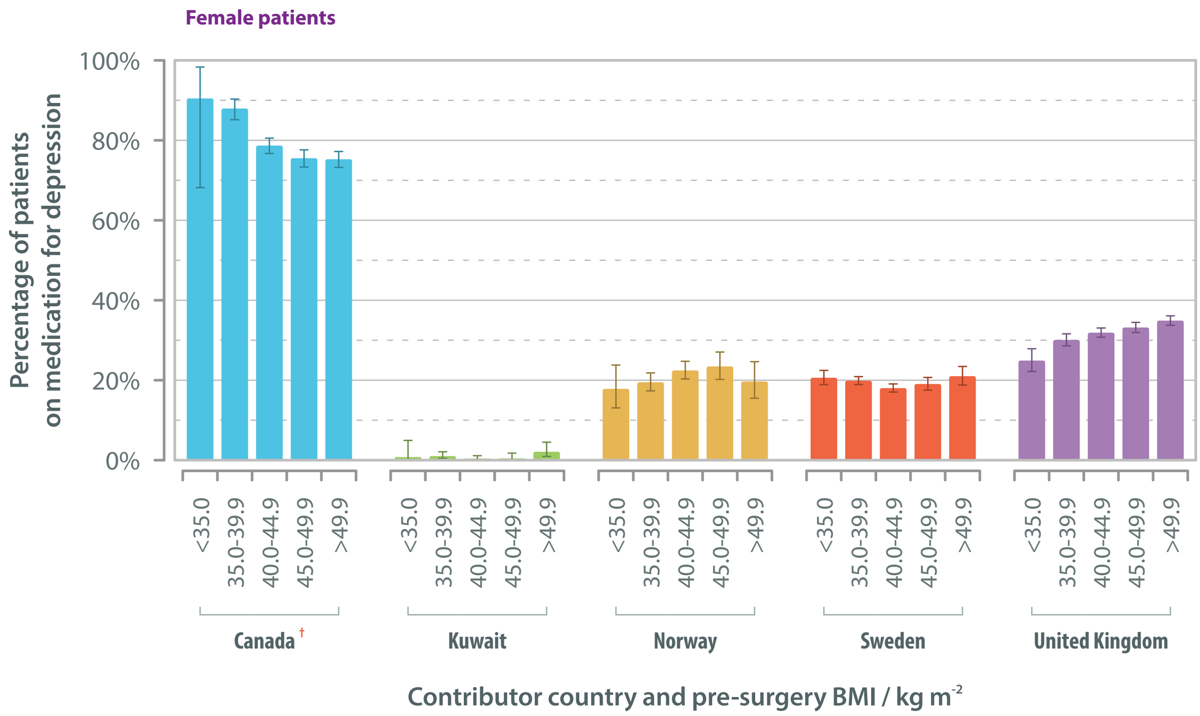
Primary surgery: Patients on medication for depression prior to surgery; calendar years 2016-2020 (n=106,231)



There are marked differences in the rate of medication for depression in the Ontario dataset when considered by BMI class. Those with BMI<35 are more likely to be on antidepressant medication compared with those with a BMI >49.9 in both men and women, although the effect is most pronounced in men.

Primary surgery: Patients on medication for depression prior to surgery according to pre-surgery BMI and gender; calendar years 2016-2020





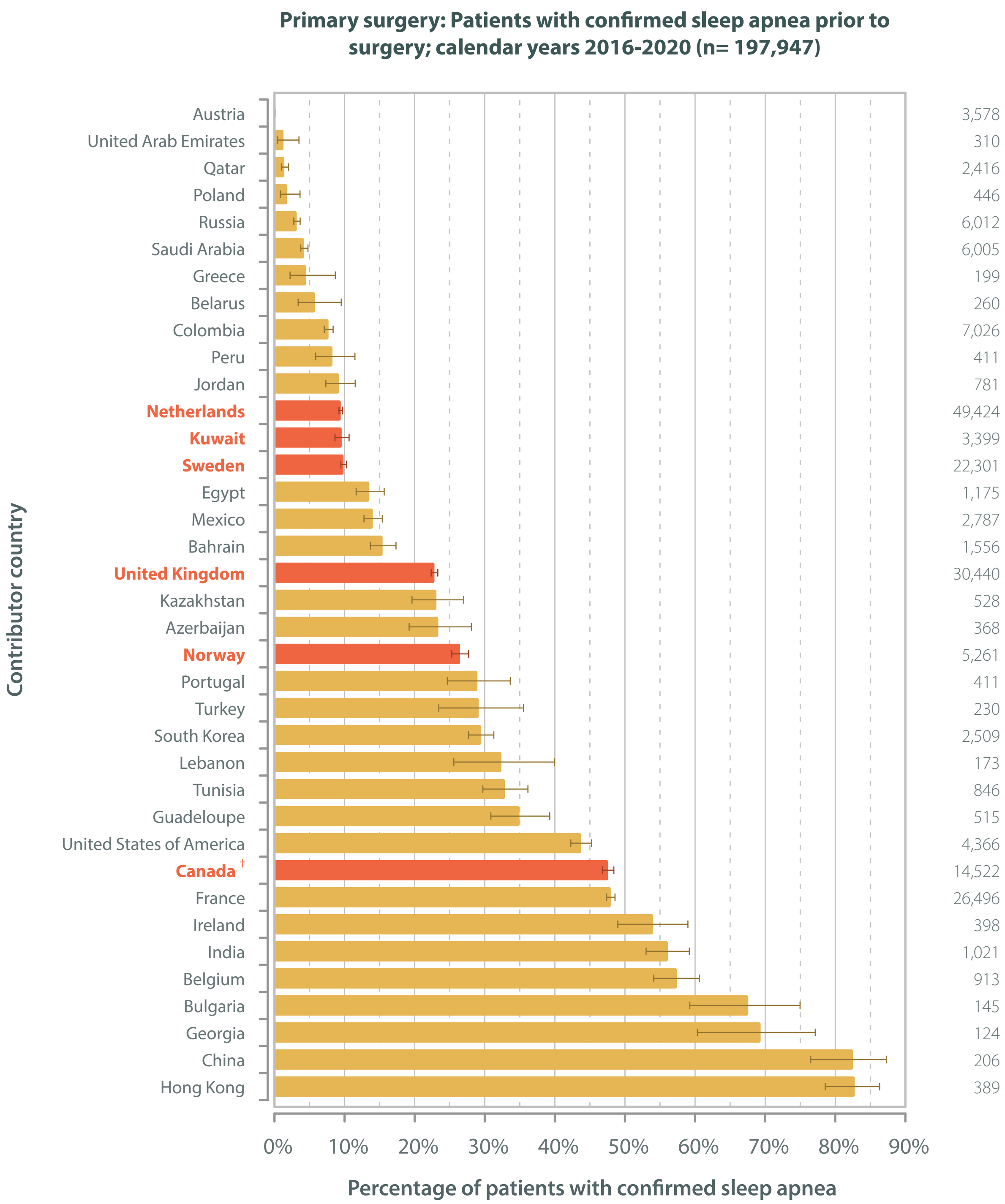
Analysis

Sleep apnea

The graph below shows the recorded rates of sleep apnea *per* country. 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.

It is of interest that those countries offering bariatric surgery to those with lower BMI also report high rates of pre-operative sleep apnea, further pointing to the severity of the disease of obesity that is being treated in these countries.

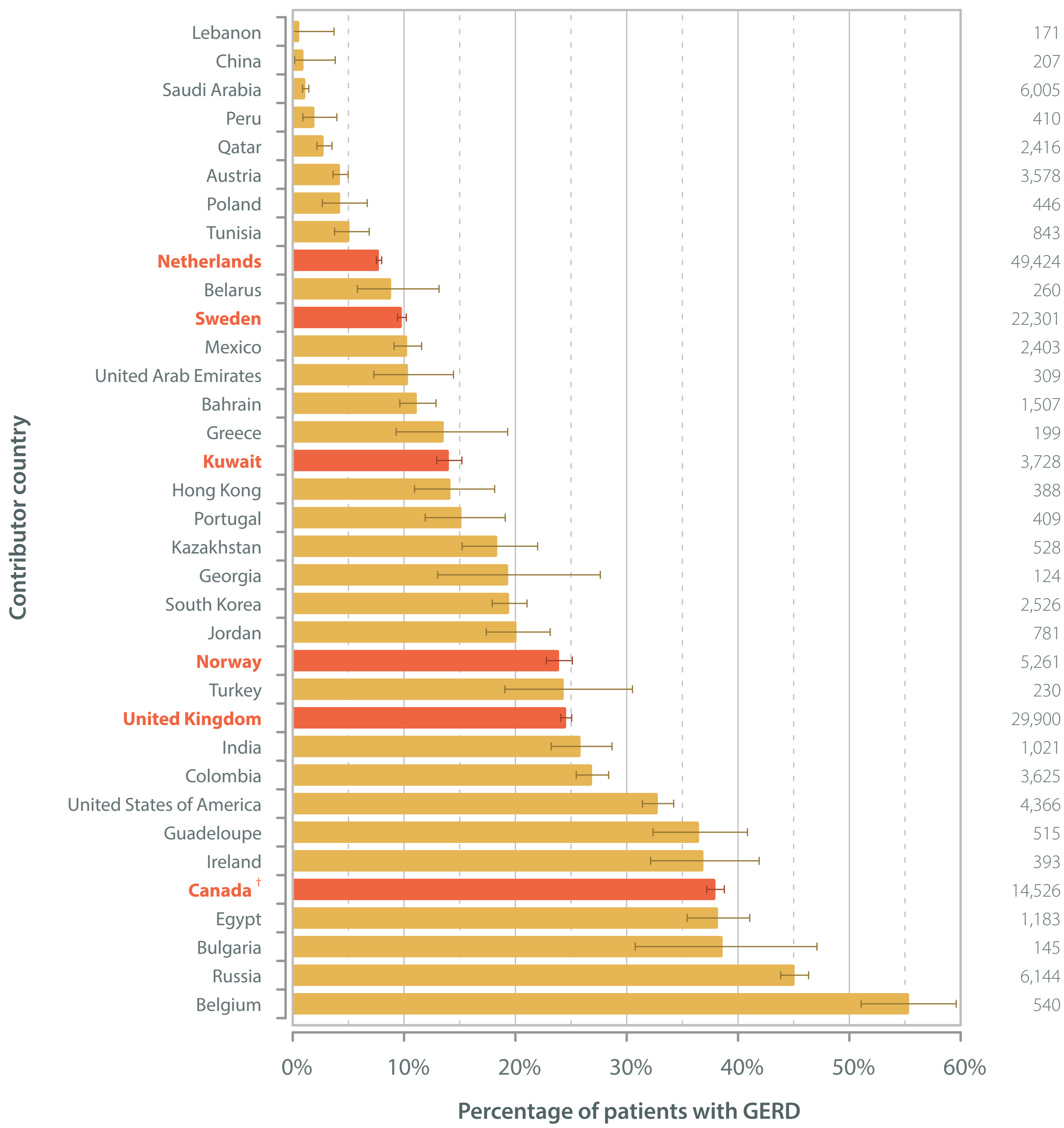


GERD

The graph below shows the rate of gastro-esophageal reflux disease (GERD) *per* country ordered by increasing prevalence. As shown in previous reports, there is wide variation in the reported rates of GERD across the contributor countries.

Each metabolic / bariatric procedure has a different effect on GERD, with most clinicians accepting that sleeve gastrectomy is refluxogenic, whilst Roux en Y gastric bypass is seen as an effective treatment for GERD. This is an important issue in that, in most countries, more than 20% of patients undergoing a metabolic / bariatric procedure report regular GERD. Our future reports may be able to not only document what kind of operations patients with GERD are being offered across different countries, but also help us to understand the impact that each different operative procedure has on GERD in the medium-term. However, this will, of course, depend upon data collected using standardised definitions and on standardised methods of diagnosis for GERD.

Primary surgery: Patients with GERD prior to surgery; calendar years 2016-2020 (n=166,812)



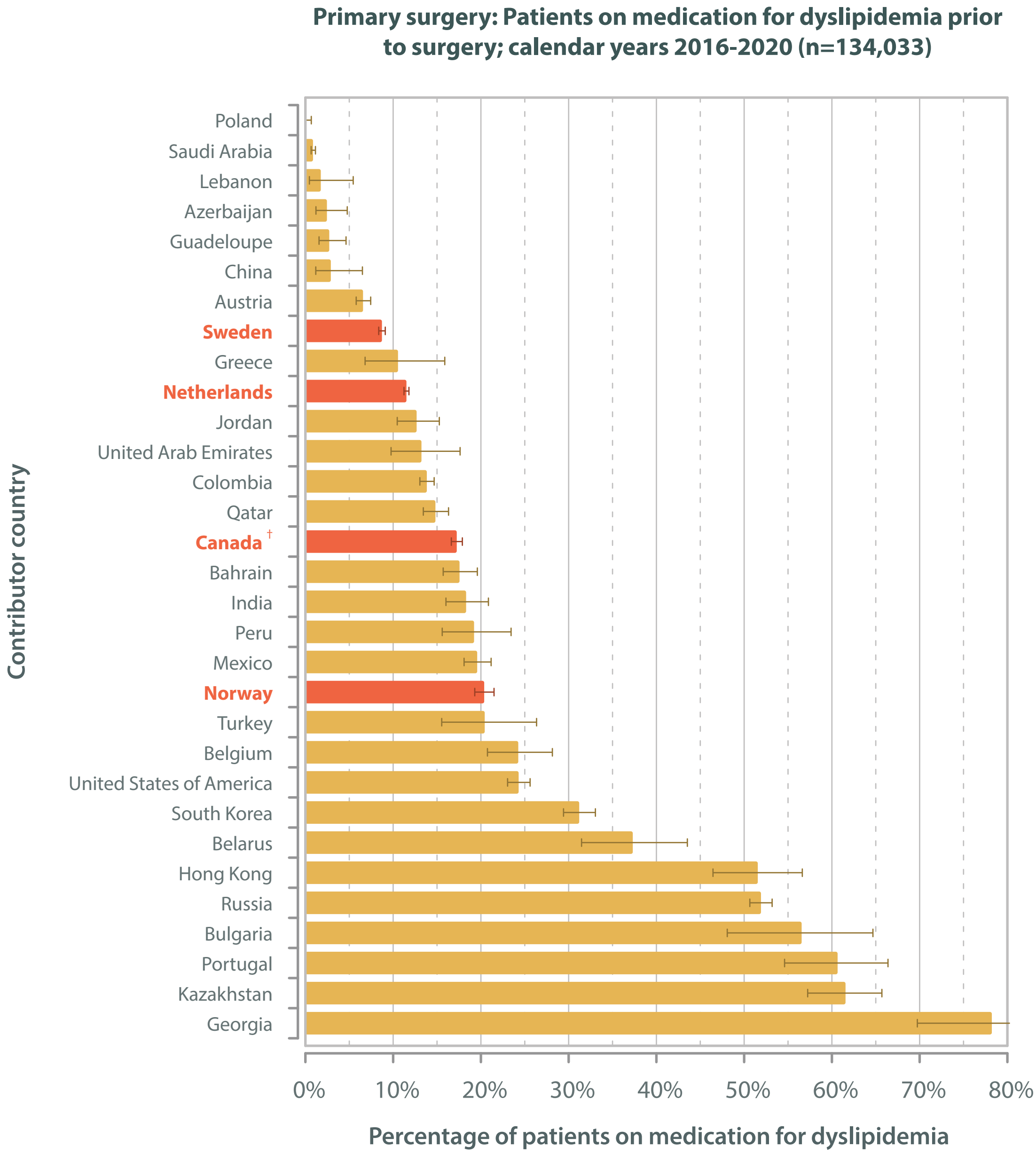
Analysis

Dyslipidemia

The graph below shows the rate of medication for dyslipidemia in bariatric surgery patients on a country-by-country basis ranked according to the prevalence.

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 be affected by either failure or success of appropriate clinical investigations for dyslipidemia in the period prior to bariatric surgery.



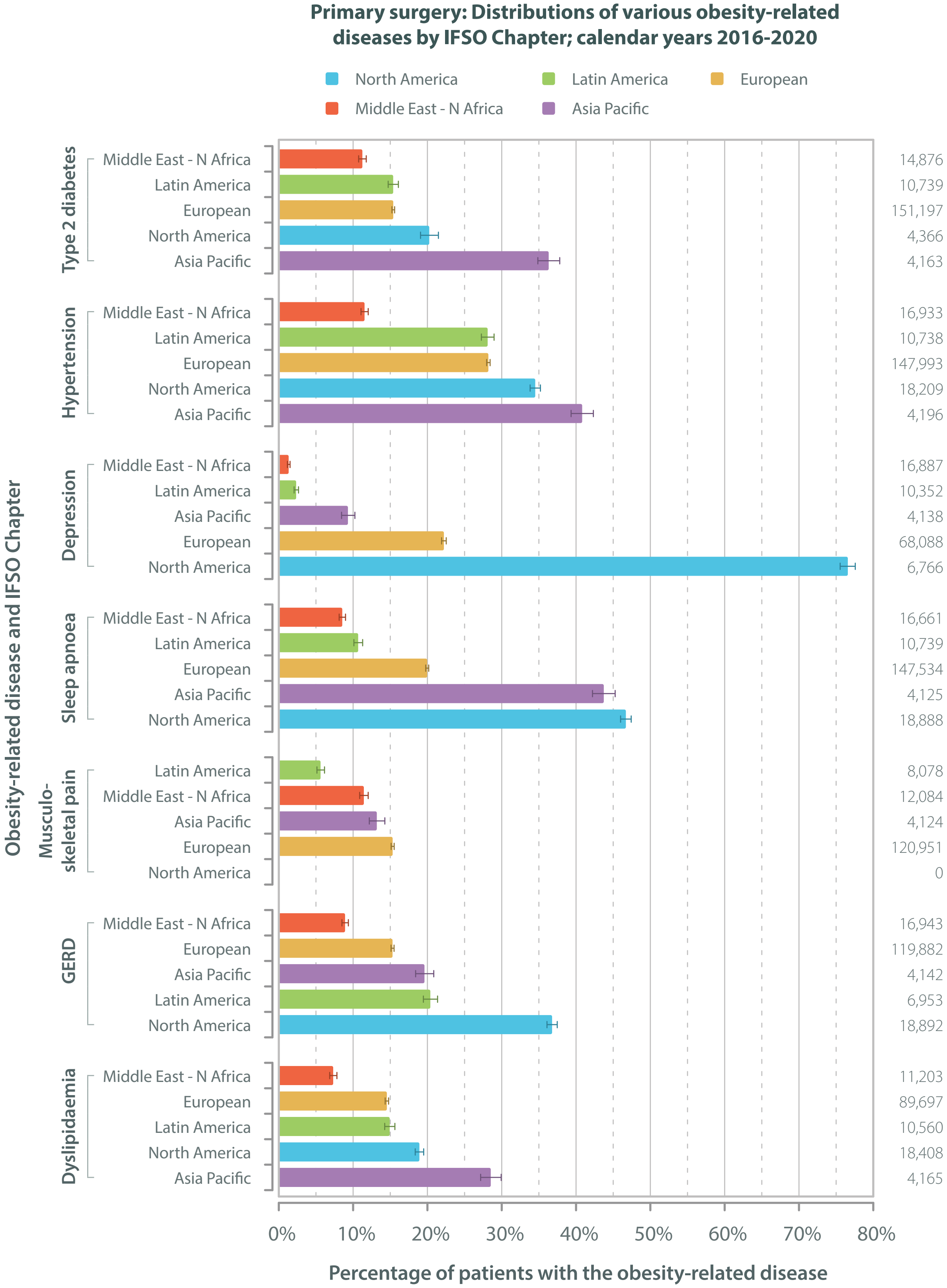
Inter-Chapter comparison of obesity-related disease

The composite graph and chart on the following pages show the prevalence of each obesity-related disease for the patient populations in each IFSO Chapter, using a consistent colour-coding for each IFSO Chapter; each distribution of the individual obesity-related disease is sorted by Chapter in ascending order of incidence.

Most striking is the high proportion of patients in the Asia-Pacific region who are on treatment for type 2 diabetes, hypertension and dyslipiedemia prior to surgery, all of which are components of the metabolic syndrome. Centres reporting from the Asia-Pacific also report operating on lower BMI patients, reaffirming that obesity should be diagnosed at a lower BMI in these populations.

There is also a 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 Ontario, Canada. There are insufficient data to ascertain if this is generalisable across Canada or the USA, however maybe worth further investigation as to whether or not there is a true difference in disease prevalence, or if it is just a difference in reporting and recording.

Please note that the labels type 2 diabetes, hypertension, depression, musculo-skeletal 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 operation records** with the specified data recorded; calendar years 2016-2020

Obesity-related disease and IFSO Chapter

		Pre-operative obesity-related disease status				
		No	Yes	Missing	Disease rate	Missing rate
Type 2 diabetes	North America	3,482	884	0	20.2%	0.0%
	Latin America	9,086	1,653	17	15.4%	0.2%
	European	127,908	23,289	4,345	15.4%	2.8%
	Middle East - N Africa	13,203	1,673	2,194	11.2%	12.9%
	Asia Pacific	2,651	1,512	252	36.3%	5.7%
Hypertension	North America	11,925	6,284	711	34.5%	3.8%
	Latin America	7,720	3,018	18	28.1%	0.2%
	European	106,254	41,739	7,549	28.2%	4.9%
	Middle East - N Africa	14,979	1,954	137	11.5%	0.8%
	Asia Pacific	2,483	1,713	219	40.8%	5.0%
Depression	North America	1,585	5,181	7,788	76.6%	53.5%
	Latin America	10,110	242	404	2.3%	3.8%
	European	52,961	15,127	10,392	22.2%	13.2%
	Middle East - N Africa	16,663	224	183	1.3%	1.1%
	Asia Pacific	3,753	385	277	9.3%	6.3%
Sleep apnea	North America	10,066	8,822	32	46.7%	0.2%
	Latin America	9,592	1,147	17	10.7%	0.2%
	European	118,070	29,464	8,008	20.0%	5.1%
	Middle East - N Africa	15,238	1,423	409	8.5%	2.4%
	Asia Pacific	2,321	1,804	290	43.7%	6.6%
Musculo-skeletal pain	North America	0	0	0	NA	NA
	Latin America	7,624	454	2,678	5.6%	24.9%
	European	102,421	18,530	6,953	15.3%	5.4%
	Middle East - N Africa	10,701	1,383	13	11.4%	0.1%
	Asia Pacific	3,580	544	291	13.2%	6.6%
GERD	North America	11,944	6,948	28	36.8%	0.1%
	Latin America	5,535	1,418	3,803	20.4%	35.4%
	European	101,533	18,349	7,914	15.3%	6.2%
	Middle East - N Africa	15,432	1,511	127	8.9%	0.7%
	Asia Pacific	3,330	812	273	19.6%	6.2%
Dyslipidaemia	North America	14,925	3,483	512	18.9%	2.7%
	Latin America	8,984	1,576	196	14.9%	1.8%
	European	76,653	13,044	7,396	14.5%	7.6%
	Middle East - N Africa	10,383	820	43	7.3%	0.4%
	Asia Pacific	2,977	1,188	250	28.5%	5.7%

Analysis

Surgery

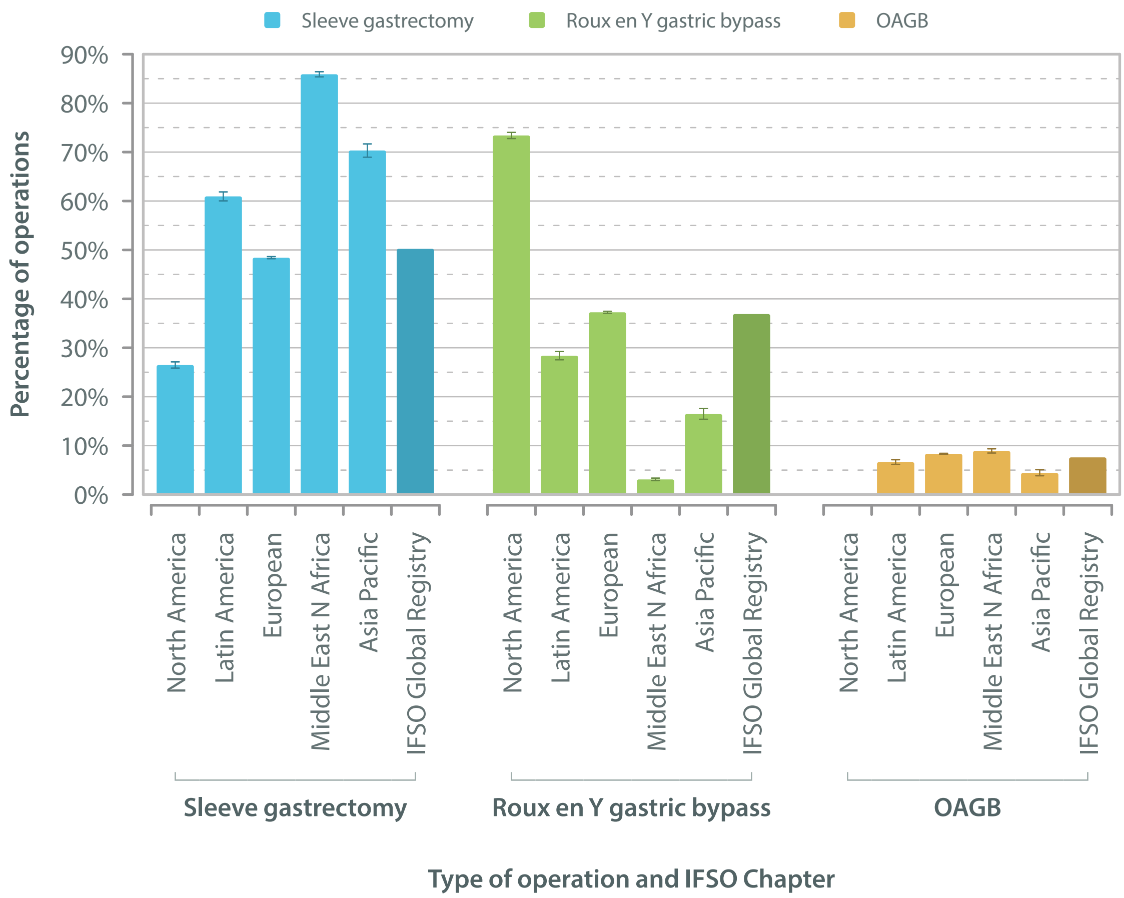
Type of primary surgery

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. These data must be interpreted with caution as the data for each Chapter are not complete.

Primary surgery: operation performed; calendar years 2016-2020

Operation	Count	Percentage
Sleeve gastrectomy	128,382	50.2%
Roux en Y gastric bypass	94,315	36.9%
OAGB	19,421	7.6%
Gastric band	8,539	3.3%
Other	4,474	1.8%
Duodenal switch with sleeve	253	0.1%
Bilio-pancreatic diversion	147	0.1%
Duodenal switch	78	0.0%
Unspecified	11	
All	**255,620**	

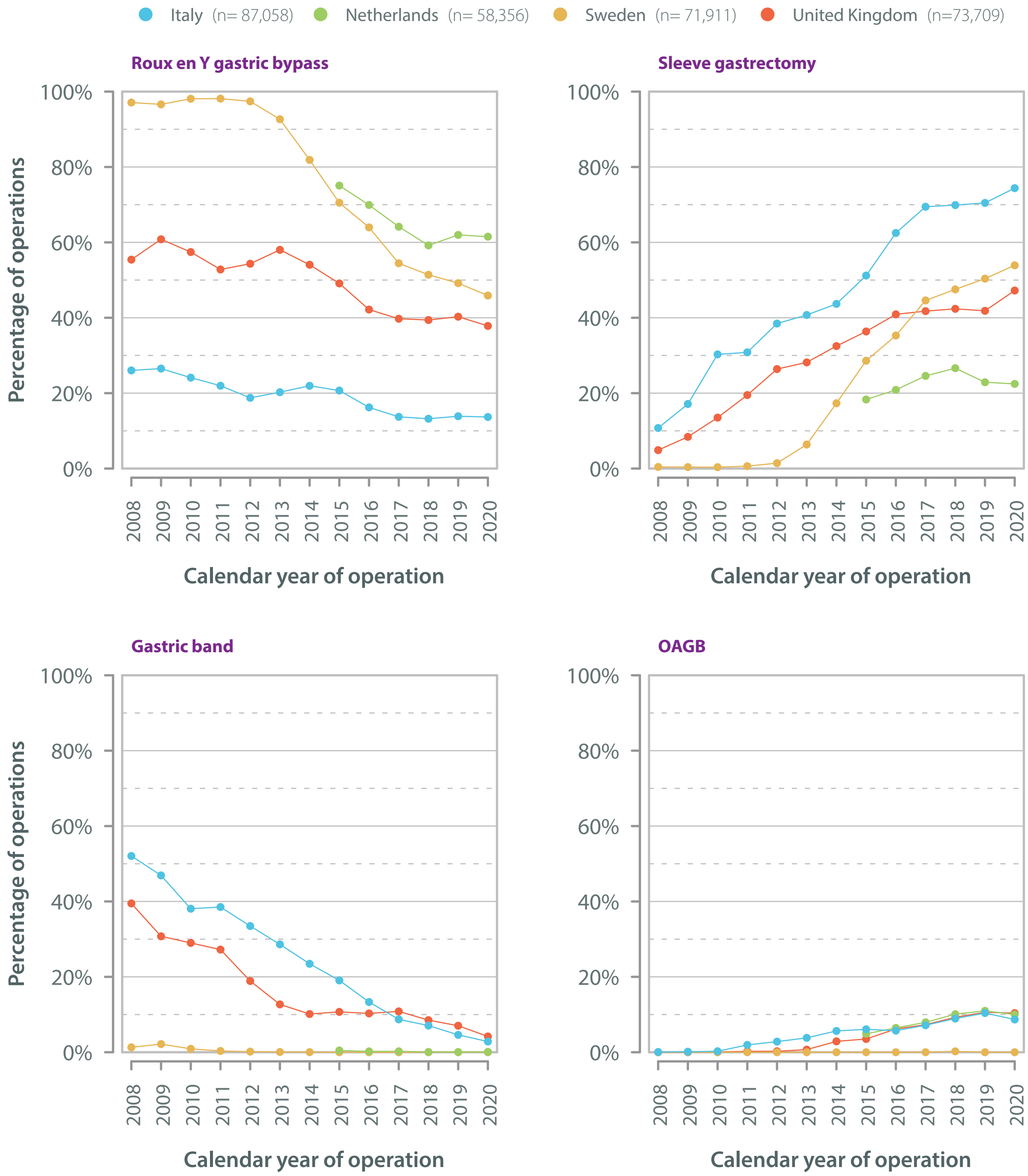
Primary surgery: Type of operation; calendar years 2016-2020 (n=255,609)



For example the Ontario regional registry and a single-center practice are the only contributors to the North American Chapter data. According to the ASMBS, in 2019, 59.4% of procedures in the USA were sleeve gastrectomies and 17.8% were gastric bypasses (https://asmbs.org/resources/estimate-of-bariatric-surgery-numbers). These are quite different to the proportions described in this registry, and are a good example of how incomplete data capture introduces bias.

The case mix in four selected high-volume registries where we have longer term data show distinct changes over time, with the incidence of Roux en Y gastric bypass and gastric bands going down, and sleeve gastrectomy and OAGB increasing.

Primary surgery recorded in selected high-volume National Registries: Changes in operation type over time



Analysis

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. The registry does not yet capture the robotic approach. This will be a data field that may need to be modified as surgical practice continues to evolve.

Primary surgery: operative approach; calendar years 2016-2020

		Approach					
		Laparoscopic	Laparoscopic converted to open	Endoscopic	Open	Unspecified	Laparoscopic rate
National registries	Gastric band	2,776	0	5	1	3,549	99.8%
	Roux en Y gastric bypass	71,310	85	11	65	6,846	99.8%
	OAGB / MGB	7,583	3	2	7	4,029	99.8%
	Sleeve gastrectomy	44,382	30	40	61	33,644	99.7%
	All operations	**128,135**	**122**	**135**	**150**	**48,559**	**99.7%**
Other contributors	Gastric band	1,921	3	0	0	284	99.8%
	Roux en Y gastric bypass	15,378	27	5	70	518	99.3%
	OAGB / MGB	7,715	11	0	32	39	99.4%
	Sleeve gastrectomy	49,433	26	9	81	676	99.8%
	All operations	**76,305**	**69**	**72**	**436**	**1,637**	**99.2%**

Analysis

Outcomes

Post-operative stay

Post-operative stay for selected national registries

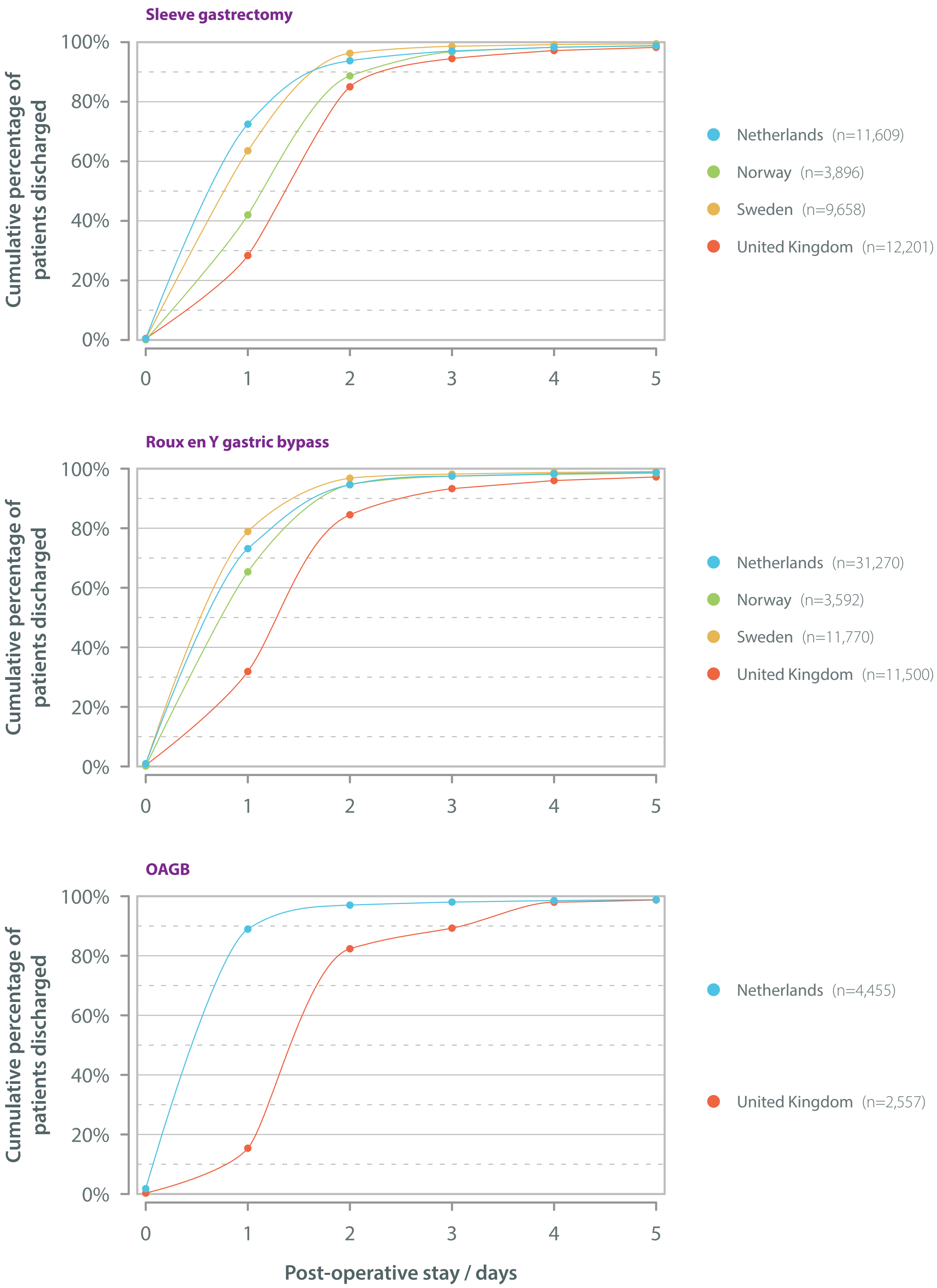
The tables and graphs on these two pages compare post-operative length-of-stay (for selected national registries, and then in total) for the four most common operations types recorded in the registry, namely: gastric banding, Roux en Y gastric bypass, one anastomosis gastric bypass (OAGB) and sleeve gastrectomy.

Primary surgery: post-operative stay for the most frequently-performed operations; selected national registry data for the calendar years 2016-2020

Operation	National registry country	Post-operative stay: 0 days	1 day	2 days	3 days	>3 days	No data
Sleeve gastrectomy	Italy	0	0	0	0	0	33,615
	Netherlands	51	8,362	2,472	380	344	29
	Norway	3	1,633	1,819	315	126	0
	Sweden	34	6,102	3,162	227	133	381
	United Kingdom	64	3,396	6,913	1,156	672	776
	All national registries	**152**	**19,493**	**14,366**	**2,078**	**1,275**	**34,801**
Roux en Y gastric bypass	Italy	0	0	0	0	0	6,826
	Netherlands	290	22,581	6,717	902	777	83
	Norway	5	2,342	1,051	103	91	0
	Sweden	96	9,187	2,110	163	214	325
	United Kingdom	52	3,614	6,053	1,010	771	793
	All national registries	**443**	**37,724**	**15,931**	**2,178**	**1,853**	**8,027**
OAGB	Italy	0	0	0	0	0	4,029
	Netherlands	80	3,882	360	45	88	23
	Norway	0	171	171	21	11	0
	Sweden	0	1	11	0	0	0
	United Kingdom	8	385	1,713	177	274	77
	All national registries	**88**	**4,439**	**2,255**	**243**	**373**	**4,129**
Gastric band	Italy	0	0	0	0	0	3,548
	Netherlands	11	46	7	2	5	0
	Norway	0	0	0	0	0	0
	Sweden	0	0	0	0	0	0
	United Kingdom	779	1,641	105	12	19	94
	All national registries	**790**	**1,687**	**112**	**14**	**24**	**3,642**

As shown graphically on the page opposite, there is some variance between registries, suggesting different post-operative practices; however, there are few cases where a patient's stay exceeds 3 days for any operation. This suggests that prolonged length-of-stay may be an important marker of a post-operative complication when analysing registry data.

Primary surgery: Post-operative stay; national registry data for calendar years 2016-2020



Post-operative stay for IFSO Chapters

When considering the data presented here for length-of stay by IFSO Chapter, it must be noted that these data may not perfectly reflect outcomes across the entire Chapter. Within the IFSO Global Registry no Chapter has complete representation of all its member countries; for example, North America is represented by a single centre in the USA accompanied by data from a regional registry for Ontario, Canada. In addition, no single country has been able to demonstrate that they have complete data acquisition for their patient population.

However, it is still clear that most people are discharged by 3 days for the vast majority of procedures, with perhaps the exception of procedures in Asia Pacific, where the post-operative stay appears to be longer across all of the different operation types.

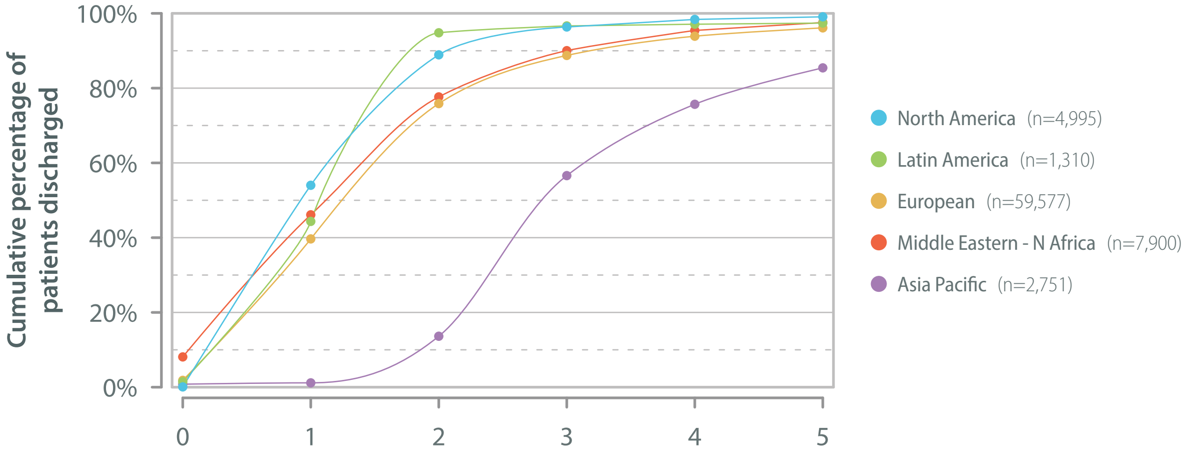
Identifying *markers* or *flags* of post-operative complications that are easily and reliably measured in large repositories of data such as this registry will be important in the future as we seek to track and improve the quality of surgery performed globally.

Primary surgery: post-operative stay for the most frequently-performed operations; calendar years 2016-2020

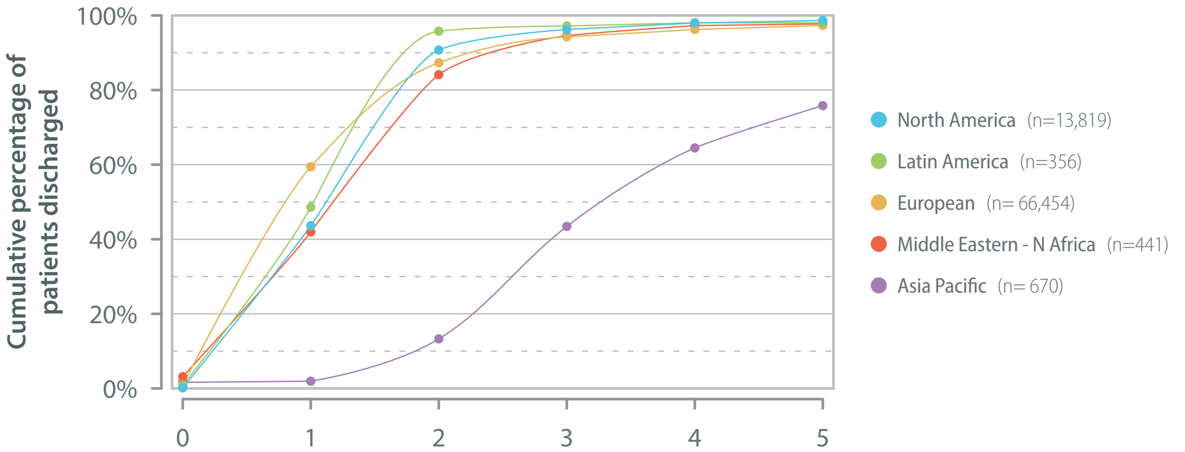
Operation and IFSO Chapter		Post-operative stay					
		0 days	1 day	2 days	3 days	>3 days	No data
Sleeve gastrectomy	North America	4	2,694	1,743	372	182	15
	Latin America	19	562	661	24	44	5,344
	European	1,088	22,543	21,566	7,673	6,707	39,293
	Middle East - N Africa	640	3,003	2,492	977	788	6,843
	Asia Pacific	22	10	343	1,182	1,194	354
	All regions	**1,773**	**28,812**	**26,805**	**10,228**	**8,915**	**51,849**
Roux en Y gastric bypass	North America	21	6,009	6,509	759	521	68
	Latin America	3	170	168	5	10	2,749
	European	618	38,871	18,526	4,617	3,819	9,614
	Middle East - N Africa	14	171	186	46	24	90
	Asia Pacific	11	2	76	202	379	57
	All regions	**667**	**45,223**	**25,465**	**5,629**	**4,753**	**12,578**
OAGB	North America	0	0	0	0	0	0
	Latin America	0	8	1	0	0	708
	European	165	4,766	3,268	1,674	2,223	4,884
	Middle East - N Africa	42	299	959	80	27	122
	Asia Pacific	0	0	17	100	76	2
	All regions	**207**	**5,073**	**4,245**	**1,854**	**2,326**	**5,716**
Gastric band	North America	0	5	4	4	0	0
	Latin America	0	2	0	0	1	226
	European	1,580	2,033	251	86	85	3,918
	Middle East - N Africa	45	127	11	5	5	14
	Asia Pacific	32	19	10	6	2	68
	All regions	**1,657**	**2,186**	**276**	**101**	**93**	**4,226**

Primary surgery: Post-operative stay; calendar years 2016-2020

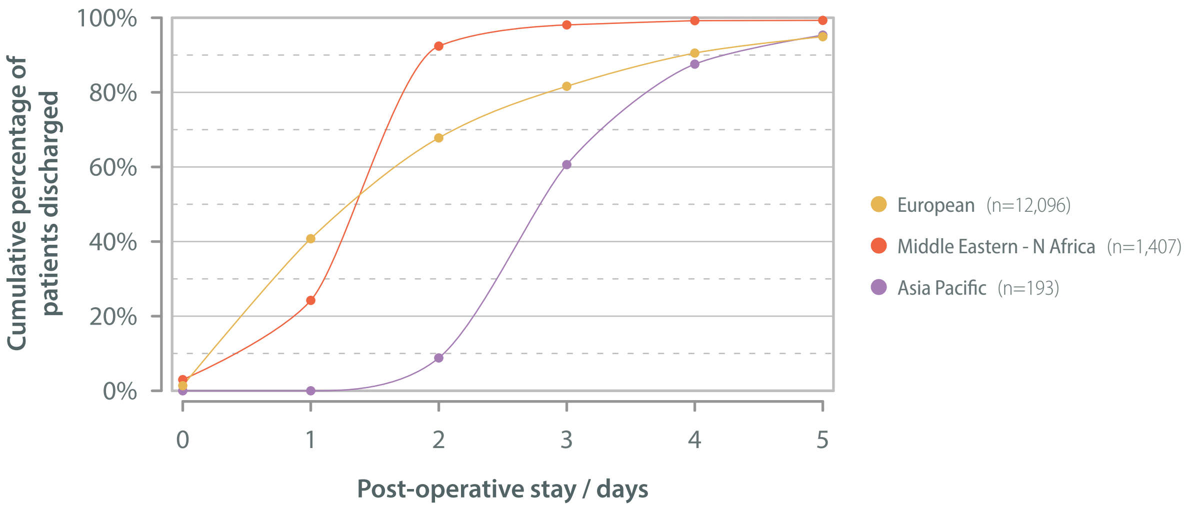
Sleeve gastrectomy



Roux en Y gastric bypass



OAGB



Follow up data

Availability of one-year data

The following table outlines the percentage of available follow up data from the seven highlighted national / regional registries. Whilst all of these registries we believe have >80% enrolment of patients undergoing metabolic / bariatric procedures in their countries / regions, the availability of data at one year varies widely. To minimise the effect of observer bias, it is recommended that registries aim for >95% capture of all data elements at all time points. This is difficult to achieve in practice, and pragmatically >80% is considered a reasonable target to minimise the effect of bias. None of our selected national registries have achieved this benchmark at 1 year, and all data must therefore be interpreted with caution.

Our top five contributors also have varying follow up data available as does the registry in general.

The low levels of follow-up data collected most likely reflect the difficulty of following up metabolic / bariatric surgical patients in to the short- and long-term, and flags the importance of developing systems that enable effective follow up.

Primary surgery in the calendar years 2010-2019: availability of one-year follow up data for key data-items

		One-year weight loss	
		Operation records	Percent with 1-year data
National registries	**All mature national registries**	**258,205**	**51.4%**
	Netherlands	13,971	72.7%
	Norway	2,050	72.4%
	Sweden	18,661	70.3%
	Italy	33,211	54.6%
	United Kingdom	44,006	31.0%
	Kuwait	3,545	2.0%
	Canada †	23,363	0.0%
Other contributors (top 5)	**All other contributors**	**110,969**	**13.8%**
	Hong Kong	536	81.3%
	Portugal	616	60.2%
	Ireland	672	52.8%
	United States of America	6,519	40.4%
	Guadeloupe	491	38.5%

		One-year type 2 diabetes data	
		Operation records	Percent with 1-year data
National registries	**All mature national registries**	**258,205**	**38.8%**
	Netherlands	51,087	73.3%
	Sweden	62,853	70.4%
	Norway	7,415	33.1%
	United Kingdom	63,771	25.0%
	Kuwait	3,116	2.6%
	Italy	73,079	0.0%
	Canada †	23,366	0.0%
Other contributors (top 5)	**All other contributors**	**110,969**	**12.2%**
	Hong Kong	536	59.3%
	Ireland	672	51.9%
	Guadeloupe	491	38.5%
	United States of America	6,519	30.9%
	Mexico	3,516	30.9%

The follow up rates at one year for both weight and diabetes status have varied over time. There is a striking fall off in the percentage of available data for patients operated on in 2019 across all of our highlighted national registries where follow up data is routinely obtained. These patients would have been due for their one year review in 2020, suggesting that there has been an adverse impact on after-care during the COVID-19 global pandemic. The impact of COVID-19 on bariatric surgery around the world will be discussed more fully later in this report.

Primary surgery in the calendar years 2010-2019: availability of one-year weight-loss data; selected national registry data

Calendar year of operation	Italy Operation records	Italy Percent with 1-year data	Netherlands Operation records	Netherlands Percent with 1-year data	Norway Operation records	Norway Percent with 1-year data	Sweden Operation records	Sweden Percent with 1-year data	United Kingdom Operation records	United Kingdom Percent with 1-year data
2010	4,197	56.3%	0		0		7,157	71.0%	5,610	34.6%
2011	5,002	56.0%	0		0		8,002	75.7%	5,361	39.7%
2012	4,612	61.6%	0		0		7,300	74.6%	6,291	33.6%
2013	5,349	63.4%	0		0		7,404	71.3%	6,484	34.4%
2014	5,630	65.7%	12	75.0%	194	59.3%	6,623	69.3%	6,035	34.4%
2015	6,858	66.8%	8,929	70.5%	475	78.1%	6,136	70.1%	6,548	33.9%
2016	8,481	67.0%	10,171	71.4%	1,337	80.2%	5,449	73.6%	6,265	32.2%
2017	10,413	54.1%	10,731	70.0%	1,736	77.0%	5,265	74.4%	7,335	27.0%
2018	10,970	49.8%	10,239	76.5%	1,826	70.4%	4,997	71.7%	6,842	25.4%
2019	11,567	30.5%	11,005	74.6%	1,847	64.7%	4,520	42.5%	7,000	19.6%
2010-2019	**73,079**	**54.7%**	**51,087**	**72.7%**	**7,415**	**72.5%**	**62,853**	**70.3%**	**63,771**	**31.1%**

Primary surgery in the calendar years 2010-2019: availability of one year type 2 diabetes data; selected national registry data

Calendar year of operation	Italy Operation records	Italy Percent with 1-year data	Netherlands Operation records	Netherlands Percent with 1-year data	Norway Operation records	Norway Percent with 1-year data	Sweden Operation records	Sweden Percent with 1-year data	United Kingdom Operation records	United Kingdom Percent with 1-year data
2010	4,197	0.0%	0		0		7,157	71.1%	5,610	26.7%
2011	5,002	0.0%	0		0		8,002	75.7%	5,361	28.5%
2012	4,612	0.0%	0		0		7,300	74.6%	6,291	26.2%
2013	5,349	0.0%	0		0		7,404	71.3%	6,484	31.8%
2014	5,630	0.0%	12	83.3%	194	31.4%	6,623	69.3%	6,035	32.3%
2015	6,858	0.0%	8,929	71.9%	475	31.8%	6,136	70.1%	6,548	29.6%
2016	8,481	0.0%	10,171	73.3%	1,337	37.2%	5,449	73.7%	6,265	28.4%
2017	10,413	0.0%	10,731	70.0%	1,736	36.4%	5,265	74.4%	7,335	15.1%
2018	10,970	0.0%	10,239	76.6%	1,826	31.8%	4,997	71.9%	6,842	18.3%
2019	11,567	0.0%	11,005	74.6%	1,847	29.2%	4,520	42.7%	7,000	17.4%
2010-2019	**73,079**	**0.0%**	**51,087**	**73.3%**	**7,415**	**33.2%**	**62,853**	**70.4%**	**63,771**	**25.1%**

One-year percentage weight loss

Percentage weight loss and operation

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

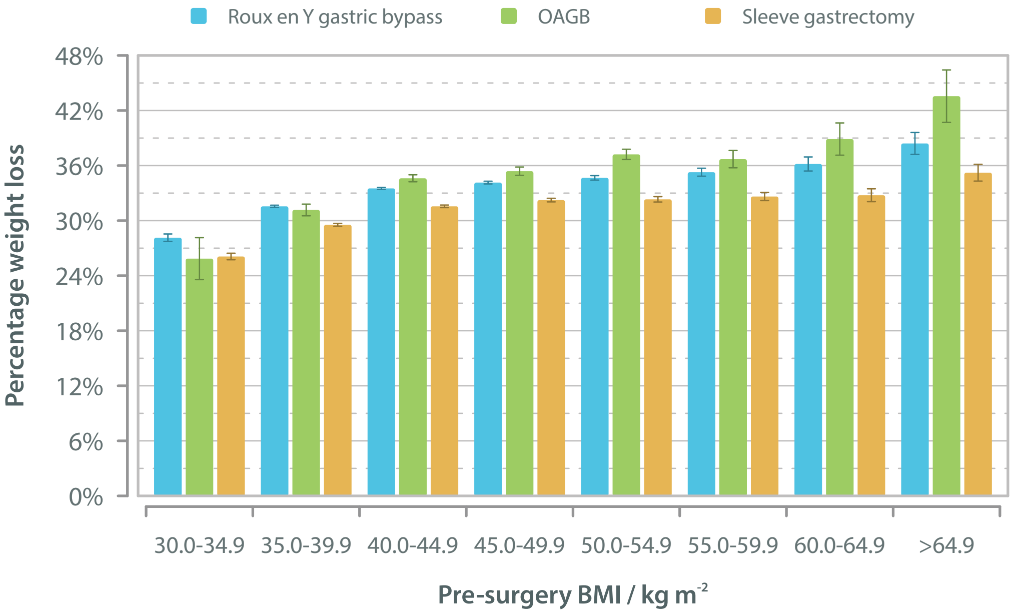
$$\text{Percentage weight loss} = \frac{\text{initial weight (kg)} - \text{current weight (kg)}}{\text{initial weight (kg)}} \times 100\%$$

The table and graph below show percentage weight loss one year after surgery for all patients undergoing primary Roux en Y gastric bypass, OAGB 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 is generally greater than after sleeve gastrectomy. There is also 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 the calendar years 2013-2018

	Average percentage weight loss one year after surgery (with count and 95% confidence interval)		
Pre-surgery BMI / kg m^{-2}	Roux en Y gastric bypass	OAGB	Sleeve gastrectomy
30.0-34.9	**28.2** (1,542; 27.7-28.6)	**25.9** (71; 23.6-28.1)	**26.1** (2,043; 25.7-26.5)
35.0-39.9	**31.6** (14,124; 31.4-31.7)	**31.2** (726; 30.5-31.8)	**29.6** (11,007; 29.4-29.7)
40.0-44.9	**33.5** (20,852; 33.4-33.6)	**34.6** (1,705; 34.2-35.0)	**31.6** (14,600; 31.4-31.7)
45.0-49.9	**34.1** (10,804; 34.0-34.3)	**35.4** (1,387; 34.9-35.8)	**32.2** (7,951; 32.1-32.4)
50.0-54.9	**34.7** (4,611; 34.4-34.9)	**37.2** (821; 36.7-37.8)	**32.3** (3,885; 32.0-32.6)
55.0-59.9	**35.3** (1,557; 34.8-35.7)	**36.7** (331; 35.8-37.7)	**32.6** (1,824; 32.2-33.1)
60.0-64.9	**36.2** (522; 35.4-36.9)	**38.9** (116; 37.1-40.6)	**32.8** (789; 32.1-33.5)
>64.9	**38.4** (273; 37.2-39.6)	**43.6** (51; 40.7-46.4)	**35.2** (571; 34.3-36.1)

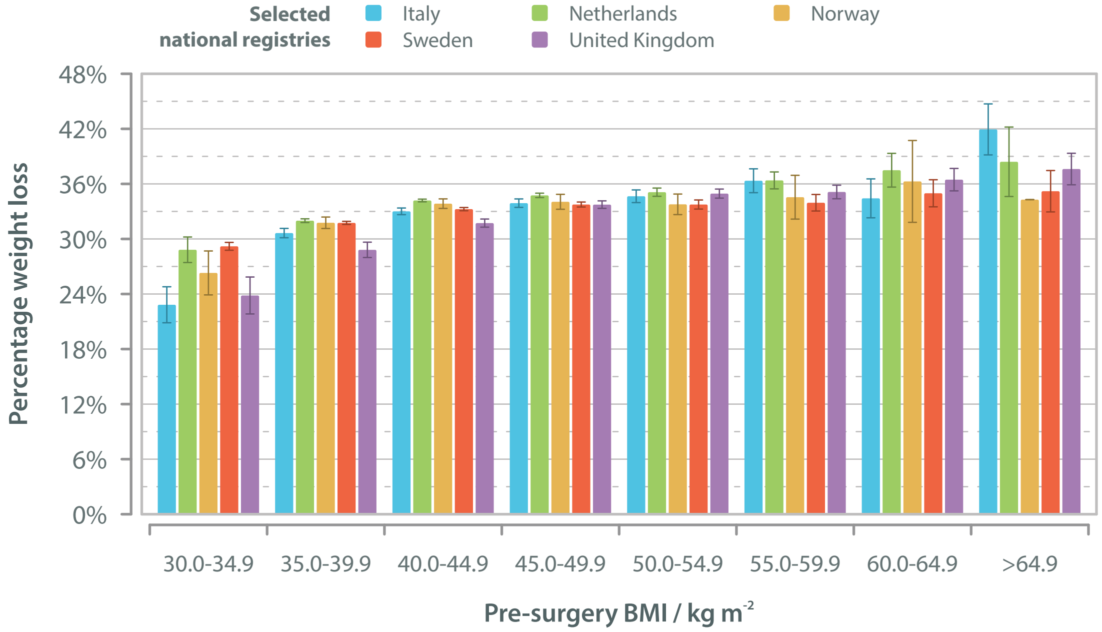
Primary surgery: Percentage weight loss at one year and pre-surgery BMI; operations in calendar years 2013-2018



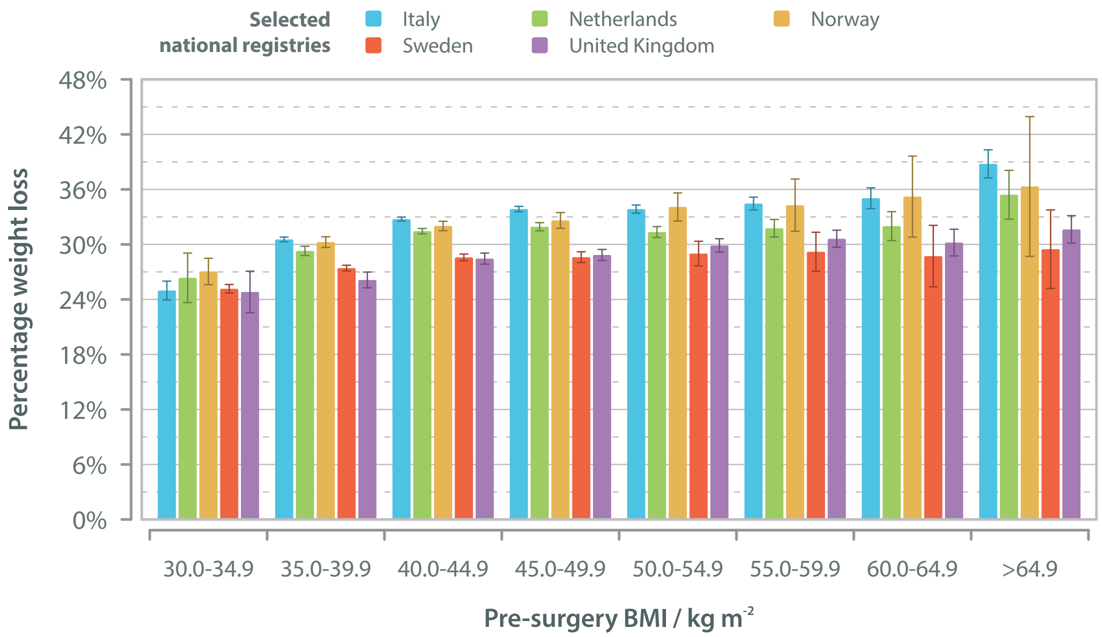
Percentage weight loss for selected national registries

The follow up data from the selected national / regional registries with 1 year follow up show very similar weight loss to the registry as a whole across the range of pre-operative BMIs.

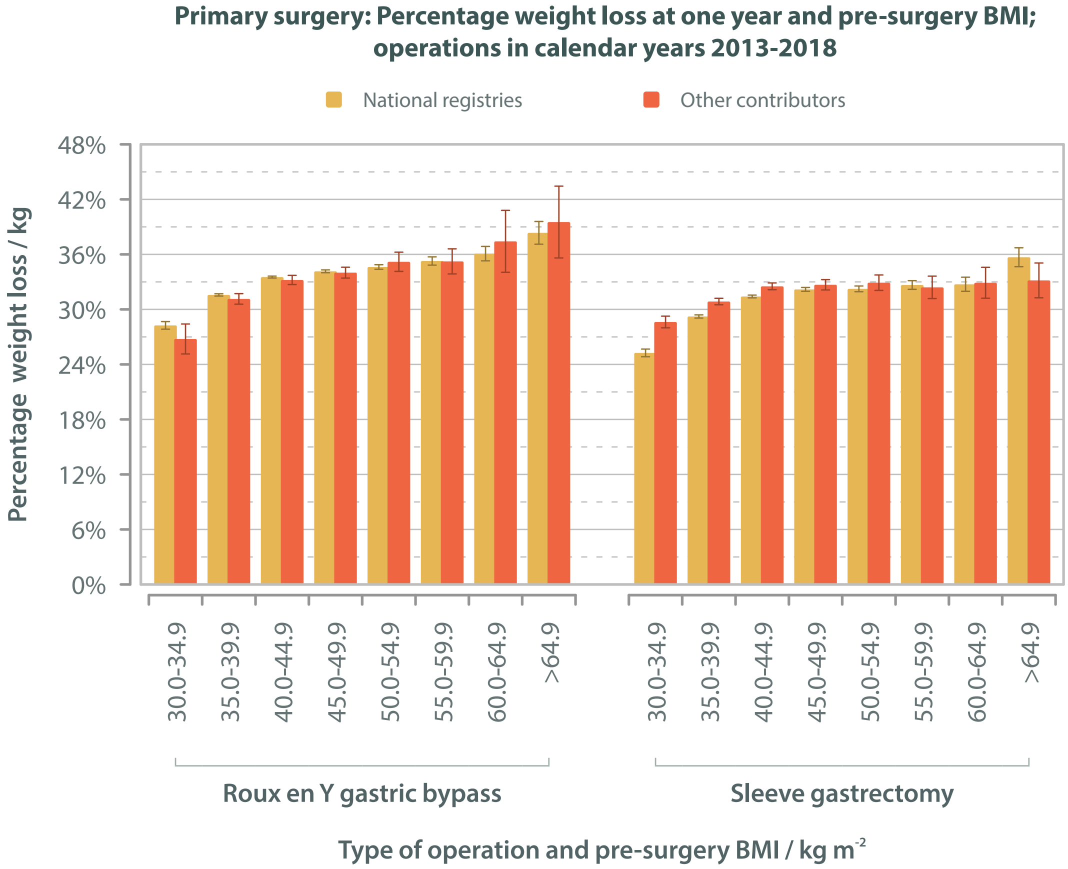
Primary Roux en Y gastric bypass: Percentage weight loss at one year and pre-surgery BMI; operations in calendar years 2013-2018



Primary sleeve gastrectomy: Percentage weight loss at one year and pre-surgery BMI; operations in calendar years 2013-2018



Percentage weight loss for national / regional registries versus other contributors



One-year BMI loss

Whilst total body weight loss (TBWL) is the preferred standard for reporting weight loss, considering the BMI units lost, can make it easier to conceptualize at a patient level the impact of this weight loss has had on a person's BMI and therefore their health.

As the baseline BMI goes up, the percentage weight loss translates to an increase in BMI points lost. Those with a BMI of 45-49.9 kg m^{-2}, can expect to lose 15-16 BMI points at one year, bringing their BMI down from class III obesity to class I, usually also meaning a significant improvement in health and well-being. This is true for each of the most commonly performed bariatric procedures.

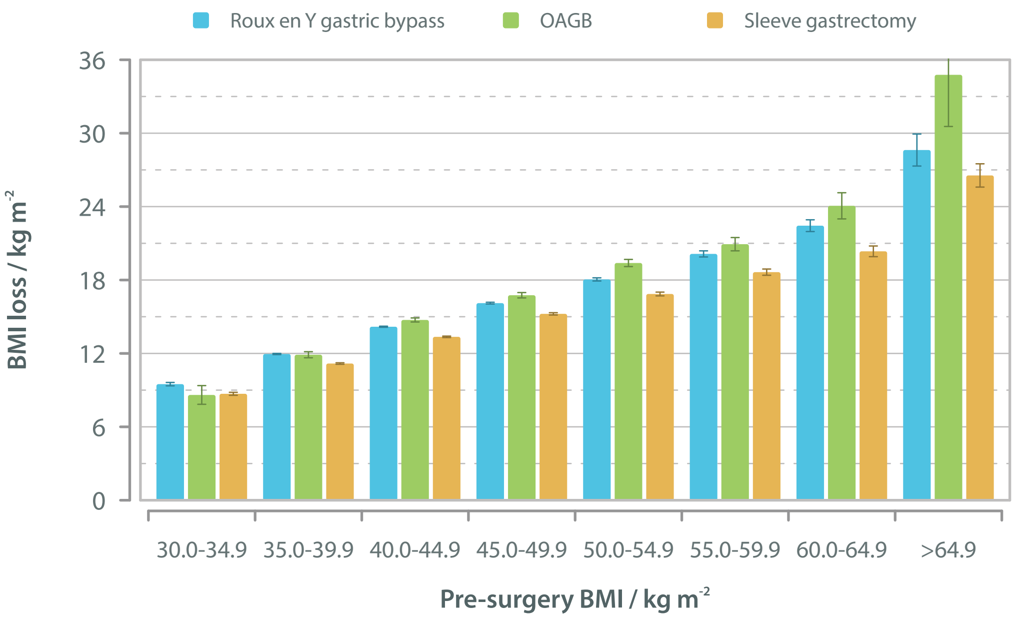
For those with the highest BMI, this graph suggest that they will lose the most BMI points with OAGB; however, the error bars are large, suggesting this is a small sample size, and quite high levels of uncertainty around the calculated value.

Primary surgery: average BMI loss one year after surgery according to pre-surgery BMI for the most-frequently performed operations; surgery in the calendar years 2013-2018

Average BMI loss one year after surgery
(with count and 95% confidence interval)

Pre-surgery BMI / kg m^{-2}	Roux en Y gastric bypass	OAGB	Sleeve gastrectomy
30.0-34.9	**9.5** (1,543; 9.4- 9.6)	**8.6** (71; 7.8- 9.4)	**8.7** (2,043; 8.6- 8.8)
35.0-39.9	**12.0** (14,124; 11.9-12.0)	**11.9** (726; 11.6-12.1)	**11.2** (11,022; 11.1-11.2)
40.0-44.9	**14.2** (20,853; 14.1-14.2)	**14.7** (1,706; 14.6-14.9)	**13.4** (14,617; 13.3-13.4)
45.0-49.9	**16.1** (10,804; 16.0-16.2)	**16.8** (1,387; 16.5-17.0)	**15.2** (7,965; 15.1-15.3)
50.0-54.9	**18.1** (4,612; 17.9-18.2)	**19.4** (822; 19.1-19.7)	**16.9** (3,890; 16.7-17.0)
55.0-59.9	**20.1** (1,558; 19.9-20.4)	**20.9** (332; 20.4-21.5)	**18.6** (1,827; 18.4-18.9)
60.0-64.9	**22.4** (522; 22.0-22.9)	**24.1** (116; 23.0-25.1)	**20.3** (795; 19.9-20.8)
>64.9	**28.6** (273; 27.3-29.9)	**34.8** (51; 30.5-39.0)	**26.5** (572; 25.6-27.5)

Primary surgery: BMI loss at one year and pre-surgery BMI; operations in calendar years 2013-2018



One-year total weight loss

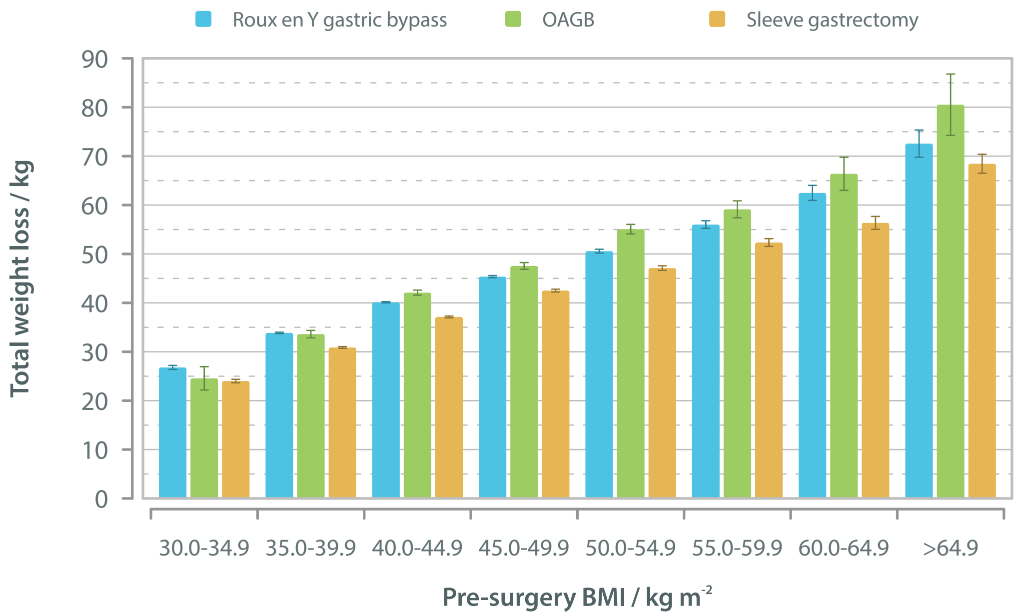
Total weight loss and operation

These data again demonstrate the powerful effect of all bariatric procedures enabling people with obesity to lose substantial amounts of weight within one year of surgery.

Primary surgery: average total weight loss one year after surgery according to pre-surgery BMI for the most-frequently performed operations; surgery in the calendar years 2013-2018

Pre-surgery BMI / kg m⁻²	Average total weight loss one year after surgery / kg (with count and 95% confidence interval)		
	Roux en Y gastric bypass	**OAGB**	**Sleeve gastrectomy**
30.0-34.9	**26.8** (1,543; 26.4-27.2)	**24.6** (71; 22.2-26.9)	**24.0** (2,043; 23.7-24.4)
35.0-39.9	**33.9** (14,124; 33.7-34.0)	**33.6** (726; 32.8-34.4)	**30.9** (11,022; 30.7-31.1)
40.0-44.9	**40.1** (20,853; 40.0-40.3)	**42.1** (1,706; 41.6-42.6)	**37.1** (14,617; 36.9-37.3)
45.0-49.9	**45.4** (10,804; 45.1-45.6)	**47.6** (1,387; 46.9-48.2)	**42.5** (7,965; 42.2-42.8)
50.0-54.9	**50.6** (4,611; 50.2-51.0)	**55.1** (822; 54.1-56.0)	**47.1** (3,890; 46.6-47.6)
55.0-59.9	**56.0** (1,558; 55.2-56.8)	**59.1** (332; 57.4-60.9)	**52.3** (1,827; 51.5-53.1)
60.0-64.9	**62.5** (522; 60.9-64.0)	**66.4** (116; 63.0-69.8)	**56.4** (795; 55.0-57.7)
>64.9	**72.6** (273; 69.8-75.3)	**80.5** (51; 74.2-86.8)	**68.4** (572; 66.5-70.4)

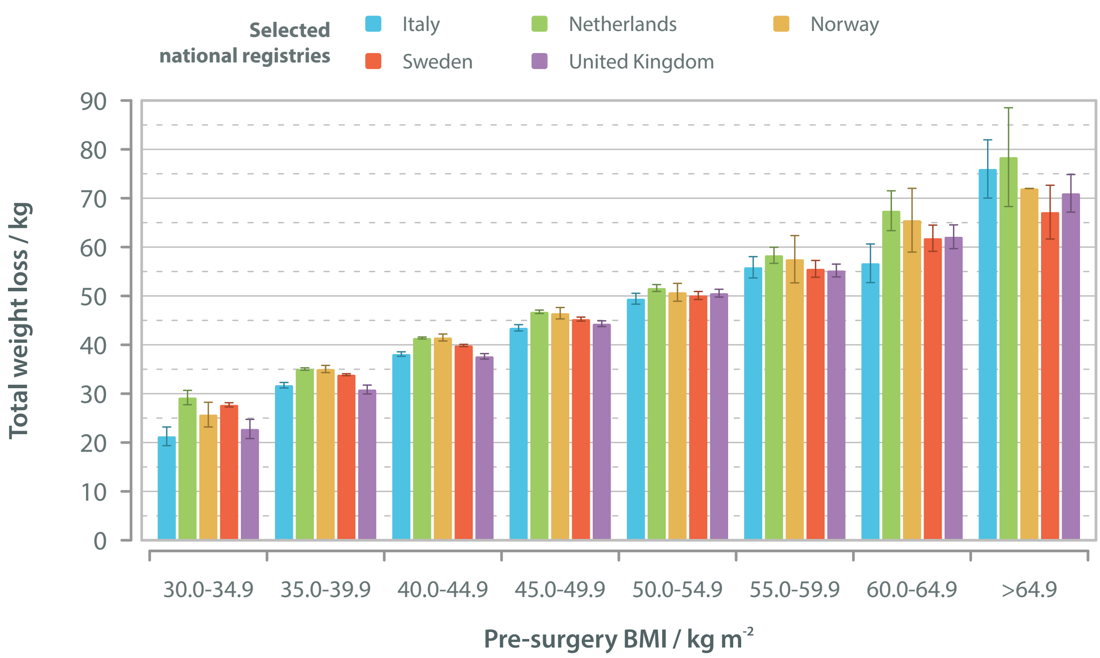
Primary surgery: Total weight loss at one year and pre-surgery BMI; operations in calendar years 2013-2018



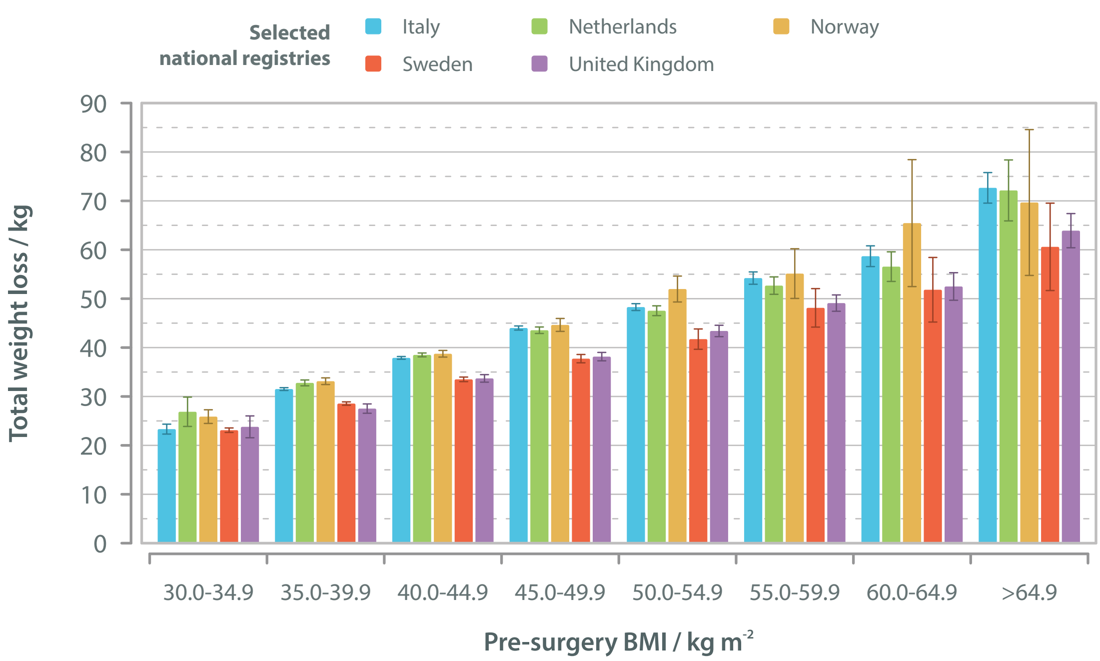
Total weight loss for selected national registries

Following Roux en Y gastric bypass, the calculated weight loss in each of these pre-surgery BMI groups is remarkably similar across the 5 selected national registries. The same general pattern of concordance within each BMI group is also evident after sleeve gastrectomy, although one-year total weight loss seems a little lower in Sweden & the United Kingdom compared to the other three contributors.

Primary Roux en Y gastric bypass: Total weight loss at one year and pre-surgery BMI; operations in calendar years 2013-2018



Primary sleeve gastrectomy: Total weight loss at one year and pre-surgery BMI; operations in calendar years 2013-2018



Analysis

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 2013-2018, there were 107,134 Roux en Y gastric bypass operation records submitted to the registry, along with 106,711 records for sleeve gastrectomy procedures, and 12,032 records for OAGB. Importantly, only a small percentage of these cases include pre-operative and one-year follow up data of the listed obesity-related conditions, meaning these data must be interpreted with caution.

Nevertheless, it is striking that there is generally an improvement across-the-board in all of these conditions after weight loss surgery, with two major exceptions: GERD rates following sleeve gastrectomy and medication usage for musculo-skeletal pain after OAGB where the pattern apparently reverses.

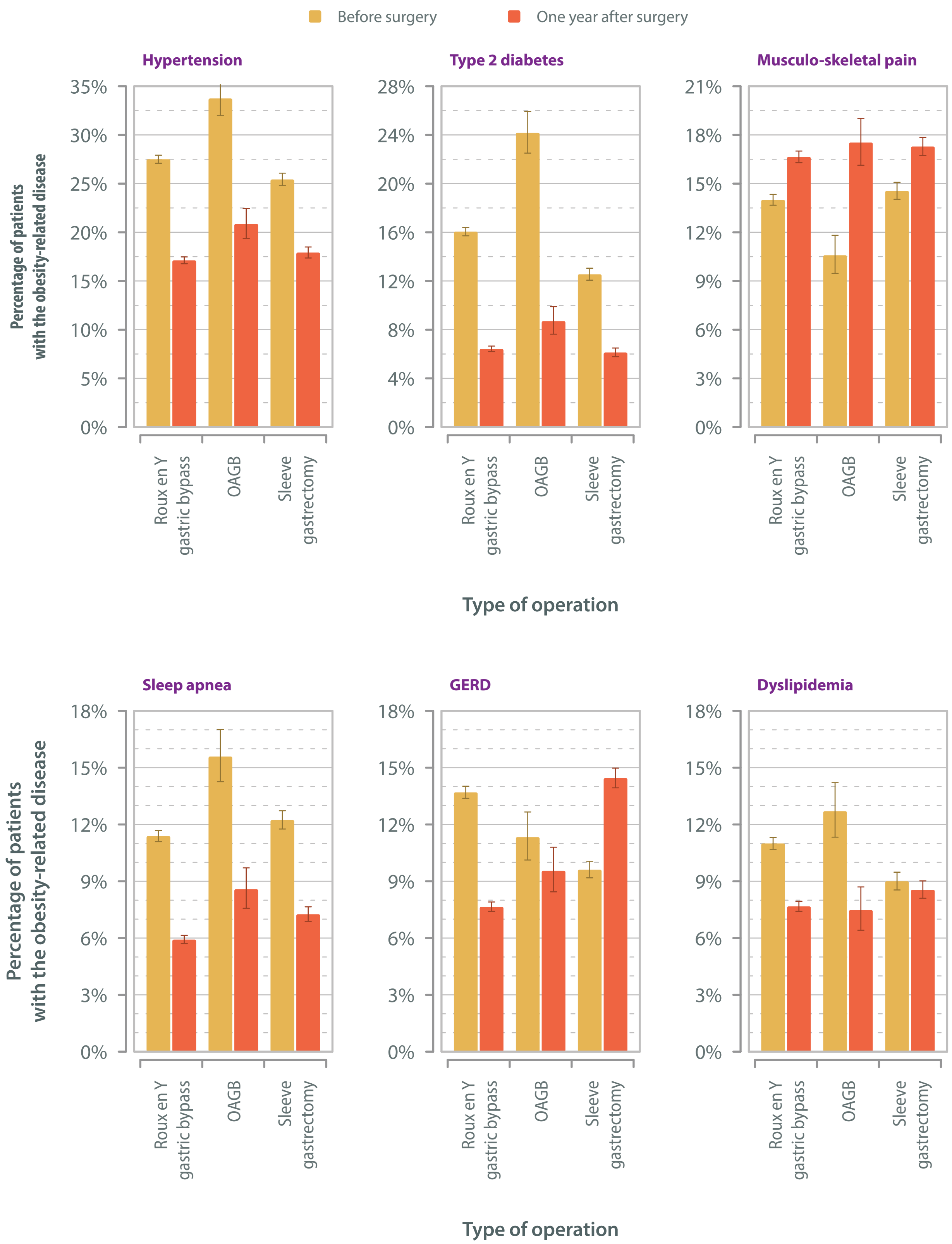
Primary surgery: obesity-related disease before and one year after surgery; records with complete data at both time-points; selected National Registry data [1] for surgery in calendar years 2013-2018

		Before surgery			One year after surgery		
		No	Yes	Rate	No	Yes	Rate
Roux en Y gastric bypass	Type 2 diabetes	37,279	7,128	16.1%	41,557	2,850	6.4%
	Hypertension	32,740	12,419	27.5%	37,428	7,731	17.1%
	Depression	16,418	3,136	16.0%	16,748	2,806	14.4%
	Sleep apnea	40,019	5,142	11.4%	42,486	2,675	5.9%
	GERD	38,376	6,090	13.7%	41,062	3,404	7.7%
	Musculo-skeletal pain	36,068	5,871	14.0%	34,958	6,981	16.6%
	Dyslipidemia	34,637	4,280	11.0%	35,931	2,986	7.7%
OAGB	Type 2 diabetes	1,866	596	24.2%	2,247	215	8.7%
	Hypertension	1,816	926	33.8%	2,169	573	20.9%
	Depression	59	16	21.3%	59	16	21.3%
	Sleep apnea	2,312	428	15.6%	2,504	236	8.6%
	GERD	2,200	281	11.3%	2,243	238	9.6%
	Musculo-skeletal pain	2,434	288	10.6%	2,245	477	17.5%
	Dyslipidemia	1,856	270	12.7%	1,967	159	7.5%
Sleeve gastrectomy	Type 2 diabetes	15,436	2,215	12.5%	16,570	1,081	6.1%
	Hypertension	13,337	4,555	25.5%	14,684	3,208	17.9%
	Depression	6,377	1,261	16.5%	6,489	1,149	15.0%
	Sleep apnea	15,706	2,193	12.3%	16,596	1,303	7.3%
	GERD	16,006	1,707	9.6%	15,147	2,566	14.5%
	Musculo-skeletal pain	15,122	2,580	14.6%	14,640	3,062	17.3%
	Dyslipidemia	13,157	1,301	9.0%	13,222	1,236	8.5%

These data from the selected national registries with available 1 year follow up of obesity-related disease, confirms that all bariatric procedures lead to an improvement in obesity related diseases at one year, with the exception of musculo-skeletal pain for all procedures, and reflux following sleeve gastrectomy.

1. High-volume national registries with one-year follow up data: Netherlands, Norway, Sweden, United Kingdom.

Primary surgery: Obesity-related disease before and one year after surgery; patients with complete data at both time-points; national registry data for operations in calendar years 2013-2018



Obesity-related disease one year after surgery

This table demonstrates the change in various diseases before and after metabolic/bariatric surgery. It is important to note that this is only a sample or sub-set of the entire registry, and describes only those who definitely had the condition pre-surgery and also have one-year follow up data. The advantage of this approach is that it more clearly demonstrates the effect of surgery on a given disease, and removes the effect of including patients who did not have a condition pre-operatively but developed it after the operation. This is especially important for the GERD outcomes where some procedures could be considered refluxogenic.

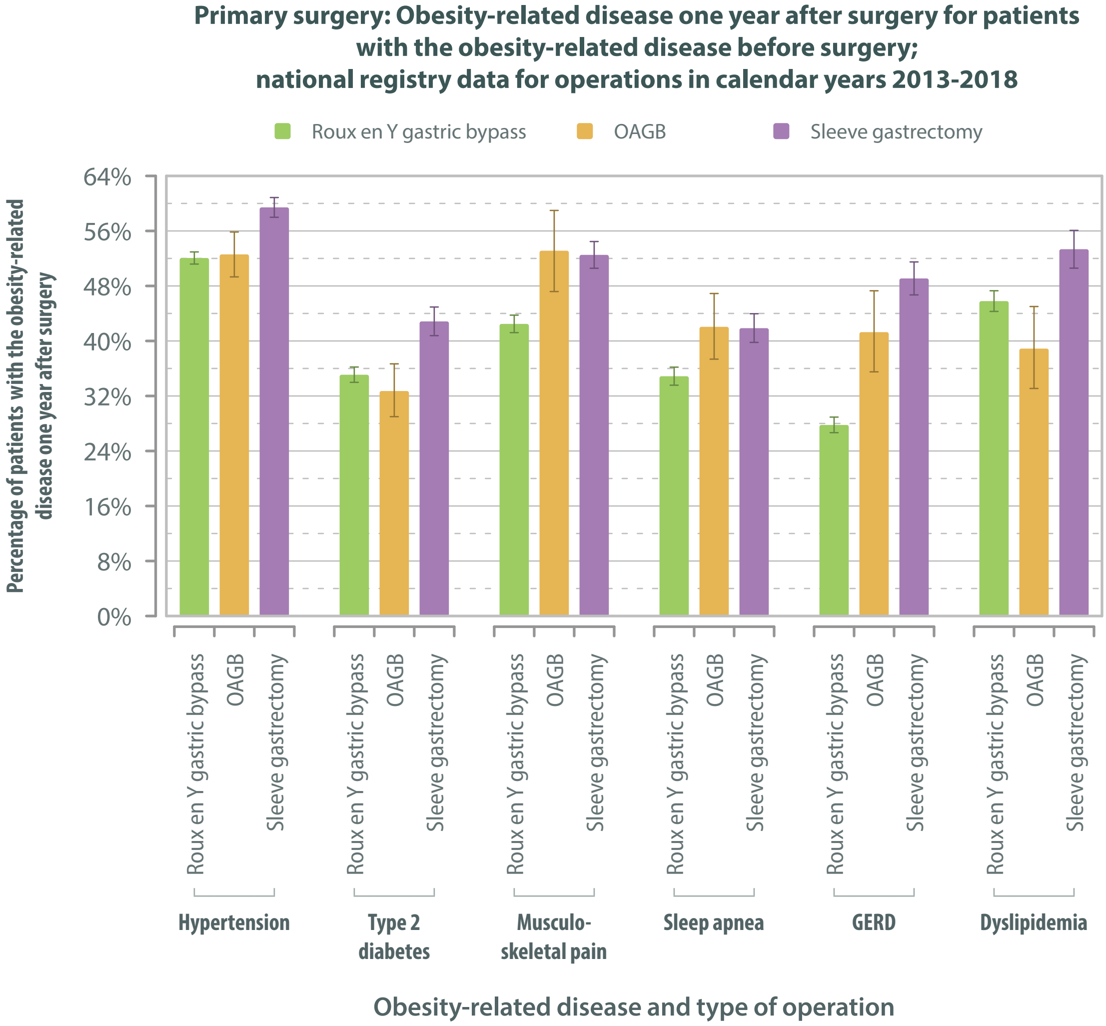
Primary surgery: obesity-related disease one year after surgery for patients who had the condition at the time of surgery; records with complete data at one-year follow up; selected national registry data [1] for surgery in calendar years 2013-2018

		Before surgery			One year after surgery		
		No	Yes	Rate	No	Yes	Rate
Roux en Y gastric bypass	Type 2 diabetes	0	7,128	100.0%	4,627	2,501	35.1%
	Hypertension	0	12,419	100.0%	5,953	6,466	52.1%
	Depression	0	3,136	100.0%	1,020	2,116	67.5%
	Sleep apnea	0	5,142	100.0%	3,349	1,793	34.9%
	GERD	0	6,090	100.0%	4,398	1,692	27.8%
	Musculo-skeletal pain	0	5,871	100.0%	3,377	2,494	42.5%
	Dyslipidemia	0	4,280	100.0%	2,320	1,960	45.8%
OAGB	Type 2 diabetes	0	596	100.0%	401	195	32.7%
	Hypertension	0	926	100.0%	439	487	52.6%
	Depression	0	16	100.0%	4	12	75.0%
	Sleep apnea	0	428	100.0%	248	180	42.1%
	GERD	0	281	100.0%	165	116	41.3%
	Musculo-skeletal pain	0	288	100.0%	135	153	53.1%
	Dyslipidemia	0	270	100.0%	165	105	38.9%
Sleeve gastrectomy	Type 2 diabetes	0	2,215	100.0%	1,266	949	42.8%
	Hypertension	0	4,555	100.0%	1,848	2,707	59.4%
	Depression	0	1,261	100.0%	386	875	69.4%
	Sleep apnea	0	2,193	100.0%	1,275	918	41.9%
	GERD	0	1,707	100.0%	869	838	49.1%
	Musculo-skeletal pain	0	2,580	100.0%	1,225	1,355	52.5%
	Dyslipidemia	0	1,301	100.0%	607	694	53.3%

1. High-volume national registries with one-year follow up data: Netherlands, Norway, Sweden, United Kingdom.

Using data taken from our highlighted national registries, this graph analyses groups of patients who had an obesity-related disease pre-operatively and shows the proportion who **still have** that same obesity-related disease 12 months after their metabolic / bariatric procedure.

All kinds of bariatric procedures lead to a substantial improvement in each of these conditions. There appears to be a trend towards improved resolution of both hypertension and diabetes with the bypass procedures, although these data maybe skewed by the fact that these registries reported on more bypass procedures than sleeve gastrectomies.



Analysis

Type 2 diabetes and weight loss at one year

Type 2 diabetes and weight loss at one year and operation

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.

Greater improvement in diabetic 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 are suggestive of a similar trend.

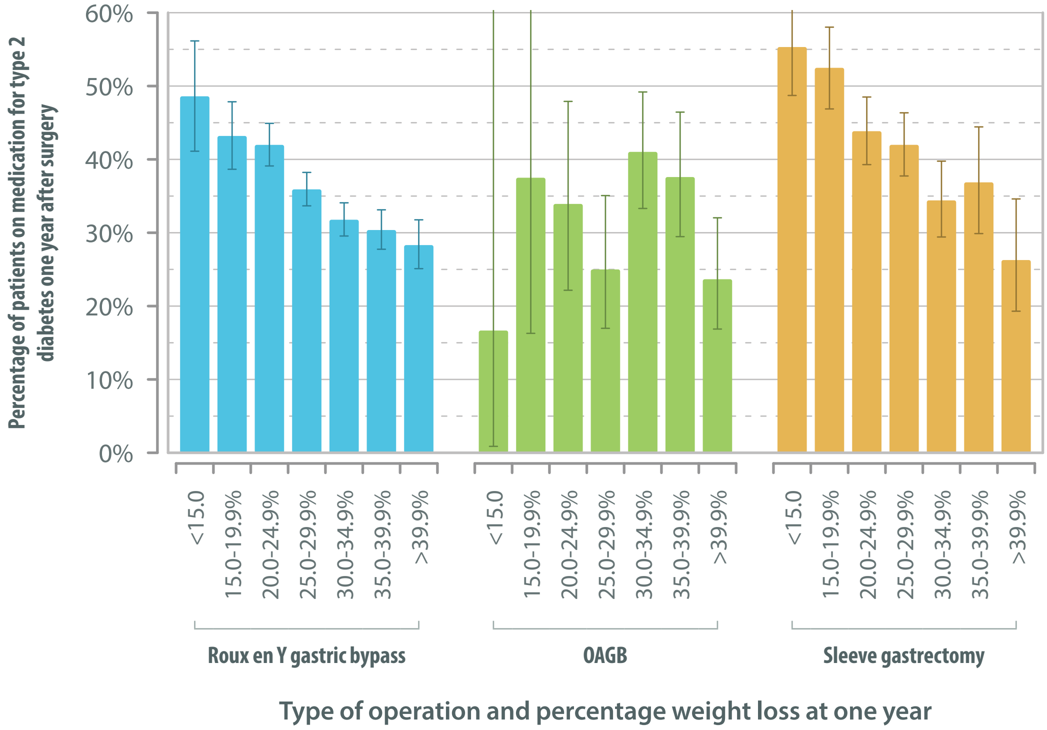
On a cautionary note, it is worth emphasising that interpretation of this information is limited firstly by the incompleteness of the follow up data and secondly because of the Euro-centric nature of the data that is available.

Primary surgery for patients on medication for type 2 diabetes pre-operatively: medication for type 2 diabetes one year after surgery and one-year percentage weight loss; selected National Registry data [1] for operations in the calendar years 2013-2018

Type of operation and one-year percentage weight loss group		Medication for type 2 diabetes one year after surgery			
		No	Yes	Unspecified	Rate
Roux en Y gastric bypass	<15.0%	92	87	25	48.6%
	15.0-19.9%	263	200	24	43.2%
	20.0-24.9%	662	479	53	42.0%
	25.0-29.9%	1,117	626	78	35.9%
	30.0-34.9%	1,138	530	97	31.8%
	35.0-39.9%	807	352	62	30.4%
	>39.9%	524	207	49	28.3%
	Unspecified	24	20	5,496	45.5%
OAGB	<15.0%	5	1	7	16.7%
	15.0-19.9%	10	6	9	37.5%
	20.0-24.9%	37	19	9	33.9%
	25.0-29.9%	72	24	15	25.0%
	30.0-34.9%	92	64	12	41.0%
	35.0-39.9%	83	50	8	37.6%
	>39.9%	100	31	11	23.7%
	Unspecified	2	0	605	0.0%
Sleeve gastrectomy	<15.0%	105	130	27	55.3%
	15.0-19.9%	153	169	22	52.5%
	20.0-24.9%	260	203	42	43.8%
	25.0-29.9%	304	220	36	42.0%
	30.0-34.9%	223	117	27	34.4%
	35.0-39.9%	113	66	18	36.9%
	>39.9%	101	36	21	26.3%
	Unspecified	7	8	2,693	53.3%

1. High-volume national registries with one-year follow up data: Netherlands, Norway, Sweden, United Kingdom.

Primary surgery for patients on medication for type 2 diabetes pre-operatively: Medication for type 2 diabetes one year after surgery; national registry data; operations in calendar years 2013-2018



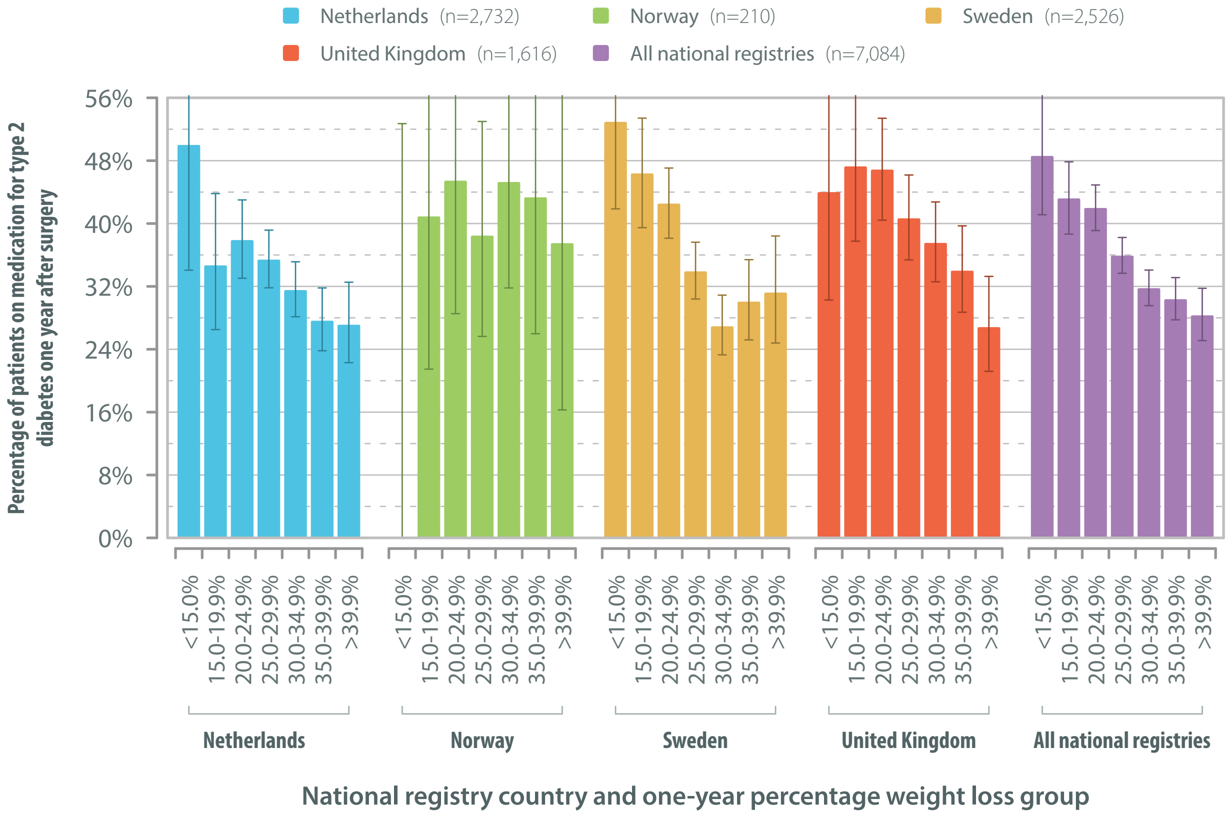
Type 2 diabetes and weight loss at one year for National Registries

The graph below shows the rates of medication use 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 Roux en Y gastric bypass operation, according to the percentage weight loss at the same follow up time-point.

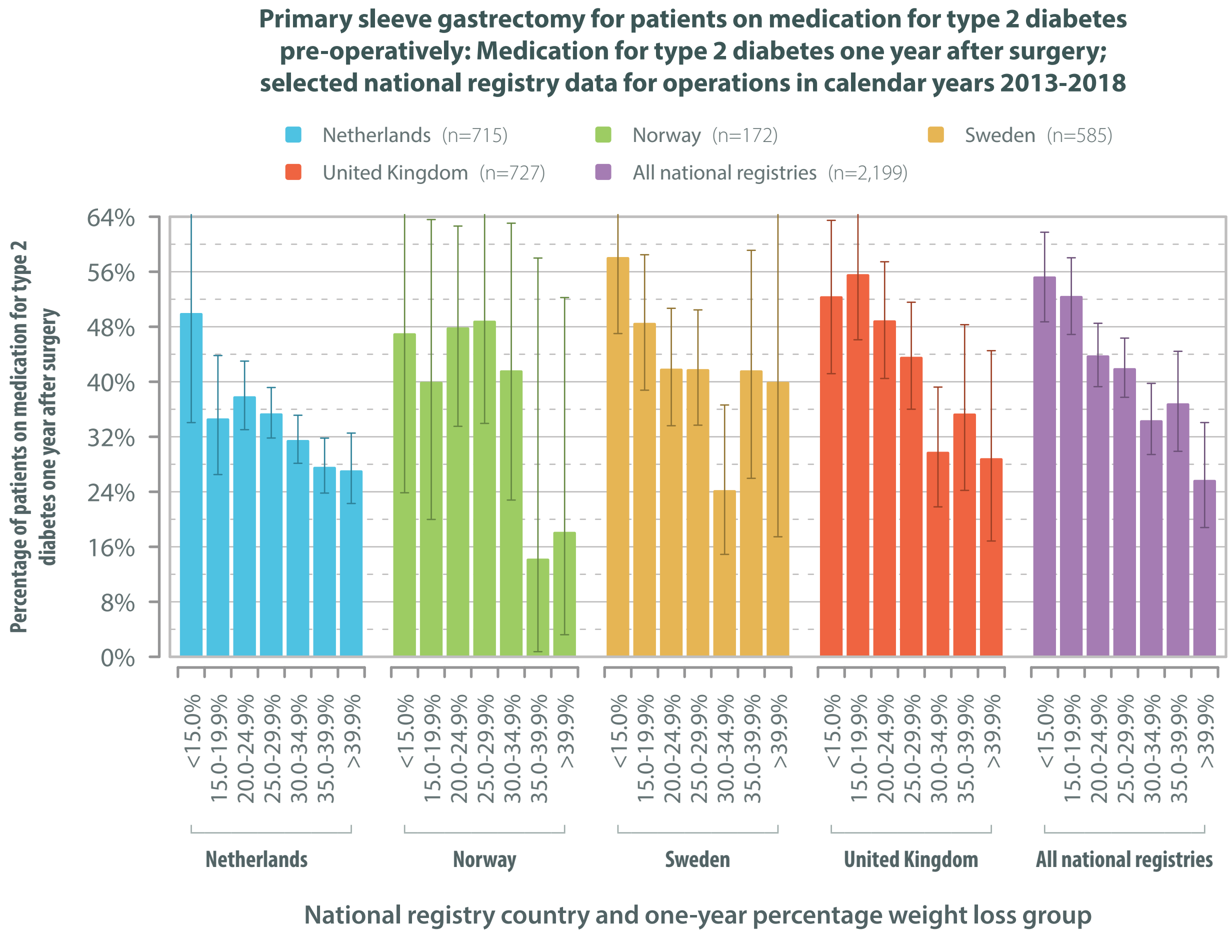
Greater improvement in diabetes status appears to be associated with greater weight loss, except for in Norway, where the impact on diabetes appears to be independent of the amount of weight lost. This may be a *real* difference, or it may reflect the lower numbers available for analysis in the Norwegian dataset, contributed to by the noted incomplete data transfer, making it more prone to statistical error. However, rates of patient follow up at 1 year have also been good in Norway ranging from 59.3% to 80.2%(average 72.3%) meaning that whilst there is a risk of bias, it is not as high as other similar registries. This interesting finding maybe worth further exploration.

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

Primary Roux en Y gastric bypass for patients on medication for type 2 diabetes pre-operatively: Medication for type 2 diabetes one year after surgery; selected national registry data for operations in calendar years 2013-2018



Increasing weight-loss seems to be related to increasing rates of diabetes resolution following sleeve gastrectomy, which is most clearly seen in the combined data from our highlighted national registries.



Analysis

Hypertension and weight loss at one year

Hypertensions and weight loss at one year and operation

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.

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.

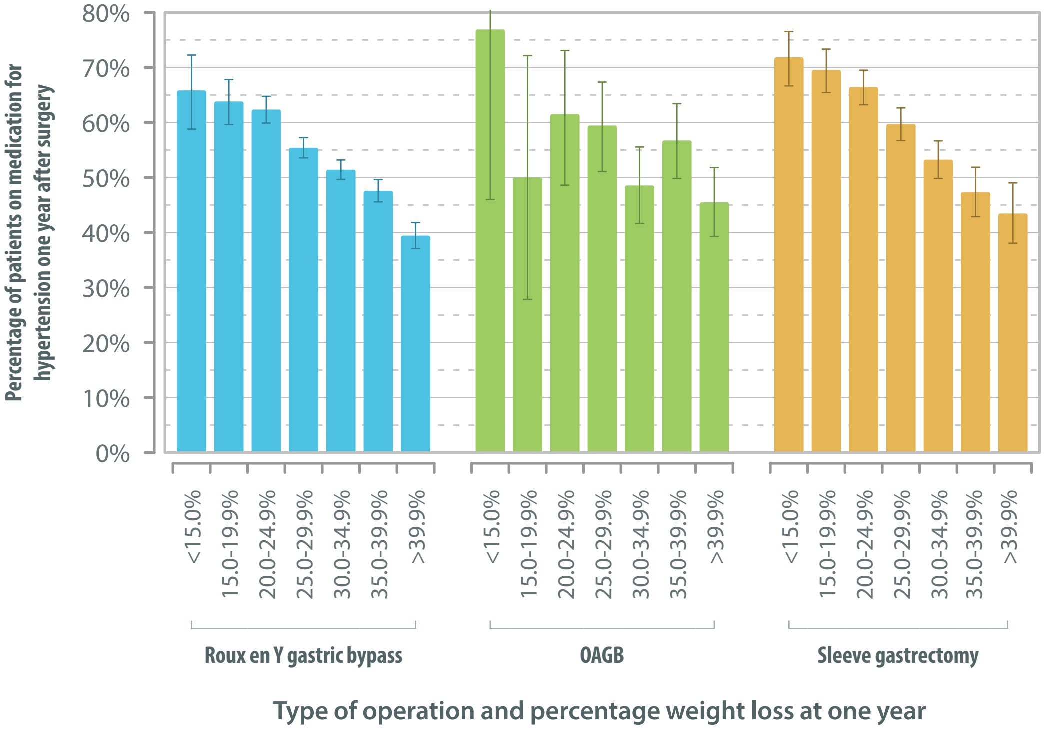
The relationship looks clear and consistent after Roux en Y gastric bypass and sleeve gastrectomy, whereas the data for patients who had an OAGB are much less certain, probably reflecting the lower numbers, increasing the possibility of a type I statistical error. To determine any definitive association between weight loss and the resolution of obesity-related diseases will need much more longitudinal data.

Primary surgery for patients on medication for hypertension pre-operatively: medication for hypertension one year after surgery and one-year percentage weight loss; selected National Registry data [1] for operations in the calendar years 2013-2018

Type of operation and one-year percentage weight loss group		Medication for hypertension one year after surgery			
		No	Yes	Unspecified	Rate
Roux en Y gastric bypass	<15.0%	69	133	11	65.8%
	15.0-19.9%	200	353	16	63.8%
	20.0-24.9%	589	976	40	62.4%
	25.0-29.9%	1,263	1,570	58	55.4%
	30.0-34.9%	1,530	1,620	91	51.4%
	35.0-39.9%	1,242	1,128	59	47.6%
	>39.9%	1,024	667	46	39.4%
	Unspecified	36	19	7,749	34.5%
OAGB	<15.0%	3	10	0	76.9%
	15.0-19.9%	10	10	2	50.0%
	20.0-24.9%	25	40	2	61.5%
	25.0-29.9%	60	88	3	59.5%
	30.0-34.9%	107	101	6	48.6%
	35.0-39.9%	93	122	6	56.7%
	>39.9%	139	116	4	45.5%
	Unspecified	2	0	778	0.0%
Sleeve gastrectomy	<15.0%	94	240	12	71.9%
	15.0-19.9%	166	379	13	69.5%
	20.0-24.9%	301	596	41	66.4%
	25.0-29.9%	437	648	63	59.7%
	30.0-34.9%	395	450	68	53.3%
	35.0-39.9%	259	233	36	47.4%
	>39.9%	186	143	33	43.5%
	Unspecified	10	18	4,833	64.3%

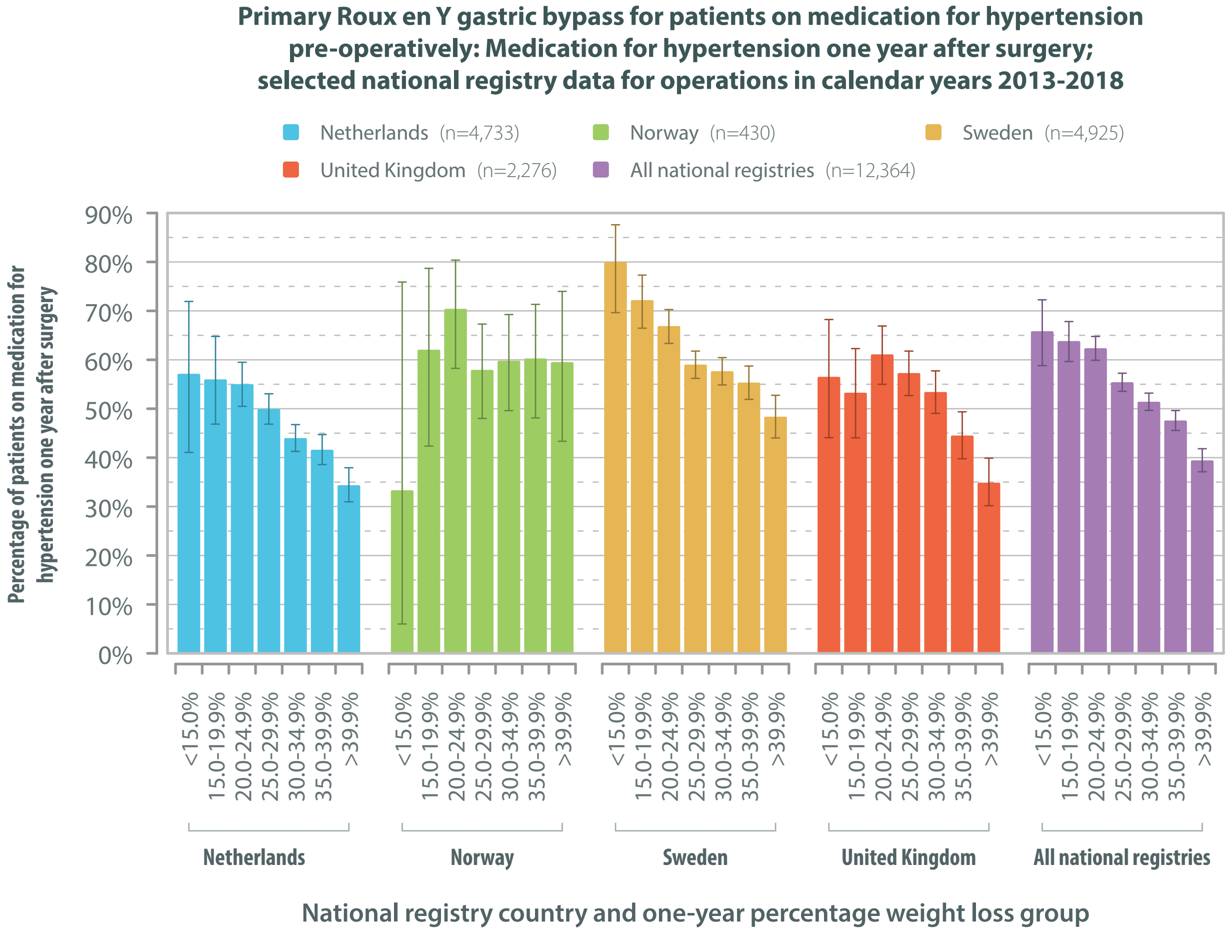
1. High-volume national registries with one-year follow up data: Netherlands, Norway, Sweden, United Kingdom.

Primary surgery for patients on medication for hypertension pre-operatively: Medication for hypertension one year after surgery; national registry data; operations in calendar years 2013-2018

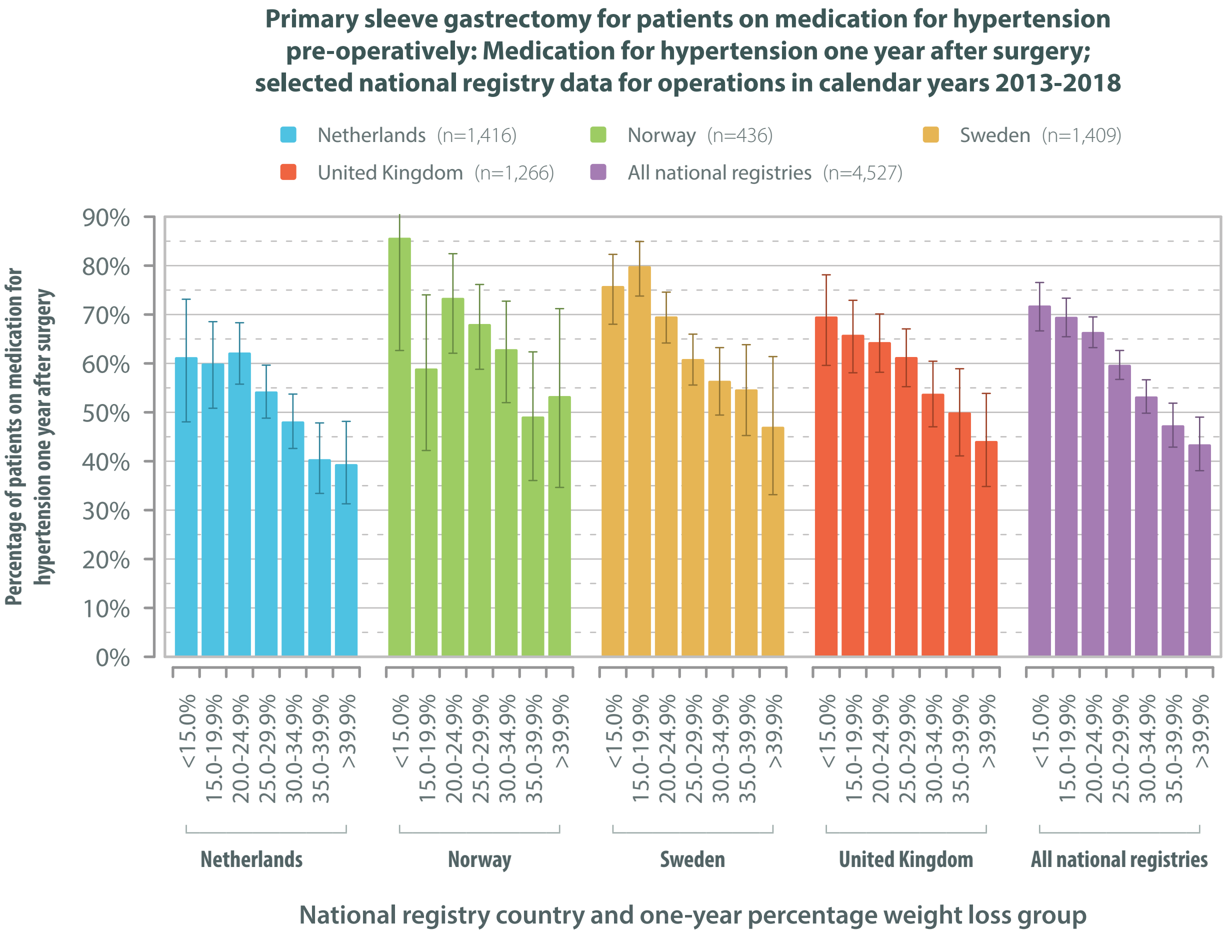


Hypertension and weight loss at one year for National Registries

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 following Roux en Y gastric bypass: greater weight loss correlates with greater reduction in the need for medication in the registry proper again, apart from Norway where this effect is not seen.



This correlation between weight loss and change in medication for hypertension is also seen following sleeve gastrectomy. The data from Norway are similar to other countries in this instance.



Analysis

The COVID effect

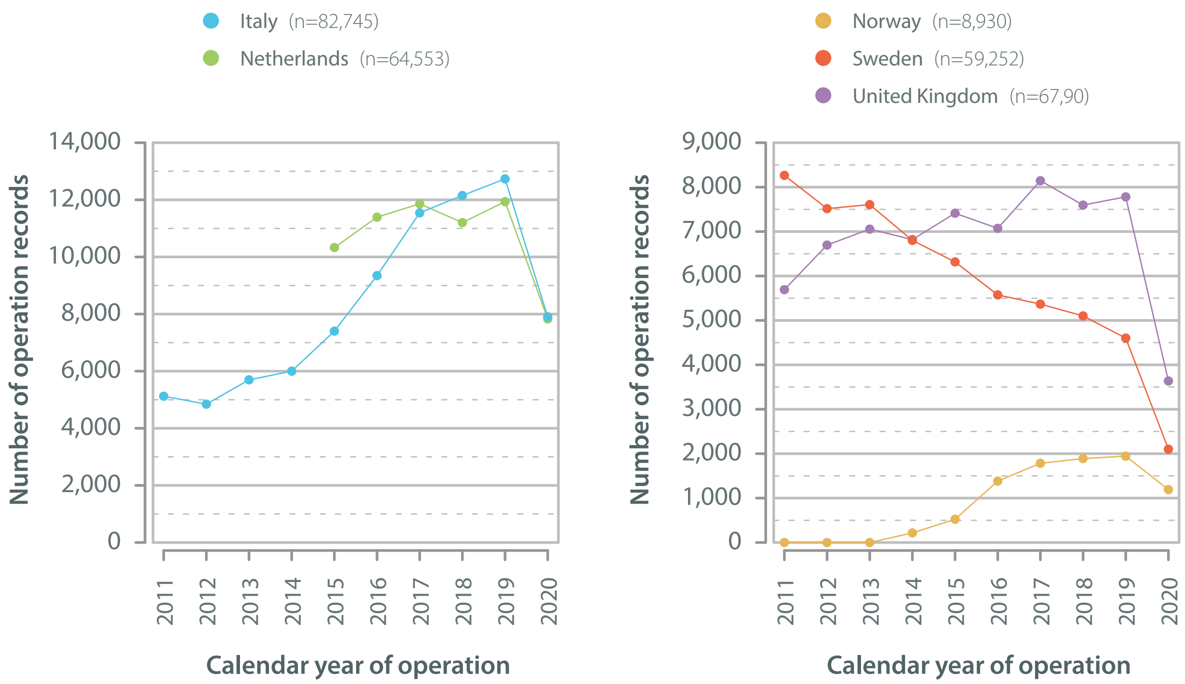
The first official reports of a novel coronavirus came from Wuhan, China on 31 December 2019. The causal pathogen was named severe acute respiratory syndrome corona virus 2 (SARS-CoV2) and the confirmed infection coronavirus disease 2019 (COVID-19) [1,2]. The virus spread rapidly around the world and a global pandemic was declared by the World Health Organisation on 11 March 2020 [3].

As health care systems around the world struggled to cope with the influx of patients, elective surgery was reduced in an attempt to reduce the usage of Personal Protective Equipment (PPE), free up staffing resources, reduce the demand on hospital beds and intensive care units and also to minimise movement around countries and traffic through hospitals, as part of a community-wide strategy to reduce spread of the virus.

Metabolic / bariatric surgery is considered elective surgery in most countries. Whilst the health benefits and impact on morbidity and mortality for persons with obesity are well documented, these positive effects take time to realise. Therefore, they are not typically categorised as urgent or emergent surgeries, unlike other conditions such as cancer where the effect of not operating is realised more immediately.

The effect of these restrictions on elective surgery are well demonstrated in these graphs, with a marked reduction in the number of operations recorded in registries in all of these countries. This is in sharp contrast to the situation prior to 2020. Prior to the pandemic being announced, there had been a steady increase in the numbers of procedures performed, apart from in Sweden, where numbers have slowly been decreasing since 2013.

IFSO Global Registry data from selected, high-volume national registries



1. Lescure F-X, Bouadma L, Nguyen D, et al. Clinical and virological data of the first cases of COVID-19 in Europe: a case series. *The Lancet Infectious Diseases*. 2020; **20**: 697-706.

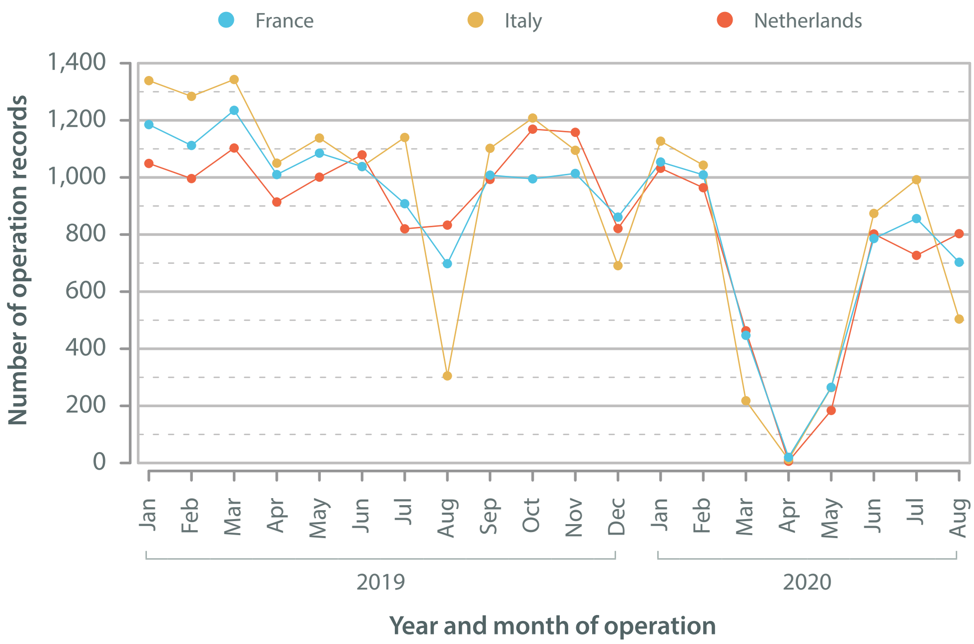
2. Machhi J, Herskovitz J, Senan AM, et al. The Natural History, Pathobiology, and Clinical Manifestations of SARS-CoV-2 Infections. *Journal of Neuroimmune Pharmacology*. 2020: 1-28.

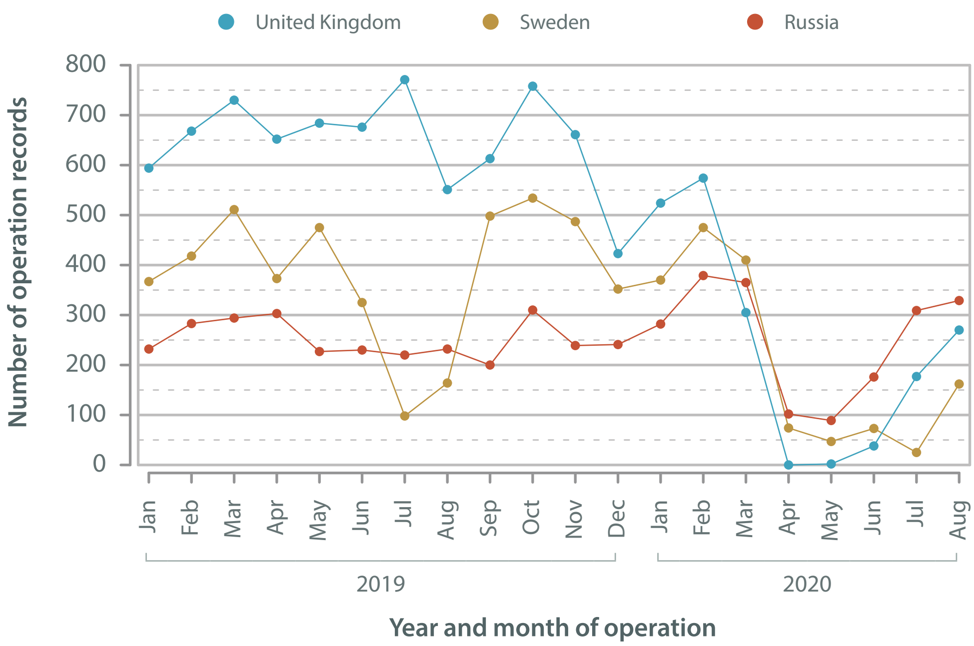
3. https://www.who.int / dg / speeches / detail / who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020.

Looking in more detail at the information from France, Italy and the Netherlands in the first chart below, and the United Kingdom, Sweden and Russia in the second chart below, it can be seen that in 2019 there was a usual slowing down of work during the height of the European Summer. In 2020 there was a 6-8 week period from April to May where very little metabolic / bariatric surgery was performed. This was during the peak of the first COVID-19 wave, and all of these countries faced significant challenges as they reallocated hospital resources to fight the threat of COVID-19 in their communities.

Recovery to more *normal* rates of metabolic / bariatric surgery varied between countries, and in 2020 there did not seem to be as consistent slowdown of surgery during the European Summer, possibly reflecting an attempt to *catch up* on cancelled procedures.

Pre- and post-COVID workload for selected countries

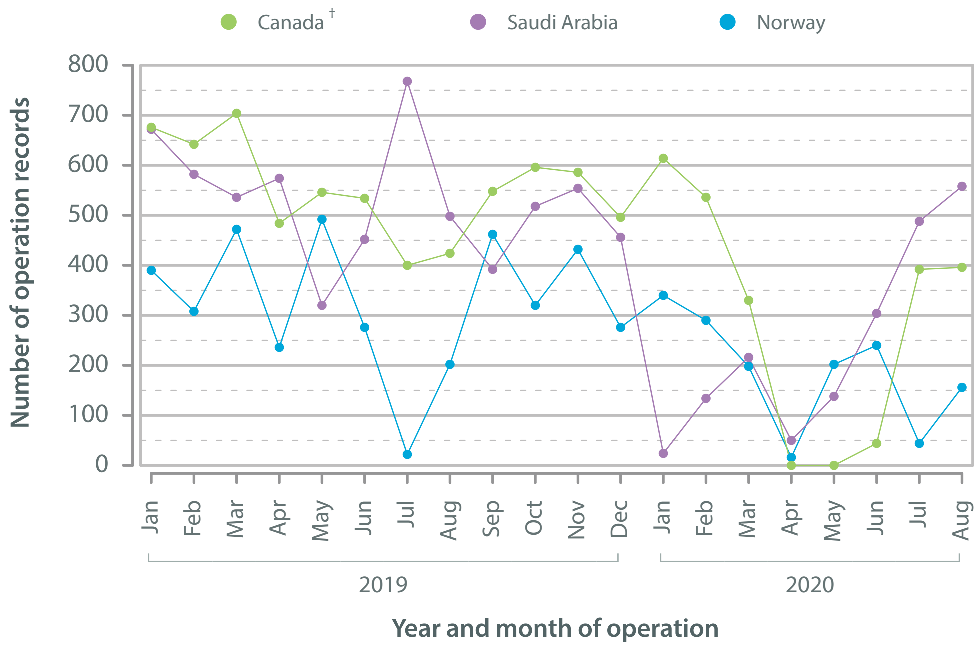


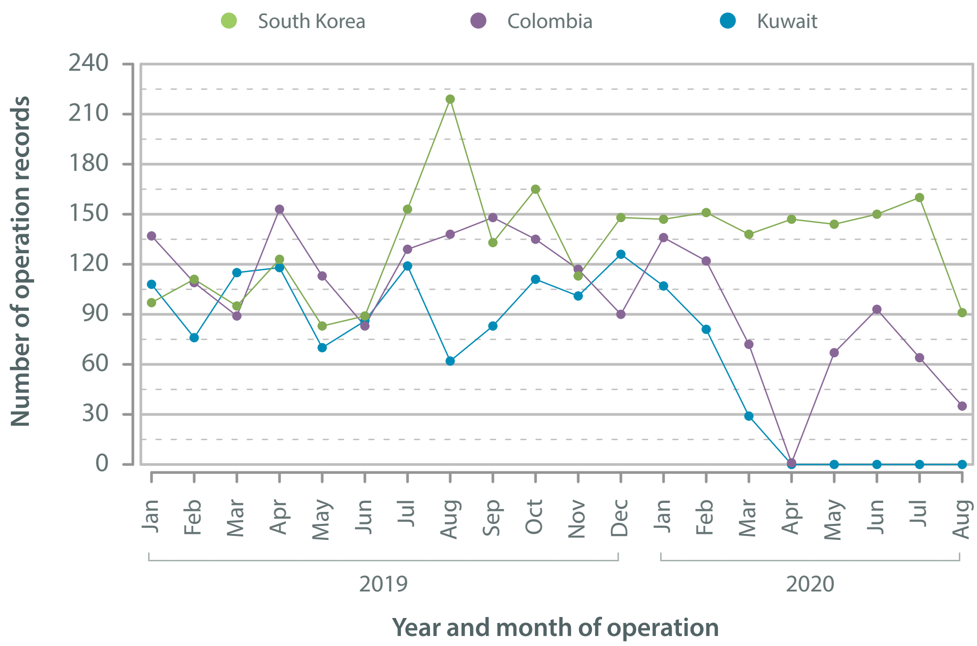


Similar trends were seen in North America, the Middle East, South America and Asia.

The only country that did not have a near complete cessation of bariatric surgery in that period of the first wave was South Korea. This probably reflects this country's relative success in controlling the spread of COVID-19 amongst their population at that time.

Pre- and post-COVID workload for selected countries





The pandemic is not over yet, with COVID-19 predicted to become endemic. There are new variants of the virus emerging, and communities are still being affected by high case loads and deaths from this virus. However, on the positive side, there are now vaccines broadly available, enabling resumption of more normal clinical practice in many countries.

It is noteworthy, that at the time data collection ceased in 2020 for the purpose of this report, only Saudi Arabia and South Korea had returned to pre-pandemic levels of operating. This suggests that the ability to access metabolic / bariatric surgery has remained constrained. This may represent resource availability, but may also reflect the stigma experienced by people with obesity and a reluctance amongst policy makers and payers to prioritise their care.

The downstream effect of restricting access to metabolic / bariatric surgery will not be appreciated for some time. The benefits of these procedures are only realised in the medium to longer term, as the reduction in weight and improved metabolic health translates to better health outcomes, better quality-of-life and less premature mortality. This period of history has significantly reduced patients' access to metabolic / bariatric surgery, and registries will be critically important in helping to document the impact of this time on the long-term health and well-being of people with obesity.

Appendix

Contributor hospitals by country

Austria

Österreichische Gesellschaft für Adipositaschirurgie

- Bezirkskrankenhaus Kufstein
- Bezirkskrankenhaus Schwaz
- Bezirkskrankenhaus St. Johann in Tirol
- Evangelisches Krankenhaus Wien
- Kepler Universitätsklinikum Linz
- Klinik Donaustadt Wien
- Klinik Hietzing Wien
- Klinik Landstraße Wien
- Klinikum Klagenfurt KABEG
- Klinikum Wels-Grießkirchen
- Krankenhaus der Barmherzige Schwestern Wien
- Krankenhaus der Barmherzigen Brüder Salzburg
- Krankenhaus der Barmherzigen Brüder St. Veit
- Krankenhaus Dornbirn
- Krankenhaus Elisabethinen Graz
- Krankenhaus Gmunden
- Krankenhaus Göttlicher Heiland Wien
- Krankenhaus St. Joseph Wien
- Krankenhaus St. Vinzenz Zams
- Landesklinikum Amstetten
- Landesklinikum Hollabrunn
- Landeskrankenhaus Bregenz
- Landeskrankenhaus Hochsteiermark Leoben
- Landeskrankenhaus Villach KABEG
- Medizinische Universitätsklinik Graz
- Medizinische Universitätsklinik Innsbruck
- Medizinische Universitätsklinik Wien
- Ordensklinikum Linz
- Pyhrn-Eisenwurzen Klinikum Kirchdorf Steyr
- Tauernklinikum Zell am See
- Universitätsklinikum Chirurgie Salzburg
- Universitätsklinikum Kinder- und Jugendchirurgie Salzburg

Azerbaijan

- Teaching Surgery Clinic of Azerbaijan Medical University, Baku

Bahrain

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

Belarus

- The 9th City Hospital, Minsk

Belgium

- Clinique CHC Montlégia, Liege
- Delta Hospital, Brussels

Bolivia

- Clínica Los Olivos, Cochabamb

Brazil

- Hospital Oswaldo Cruz Almeão, São Paulo

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
- 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

China

- The First Affiliated Hospital of Jinan University

Colombia

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

Dominican Republic

- Centro Medico Dominicano / Cecilip, Santo Domingo
- Centro Medico Moderno, Santo Domingo
- CEDIMAT, Santo Domingo
- Policlinico Nacional, Santo Domingo

Egypt

- Al Jamila Hospital, Cairo
- Arab Contract Medical Center
- Bedayat Hospital, Cairo – These red are Dr Masry
- Dream Specialized Hospital, Giza
- El Ahly Hospital, Alexandria
- El Salam Hospital, Giza – these black ones Dr Nabil
- El Sherouk Hospital, Glim, Alexandria
- El Zohour Hospital, Giza
- Kenana Hospital, Tanta, Gharbia
- Madina Hospital, Alexandria
- Misr International Hospital, Cairo
- Queens Royal Hospital, Cairo
- The Woman Hospital, Cairo

El Salvador

- Obesity El Salvadore

France

- Capio Clinique D'orange
- Centre Clinical Sa, Soyaux
- Central Hospitalier Universitaire a Limoges
- Centre Hospitalier Universitaire de La Reunion
- Central Hospitalier Universitaire de Nantes
- Centre Hospitalier de Beziers
- Centre Hospitalier Bretagne Atlantique de Vannes
- Centre Hospitalier de Cambrai
- Centre Hospitalier de Denain
- Centre Hospitalier de Fleyriat
- Centre Hospitalier de Mont St Martin
- Centre Hospitalier de Saint Denis
- Centre Hospitalier de Salon de Provence
- Centre Hospitalier de Sens
- Centre Hospitalier des Vals d'Ardeche
- Centre Hospitalier d'Arcachon
- Centre Hospitalier Intercommunal de Creteil
- Centre Hospitaler Intercommunal Toulon - la Seyne Sur Mer
- Centre Hospitalier de L'Arrondissement de Montreuil-sur-Mer
- Centre Hospitalier la Miletrie, Poitiers
- Centre Hospitalier La Roche-sur-Yon
- Centre Hospitalier Marie Madeleine, Forbach
- Centre Hospitalier Memorial France Etats-unis Saint-Lo
- Centre Hospitalier Perpignan
- Centre Hospitalier Privè Saint Grègoire, Rennes
- Centre Hospitalier Privè Sainte Marie, Osny
- Centre Hospitalier Public du Cotentin, Cherbourg
- Centre Hospitalier Rene-Dubos, Pointoise
- Centre Hospitalier Rochefort
- Centre Hospitalier Universitaire Grenoble Alps
- Centre Hospitalier Universitaire de Nîmes
- Centre Hospitalier, Le Mans
- Centre Hospitalier Salon De Provence
- Centre Medico-Chirurgical du Mans
- Clinique Ambroise Parè, Beuvry
- Clinique Axium, Aix-en-Provence
- Clinique de Bercy, OC Sante
- 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'etang se L'Olivier
- Clinique de l'Europe, Rouen
- Clinique de l'Yvette, Longjumeau
- Clinique des Cèdres, Blagnac
- Clinique des Landes, Mont de Marsan
- Clinique des Cedres, Echirolles
- Clinique du Diaconat Fonderie & Roosevelt
- Clinique du Mail, La Rochelle
- Clinique Du Palais, Grasse
- Clinique du Parc Lyon
- Clinique Geoffroy Saint Hilaire, Paris
- Clinique Gènèrale, Annecy

France continued …

- Clinique Gènèrale de Marignane
- Clinique Internationale du Parc Monceau, Paris
- Clinique Jules Verne, Pôle Hosital Mutualiste
- Clinique Jules Verne, Nantes
- Clinique Les Cedres, Brive
- Clinique Les Orchidèes, La Réunion
- Clinique Mathilde, Rouen
- Clinique Mutualiste Bénigne Joly, Dijon
- Clinique Mutualiste de l'Estuaire, Saint Nazaire
- Clinique Mutualiste Saint Etienne
- Clinique Pasteur, Toulouse
- Clinique Rhéna de Strasbourg
- Clinique Saint Charles, La Roche-sur-Yon
- Clinique Saint George, Nice
- Clinique Saint Hilaire Rouen
- Clinique Saint Marie, Groupement Des Hôpitaux de L'Institut Catholique de Lille,(GHICL)
- Clinique Saint Michel, Troulon
- Clinique Saint-Vincent de Paul, Bourgoin
- Clinique Tivoli-Ducos, Bordeaux
- Clinique Turin, Paris
- Elsan Pole Santé Sud, Le Mans
- Grand Hôpital de l'Est Francilien, Marne la Vallée
- Group Hospitalier Mutualiste Les Portes du Sud
- Hôpital-clinique Claude Bernard, Metz/Elsan
- Hôpital de la Conception, Marseille
- Hôpital Emile Muller, Mulhouse
- Hôpital De Rangueil, CHU Toulouse
- Hôpital Edouard Herriot, Lyon
- Hôpital Européen Georges-Pompidou, Paris
- Hôpital Joseph Ducuing, Toulouse
- Hôpital Prive Arras Les Bonnettes
- Hôpital Privé Claude Galien, Quincy-sous-Senart
- Hôpital Prive d'Amberieu
- Hôpital Prive d'Antony
- 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 de La Loire
- Hôpital Privé des Cotes d'Armor
- Hôpital Privé La Louviére, Lille
- Hôpital Privé Médipôle de Savoie, Challes les Eaux
- Hôpital Prive Saint-Martin-Caen
- Hôpital Privé Toulon Hyères Saint Jean, Toulon
- Hôpitaux Civils de Colmar
- Hospitalia Mutualite Pfc
- Hu Paris Site de Avicenne APHP
- Infirmerie Protestante de Lyon
- 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, Caen
- 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 Quimper SUD
- Polyclinique Reims-Bezannes
- Polyclinique Saint Côme, Compiègne
- Polyclinique Saint Privat, Boujan-sur-Libron
- Polyclinique Saint Therese, Sete
- 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
- St John the Merciful Private Clinic, Tbilisi
- Tbilisi Central Hospital, Tbilisi
- JSCK Eristavi National Center of Experimental and Clinical Surgery, Tbilisi

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

Hungary

- Semmelweis University 1st. Department of Surgery, Budapest

India

- Digestive Health Institute, Mumbai
- Dr Tulips Obesity and Diabetes Center, Koramangala, Bangalore
- MOHAK Bariatrics & Robotics Surgery Centre, Indore

Ireland

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

Italy

S.I.C.OB.

Società Italiana di Chirurgia dell'Obesità e delle malattie metaboliche

- 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

Italy continued …

- 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
- 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

Italy continued …

- 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

- Aichi Medical University Hospital
- Center Hospital of the National Center for Global Health and Medicine
- 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
- Ehime University Hospital
- First Towakai Hospital
- Frontier Surgery Chiba University Graduate School of Medicine

Japan continued …

- Hiroshima University Hospital
- Hokkaido University Hospital
- Kakogawa Central City Hospital
- Kamagaya General Hospital
- Kansai Medical University Hospital
- Kasugai Municipal Hospital
- Kawasaki Saiwai Hospital
- Kochi Health Science Center
- Konan Medical Center
- Kusatsu General Hospital
- Minami Osaka Hospital
- Morioka Municipal Hospital
- Nagoya University Hospital
- Nakagami Hospital
- Ohama Daiichi Hospital
- Okazaki City Hospital
- Osaka General Medical Center
- 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
- Wakayama Medical University Hospital
- Yotsuya Medical Cube

Jordan

- Dr Hamzeh Halawani Clinic for Bariatric, Endoscopic and Robotic Surgery, Amman
- Gastrointestinal Bariatric & Metabolic Center, Jordan Hospital, Amman
- SGBC, Specialized GI, Liver, Pancreas, and Bariatric Surgery, Amman

Kazakhstan

- Astana Medical University
- Green Clinic, Nur Sultan

Kingdom of Saudi Arabia

- Tabuk New You Medical Center, Riyadh

Kuwait

- Al Adan Hospital, Kuwait City
- Al-Amiri Hospital, Kuwait City
- Al Jahra Hospital, Al Jahra
- Al Sabah Hospital, Kuwait City
- Farwaniya Hospital, Kuwait City
- Jaber Hospital, Kuwait City
- Mubarak Al-Kabeer Hospital, Kuwait City

Appendix

Lebanon

- Khoory Hospital, Beirut

Mexico

- Centro Médico ABC, Mexico City
- Instituto Nacional de Ciencias Médicas y Nutricion, Mexico City
- OLA – Obesidad Y Laparoscopia Avanzada Hospital Puerta de Hierro SUR
- Private Hospital Jardin, Mexico City
- Hospital General Rubén Leñero, Mexico City
- Hospital Christus Muguerza, Monterrey
- Hospital General Tláhuac, Mexico City
- Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City

Morocco

- Richard Abittan, Surgery of Obesity, Casablanca

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

Scandinavian Obesity Surgery Registry

- 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
- østfold Hospital, Moss
- 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

Peru

- Clinica de dia Avendana, Lima

Poland

- Ceynowa Hospital, Wejherowo

Portugal

- Centro Hospitalar de Setúbal, EPE
- Clinica de Santo Antonio-Lusiades, Amadora

Qatar

- Al Emadi Hospital, Doha

Russia

Russian National Bariatric Surgery Registry

- Almazov National Medical Research Centre, St Petersburg
- City Clinical Hospital S.S. Yudina, Moscow
- Clinic of Endoscopic & Minimal Invasive Surgery, Stavropol State Medical University, Stavropol
- Clinic UGMK Health, Ekaterinburg
- Emergency Medical Service Hospital, Ryazan
- Family Clinic Olymp Zdorovia, Voronezh
- Federal State Budgetary Healthcare Institution, Clinical Hospital 85 FMBA of Russia, Moscow
- Hospital Krasnodar
- 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
- Private Health Care Institution, Hospital Russian Railway-Medicine, Kaliningrad
- 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

- Ajou University Hospital, Suwon
- Asan Medical Center, Seoul
- Catholic Kwandong University International St. Mary's Hospital
- Cha University Gangnam Medical Center, Seoul
- Changwon Fatima Hospital
- Cheil Hospital, Seoul
- Chonnam National University Hwasun Hospital
- Chung-ang University Hospital
- Chungnam National University Hospital, Daejeon
- Daehan Wellness Hospital
- Daejeon Eulji Medical Center, Eulji University
- Daejeon Sun Hospital
- Dankook University Hospital, Cheonan
- EWHA Womans University Seoul Hospital
- Gyungsang National University Changwon Hospital
- H+ Yangji Hospital, Seoul
- Hallym University Medical Center, Seoul
- Hansarang Hospital, Gyeonggi-do
- Hanyang University Hospital, Seol
- Inha University Hospital, Incheon
- Keimyung University Dongsan Medical Center
- Konyang University Hospital. Daejeon
- Korea University Anam Hospital
- Korea University Guro Hospital
- Kosin University Gospel Hospital, Busan
- Kyunghee University Hospital at Gangdong, Seoul
- Kyungpook National University Chilgok Hospital, Daegu
- Min Hospital, Seoul
- Mokpo Hankook Hospital
- Seoul Medical Center
- Seoul National University Bundang Hospital
- Seoul National University Hospital
- Seoul Slim Surgery Hospital
- Soonchunghyang University Cheonan Hospital
- Soonchunghyang University Seoul Hospital
- The Catholic University of Korea, Bucheon St. Mary's Hospital
- The Catholic University of Korea, Daejeon St. Mary's 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. Paul's Hospital
- The Catholic University of Korea, St. Vincent's Hospital
- The Catholic University of Korea, Uijeongbu St. Mary's Hospital
- Ulsan University Hospital
- Wonju Severance Christian Hospital
- Yonsei University Gangnam Severance Hospital

Appendix

Spain

- Hospital Clinico San Carlos, Universidad Complutense de Madrid - SPN-G

Sweden

Scandinavian Obesity Surgery Registry

- Aleris Obesitas, Stockholm
- Aleris Skane
- Blekinge Hospital
- Boras Hospital
- Capio St Goran Hospital
- Carlanderska Hospital
- CFTK Stockholm
- Danderyd Hospital
- Ersta Hospital
- Falun Hospital
- Gavle Hospital
- GB Obesitas Skane
- Hermelinen Specialistvard
- Hudiksvall Hospital
- Kalmar Hospital
- Kirurgicentrum Skane
- Landskrona Hospital
- Ljungby Hospital
- Lycksele Hospital
- Mora Hospital
- NCK Ostergotland
- Norrkoping Hospital
- Norrtalje Hospital
- Nykoping Hospital
- Orebro/Lindesberg University Hospital
- Ostersund Hospital
- Sahlgrenska University Hospital
- Skovde Hospital
- Sodersjukhuset Hospital
- Sodertalje Hospital
- Sophiahemmet Stockholm
- Sunderbyn Hospital
- Sundsvall Hospital
- Torsby Hospital
- Trollhattan Hospital
- Uppsala University Hospital
- Varberg Hospital
- Varnamo Hospital
- Vasteras Hospital
- Vastervik Hospital
- Vaxjo Hospital

Taiwan

- Bariatric & Metabolic International Surgery Center E-Da Hospital, Kaohsiung City
- China Medical University Hospital, Taichung City
- Jen-Ai Hospital International Patient Center, Dali
- Min Sheng General Hospital
- Taipei Medical University Hospital
- Tzu Chi Hospital, Taipei

Tunisia

- Clinique Taoufik, Tunis

Turkey

- Ersun Topal Private Clinic, Bursa
- Liv Hospital, Ulus Istanbul

Ukraine

- State Scientific Institution Center for Innovative Medical Technologies of the National Academy of Sciences

United Arab Emirates

- Seha Emirates Hospital, Abu Dhabi

United Kingdom

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
- 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

Appendix

United Kingdom continued ...

- 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
- 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

Appendix

The database form

International Federation for the Surgery of Obesity and metabolic disorders

IFSO Global Registry

Baseline section; Page 18; Version **6.2** (**12 Nov 2020**)

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 **red**.

Unique patient identifier			
Gender	O Male	O Female	O Unknown

Baseline data

Basic patient details

Age at operation		years
Height		cm
Weight on entry to the weight-loss program		kg
Funding category	O Publicly funded O Self-pay	O Private insurer

Comorbidities

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

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IFSO GLOBAL REGISTRY

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Baseline section; Page 19; Version **6.2** (**12 Nov 2020**)

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	O No	O Yes
Operative approach	O Laparoscopic O Lap converted to open	O Endoscopic O Open
Type of operation	O Gastric band O Roux en Y gastric bypass O OAGB / MGB O Sleeve gastrectomy	O Duodenal switch O Duodenal switch with sleeve O Bilio-pancreatic diversion O Other
Banded procedure	O No	O Yes
Details of other procedure	O Gastric plication O Single anastomosis duodenal-ileal surgery O Vertical banded gastroplasty O Other	

Outcomes

Leak within 30 days of surgery	O No	O Yes
Bleeding within 30 days of surgery	O No	O Yes
Obstruction within 30 days of surgery	O No	O Yes
Re-operation for complications within 30 days of surgery	O No O Yes	
Patient status at discharge	O Alive	O 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 **6.2** (**12 Nov 2020**)

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 Sixth IFSO Global Registry Report 2021

IFSO GLOBAL REGISTRY

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