7th IFSO Global Registry Report

2022

The International Federation for the
Surgery of Obesity and Metabolic Disorders

Seventh IFSO Global Registry Report 2022

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August 2022

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PREFACE

It is my pleasure as IFSO President to introduce the Seventh IFSO Global Registry Report 2022. This Seventh Report is a summary of aggregated data from 23 national registries and 2 regional registries (Ontario/Canada; Michigan/USA) which included information on 311,441 procedures performed on people with obesity who underwent bariatric metabolic surgery in either 2020 (USA) or 2021 (rest of world) focussed on demographics and activities of bariatric and metabolic surgery.

Our previous reports have been on information collected from operations from contributor countries across 5 chapters. Our Sixth report for example was from data on 507,298 operations from 50 contributor countries and 5 national registries. The big challenge for the IFSO Global Registry has been the utilisation of data provided to compare outcomes between countries which has not been meaningfully due to lack of consistent definitions for data items, inclusion of single centres representing whole countries and meeting the standards with data security regulations.

The General Data Protection Regulation (GDPR) which was enforced in May 2018 required any identifiable or potentially identifiable data be shared with the explicit consent of the provider of the data, in our case, our patients. GDPR also required ethical review of any registry activity. Data must be securely housed and only being used for the purpose it is collected. As data controller, IFSO is responsible for all data security obligations. With such challenges, the IFSO Global Registry proposed that this Seventh IFSO Global Registry Report be a report on aggregated data from established national or regional registries using a data dictionary focusing on demographic and descriptive data only.

With this change in direction, IFSO has partnered with the Data Vision Lab for the production of this report. My congratulations to the persistence efforts by Registry Committee to overcome the challenges and change of direction over the last 12 months led by Wendy Brown (Australia-APC), Ronald Liem (Netherlands-EC), Scott Shikora (USA-NAC), and the leaders of the national registries who have helped towards the generation of this report.

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

- Salman Al Sabah (MENAC)
- Mehran Anvari (NAC)
- Camilo Boza (LAC)
- Ricardo Cohen (LAC)
- Amir Ghaferi (NAC)
- Jacques Himpens (EC)
- John Morton (NAC)
- Mario Musella (EC)
- Francois Pattou (EC)
- Nasser Sakran (EC)
- Villy Vage (EC)

Each member comes with their unique knowledge and as a leader in their field have contributed enormously to the re-direction of this IFSO project and to help build the IFSO Registry towards the future. In addition a special thanks to the team at the Australia and New Zealand Bariatric Surgery registry for their assistance in the collation of the data. 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 will be continuing to work with national and regional registries on collecting good aggregate data focussing on demographics and key facts about the 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.

Hence, I would like to 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 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.

Lilian Kow
IFSO President 2019-2022

FOREWORD

This August will be an important one for IFSO. For openers, we will meet in Miami for the 25th IFSO World Congress. This will represent the first time we will be meeting in person since the COVID-19 pandemic resulted in the conversion of the 2020 World Congress from live to virtual.

The other noteworthy event is the release of the seventh IFSO Global Registry. Each year, the data from bariatric and metabolic surgery procedures worldwide are collected from all IFSO national societies and is uploaded into a database. The data is ultimately analyzed and the results, published in a hard copy, bound book. The registry is then made widely available to the 10,000 IFSO members. The ability to collect, store, merge, and analyze the data from surgeons all over the world, can not be over emphasized.

The data captured in the yearly Global Registry enables IFSO members (and others) to be able to analyze the safety and efficacy of the current operative procedures and practices. Changes in practice and the acceptance or rejection of new procedures may result from conclusions drawn from Registry reports. Individual programs could also use the Registry to compare their own results from one year to the next as a quality assessment vehicle or compare their results to other programs. In addition, with each passing year, the Registry should become more robust and more accurate. The perpetual collection of data increases the data available for analysis, improving the study results.

Since its onset, the IFSO Global Registry has collected the data from all over the world loaded into the database and analyzed the collected data and generated a yearly comprehensive report. The final published Registry reports were very well organized and easy to read. After 6 years, the IFSO Executive Board and Registry Committee decided that the current format for the Registry needed to be changed. The experience gained from the past 6 years also gave the Registry Committee the knowledge to know what changes needed to be made and how to do it in a cost-effective manner.

Therefore, the seventh IFSO Global Registry Report will appear different than the previous Global Registry Reports. Firstly, the data collected for the first 6 IFSO

Global Registry reports were based on individual level data obtained from single surgical centers and national registries. Unfortunately, the data was limited by a lack of consistent definitions for the data fields reducing the ability to compare the data between individual country chapters. To improve this weakness, a minimum dataset was created. This will restrict the data collected to just the data fields thought to be vital to improve the ability to compare data amongst the chapters. In addition, in the previous Registry Reports, some countries were represented by a single center which reduced the likelihood that this data would be truly representative of the activities being performed in some countries. In the new format, only data from national or regional registries will be included.

Lastly, in 2016, a new law was passed in Europe that governed the use of data collected in Europe. This law, called the General Data Protection Regulation (GDPR) changed the process for collecting and using individual data. Compliance with that law under the previous system proved to be labor-intense and costly. However, it will be much easier to mange under the new system.

This year's Registry Report will reflect these changes. The data in this Registry was extracted from aggregated data and not from individual level data. Secondly, only data from national or regional registries was extracted. Thirdly, the collected data is reduced to only that from demographics and key facts about the surgery that had been performed. Lastly, data definitions are included so the reader can understand what is being compared.

The transition of our current Global Registry to an entirely new one based on the work done by the Global Registry Committee was a tremendous undertaking of the Committee members. On behalf of all IFSO members who use the Global Registry, I want to acknowledge the work done by the committee Chair, Wendy Brown, the Vice Chair, Ronald Liem, and the other committee members for accomplishing this difficult but important feat.

Scott A. Shikora, MD, FACS, FASMBS
President-Elect
IFSO

EXECUTIVE SUMMARY

This is the Seventh Report of the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) Global Registry, and the first report to contain **only aggregated information from national or regional bariatric surgery registries.** The focus is on **demographics, types of operations undertaken and perioperative outcomes** aligning with the minimum dataset identified through the IFSO collaboration with Bristol University.

Important caveats

Data provided by national or regional registries are more likely to represent the practice of the area where they are established, with less chance of bias compared to when data is included from single centres representing an entire country. Whilst there are fewer contributing countries in this report, it is hoped the included data is more reflective of global practice than when information from single centres representing a whole country was included in the registry report.

However, it must be noted that there is still missing data in national/regional registries. Very few national/regional registries have complete data ascertainment, meaning not 100% of people with obesity who under go a bariatric metabolic procedure are included in the registry. In addition, not all registries have complete follow up in the perioperative period meaning important complications may not have been recorded and reported. There are also differences in the way each registry audits, or confirms, that the data they have is accurate.

There are also differences in the way various items are defined by each registry. This can make comparisons between registries difficult and where major differences in definitions occur, these are flagged in the body of the report.

These are important limitations that should be recognised when reading the outcomes of this report.

Key outcomes in this report

- There were 311,441 operations submitted by 25 contributor registries. IFSO are aware of 32 national registries, meaning that 78.1% of known registries are included.
- The majority of patients with obesity who underwent bariatric metabolic procedures were female in all reporting registries.
- The median start BMI of participants in the registry ranged from 36.8 kg/m^2 in China to 54.1 kg/m^2 in Azerbaijan. The majority of registries reported start BMI 40-45 kg/m^2.

- The median age of participants in the registry ranged from 25 and 32 years in the Kuweit and China, respectively, to 44 years in the Netherlands, Italy and New Zealand.
- The most common preoperative co-morbidity reported by was type II diabetes. The highest rates of type II diabetes in people with obesity undergoing bariatric metabolic surgery were seen in Michigan (USA) and the lowest rates in Italy.
- Males were more likely than females to report having Diabetes, OSA, dyslipidemia and hypertension at the time of their bariatric metabolic procedure, where as females were more likely to report depression. These differences are worthy of further investigation as they are consistent between countries.
- The majority of operations recorded by all registries are sleeve gastrectomies, followed, in terms of volume, by Roux en Y gastric bypass procedures.
- There are an increasing number of "other" procedures being performed, particularly in the revisional setting.
- The majority of operations are performed laparoscopically, although it is noted that the uptake robotic surgery continues to increase particularly in the revisional setting.
- Most countries report a length of stay that is slightly higher for revisional procedures than primary procedures.
- The median length of stay varies for primary procedures from 1 day in Ontario (Canada), Netherlands, Sweden, Norway and Michigan USA, to 6 days in China. Differences probably reflect cultural expectations around discharge timing and what resources are available in the community.
- The rates of unplanned readmission were slightly higher in those registries with the shortest length of stay.
- Bariatric metabolic surgery is very safe. The reported death rate following surgery was 0-0.11%.

Implications for bariatric surgery

- This report contains information from a relatively simple dataset and represents a great deal of willing engagement from 25 established national and regional registries.
- Despite the limitations noted of incomplete data acquisition and the differing data definitions between contributing registries, this report describes the common profile of people with obesity undergoing bariatric metabolic procedures as well as the frequency of procedures and perioperative safety. It raises many issues that are ripe for further research.
- There are currently 72 official member societies of IFSO, and IFSO are aware that 32 societies run a national registry. It is hoped that other established registries will be able to contribute to the next report.
- In the future, we aim to included national registry data from every one of our member societies. Through a collaboration with Bristol University, IFSO have supported development of a minimum data set for national bariatric registries which will support a common data dictionary. The common data dictionary will be the basis for a REDCAP database that can be shared with member societies, along with mentorship and support through the required jurisdictional processes. It is hoped this will enable registry activity to be a core activity of all national societies.

DATA GUIDE

Data collection and collation process

A word about the data included

The data items that are reported on in this seventh report were chosen to describe the demographics of people with obesity who undergo bariatric metabolic procedures, the types of procedures that are being undertaken as well as markers of perioperative safety. By collecting these items across registries we are able to see where there are similarities, and differences, across our Federation. The data dictionary is found in Appendix 2 and the definitions used in Appendix 3.

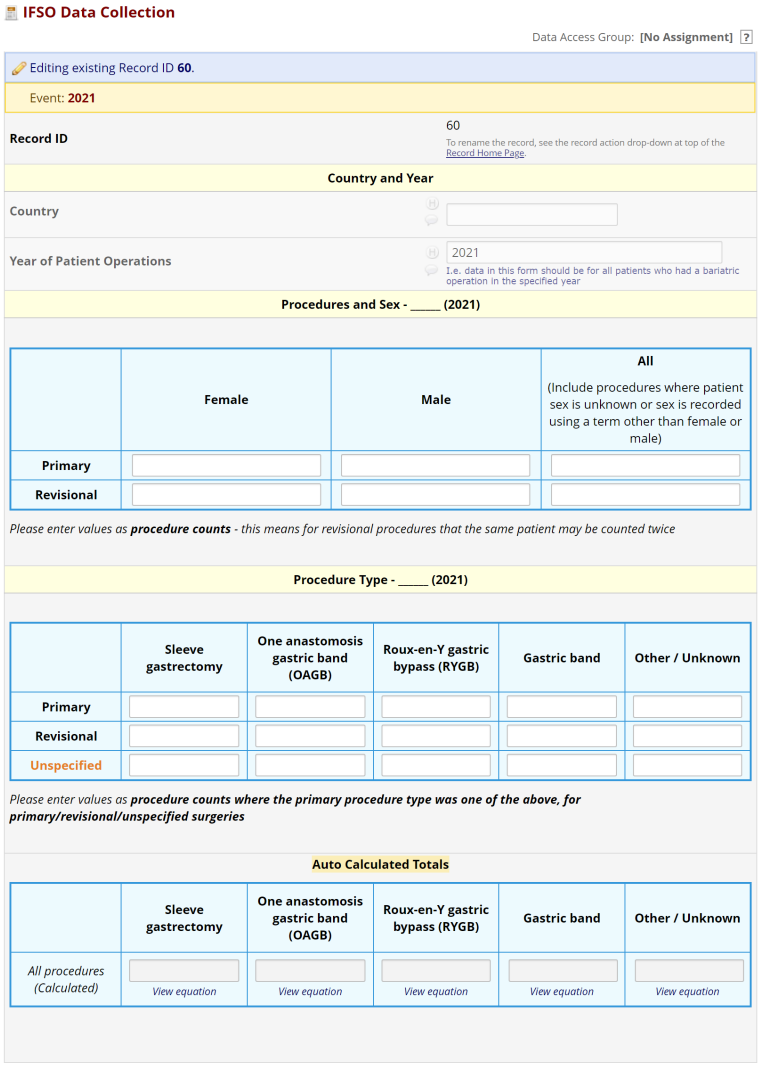
Given that all of the 25 national/regional registries are well established and already collect data according to their own definitions, it was not possible to completely align the data set against the common data dictionary. Where there are important differences in the definitions used by different countries/regions, the definitions used are described in the body of the report.

Not all countries/regions collected all of the data items that were chosen for the global report. Where an item is not collected, the country is not included in the outcome information.

Process for collecting data from national/regional registries

All of the existing bariatric metabolic surgical registries known to IFSO were contacted initially by the IFSO Secretariat inviting them to contribute to the report. Of the 32 known registries, 25 agreed to participate.

The team at the Australia and New Zealand Bariatric Surgery registry (ANZBSR) – Jennifer Holland, Angus Campbell, Robin Thompson, Jenifer Cottrell and Dianne Brown – created the data dictionary, developed a Redcap™ data base to collect data from each contributing national/regional registry and then recontacted the registries who had indicated that they were willing to contribute to the global report. The key contacts from each registry can be found in Appendix 1. The Redcap™ database was securely housed at Monash University, Melbourne, Australia.



IFSO Data Collection

Data Access Group: **[No Assignment]**

Editing existing Record ID **60**.

Event: **2021**

Record ID	60 To rename the record, see the record action drop-down at top of the Record Home Page.

Country and Year

Country	
Year of Patient Operations	2021 I.e. data in this form should be for all patients who had a bariatric operation in the specified year

Procedures and Sex - ____ (2021)

	Female	Male	All (Include procedures where patient sex is unknown or sex is recorded using a term other than female or male)
Primary			
Revisional			

*Please enter values as **procedure counts** - this means for revisional procedures that the same patient may be counted twice*

Procedure Type - ____ (2021)

	Sleeve gastrectomy	One anastomosis gastric band (OAGB)	Roux-en-Y gastric bypass (RYGB)	Gastric band	Other / Unknown
Primary					
Revisional					
Unspecified					

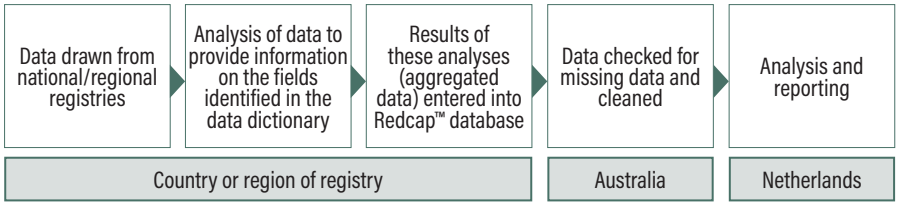
*Please enter values as **procedure counts where the primary procedure type was one of the above, for primary/revisional/unspecified surgeries***

Auto Calculated Totals

	Sleeve gastrectomy	One anastomosis gastric band (OAGB)	Roux-en-Y gastric bypass (RYGB)	Gastric band	Other / Unknown
All procedures (Calculated)	*View equation*	*View equation*	*View equation*	*View equation*	*View equation*

Screenshot of the Redcap™ reporting environment

Aggregated data was provided via the Redcap™ database directly in most instances, but in some instances data was provided on Excel™ spreadsheets. In those instances, the ANZBSR team entered the data fields into the Redcap™ database. Data was checked for completeness and then submitted to the team at the Data Vision Lab, the Netherlands, for data analysis and reporting.



Reporting

The descriptive text was provided by Wendy Brown, Ronald Liem, Lilian Kow and Scott Shikora with editorial support from Manuela Mazzarella. Sara Maria Sprinkhuizen from the Data Vision Lab undertook the data analysis and exploratory data visualisations. Report and visualization design was done by Sonja Kuijpers from Studio Terp and the map design by Leon de Korte.

Interpreting the graphs

The graphs in this report were created with specific color choices to guide the reader in the interpretation of the results.

Primary versus Revisional procedures

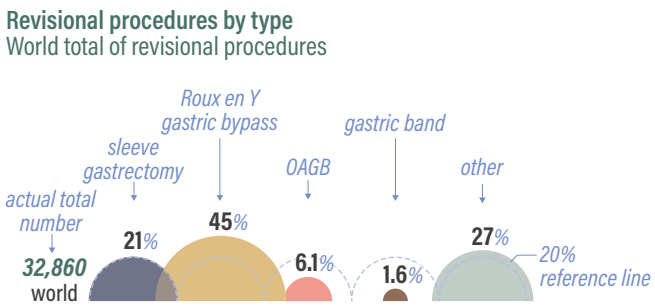
In graphs where a distincition between primary and revisional cases is made, a difference in color luminance indicates whether the data is on primary cases or on revisional cases, as shown below:

Female versus Male

In graphs where comparisons between female and male is made, a difference in color indicates whether the data is related to females (yellow) or males (blue), as shown below:

How to read this graph?

For a number of graphs, specific 'How to read this graph' information is provided in *light blue text,* as shown in the example below:



Acknowledgments and thanks

The data collection and collation process could not have been undertaken without the assistance of the ANZBSR. Jennifer Holland (Executive Officer), Jenifer Cottrell (Operations Manager), Angus Campbell (Data Services Manager), Robin Thompson (Database Business Analyst) and Dianne Brown (Consultant) all put in an enormous amount of work to rapidly create a data dictionary, data definitions, a Redcap™ database and then collect, collate and clean the aggregated data from national/ regional registries. Many thanks to them for their enormous efforts in a short timeframe.

Sara Maria Sprinkhuizen from the Data Vision Lab has brough a new perspective to the data visualisation and has driven the content of this report. Her colleagues Sonja Kuijpers at Studio Terp and also Leon de Korte have brought this report to the highest standard.

Manuela Mazzarella has worked tirelessly to engage all the registries, support the Global Registry Committee and encourage all of us. She is the powerhouse behind this report and it would not have been possible without her.

INTRODUCTION

The evolution of the IFSO global registry 2014-2022

Summary

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

- The first six IFSO global registry reports were based on individual level data collected from a combination of single centres and national registries

- Whilst these reports contained valuable data, and provided proof of principle that global collaboration is possible, the utility of the data was limited by:
  - a lack of consistent definitions for data fields meaning that true comparison was not possible between countries
    - *An ongoing collaboration with Bristol University to identify a minimum dataset for Bariatric Surgery Registries is intended to try to enable future reports to compare 'like' with 'like'*
  - a number of countries were represented by a single centre, meaning the data was not accurately representing the activity and outcomes in some countries
    - *There has been an expansion in the number of national and regional registries and IFSO is actively seeking to promote closer collaboration*
    - *The minimum dataset being developed with Bristol University may be used for future registry development*

- Over the past 4 years the introduction of the General Data Protection Regulation (GDPR) has led to changes in the way an individual's data can be provided to a registry.
  - The resources required to comply with these laws if collecting individual level data was beyond the capability of IFSO.

- In response to these challenges, this report differs from other reports as it contains:
  - Aggregated data with no individual level data collected
  - Only information from national or regional registries
  - A minimal dataset that focuses on demographics and key facts about the operations that had been performed
  - Data definitions are included so that the reader can understand what is being compared.

Purpose of the IFSO Global Registry

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.

History of the IFSO Global Registry Report

The first IFSO Global registry report was produced in 2014. In that report, information was included from 18 countries from 5 continents who contributed 100,092 operation records, with 53,197 in the calendar years 2011-2013. The number of operations contributed ranged from one individual centre that entered 24 operation records to over 34,000 each from two countries with established national registries (Sweden and the United Kingdom).

Over time, contributions to the Global Registry have grown, and by the sixth report there were 507,298 operations submitted by 50 contributor countries, 10 of whom were national or regional registries.

Notably, the fifth IFSO Global Registry report contained more patient records than the sixth report. The fifth report contained information on 833,687 operations from 61 countries. The reduction in the number of contributions between the fifth and sixth reports partially reflected the impact of COVID-19 on the access to metabolic surgery across the world, but mainly reflects the effect of changes to privacy laws that govern the sharing of potentially re-identifiable data.

Challenges facing the IFSO Global Registry

Whilst these six reports have provided valuable comparative information regarding the uptake of bariatric and metabolic procedures around the world, the utility of the data has been limited by the lack of consistent definitions for data items included in the report, meaning it is hard to compare outcomes between countries. The inclusion of single centres representing whole countries also led to misrepresentation of the practice and outcomes in a given country.

General Data Protection Regulation (GDPR), the laws that govern data in Europe where we are registered as a Society, The GDPR was adopted on 14 April 2016 and became enforceable beginning 25 May 2018. These laws required that any identifiable or *potentially* identifiable data could only be shared with the explicit consent of the provider of the data, in our case, our patients. GDPR also requires ethical review of any registry activity. Data must be securely housed and only being used for the purpose it is collected.

As data controller, IFSO became responsibility for all data security obligations, Data Protection Impact Assessments and needed to assign an expert Data Protection Officer.

Initially IFSO were able to comply with these laws by asking contributors to provide deidentified data to our data processor Dendrite. However, it has been increasingly difficult to properly deidentify data. With enough time and computing power, most data can now be reidentified.

IFSO worked with registry contributors to provide them with consent forms for patients, and a framework for ethical approval. However, the onus of proving that these activities had been properly undertaken became the responsibility of IFSO. As a small organisation, the resources required to ensure we were compliant were significant.

A new direction for the IFSO global registry report

Given the challenges with GDPR as well as the limitations of data collected without consistent data field definitions including data from single centres, the IFSO Global Registry Committee proposed to the Executive Board of IFSO that we move to report only on **aggregated data** from **established national or regional registries** using a **data dictionary** focusing on demographic and descriptive data only.

- Aggregated data means that the data is given to the registry already analysed as a mean or a median, and there is no individual data transfer required. This means that there is no risk to IFSO according to GDPR. Whilst it means that we are not able to do statistical comparisons it does provide a "snap-shot" view of global activity.
- By only including national or regional registries we are properly representing the activity of that location. Each registry has been asked to provide information on the completeness of their data, meaning it is easier to see potential sources of bias.
- The data dictionary used for this report was focused on demographic and descriptive data only as these were thought to be the most useful. Outcome data was inconsistently collected by registries around the world, however, this remains an aspiration of the Committees. The 12 core data items identified through the IFSO/Bristol collaboration are included in this dataset.
- With the shift to presenting the report using aggregated data the format of the report has changed meaning that we are now working with Sara Maria Spinkhuizen from the Data Vision Lab. We would like to acknowledge and thank Dendrite for their support over many years and we look forward to continuing to work with them into the future as they are the data processors (or custodians) for many national registries.

Future directions

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.

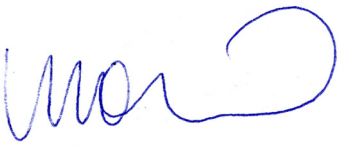
The data elements identified through the IFSO/Bristol collaboration will be formally defined this year using a Delphi process as well as feedback received through the production of this report.

Once defined, these data elements will form the basis of a common data dictionary that can be used by new national/regional registries, providing the basis for their databases. The hard work that went into developing consent forms, data sharing agreements and ethics pack can be also used to help new registries establish themselves.

Acknowledgements and thanks

I would like to acknowledge the hard work and dedication of all the members of the IFSO Global Registry Committee, the leaders of all the national registries, Sara Maria Sprinkhuizen from the Data Vision Lab who has performed the data visualization in this report, the team at the Australia and New Zealand Bariatric Surgery registry who helped to collate 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

1. AHRQ Methods for Effective Health Care. In: Gliklich RE, Dreyer NA, Leavy MB, eds. Registries for Evaluating Patient

Chapter 1
CONTRIBUTORS 2022

Contributors to the Seventh Report

The International Federation for Surgery for Obesity and Metabolic Disorders (IFSO) is a Federation composed of national associations of bariatric surgeons and Integrated Health professionals. Currently, there are 72 official member societies of IFSO.

Since its inception in 1995 IFSO has strived 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.

The IFSO Global Registry is one vehicle for achieving this mission. By combining descriptive data focusing on caseload and penetrance of surgery for metabolic disease and obesity from our member societies along with real-world data on outcome measures for our patients with adiposity-based chronic diseases we are able to give an overview of current activity and identify areas where there are service gap needs. These information can ultimately be used to inform real-world pragmatic guidance and as critical information that can be used to inform payers and policy makers alike.

In the sixth IFSO global registry report, information on 507,298 operations from 50 contributor countries, 7 of which were considered "mature" national/regional registries was included. "Mature" registries were defined as those that could confirm that they had information on >80% of all of those individuals who had undergone bariatric metabolic procedures in their country in that year. Once acquisition (or capture rates) exceed 80% there is less risk of bias, meaning that the data is more likely to accurately reflect the activity in that region. Below that threshold, the activity of one centre may skew results making it hard to be sure of the validity of the reported findings.

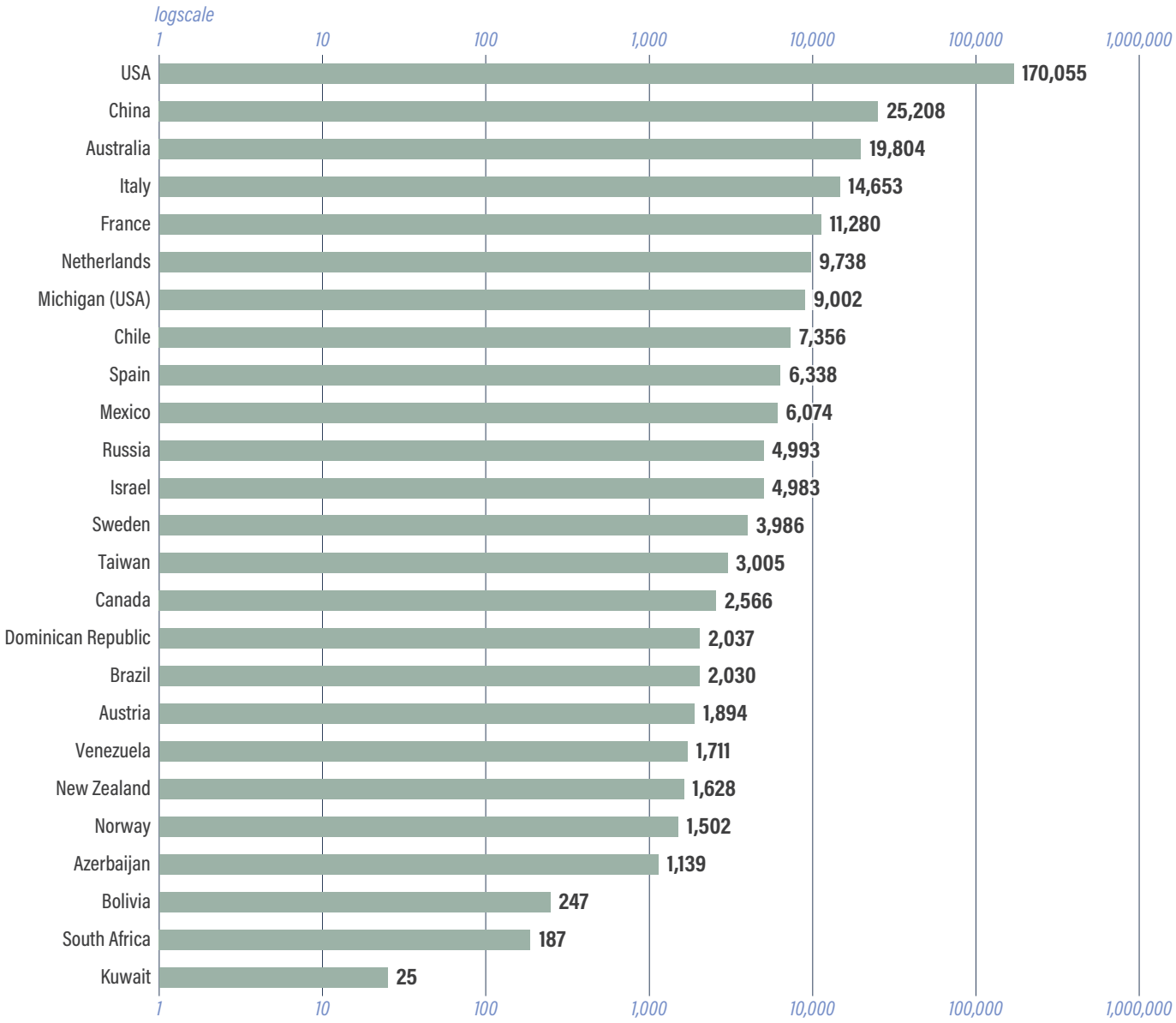
In this seventh report, the Executive Board of IFSO and the Global Registry Committee have made the strategic decision to focus only on data from national registries. There has been a significant increase in the number of national registries since the first report in 2014 where information from two established national registries (United Kingdom and Sweden) was included. As of December 2021, IFSO were aware of 32 national registries. Given the wide geographical capture of these registries, a decision was made to focus on comparing data from these national repositories of information as it was considered they would be more likely to represent genuine activity in these regions.

Each of these registries was contacted and invited to contribute aggregated data – meaning data that had already been analysed rather than individual level data - into this Seventh report. For the reasons outlined in the introduction, it has become increasingly difficult to comply with the privacy regulation and compliance requirements that go along with the collection and analysis of individual level data under the GDPR. In addition, many of our larger contributor national registries had indicated for their own jurisdictions, it would be preferable if they were able to provide data that was aggregated and already analysed.

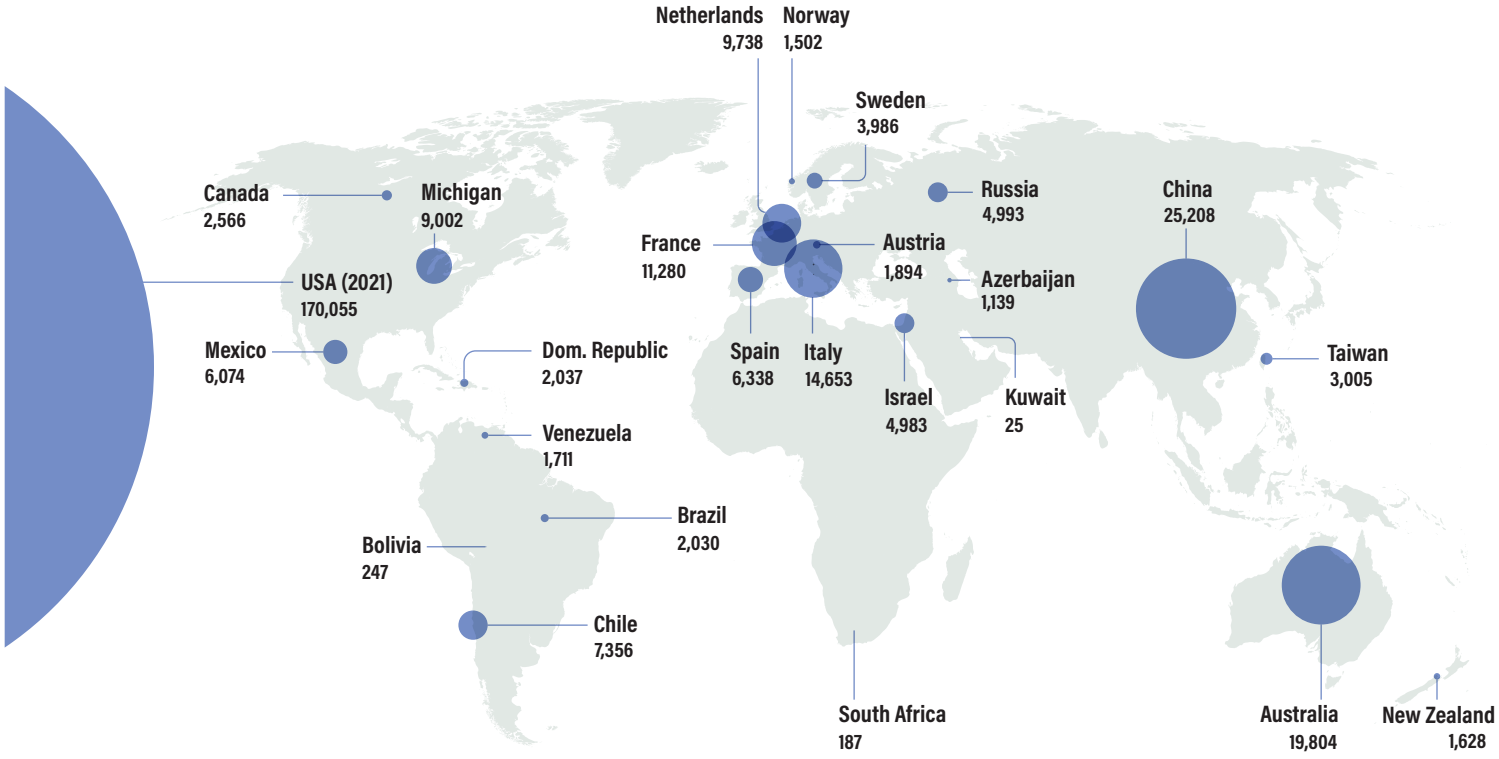
The decision to move to reporting only from national registries using aggregated data was a difficult one and was carefully debated at the IFSO Global Registry Committee as well as at the Executive Committee. By the time the decision was made, the timeframe for providing these data was short. The ongoing challenges created by COVID-19 in all of the countries associated with our Federation placed additional workload at very many levels.

Despite these challenges, we have collated information from 23 countries and 2 complete regional registries (Ontario/Canada; Michigan/USA) including information on 311,441 procedures performed on people with obesity who underwent bariatric metabolic surgery in either 2020 (USA) or 2021 (rest of world). This difference is due to differences in reporting cycles. Whilst the difference in temporality is important to acknowledge, it is hoped that it will not be of material difference.

Number of operations per country, primary and revisional
A total of 311,441 procedures from 23 countries and 2 regional registries



The geographic distribution of contributors is seen on the map below. The size of the circle is not intended to indicate the size of the region on the map rather, it reflects the number of people with obesity who were enrolled in the national/ regional registry, with the largest circles being the most contributed, and the smallest the smaller contribution.



Each of the IFSO Chapters is represented:

North America

Canada - Canadian Association of Bariatric and Physicians and Surgeons (CABPS)
USA - American Society for Metabolic and Bariatric Surgery (ASMBS)

Latin America

Bolivia - Sociedad Boliviana de Cirugia Comite Cirugia Bariatrica Y Metabolica (SBCCCM)
Brazil - Sociedade Brasileira de Cirurgia Bariátrica e Metabólica (SBCBM)
Chile - Sociedad Chilena De Cirugia Bariátrica Y metabólica (SCCBM)
Dominican Republic - Sociedad Dominicana de Cirugia Metabolica Y Bariatrica (SODOCIMEB)
Mexico - Colegio Mexicano de Cirugía para la Obesidad y Enfermedades Metabólicas
Venezuela - Venezuelan Society Of Obesity Surgery (SOVCIBAM)

Europe

Austria - Österreichische Gesellschaft für Adipositas- und metabolische Chirurgie
Italy - Società Italiana di Chirurgia dell'Obesità e delle malattie metaboliche (SICOB)
Israel - Israeli Society for Metabolic and Bariatric Surgery (ISMBS)
France - SOciété Française et Francophone de Chirurgie de l'Obésité et des Maladies Métaboliques (SOFFCO.MM)
Netherlands - Dutch Society for Metabolic and Bariatric Surgery (DSMBS)
Spain - Sociedad Española de Cirugia de la Obesibad (SECO)
Russia - Society of Bariatric Surgeons of Russia (SBSR)
Sweden - Swedish Association for Bariatric Surgery(SABS)
Norway - Norwegian Society for the Surgery of Obesity
Azerbaijan - Azerbaijan Bariatric and Metabolic Surgery Association (ABMSA)
South Africa - South African Association for Obesity and Metabolism (SASSO)

Middle East North Africa

Kuwait - Ministry of Health Bariatric registry

Asia Pacific

Australia & New Zealand - Australian & New Zealand Obesity Surgery Society (ANZMOSS)
China - Chinese Society for Metabolic & Bariatric Surgery (CSMBS)
Taiwan - Taiwan Society for Metabolic and Bariatric Surgery (TSMBS)

A list of the key contacts from each registry can be found in Appendix 1.

A note on data provided by each registry

Appendix 2 contains the data dictionary used for the purpose of this report. Not every national registry contains information on each of these variables, and whilst definitions are provided in the data dictionary, there are instances where the definition used by the contributing countries differ. Where differences occur, these are noted in the report and in Appendix 3.

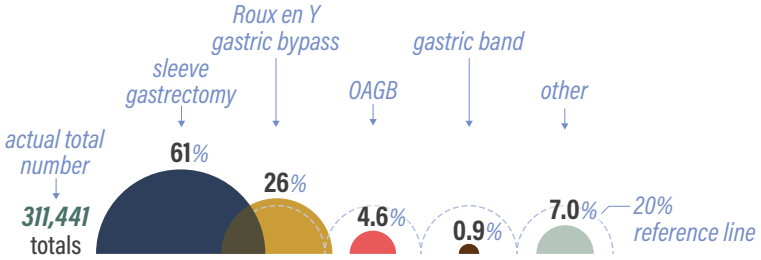
Future directions

It is hoped that in future reports that we will be able to engage with all of the known national registries. There are currently 72 official member societies of IFSO. Ideally we would included national registry data from each of these societies. Through a collaboration with Bristol University, IFSO have supported development of a minimum data set for national bariatric registries which will support a common data dictionary. The common data dictionary will be the basis for a REDCAP database that can be shared with member societies, along with mentorship and support through the required jurisdictional processes. It is hoped this will enable registry activity to be a core activity of all national societies.

Chapter 2
PROCEDURES & OPERATIVE APPROACH

There were 311,441 procedures undertaken in the reporting period of this report. Sleeve gastrectomy is the predominant procedure around the world, followed by RYGB, OAGB and Gastric Band. Interestingly, the proportion of "other" procedures is increasing in many countries. It is likely in future reports that we will need to specifically report on these emerging procedures.

All procedures (primary and revisional) by type

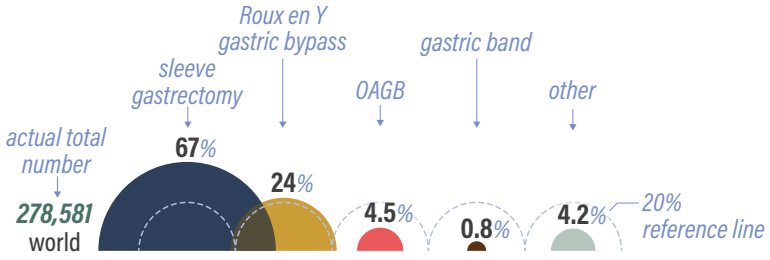


Primary Procedures

Primary Bariatric Metabolic procedures that are the first procedure a person with obesity undertakes as treatment for their obesity. It can be seen that Sleeve Gastrectomy is the preferred procedure in this setting in all reporting countries.

Again, "other" procedures are emerging as popular procedures in some countries.

Primary procedures by type
World total of primary procedures



Primary procedures by type per country

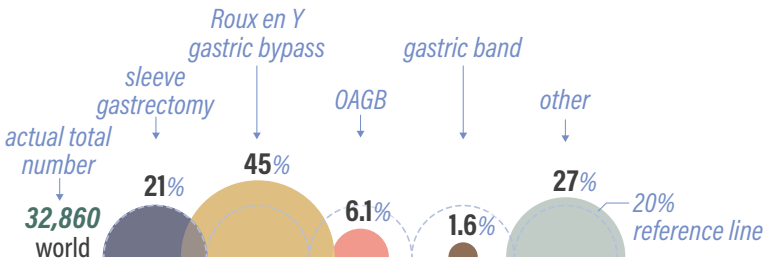
Revisional procedures

Revisional bariatric metabolic procedures are defined as those procedures performed to change one type of procedure to another procedure. This may be necessary for either weight regain, side effects of the initial procedure or recurrence of metabolic disorders.

Ideally we would collect reasons for revision, as well as be able to document the "journey" some of our patients undertake over the years and decades after their original procedure. This is something that we aspire to report upon as our national registries continue to mature.

Revisional procedures by type

World total of revisional procedures



Revisional procedures by type per country

Operative approach

The vast majority of procedures are undertaken via the laparoscopic approach. However, in the revisional setting it is notable that a higher proportion are undertaken either via the open response or using a robotic approach. This probably reflects the complexity of the procedures and the technical difficulty.

world total

	laparoscopic	robotic	endoscopic	open	unspecified	laparoscopic rate	robotic rate
primary	233,526	28,671	992	231	2,655	88.7%	10.9%
revisional	25,834	3,846	871	571	319	83.2%	12.4%

primary

country	laparoscopic	robotic	endoscopic	open	unspecified	laparoscopic rate	robotic rate
USA	121,601	25,711	763	106	0	82.1%	17.4%
China	24,432	473	64	1	238	97.8%	1.9%
Australia	16,920	150	1	3	2	99.1%	0.9%
Italy	12,044	74	0	9	1,154	99.3%	0.6%
Netherlands	8,745	0	16	7	0	99.7%	0.0%
France	7,525	385	0	13	1,105	95.0%	4.9%
USA Michigan	6,307	1,668	0	6	0	79.0%	20.9%
Mexico	5,686	1	11	2		99.8%	0.0%
Spain	5,324	193		5		96.4%	3.5%
Russia	4,612	0	0	61	0	98.7%	0.0%
Israel	4,127	0	0	4	0	99.9%	0.0%
Sweden	3,760	0	0	3	0	99.9%	0.0%
Taiwan	2,529	9	131	0	156	94.8%	0.3%
Canada	2,448	0	0	3	0	99.9%	0.0%
Austria	1,679	7	6	6	0	98.9%	0.4%
New Zealand	1,570	0	0	1	0	99.9%	0.0%
Venezuela	1,559	0	0	0	0	100%	0.0%
Norway	1,395			1		99.9%	
Brazil	834					100%	
Bolivia	224	0	0	0	0	100%	0.0%
South Africa	181	0	0	0	0	100%	0.0%
Kuwait	24	0	0	0	0	100%	0.0%

revisional

country	laparoscopic	robotic	endoscopic	open	unspecified	laparoscopic rate	robotic rate
USA	15,649	3,545	779	414	0	76.8%	17.4%
China	223	0	12	2	0	94.1%	0.0%
Australia	2,650	44	23	10	1	97.2%	1.6%
Italy	1,271	5	0	16	80	98.4%	0.4%
Netherlands	964	0	1	5	0	99.4%	0.0%
France	1,893	68	0	53	238	94.0%	3.4%
USA Michigan	825	184	0	12	0	80.8%	18.0%
Mexico	374	0	0	0		100%	0.0%
Spain							
Russia	282	0	2	27	0	90.7%	0.0%
Israel	848	0	0	4	0	99.5%	0.0%
Sweden	219	0	0	4	0	98.2%	0.0%
Taiwan							
Canada	115	0	0	0	0	100%	0.0%
Austria	181	0	0	15	0	92.3%	0.0%
New Zealand	55	0	0	2	0	96.5%	0.0%
Venezuela	152	0	0	0	0	100%	0.0%
Norway	103			3		97.2%	
Brazil							
Bolivia	23	0	0	0	0	100%	0.0%
South Africa	6	0	0	0	0	100%	0.0%
Kuwait	1	0	0	4	0	20.0%	0.0%

Chapter 3
DEMOGRAPHICS

Sex

For the purpose of this report, participant sex is defined as *being based upon their sex characteristics, such as their chromosomes, hormones and reproductive organs at the time of undergoing a bariatric procedure*. Limited information was available on any sex other than male and female in the available data set.

Data on sex was provided by 18 registries. It can be seen that more females than men with obesity chose to undertake bariatric metabolic procedures in most countries.

Female to male ratio for primary procedures per country

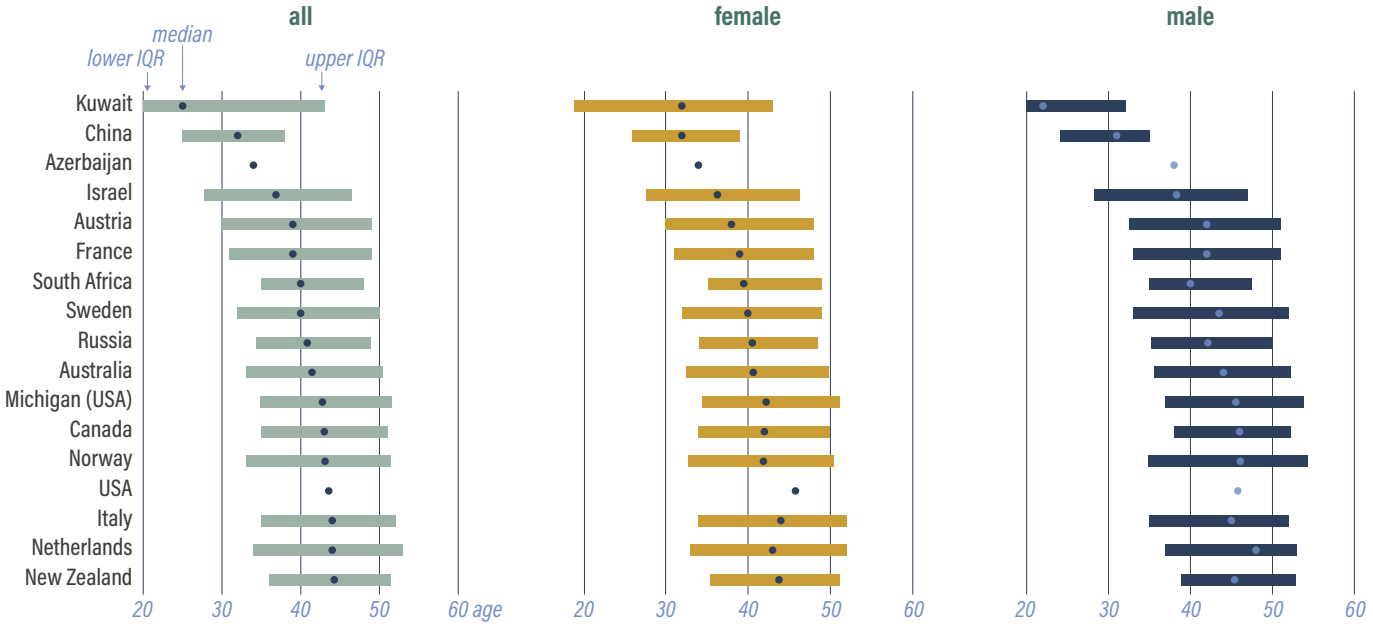
Female to male ratio for revisional procedures per country

Age

The median age on the day of surgery varied from 25 to 52. The youngest median was seen in Kuwait, and the oldest in New Zealand. As expected the median age of primary patients is younger than revisional procedures.

Age at surgery for primary procedures per country

Age distribution (median and interquartile range) of all patients, and females and males separately



** Upper and lower IQR data not available for USA and Azerbaijan*

Age at surgery for revisional procedures per country

Age distribution (median and interquartile range) of all patients, and females and males separately

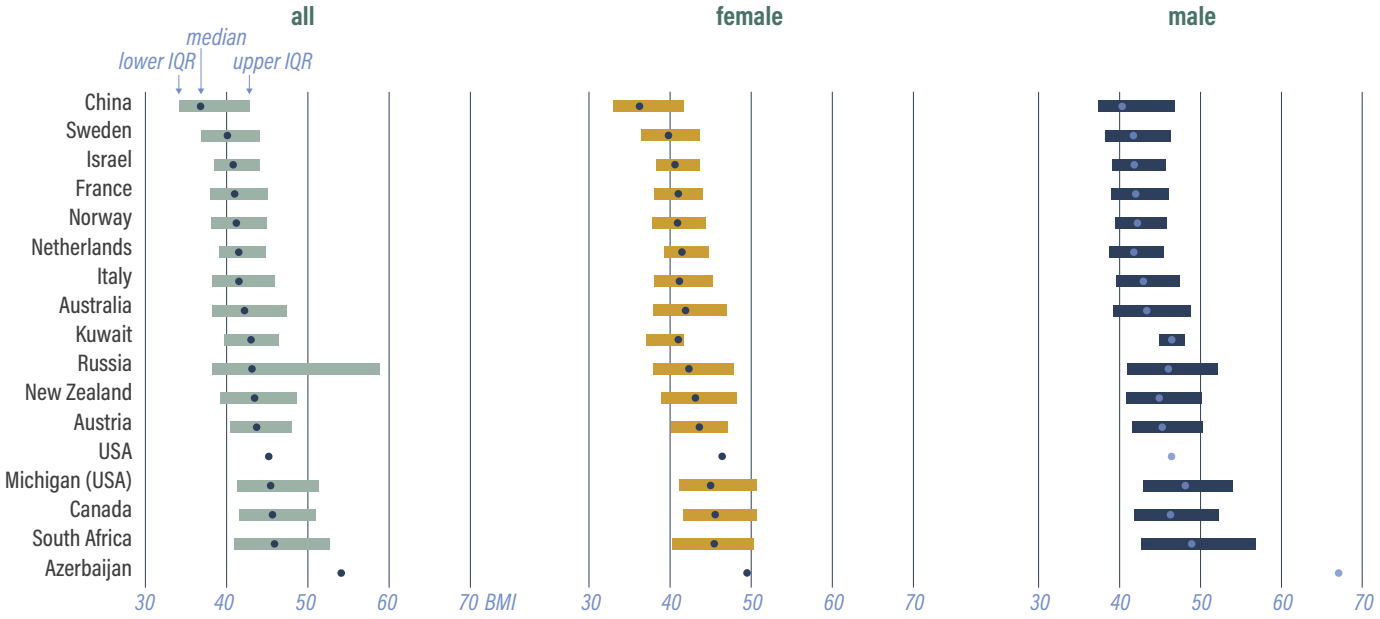
** Upper and lower IQR data not available for USA and Azerbaijan. Female/male breakdown not available for Azerbaijan. Data not shown for groupsize n = 1 (South Africa male).*

BMI

The median BMI on day of surgery for those people with obesity undergoing a primary bariatric metabolic procedure ranged from 36.2 - 49.5 for females and 40.3 - 67.1 for males. The lowest BMIs were seen in Asian populations who are more likely to have the diseases related to obesity at lower BMIs.

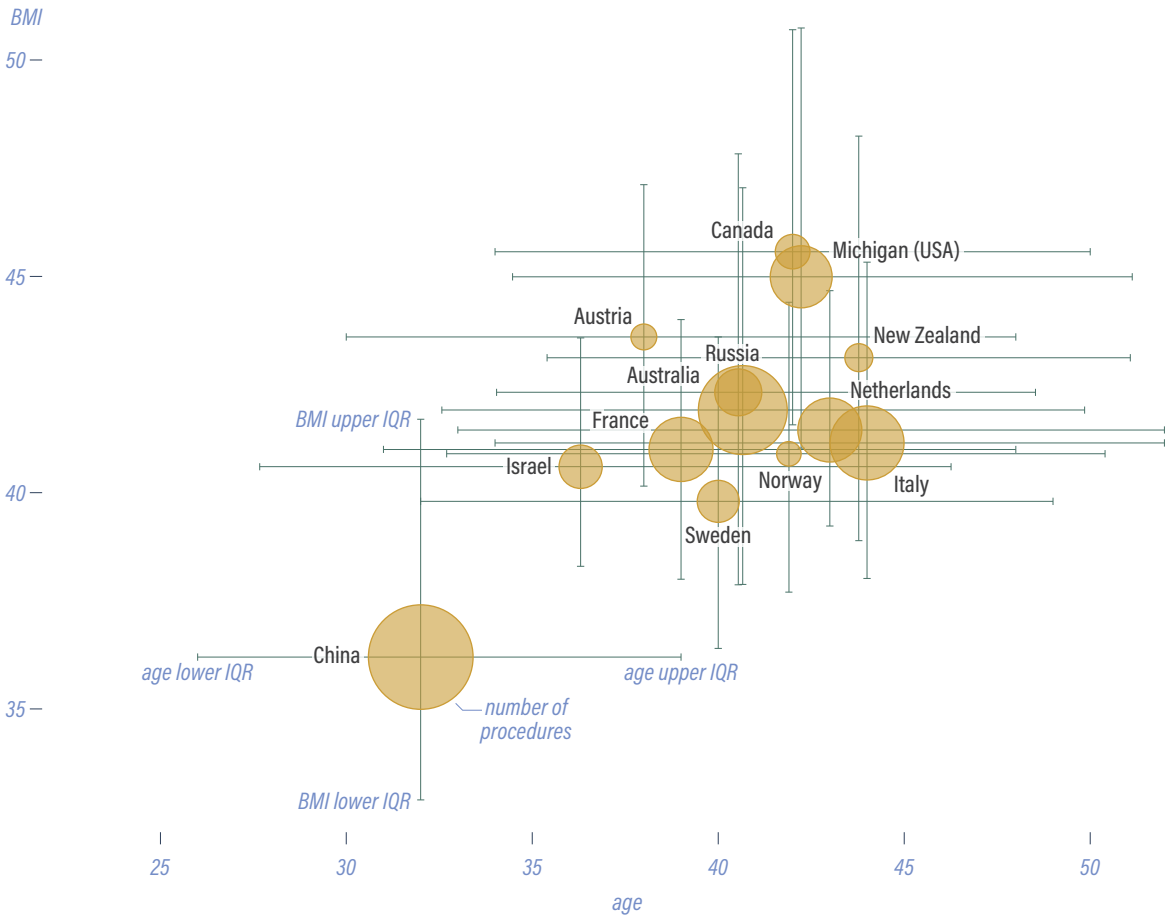
Pre-surgery BMI for primary procedures per country

BMI distribution (median and interquartile range) of all patients, and females and males separately

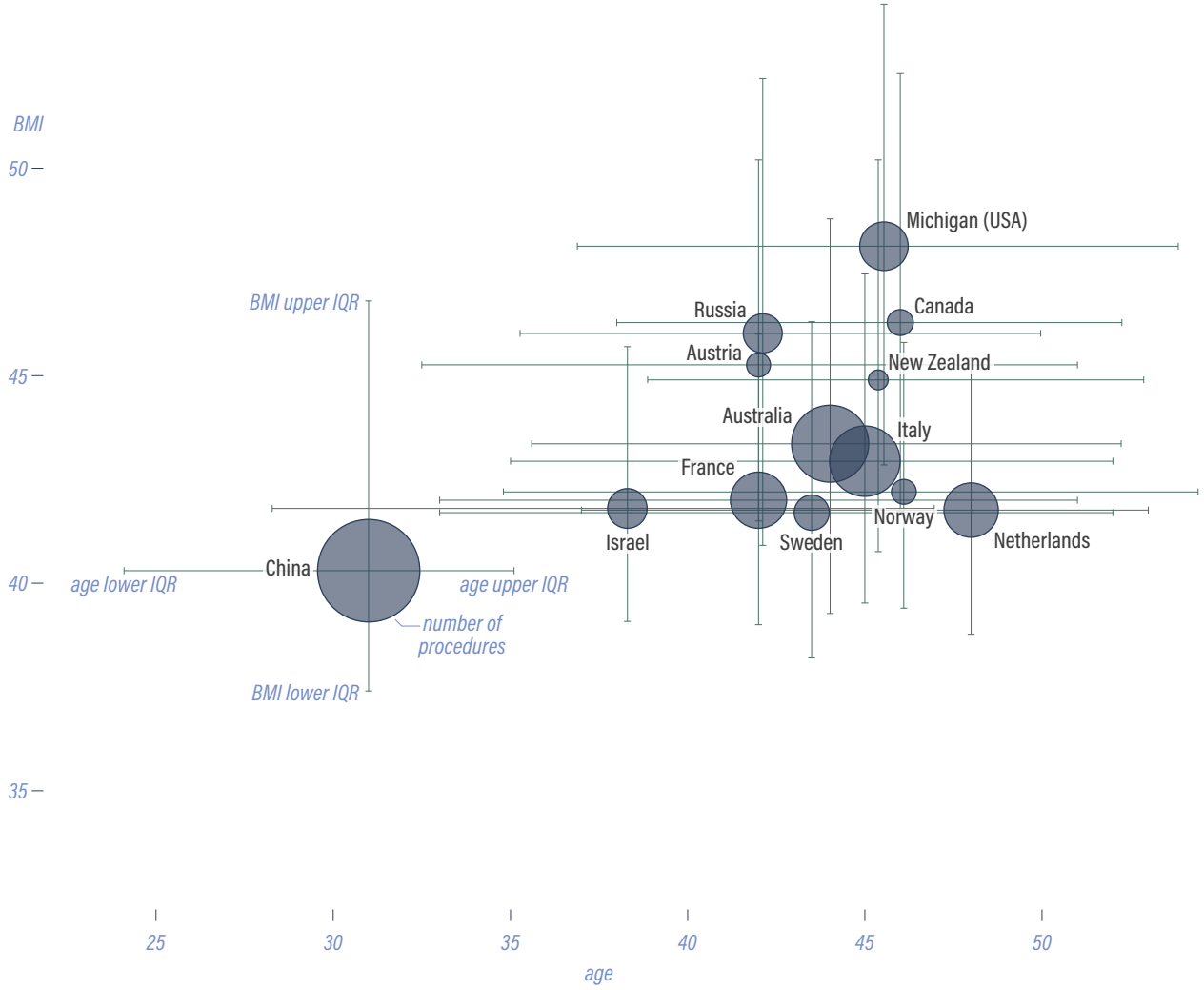


** Upper and lower IQR data not available for USA and Azerbaijan*

Female age and BMI for primary procedures per country
Age and BMI distribution (median and interquartile range) as well as number of procedures (indicated by circle size)



Male age and BMI for primary procedures per country
Age and BMI distribution (median and interquartile range) as well as number of procedures (indicated by circle size)



Chapter 4
OBESITY RELATED DISEASE

Diseases related to obesity and improved with weight loss

Obesity is one of the most pathogenic diseases affecting our populations. Weight loss has the potential to be one of the most powerful health giving tools available to health care professionals. If we are to focus on person-based goals, conditions that will be improved with weight loss may be a better indication for bariatric metabolic surgery than BMI alone.

There are over 100 diseases and conditions that could potentially improve with weight loss, most registries focus on the impact on the more common conditions including diabetes, Gastro Esophageal Reflux Disease (GERD), Obstructive Sleep Apnoea (OSA), dyslipidemia, hypertension and depression.

Of interest, males are more likely than females to report having diabetes, OSA, dyslipidemia and hypertension at the time of undergoing a bariatric metabolic procedure, where as females are more likely to report depression. These differences are worthy of further investigation as they are consistent between countries.

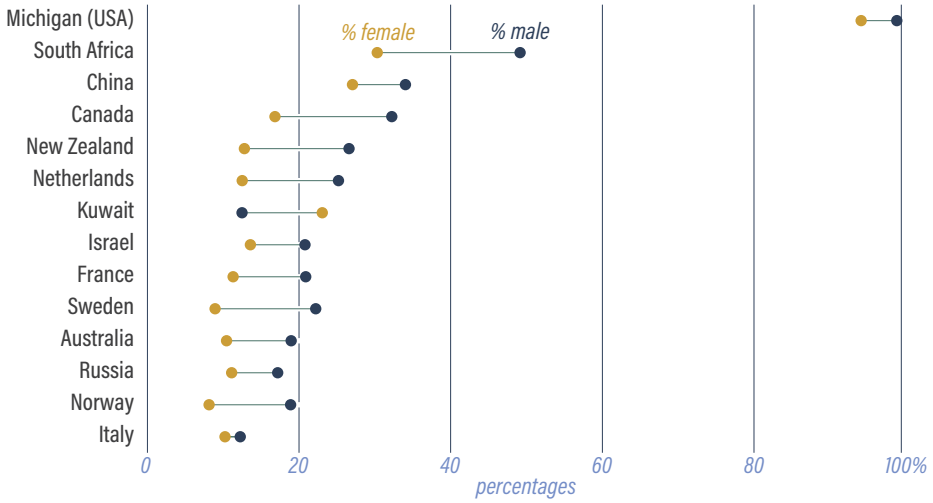
Definitions

The definitions of the diseases of obesity varies between registries. For example whilst the IFSO global registry data dictionary defines diabetes as *a person who identifies as a person with diabetes or is being treated for diabetes* each of the 14 national/regional registries who report on this item have a different definition ranging from HbA1c levels to self reported. A full range of definitions used by national and regional registries for the included diseases is found in Appendix 3.

Diabetes

The proportion of people with obesity undergoing bariatric metabolic surgery who also have diabetes ranges from 94% (females) and 99% (males) for the Michigan registry to 6% (females) and 5% (males) for the Italian Registry. Interestingly, even though women are more likely to under go bariatric metabolic surgery than men in all countries, men are overrepresented in the proportion of people with diabetes undergoing a bariatric metabolic procedures. The only exception is Kuwait, which is also the country that has the highest proportion of men undergoing bariatric metabolic procedures.

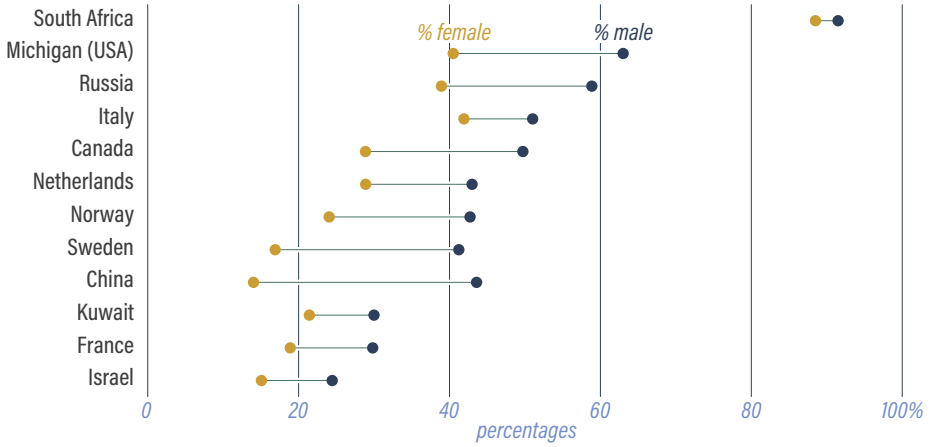
Percentage of females and males undergoing primary surgery with diabetes



Hypertension

Information on the proportion of patients undergoing a bariatric metabolic procedure who also have hypertension was available from 12 registries. The highest proportion was seen in the South African registry, with the lowest rates seen in Israel. Again, males were over represented in every registry.

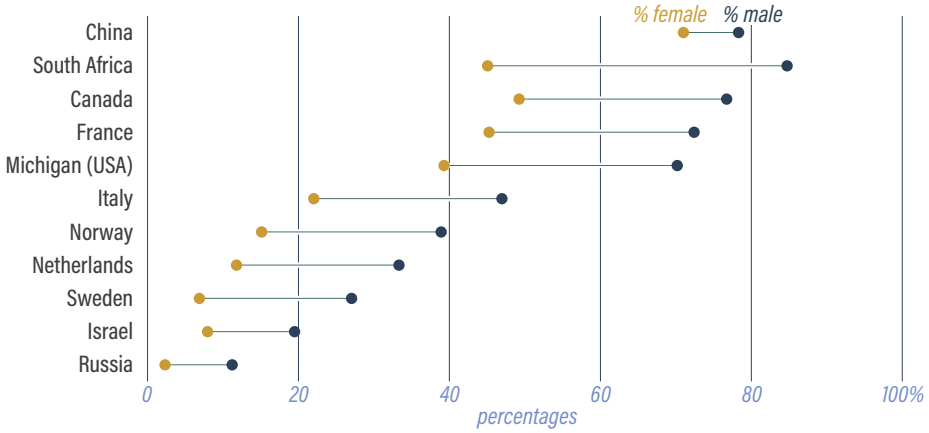
Percentage of females and males undergoing primary surgery with hypertension



Obstructive Sleep Apnoea (OSA)

The highest rates of OSA were seen in China with the lowest rates in Russia. Males were more likely than females to report treatment for this condition in all of the eleven reporting countries.

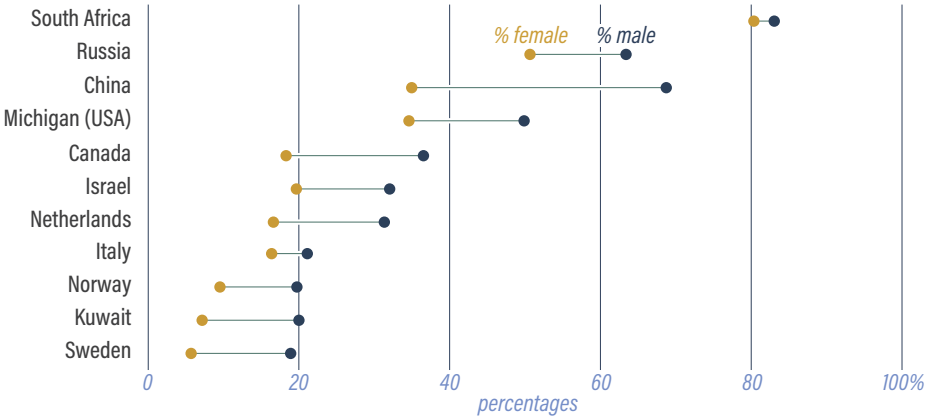
Percentage of females and males undergoing primary surgery with obstructive sleep apnoea



Dyslipidemia

Treatment for dyslipidemia was most common in South Africa and least frequent in Sweden. Again, males were overrepresented in the eleven countries who reported on this comorbidity.

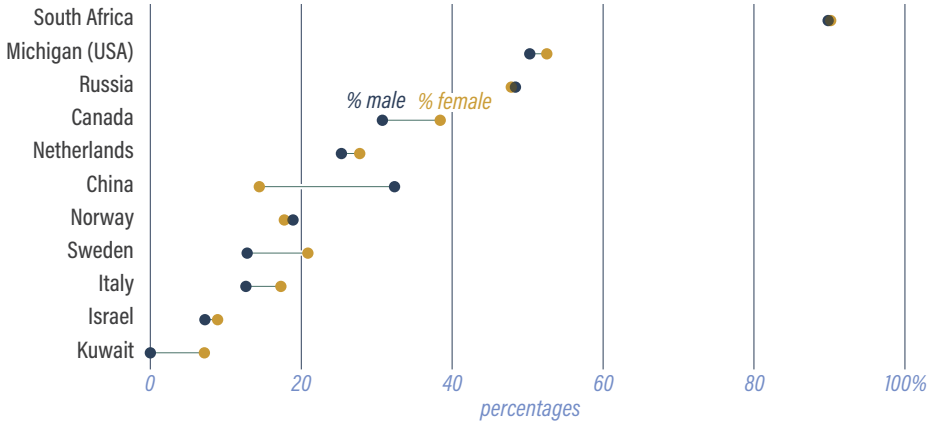
Percentage of females and males undergoing primary surgery with dyslipidemia



Gastroesophageal Reflux Disease (GERD)

The proportion of patients undergoing bariatric metabolic surgery with GERD was highest in South Africa and lowest in Kuwait. The difference between males and females varied by country. This is potentially an important metric for other registries to consider including given that the side effect of some of the commonly performed bariatric metabolic procedures is GERD.

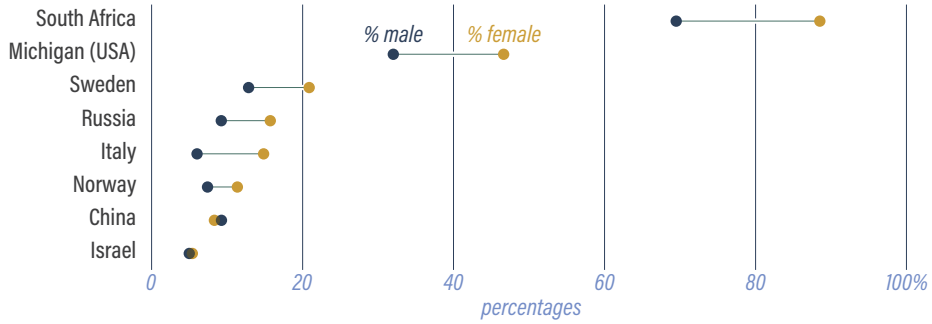
Percentage of females and males undergoing primary surgery with GERD



Depression

Depression was reported most commonly in South Africa and least in Israel. Women were more likely than men to report depression prior to bariatric metabolic surgery.

Percentage of females and males undergoing primary surgery with depression



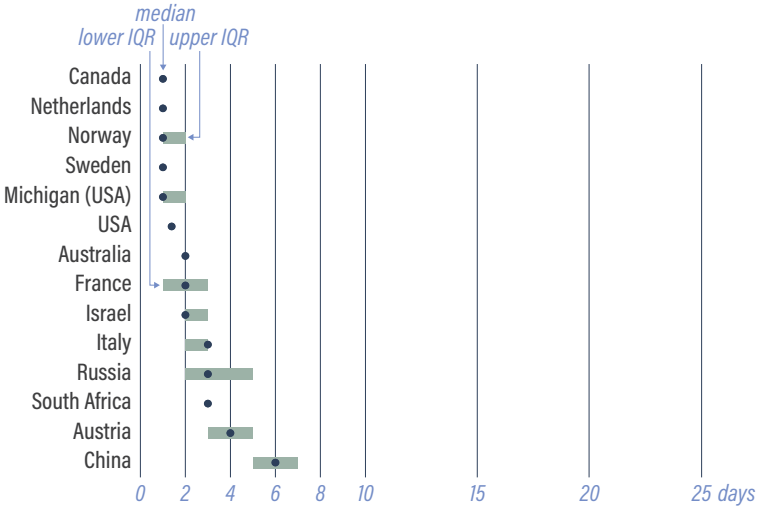
Chapter 5
PERIOPERATIVE OUTCOMES

There are currently only a few registries able to provide longer term data on weight loss and comorbidity change. For this reason, the IFSO Global Registry has decided to concentrate on perioperative outcomes as these are indicators of procedural safety.

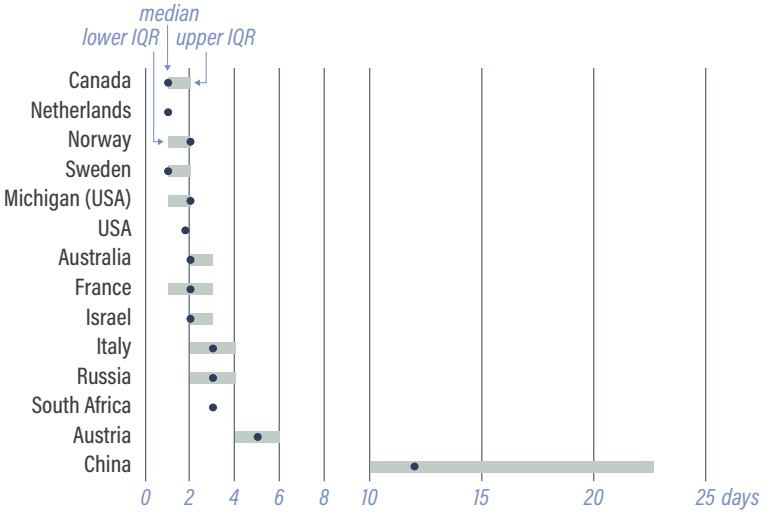
Length of stay (LOS)

Whilst there is no accepted international standard for LOS for each bariatric procedure, these data suggest that there is a relatively tight range of days in hospital for most procedures. Whilst the median varies between countries, probably affected by health system factors and cultural expectations, it is likely that if a person who has undergone a bariatric metabolic procedure whose stay exceeds the average for their country has had a complication. This may make LOS a good surrogate marker in registries for identifying procedures that have had a complication associated with it.

Length of stay for primary procedures per country
Length of stay distribution (median and interquartile range) in days



Length of stay for revisional procedures per country
Length of stay distribution (median and interquartile range) in days



Perioperative indicators of complications

There are a range of quality indicators that can be measured to document the quality and safety of any procedure. Typically these measures have been taken at 30 days, but increasingly they are being measured out to 90 days recognizing that not all important perioperative complications occur in the early time frame after surgery.

There are a number of ways to measure perioperative complications. Perioperative mortality is the most feared complication, however fortunately these events are rare in bariatric metabolic surgery. Whilst the death (or mortality) is critical to measure so that events leading to this tragic outcome can be analysed and lessons learnt for the future, morbidity or non-fatal complications are equally important as they also provide opportunity for practice improvement.

Three common ways used by clinical quality registries include unplanned return to theatre, unplanned readmission and unplanned admission to ICU. These are chosen because they are events in the patient journey that flag that an unwanted complication has occurred.

It is important to note when interpreting these data that there are only a few registries who have 100% follow up rates at the time point where they measure each metric. The lower the follow up rate, the less certain it is that the data are actually representative of the safety of a procedure in the jurisdiction due to the risk of bias.

Unplanned return to theatre

Of the registries that report on these metrics, the following registries measure this metric at 30 and 90 days respectively. The rates of unplanned return to theatre tend to be higher for revisional procedures, reflecting the technical difficulty of these operations.

			primary				revisional			
	country	definition	RTT (n)	total* (n)	RTT rate*	known cases*	RTT (n)	total* (n)	RTT rate*	known cases*
30 days from procedure	Sweden	All patients having an operation under general anesthesia 30 days from procedure.	73	3,616	2.0%	96%	14	206	6.8%	92%
	Russia	Return to OT reported by the surgeon within 30 days from the index operation	59	4,681	1.3%	100%	8	312	2.6%	100%
	USA Michigan	All patients having an operation under general anesthesia within 30 days of procedure date.	84	7,981	1.1%	100%	22	1,021	2.2%	100%
	Netherlands	Whenever a patient has to return to the OR for intervention. Endoscopic or radiologic interventions are not included	62	8,768	0.7%	100%	16	970	1.6%	100%
	Italy	Unplanned return to the operating room occurring in the perioperative phase (up to 30 days) to resolve post-operative complications.	66	12,773	0.5%	96%	19	1,324	1.4%	97%
90 days from procedure	Israel	All patients who were readmitted within 90 days only to the surgical department	221	4,131	5.3%	100%	105	852	12%	100%
	Austria		50	1,428	3.5%	84%	14	143	9.8%	73%
	New Zealand	Unplanned return to theatre occurring in the peri-operative phase (up to 90 days) in the healthcare setting	18	908	2.0%	58%	3	38	7.9%	67%
	Australia	Unplanned return to theatre occurring in the peri-operative phase (up to 90 days) in the healthcare setting	113	11,510	1.0%	67%	124	1,913	6.5%	70%

* total = number of procedures with known unplanned RTT status.
RTT rate = percentage of patients with an unplanned RTT out of all procedures where RTT status is known.
known cases = percentage of procedures where RTT status is known out of the total number of procedures. Excludes unknown/missing values.

Unplanned ICU admission

This metric is low in all juristictions perhaps indicating that ICU Is appropriately being utilized in a planned fashion.

			primary				revisional			
	country	definition	ICU (n)	total* (n)	ICU rate*	known cases*	ICU (n)	total* (n)	ICU rate*	known cases*
30 days from procedure	Italy	ICU admission after surgery	361	8,261	4.4%	62%	36	950	3.8%	69%
	France	Patients with ICU admission	38	6,351	0.6%	70%	28	1,292	2.2%	57%
	Canada	Unplanned ICU admission occurring immediately after bariatric surgery	8	2,451	0.3%	100%	1	115	0.9%	100%
	Netherlands	Acute admittance to the ICU which was not previously accounted for. Planned ICU observation because of comorbidities is not included.	22	8,768	0.3%	100%	3	970	0.3%	100%
	Sweden	All patients with a complication classified as Clavien-Dindo IV	1	3,673	0.0%	98%	0	208	0.0%	93%
90 days from procedure	Austria		22	1,428	1.5%	84%	5	143	3.5%	73%
	Israel	All patients who were readmitted within 90 days to the intensive care unit	8	4,131	0.2%	100%	1	852	0.1%	100%
	New Zealand	Unplanned ICU admission occurring in the peri-operative phase (up to 90 days) in the healthcare setting	1	908	0.1%	58%	0	38	0.0%	67%
	Australia	Unplanned ICU admission occurring in the peri-operative phase (up to 90 days) in the healthcare setting	7	11,510	0.1%	67%	7	1,913	0.4%	70%

* total = number of procedures with known unplanned ICU status.
ICU rate = percentage of patients with an unplanned ICU out of all procedures where ICU status is known.
known cases = percentage of procedures where ICU status is known out of the total number of procedures. Excludes unknown/missing values.

Unplanned readmissions to hospital

This is again fairly constant between countries, it is however perhaps notable that some of the countries with the shortest LOS (e.g. USA Michigan and Israel) post procedure also have slightly higher readmission rates. It maybe that one of the "trade-offs" of earlier discharge is accepting a slightly higher need for readmission.

			primary				revisional			
	country	definition	readm (n)	total* (n)	readm rate*	known cases*	readm (n)	total* (n)	readm rate*	known cases*
30 days from procedure	Norway	Readmission to any hospital within 30 days after surgery	74	1,285	5.8%	92%	10	97	10%	92%
	Sweden	Readmission to hospital at any clinic for any reason/diagnosis. This means the definition includes readmissions that may be totally unrelated to the bariatric operation or obesity.	152	3,611	4.2%	96%	23	205	11%	92%
	USA Michigan	Readmission to hospital at any clinic for any reason/diagnosis. This means the definition includes readmissions that may be totally unrelated to the bariatric operation or obesity.	205	7,981	2.6%	100%	68	1,021	10%	100%
	Netherlands	Readmission to the hospital within 30 days after surgery. If somebody presents at the emergency ward but is not readmitted to the surgery ward, this does not count as a readmission.	205	8,768	2.3%	100%	64	970	6.6%	100%
	France	Patients with reintervention	99	6,351	1.6%	70%	37	1,292	2.9%	57%
90 days from procedure	Austria		82	1,428	5.7%	84%	6	143	4.2%	73%
	Israel	All patients who were readmitted within 90 days only to the surgical department	221	4,131	5.3%	100%	105	852	12%	100%
	New Zealand	Unplanned re-admission to hospital occurring in the peri-operative phase (up to 90 days) in the healthcare setting.	32	908	3.5%	58%	2	38	5.3%	67%
	Australia	Unplanned re-admission to hospital occurring in the peri-operative phase (up to 90 days) in the healthcare setting.	146	11,510	1.3%	67%	59	1,913	3.1%	70%

* total = number of procedures with known readmission status.
readm rate = percentage of patients who were readmitted out of all procedures where readmission status is known.
known cases = percentage of procedures where readmission status is known out of the total number of procedures. Excludes unknown/missing values.

Deaths after bariatric metabolic surgery

The overwhelming message from these data is that bariatric metabolic surgery is incredibly safe. Mortality rates are less than 1% in every registry, with most <0.1%.

	primary				revisional			
country	deaths (n)	total* (n)	mortality rate*	known cases*	deaths (n)	total* (n)	mortality rate*	known cases*
New Zealand	1	908	0.11%	58%	0	38	0.00%	67%
Norway	1	1,396	0.07%	100%	0	106	0.00%	100%
Austria	1	1,428	0.07%	84%	0	143	0.00%	73%
Sweden	2	3,673	0.05%	98%	0	208	0.00%	93%
Australia	6	11,510	0.05%	67%	1	1,913	0.05%	70%
USA Michigan	4	7,981	0.05%	100%	1	1,021	0.10%	100%
France	3	6,351	0.05%	70%	0	1,292	0.00%	57%
Israel	1	4,131	0.02%	100%	1	852	0.12%	100%
Russia	1	4,681	0.02%	100%	0	312	0.00%	100%
Netherlands	1	8,768	0.01%	100%	0	970	0.00%	100%
Italy	0	13,281	0.00%	100%	0	1,372	0.00%	100%
Canada	0	2,451	0.00%	100%	1	115	0.87%	100%

* total = number of procedures with known death status.
mortality rate = percentage of patients who were readmitted out of all procedures where death status is known.
known cases = percentage of procedures where death status is known out of the total number of procedures. Excludes unknown/missing values.

Chapter 6
CONCLUSION

This is the seventh report of the IFSO global registry and the first to contain only data from national or regional registries. Aggregated rather than individual level data was collected to ensure that IFSO were compliant with both GDPR as well as local jurisdictional privacy regulations governing each regional and national registry.

The aim of this report is to compare the demographics of people with obesity undergoing bariatric surgery, the types of surgery they chose and the safety of their chosen procedures across the globe. A relatively lean data dictionary has been used based upon the items that were identified through the Bristol University/ IFSO collaboration on bariatric metabolic surgery registry minimum dataset. Whilst outcome measurements such as weight change and comorbidity resolution would be ideal, few registries reliably collect this information. It is our aspiration to be able to include these critical data in the future.

Information from reports such as these are only as useful if the data presented is of the highest quality. Whilst there are less operations included in this report than previous, these data are considered more reliable and better representative of the global practice of bariatric metabolic surgery than previous reports where information from single centers representing an entire country was included. By only reporting data that has come from registries that attempt to capture the information from the entire potential population it is hoped the risk of bias is minimized. Ideally, all registries will report their data acquisition rates as well as their audit processes. This will be a focus of future reports.

The time frame to produce this report was very short, and it is a testament to the good will and fellowship of the IFSO that we were able to include information from 78% of all known bariatric metabolic surgery registries. The willingness of the team at the Australian and New Zealand Registry to assist us with creating a Redcap™ database to collect and then manage the process to collate the data from each of the contributing registries is very much appreciated.

We have learnt a lot through the process of producing this report and feel confident that we will be able to include contributions from all known national and regional registries in the eighth report. Our aim is to include information from all 72 member societies of IFSO, and we look forward to working with member societies who currently do not have a registry to achieve this goal.

A coordinated global registry effort will not only enable us to properly document the uptake and safety of bariatric metabolic surgery but will also enable us to inform important research questions that will drive innovation and progress in our field. This is our future. The foundations set by previous reports, and now this new direction, makes the future look very bright indeed.

APPENDIX 1
REGISTRY CONTACTS

Country	Contributors	Society President
Australia	Angus Campbell, Jennifer Holland, Jenifer Cottrell, Robin Thompson, Dianne Brown	Jeffrey Hamdorf
Austria	Felix Langer	Philipp Beckerhinn
Azerbaijan	Taryel Omerov	Taryel Omerov
Bolivia	Hassan Bakry	Hassan Bakry
Brazil	Karina Otani	Fabio Viegas
Canada - Ontario	Mehran Anvari	Stephen Glazer
Chile	Camilo Boza	Francisco Pacheco
China	Wah Yang	Cunchuan Wang
Dominican Republic	Ricardo Domingo	Pablo Daniel Garcia Vargas
France	Adeline Morisot	Vincent Frering
Israel	Nasser Sakran	Nasser Sakran
Italy	Mario Musella	Marco Antonio Zappa
Kuwait	Salman Al-Sabah	Mohammad Al Jarallah
Mexico	José G Rodríguez Villarreal, Juan R González Santamaría	José G Rodríguez Villarreal
Netherlands	Floris Bruinsma	Marloes Emous
New Zealand	Angus Campbell, Jennifer Holland, Jenifer Cottrell, Dianne Brown	Jeffrey Hamdorf
Norway	Hannu Lyyjynen	Jon Kristinsson
Russia	Bekkhan Khatsiev	Bekkhan Khatsiev
South Africa	Eugene van Zyl	Tess van der Merwe
Spain	Esteban Martin Antona	Andres Sanchez Pernaute
Sweden	Johan Ottosson	Torsten Olbers
Taiwan	Chen Peijuan	Weu Wang
United States of America - 2020	Benjamin Clapp	Teresa La Masters
USA Michigan	Aaron Bonham	Amir Ghaferi*
Venezuela	Luis Level	Luis Level

*Director, Michigan Bariatric Surgery Collaborative

APPENDIX 2
DATA DICTIONARY

Sub-group	Label	Definition	Purpose
	Country	Country designation as per IFSO specifications	To distinguish between countries
	Age at surgery	The age of the patient at the time of the operation in years. Age is a particular measure that is usually never rounded up when reported by participants.	To identify differences in age at which patients come for treatment between countries, prim/rev and sexes
	Sex	A person's sex is based upon their sex characteristics, such as their chromosomes, hormones and reproductive organs. It is usually described as male or female. Although could be described using another term in instances where a person both male and female characteristics or has neither male nor female characteristics, or has other characteristics.	To identify the diffences in the prevalence of Sex in those having bariatric surgery between countries and potential other factors
	Body mass index (BMI) before surgery	Body mass index prior to surgery is a measure of an adult's weight (body mass) relative to height before their bariatric surgery, to two decimal places.	To identify differences in morbidity between countries, prim/rev and sexes
Procedure type	Primary	Primary surgery is a bariatric surgery on a stomach that has not yet had a completed bariatric procedure.	To identify the diffences in Operationt type between countries, sexes, and potential other factors
Procedure type	Revisional	Revisional surgery is a conversion bariatric procedure that is changing the bariatric procedure from one type to another. It excludes remedial and salvage procedures such as port revisions on gastric bands, dilitation of stenoses/ strictures, sub-total and total gastrectomies and reversals of gastric bands.	To identify the diffences in Operationt type between countries, sexes, and potential other factors
Procedure type	Sleeve Gastrectomy	The number of sleeve gastrectomies completed	To understand the different procedure types undertaken in primary vs revisional context by country
Procedure type	One Anastomosis Gastric Bypass	The number of One Anastomosis Gastric Bypass completed (also known as Single Anastomosis Gastric Bypass or Mini Gastric Bypass)	To understand the different procedure types undertaken in primary vs revisional context by country
Procedure type	Roux-en-Y Gastric Bypass	The number of Roux-en-Y Gastric Bypass completed	To understand the different procedure types undertaken in primary vs revisional context by country

Procedure type	Gastric Band	The number of Gastric Band procedures completed	To understand the different procedure types undertaken in primary vs revisional context by country
Procedure type	Other / Unknown	The number of all other bariatric procedures completed including (but not limited) to duodenal switch, bilio-pancreatic diversion, single anastomosis duodeno-ileostomy, stomach intestinal pylorus sparing surgery, gastric imbrication, gastroplasty or procedures with an unknown procedure type. Sleeve gastrectomy, OAGB, RYGB and gastric band procedures should be excluded from this category.	To understand the different procedure types undertaken in primary vs revisional context by country
Operative Approach	Laparotomy (Open)	The number of completed procedures where the operative approach was open (including those that began laparoscopically, endoscopically or with robotic assistance)	To understand the different surgical approaches used in primary vs revisional context by country
Operative Approach	Robotic	The number of completed procedures where the operative approach included the assistance of a robot to perform the surgery, excluding open procedures.	To understand the different surgical approaches used in primary vs revisional context by country
Operative Approach	Laparoscopic	The number of completed procedures where the operative approach was laparoscopic only. This excludes any procedure that was converted to open or had robotic assistance	To understand the different surgical approaches used in primary vs revisional context by country
Operative Approach	Endoscopic	The number of completed procedures where the operative approach was endoscopic only.	To understand the different surgical approaches used in primary vs revisional context by country
Operative Approach	Unspecified	The number of completed procedures where the operative approach is unknown / unspecified	To understand the different surgical approaches used in primary vs revisional context by country
Obesity-related disease	Type 2 Diabetes	Number of procedures where a patient has type 2 diabetes mellitus at time of surgery.	To identify the differences in the prevalence of Type 2 Diabetes in those having bariatric surgery between countries and sexes
Obesity-related disease	Type 2 diabetes definition	Free text field to record your registry's definition of type 2 diabetes.	to clarify any diferences between data provided and the assumed definition of the obesity-related disease
Obesity-related disease	Hypertension	Number procedures where a patient has hypertension and/or clinical evidence of high blood pressure at time of surgery	To identify the diffences in the prevalence of Hypertension in those having bariatric surgery between countries and sexes
Obesity-related disease	Hypertension definition	Free text field to record your registry's definition of hypertension	to clarify any diferences between data provided and the assumed definition of the obesity-related disease
Obesity-related disease	Depression	Number of procedures where the patient has depressive disorder at time of surgery	To identify the diffences in the prevalence of Depression in those having bariatric surgery between countries and sexes
Obesity-related disease	Depression definition	Free text field to record your registry's definition of depression	to clarify any diferences between data provided and the assumed definition of the obesity-related disease
Obesity-related disease	Sleep Apnoea	Number of procedures where a patient has sleep apnoea at time of surgery	To identify the diffences in the prevalence of Sleep Apnoea in those having bariatric surgery between countries and sexes
Obesity-related disease	Sleep apnoea definition	Free text field to record your registry's definition of sleep apnoea	to clarify any diferences between data provided and the assumed definition of the obesity-related disease
Obesity-related disease	GERD	Number of procedures where a patient has gastroesophageal reflux disease (GERD) at time of surgery .	To identify the diffences in the prevalence of GERD in those having bariatric surgery between countries and sexes
Obesity-related disease	GERD definition	Free text field to record your registry's definition of GERD	to clarify any diferences between data provided and the assumed definition of the obesity-related disease

APPENDIX 2 - DATA DICTIONARY

Obesity-related disease	Dyslipidemia	Number of procedures where a patient has dyslipidemia at time of surgery.	To identify the diffences in the prevalence of Dyslipidemia in those having bariatric surgery between countries and sexes
Obesity-related disease	Dyslipidemia definition	Free text field to record your registry's definition of dyslipidemia	to clarify any diferences between data provided and the assumed definition of the obesity-related disease
	Length of Stay	The number of days the patient was in hospital for the episode of care	To understand the outcomes in primary vs revisional context by country
Peri-operative outcomes	Unplanned return to theatre	The prevalence of unplanned return to theatre in the perioperative period (between 30-90 days) as a consequence of the bariatric procedure	To understand the outcomes in primary vs revisional context by country
Peri-operative outcomes	Unplanned ICU	The prevalence of unplanned admission to ICU in the perioperative period (between 30-90 days) as a consequence of the bariatric procedure	To understand the outcomes in primary vs revisional context by country
Peri-operative outcomes	Unplanned readmission rate	The prevalence of unplanned readmission into hospital in the perioperative period (between 30-90 days) as a consequence of the bariatric procedure	To understand the outcomes in primary vs revisional context by country
Peri-operative outcomes	Deaths	The prevalence of mortality (between 30-90 days) after the bariatric procedure	To understand the outcomes in primary vs revisional context by country
	Median	The median is the central value when all observations are sorted in ascending order. If there is an odd number of observations then it is the middle value; if there is an even number of observations then it is the average of the middle two values.	Define centre value and the spread of aggregate data in the dataset
	Lower quartile	The lower quartile is the median of the lower 50% of observations when are sorted in ascending order.	Define centre value and the spread of aggregate data in the dataset
	Upper quartile	The upper quartile is the median of the upper 50% of observations when are sorted in ascending order.	Define centre value and the spread of aggregate data in the dataset

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REDCap field title	Long-form Name
prim_sex_female	Count of completed primary procedures where sex is female
prim_sex_male	Count of completed primary procedures where sex is male
rev_sex_female	Count of completed revision procedures where sex is female
rev_sex_male	Count of completed revision procedures where sex is male
prim_sex_all	Count of completed primary procedures
rev_sex_all	Count of completed revision procedures
prim_sleeve	Count of completed primary procedures that were Sleeve Gastrectomy
prim_oagb	Count of completed primary procedures that were One Anastomosis Gastric Bypass
prim_rygb	Count of completed primary procedures that were Roux en Y Gastric Bypass
prim_band	Count of completed primary procedures that were Gastric Band
prim_other	Count of completed primary procedures that were not sleeve, nor OAGB nor RYGB nor Gastric Band
rev_sleeve	Count of completed revision procedures that were Sleeve Gastrectomy
rev_oagb	Count of completed revision procedures that were One Anastomosis Gastric Bypass
rev_rygb	Count of completed revision procedures that were Roux en Y Gastric Bypass
rev_band	Count of completed revision procedures that were Gastric Band
rev_other	Count of completed revision procedures that were not sleeve, nor OAGB nor RYGB nor Gastric Band
unsp_sleeve	Count of completed Unspecified procedures, Sleeve Gastrectomy
unsp_oagb	Count of completed Unspecified procedures, One Anastomosis Gastric Bypass
unsp_rygb	Count of completed Unspecified procedures, Roux en Y Gastric Bypass
unsp_band	Count of completed Unspecified procedures, Gastric Band
unsp_other	Count of completed Unspecified procedures unknown if prior bariatric procedure took place to other
prim_lap	Count of completed primary Laparoscopic procedure
prim_open	Count of completed primary Laparotomy (Open) procedure
prim_endo	Count of completed primary Endoscopic procedure
prim_robot	Count of completed primary Robotic procedure
prim_unsp	Count of completed primary procedure with unspecifed approach
rev_lap	Count of completed revision procedure from one type to Laparoscopic procedure
rev_open	Count of completed revision procedure from one type to Laparotomy (Open) procedure
rev_endo	Count of completed revision procedure from one type to Endoscopic procedure
rev_robot	Count of completed revision procedure from one type to Robotic procedure
rev_unsp	Count of completed revision procedure from one type to Unspecified Approach
unsp_lap	Count of completed Unspecified procedures, Laparoscopic procedure
unsp_open	Count of completed Unspecified procedures, Laparotomy (Open) procedure
unsp_endo	Count of completed Unspecified procedures, Endoscopic procedure
unsp_robot	Count of completed Unspecified procedures, Robotic procedure
unsp_unsp	Count of completed Unspecified procedures, current procedure with unspecifed approach
prim_female_age_median	Median Age of Sex: Female at time of completed Primary procedure
prim_female_age_iqr_lower	Lower Inner quartile range (25th percentile population) for Age of Sex: Female with completed primary procedure at time of procedure
prim_female_age_iqr_upper	Upper Inner quartile range (75th percentile population) for Age of Sex: Female with completed primary procedure at time of procedure

prim_female_age_n	Number of Primary patients that qualify for the calculation (having primary procedure, Sex:female, age captured at time of procedure)
prim_male_age_median	Median Age of Sex: Male at time of completed Primary procedure
prim_male_age_iqr_lower	Lower Inner quartile range (25th percentile population) for Age of Sex: Male with completed primary procedure at time of procedure
prim_male_age_iqr_upper	Upper Inner quartile range (75th percentile population) for Age of Sex: Male with completed primary procedure at time of procedure
prim_male_age_n	Number of Primary patients that qualify for the calculation (having primary procedure, Sex:Male, age captured at time of procedure)
prim_age_median	Median Age at time of completed Primary procedure
prim_age_iqr_lower	Lower Inner quartile range (25th percentile population) for Age with completed primary procedure at time of procedure
prim_age_iqr_upper	Upper Inner quartile range (75th percentile population) for Age with completed primary procedure at time of procedure
prim_age_n	Number of Primary patients that qualify for the calculation (having primary procedure, age captured at time of procedure)
rev_female_age_median	Median Age of Sex: Female at time of completed revision procedure
rev_female_age_iqr_lower	Lower Inner quartile range (25th percentile population) for Age of Sex: Female with completed Revision procedure at time of procedure
rev_female_age_iqr_upper	Upper Inner quartile range (75th percentile population) for Age of Sex: Female with completed Revision procedure at time of procedure
rev_female_age_n	Number of Revision patients that qualify for the calculation (having Revision procedure, Sex:female, age captured at time of procedure)
rev_male_age_median	Median Age of Sex: Male at time of completed revision procedure
rev_male_age_iqr_lower	Lower Inner quartile range (25th percentile population) for Age of Sex: Male with completed Revision procedure at time of procedure
rev_male_age_iqr_upper	Upper Inner quartile range (75th percentile population) for Age of Sex: Male with completed Revision procedure at time of procedure
rev_male_age_n	Number of Revision patients that qualify for the calculation (having Revision procedure, Sex:Male, age captured at time of procedure)
rev_age_median	Median Age with completed Revision procedure at time of procedure
rev_age_iqr_lower	Lower Inner quartile range (25th percentile population) for Age with completed Revision procedure at time of procedure
rev_age_iqr_upper	Upper Inner quartile range (75th percentile population) for Age with completed Revision procedure at time of procedure
rev_age_n	Number of Revision patients that qualify for the calculation (having Revision procedure, age captured at time of procedure)
all_age_median	Median Age at time of completed procedure
all_age_iqr_lower	Lower Inner quartile range (25th percentile population) for Age with completed procedure at time of procedure
all_age_iqr_upper	Upper Inner quartile range (75th percentile population) for Age with completed procedure at time of procedure
all_age_n	Number of Primary patients that qualify for the calculation (having primary procedure, age captured at time of procedure)
prim_female_prebmi_median	Median PreBMI of Sex: Female at time of completed Primary procedure
prim_female_prebmi_iqr_lower	Lower Inner quartile range (25th percentile population) for PreBMI of Sex: Female with completed primary procedure at time of procedure
prim_female_prebmi_iqr_upper	Upper Inner quartile range (75th percentile population) for PreBMI of Sex: Female with completed primary procedure at time of procedure

APPENDIX 2 - DATA DICTIONARY

prim_female_prebmi_n	Number of Primary patients that qualify for the calculation (having primary procedure, Sex:female, PreBMI captured at time of procedure)
prim_male_prebmi_median	Median PreBMI of Sex: Male at time of completed Primary procedure
prim_male_prebmi_iqr_lower	Lower Inner quartile range (25th percentile population) for PreBMI of Sex: Male with completed primary procedure at time of procedure
prim_male_prebmi_iqr_upper	Upper Inner quartile range (75th percentile population) for PreBMI of Sex: Male with completed primary procedure at time of procedure
prim_male_prebmi_n	Number of Primary patients that qualify for the calculation (having primary procedure, Sex:Male, PreBMI captured at time of procedure)
prim_all_prebmi_median	Median PreBMI at time of completed Primary procedure
prim_all_prebmi_iqr_lower	Lower Inner quartile range (25th percentile population) for PreBMI with completed primary procedure at time of procedure
prim_all_prebmi_iqr_upper	Upper Inner quartile range (75th percentile population) for PreBMI with completed primary procedure at time of procedure
prim_all_prebmi_n	Number of Complete Primary patients that qualify for the calculation (having primary procedure, PreBMI captured at time of procedure)
t2d_definition	Definition of 'type 2 diabetes' that was used to calculate the figures, only if provided
prim_female_t2d	Number of Complete Primary Procedures where a patient is Sex: Female and has type 2 diabetes mellitus at time of surgery.
prim_female_t2d_n*	Number of Complete Primary Procedures where a patient is Sex: Female with diabetes data time of surgery.
prim_male_t2d	Number of Complete Primary Procedures where a patient is Sex: Male and has type 2 diabetes mellitus at time of surgery.
prim_male_t2d_n*	Number of Complete Primary Procedures where a patient is Sex: Male with diabetes data time of surgery.
prim_all_t2d	Number of Complete Primary Procedures where a patient has type 2 diabetes mellitus at time of surgery.
prim_all_t2d_n	Number of Complete Primary Procedures where a patient has captured diabetes data time of surgery.
ht_definition	Definition of 'Hypertension' that was used to calculate the figures, only if provided
prim_female_hypertension	Number of Complete Primary Procedures where a patient is Sex: Female and has hypertension at time of surgery.
prim_female_hypertension_n*	Number of Complete Primary Procedures where a patient is Sex: Female with hypertension data time of surgery.
prim_male_hypertension	Number of Complete Primary Procedures where a patient is Sex: Male and has hypertension at time of surgery.
prim_male_hypertension_n*	Number of Complete Primary Procedures where a patient is Sex: Male with hypertension data time of surgery.
prim_all_hypertension	Number of Complete Primary Procedures where a patient has hypertension at time of surgery.
prim_all_hypertension_n	Number of Complete Primary Procedures where a patient has captured hypertension data time of surgery.
depression_definition	Definition of 'Depression' that was used to calculate the figures, only if provided
prim_female_depression	Number of Complete Primary Procedures where a patient is Sex: Female and has Depression at time of surgery.
prim_female_depression_n*	Number of Complete Primary Procedures where a patient is Sex: Female with Depression data time of surgery.
prim_male_depression	Number of Complete Primary Procedures where a patient is Sex: Male and has Depression at time of surgery.
prim_male_depression_n*	Number of Complete Primary Procedures where a patient is Sex: Male with Depression data time of surgery.
prim_all_depression	Number of Complete Primary Procedures where a patient has Depression at time of surgery.
prim_all_depression_n	Number of Complete Primary Procedures where a patient has captured Depression data time of surgery.
sleep_apnoea_definition	Definition of 'Sleep Apnoea' that was used to calculate the figures, only if provided
prim_female_sleep_apnoea	Number of Complete Primary Procedures where a patient is Sex: Female and has Sleep Apnoeat time of surgery.
prim_female_sleep_apnoea_n*	Number of Complete Primary Procedures where a patient is Sex: Female with Sleep Apnoea data time of surgery.
prim_male_sleep_apnoea	Number of Complete Primary Procedures where a patient is Sex: Male and has Sleep Apnoeat time of surgery.
prim_male_sleep_apnoea_n*	Number of Complete Primary Procedures where a patient is Sex: Male with Sleep Apnoea data time of surgery.
prim_all_sleep_apnoea	Number of Complete Primary Procedures where a patient has Sleep Apnoeat time of surgery.

* counted cases are cases with known disease status (Yes or No) only

prim_all_sleep_apnoea_n	Number of Complete Primary Procedures where a patient has captured Sleep Apnoea data time of surgery.
gerd_definition	Defintion of 'GERD' that was used to calculate the figures, only if provided
prim_female_gerd	Number of Complete Primary Procedures where a patient is Sex: Female and has gastroesophageal reflux disease at time of surgery.
prim_female_gerd_n*	Number of Complete Primary Procedures where a patient is Sex: Female with gastroesophageal reflux disease data time of surgery.
prim_male_gerd	Number of Complete Primary Procedures where a patient is Sex: Male and has gastroesophageal reflux disease at time of surgery.
prim_male_gerd_n*	Number of Complete Primary Procedures where a patient is Sex: Male with gastroesophageal reflux disease data time of surgery.
prim_all_gerd	Number of Complete Primary Procedures where a patient has gastroesophageal reflux disease at time of surgery.
prim_all_gerd_n	Number of Complete Primary Procedures where a patient has captured gastroesophageal reflux disease data time of surgery.
dyslipidemia_definition	Defintion of 'dyslipidemia' that was used to calculate the figures, only if provided
prim_female_dyslipidemia	Number of Complete Primary Procedures where a patient is Sex: Female and has dyslipidemiat time of surgery.
prim_female_dyslipidemia_n*	Number of Complete Primary Procedures where a patient is Sex: Female with dyslipidemia data time of surgery.
prim_male_dyslipidemia	Number of Complete Primary Procedures where a patient is Sex: Male and has dyslipidemiat time of surgery.
prim_male_dyslipidemia_n*	Number of Complete Primary Procedures where a patient is Sex: Male with dyslipidemia data time of surgery.
prim_all_dyslipidemia	Number of Complete Primary Procedures where a patient has dyslipidemiat time of surgery.
prim_all_dyslipidemia_n	Number of Complete Primary Procedures where a patient has captured dyslipidemia data time of surgery.
prim_los_median	Median of total primary patients LOS, date the patient is admitted from the date of discharge (separation) as measured in number of days,
prim_los_iqr_lower	Lower Inner quartile range (25th percentile population) for LOS of completed Primary procedures.
prim_los_iqr_upper	Upper Inner quartile range (75th percentile population) for LOS of completed Primary procedures.
prim_los_n	Number of Complete Primary Procedures where a patient has captured Length of Stay data.
rev_los_median	Median of total Revision patients LOS, date the patient is admitted from the date of discharge (separation) as measured in number of days,
rev_los_iqr_lower	Lower Inner quartile range (25th percentile population) for LOS of completed Revision procedures.
rev_los_iqr_upper	Lower Inner quartile range (75th percentile population) for LOS of completed Revision procedures.
rev_los_n	Number of Complete Revision Procedures where a patient has captured Length of Stay data.
peri_operative_outcomes_ar	for the data provided Peri-operative Outcomes are measured as occurring within (days)
readmission_definition	Defintion of 'unplanned readmission to hospital' that was used to calculate the figures, only if provided
prim_readmission	Number of Complete Primary Procedures where a patient has an 'Unplanned re-admission to hospital' 30-90days after surgery.
prim_readmission_n	Number of Complete Primary Procedures where a patient has captured 'Unplanned re-admission to hospital' data 30-90days after surgery.
rev_readmission	Number of Complete Revision Procedures where a patient has an 'Unplanned re-admission to hospital' data 30-90days after surgery.
rev_readmission_n	Number of Complete Revision Procedures where a patient has captured 'Unplanned re-admission to hospital' data 30-90days after surgery.
rtt_definition	Defintion of 'unplanned return to theatre' that was used to calculate the figures, only if provided
prim_rtt	Number of Complete Primary Procedures where a patient has an 'Unplanned return to theatre' 30-90days after surgery.
prim_rtt_n	Number of Complete Primary Procedures where a patient has captured 'Unplanned return to theatre' data 30-90days after surgery.
rev_rtt	Number of Complete Revision Procedures where a patient has an 'Unplanned return to theatre' 30-90days after surgery.

* counted cases are cases with known disease status (Yes or No) only

APPENDIX 2 - DATA DICTIONARY

rev_rtt_n	Number of Complete Revision Procedures where a patient has captured 'Unplanned return to theatre' data 30-90days after surgery.
icu_definition	Defintion of 'unplanned ICD admission' that was used to calculate the figures, only if provided
prim_icu	Number of Complete Primary Procedures where a patient has an 'Unplanned ICU admission' 30-90days after surgery.
prim_icu_n	Number of Complete Primary Procedures where a patient has captured 'Unplanned ICU admission' data 30-90days after surgery.
rev_icu	Number of Complete Revision Procedures where a patient has an 'Unplanned ICU admission' 30-90days after surgery.
rev_icu_n	Number of Complete Revision Procedures where a patient has captured 'Unplanned ICU admission' 30-90days after surgery.
prim_death	Number of Complete Primary Procedures where a there is a death 30-90 days after surgery.
prim_death_n	Number of Complete Primary Procedures where a patient has captured Morality datafter surgery.
rev_death	Number of Complete Revision Procedures where a there is a death 30-90 days after surgery.
rev_death_n	Number of Complete Revision Procedures where a patient has captured Morality datafter surgery.

APPENDIX 3
DEFINITIONS

Diabetes

Country	Definition used
Australia	Diabetes Status at Baseline is determined by the patient identifying themselves as having diabetes at the time of the operation and having a treatment for their diabetes. (Including type 1 & 2)
Canada	Diabetes status at baseline is determined by the patient's primary care physician at baseline
China	Symptoms of T2DM and Random blood glucose ≥11.1 mmol/L or Fasting blood glucose ≥7.0 mmol/L or OGTT 2h ≥11.1 mmol/L or HbA1c ≥6.5%
France	Patients with type 2 diabetes at surgery that are treated with diabetes medication
Israel	Self-reported by the patient before surgery
Italy	Diabetes status is determined as reported by the patients and based on preoperative blood chemistry according to ADA (American Diabetes Association) Diabetes Care 2014; 37(S 1): S81-90
Netherlands	No diabetes: 20-42 mmol HbA1c/ mol HbA Present: both type 1 and type 2 diabetes, with or without medication
New Zealand	Diabetes Status at Baseline is determined by the patient identifying themselves as having diabetes at the time of the operation and having a treatment for their diabetes. (Including type 1 & 2)
Norway	Treated with medication
Russia	Diabetes status at baseline is determined by the patient self-reporting as having diabetes at the time of the operation or having a treatment for diabetes.
South Africa	ADA criteria for DM/pre-diabetes and gestational DM
Sweden	Pharmakological treatment for type 2 diabetes
USA Michigan	Type II diabetes: (Disease marked by high levels of sugar in the blood that occurs because the body does not respond correctly to insulin, a hormone released by the pancreas) Noninsulin-dependent diabetes mellitus (NIDDM), adult-onset diabetes mellitus treated with (please check all that apply): o Diet: Type II diabetes including hyperglycemia, insulin resistance, or compensatory hyperinsulinemia that is managed with dietary modifications alone o Oral medications: Type II diabetes managed with oral medications o Insulin-dependent: Type II diabetes treated with insulin o Non-Insulin Injectables (Byetta)
Venezuela	FBG > 125 mg/dl

Hypertension

Country	Definition used
Australia	Data not collected by the Bariatric Surgery Registry (Australia)
Canada	Hypertension at baseline is determined by the patient's primary care physician at baseline
China	Systolic BP ≥ 140mmHg or Diastolic BP ≥ 90mmHg
France	Patients with hypertension that are treated with medication
Israel	Self-reported by the patient before surgery
Italy	Hypertension status is determined according to AHA (American Heart Association) Journal of the American Heart Association, 2020;9:e017546
Netherlands	No hypertension: systolisc pressure <120 mmHg, diastolic pressure <80 mmHg; Present: also pre-hypertension, so anything which deviates from the blood pressures mentioned above, with or without medication
New Zealand	Data not collected by the Bariatric Surgery Registry (NZ)
Norway	Use of medication
Russia	Hypertension status at baseline is determined by the patient having antihypertensive treatment.
South Africa	WHO criteria of > 130/85 with Karotkoff 1 and 4 sounds.
Sweden	Pharmacological treatment of hypertension
USA Michigan	Treated hypertension (HTN): Clinical diagnosis of elevated BP, ↑BP, HBP, HCVD (hypertensive cardiovascular disease), or HASHD (hypertensive arteriosclerotic heart disease) AND treatment with daily anti-hypertensive medication (listed below). If patient is on 0 anti-hypertensive meds, then they do not have treated HTN and the box for "Treated HTN" should not be checked.
Venezuela	BP > 140/90 mmHg

Sleep apnea

Country	Definition used
Australia	Data not collected by the Bariatric Surgery Registry (Australia)
Canada	Sleep Apnoea at baseline is determined by the patient's primary care physician at baseline or following the presurgical sleep study
China	Diagnosed by symptoms and polysomnogram (PSG)
France	Patients with sleep apnoea with or without medication
Israel	Self-reported by the patient before surgery
Italy	Sleep apnoea status at baseline is determined by the patient identifying themselves as having sleep apnoea or when diagnosed by polysomnography according to The Lancet 2002;360(9328):237-45
Netherlands	No OSAS: No symptoms, a negateve polu(somno)graphy (PSG) in combination with apnea-hypopnea index (AHI) of <5 and no (more) use of CPAP/BiPAP Present: Symptoms, in combination with a positive poly(somno)graphy (PSG), possibly in combination with a apnea-hypopnea index (AHI) of >5; with or without treatment
New Zealand	Data not collected by the Bariatric Surgery Registry (NZ)
Norway	use of CPAP
Russia	Sleep apnoea status at baseline is determined by the patient self-reporting having sleep apnoea or using CPAP/BPAP therapy.
South Africa	Official PSG testing by sleep laboratory
Sweden	Use of CPAP or BiPAP
USA Michigan	Sleep apnea, nocturnal upper airway obstruction, or sleep disordered breathing. Check all that apply Yes or No If yes, please check all that apply ▪ CPAP or BiPAP: Treated with continuous positive airway pressure (CPAP) or biphasic positive airway pressure (BiPAP) device ▪ Other treatment: Specify. Examples include, but not limited to: "oxygen at night", "patient noncompliant with CPAP/BiPAP). ▪ Unknown treatment ▪ Cor pulmonale: (Persistent pulmonary hyp
Venezuela	Positive polysomnography

Dyslipidemia

Country	Definition used
Australia	Data not collected by the Bariatric Surgery Registry (Australia)
Canada	The Ontario Bariatric Registry records hyperlipidemia. Hyperlipidemia at baseline is determined by the patient's primary care physician at baseline
China	Total Cholesterol ≥5.2mmol/L; LDL cholesterol ≥3.4mmol/L; HDL cholesterol <1.0 mmol/L; triglycerides ≥1.7 mmol/L
Israel	Self-reported by the patient before surgery
Italy	Dyslipidemia status is determined by peri-operative measure of serum lipids according to New England Journal of Surgery 2004;351:2683-2693
Netherlands	No dislipidemia: Normal lipid spectrum (LDL, HDL, Triglycerides) without the use of lipid-lowering medication Present: A deviated lipid spectrum (LDL, HDL, Triglycerides); with or without medication
New Zealand	Data not collected by the Bariatric Surgery Registry (NZ)
Norway	Use of lipid-lowering medication
Russia	Dyslipidaemia status at baseline is determined by the patient having abnormal lipid blood tests or taking antilipid drugs
South Africa	Framingham Risk Assessment tool.
Sweden	Pharmacological treatment for dyslipidemia
USA Michigan	Clinical diagnosis of hypercholesterolemia, hypertriglyceridemia, dyslipidemia, elevated lipids, or high cholesterol, OR treatment with one or more of the four major classes of prescription medications that are used to treat hyperlipidemia; HMG-CoA reductase inhibitors or statins which lower LDL cholesterol, nicotinic acid or niacin which increases HDL, fibric acids or fibrates which lower triglycerides, and bile acid sequestrants or cholesterol absorption inhibitors or CAIs which affect absorption of dietary cholesterol.
Venezuela	Cholesterol > 200 mg/dl or TG > 150 mg/dl

GERD

Country	Definition used
Australia	Data not collected by the Bariatric Surgery Registry (Australia)
Canada	GERD at baseline is determined by the patient's primary care physician at baseline
China	Diagnosed by symptoms or gastroscope
Israel	Self-reported by the patient before surgery
Italy	GERD status at baseline is determined according to Lyon Consensus Conference Gut 2018;67:1351-1362
Netherlands	The diagnosis of GERD can be made in different ways. We use the following definition: No GERD: Anamnestically no indications for GERD, possibly in combination with a negative 24-48 hrs pH-test and/or a gastro-duodenoscopy Present: Anamnestically indications for GERD, possibly in combination with a positive 24-48 hrs pH-test and/or a gastro-duodenoscopy; with or without medication
New Zealand	Data not collected by the Bariatric Surgery Registry (NZ)
Norway	Use of medication
Russia	GORD status at baseline is determined by the patient self-reporting symptoms of GORD or having an antireflux therapy
South Africa	Gastroscopy and histological evidence.
Sweden	Pharmacological treatment with PPI
USA Michigan	Chronic heartburn, acid regurgitation, acid reflux disease, acid dyspepsia, esophageal reflux, esophagitis, reflux laryngitis, Barrett's esophagus, refluxinduced cough or asthma Yes or No If yes, treated with: Meds and/or Endoscopic Procedure: - Meds include, but are not limited to: ▪ PPI (proton pump inhibitor) medication: omeprazole (Prilosec®, Losec®), lansoprazole (Prevacid®, Zoton®), rabeprazole (Aciphex®, Pariet®), pantoprazole (Protonix®, Protium®) esomeprazole (Nexium®). OR H2 blocker (antacid) medication: Ranitidine (Zantac®) Famotidine (Pepcid®) Tums, Rolaids - Endoscopic Procedure includes the following: Radiofrequency energy, Stretta System, Endoscopic plication suturing Bard EndoCinch Endoscopic Suturing System Endoscopic Suturing Device (ESD) Surgical Endoscopic Plication System (EPS) EsophX System with SerosaFuse Fastener (transoral incisionless fundoplication) Injection of implantation techniques Plexiglas [polymethylmethacrylate (PMMA)] procedure Linx procedure (magnets) - Anti-reflux procedure includes Nissen Fundoplication - Unknown treatment type
Venezuela	Positive endoscopic findings

Depression

Country	Definition used
Australia	Data not collected by the Bariatric Surgery Registry (Australia)
Canada	Not recorded in Ontario Bariatric Registry
China	Diagnosed by Psychiatrist.
Israel	Self-reported by the patient before surgery
Italy	Depression status at baseline is determined during peri-operative psychiatric counseling.
Netherlands	We do not register depression
New Zealand	Data not collected by the Bariatric Surgery Registry (NZ)
Norway	Use of medication
Russia	Depression status at baseline is determined by the patient taking antidepressants.
South Africa	Beck Depression Inventory (BDI), multiple face to face interviews with advanced psychologist and psychiatrist.
Sweden	Pharmacological treatment for depression
USA Michigan	Including clinical depression and depressive disorder, treated with medication, electroconvulsive therapy, and/or psychotherapy.