IFSO
International Federation for Surgery of Obesity & Metabolic Disorders

9TH GLOBAL REGISTRY REPORT

2024

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Contents

01 **EXECUTIVE SUMMARY**

04 **FOREWORD**

05 **INTRODUCTION**

07 **DATA GUIDE**

09 **CHAPTER 1**
Contributors to the Ninth Report

13 **CHAPTER 2**
Procedures and Operative Approach

20 **CHAPTER 3**
Demographics

26 **CHAPTER 4**
Obesity Related Diseases

47 **CHAPTER 5**
Perioperative Outcomes

58 **CHAPTER 6**
Trends in Metabolic and Bariatric Surgery Worldwide

61 **CHAPTER 7**
Conclusions

62 **APPENDIX 1**
List of Presidents and Contributors

63 **APPENDIX 2**
Known National/Regional Registries to IFSO

64 **APPENDIX 3**
Data Dictionary

67 **APPENDIX 4**
Definitions Used by Various Registries for Obesity Related Diseases

List of Figures

Figure 1	Geographic distribution of contributors to the 9th IFSO global registry report and total procedure count by IFSO chapter (2023)
Figure 2	Total procedures by country (2023)
Figure 3	Total procedures by operative type (2023)
Figure 4	Total primary procedures by operative type (2023)
Figure 5	Primary procedure count and operative type breakdown by country (2023)
Figure 6	Total revisional procedures by operative type (2023)
Figure 7	Revisional procedure count and operative type breakdown by country (2023)
Figure 8	Revisional procedure count and operative type breakdown by country (2023)
Figure 9	Total procedure count by operative approach, primary and revisional (2023)
Figure 10	Total procedure count by sex, primary and revisional (2023)
Figure 11	Procedure count by country and sex, primary and revisional (2023)
Figure 12	Percent of primary participants with type 2 diabetes by country (2023)
Figure 13	Sex distribution of patients with type 2 diabetes at the time of surgery
Figure 14	Percent of primary participants with hypertension by country (2023)
Figure 15	Proportion of male and female patients with hypertension at surgery; binary sex only
Figure 16	Percent of primary participants with obstructive sleep apnea by country (2023)
Figure 17	Proportion of male and female patients with OSA at surgery; binary sex only
Figure 18	Percent of primary participants with dyslipidemia by country (2023)
Figure 19	Proportion of male and female patients with DL or otherwise dyslipidemia at surgery; binary sex only
Figure 20	Percent of primary participants with gastroesophageal reflux disease by country (2023)
Figure 21	Proportion of male and female patients with GERD at surgery; binary sex only
Figure 22	Percent of primary participants with depression by country (2023)
Figure 23	Proportion of primary participants with depression who are female and male (2023)
Figure 24	Median length of stay by country, primary and revisional procedures (2023)
Figure 25	Total procedures by procedure type and year
Figure 26	Procedure type breakdown by year
Figure 27	Procedure type breakdown by IFSO chapter and year

List of Tables

Table 1	Primary and revisional procedures by country (2023)
Table 2	Primary and revisional operative approach by country (2023)
Table 3	Median age at time of surgery by country, all procedures (2023)
Table 4	Median age by sex and country, primary procedures (2023)
Table 5	Median age by sex and country, revisional procedures (2023)
Table 6	Median pre-surgery BMI by sex and country, primary procedures (2023)
Table 7	Number with type 2 diabetes at time of primary procedure by sex and country (2023)
Table 8	Number with hypertension at time of primary procedure by sex and country (2023)
Table 9	Number with obstructive sleep apnea at time of primary procedure by sex and country (2023)
Table 10	Number with dyslipidemia at time of primary procedure by sex and country (2023)
Table 11	Number with gastroesophageal reflux disease at time of primary procedure by sex and country (2023)
Table 12	Number with depression at time of primary procedure by sex and country (2023)
Table 13	Rate of postoperative unplanned readmission by country, primary and revisional procedures (2023)
Table 14	Rate of postoperative unplanned reoperation by country, primary and revisional procedures (2023)
Table 15	Rate of postoperative unplanned ICU admission by country, primary and revisional procedures (2023)
Table 16	Rate of postoperative death by country, primary and revisional procedures (2023)

Executive Summary

This ninth report from the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) Global Registry presents aggregated data drawn exclusively from national and two regional metabolic bariatric surgery registries. As the third edition to adopt this methodology, it builds on the groundwork laid by its two predecessors. The report focuses on patient demographics, the volume and types of procedures performed across different countries, and perioperative outcomes. All data are reported in accordance with the standardized minimum dataset developed in collaboration with the University of Bristol, offering valuable insights into the real-world impact of metabolic bariatric surgery. [1]

With the third publication in this revised new style, it is now possible to begin identifying trends based on the reliable data collected in the Global Registry, complementing findings from previous surveys. [2]

Important caveats

Data from national or regional registries generally reflect the clinical practices of their respective regions and are typically less susceptible to bias than data from single centers purporting to represent entire countries. Although this report includes fewer countries than earlier editions, the broader scope of the contributing registries likely makes the information more representative of global practice. Moreover, the number of countries meeting the new inclusion criteria is steadily increasing.

Nonetheless, several important limitations must be considered when interpreting the findings in this report:

- Incomplete data ascertainment: Most registries do not capture all individuals undergoing metabolic bariatric procedures, which can lead to underrepresentation.
- Incomplete perioperative follow-up: Key complications may go unnoticed or unreported due to gaps in follow-up.
- Variability in data auditing: The procedures used to audit or verify data accuracy vary between countries, potentially affecting the reliability of reported outcomes.
- Inconsistent definitions: Key variables are not uniformly defined across registries, complicating direct comparisons. Where such discrepancies exist, they are noted within the report. [3]

Despite these limitations, the consistency observed across contributing registries is encouraging and reinforces the overall credibility of the findings. It also reflects steady progress toward our shared mission: "Providing reliable data on metabolic and bariatric surgery worldwide."

Key Outcomes in this Report

Registry Coverage and Participation

- Total number of procedures captured in 2023: 593,500
  - 543,000 primary procedures
  - 50,500 revisional/secondary procedures
- Number of participating countries/registries: 37 countries and 2 regional registries (Michigan, USA and Ontario, representing Canada)
- Percentage of known national registries represented: 39/44 = 89%

Patient Demographics

- Sex: Most patients undergoing metabolic bariatric surgery were female, a trend consistent across all registries (82.7% for primary surgeries; 77.9% for revisional surgeries)
- Baseline BMI:
  - Range: From a mean of 27.6 kg/m² (females, lower IQR) to 62.2 kg/m² (females, upper IQR) in India
  - Most registries reported baseline BMI between 40–45 kg/m²
- Age on Day of Surgery:
  - Median age for primary surgery: 42.0 years, ranging from 32.0 years (China) to 48.6 years (Spain)

Preoperative Obesity Related Diseases

- Most common condition: Type II diabetes, with an average reported prevalence of 10–30% across the registries
- Highest prevalence: 100% in Azerbaijan and Bolivia
- Lowest prevalence: 10.5% in Australia and Norway
- Sex disparities: Males more frequently reported obstructive sleep apnea, hypertension, and dyslipidemia, while females more commonly reported depression

Types and Techniques of Procedures

- Most common primary procedure: Sleeve gastrectomy (61%), with regional variation
- Most common revisional procedure: Roux-en-Y gastric bypass (58%)
- Surgical approach:
  - Laparoscopic surgery was the predominant approach
  - Use of robotic surgery is increasing, particularly for revisional procedures

Length of Stay and Readmissions

- Primary procedures: Median length of stay ranged from 1 day (El Salvador, Iran, Netherlands, Ontario, Sweden) to 6 days (China, South Korea)
- Revisional procedures: Generally associated with equal or longer hospital stays compared to primary procedures Cultural factors: Variability in length of stay likely reflects local discharge norms and the availability of community-based support systems

Safety

- Revisional procedures consistently show a higher reoperation rate (reop) than primary procedures
- Reported postoperative mortality rates range from 0–0.44%, with most registries reporting <0.1%
- Conclusion: Metabolic bariatric surgery continues to be a very safe intervention

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Foreword

The 9th edition of the IFSO Global Registry Report marks a pivotal moment in our ongoing journey to understand, monitor, and improve the practice of metabolic and bariatric surgery worldwide. Through the tireless efforts of national and regional registries, this report consolidates 600,000 procedures performed across five continents, offering a uniquely global and evidence-informed view of the evolving landscape of obesity treatment.

In recent years, the IFSO Global Registry has matured from an ambitious concept into a robust platform of international collaboration. By transitioning to aggregated data reporting and harmonizing our methodology with international data protection standards, we have not only ensured greater compliance, but also improved the integrity, transparency, and clinical relevance of the data presented. The addition of longitudinal trends in this edition reflects a growing maturity in our dataset, enabling deeper insights into procedural evolution, outcomes, and emerging practices across diverse healthcare systems.

This report is more than a record of numbers. It reflects our shared commitment to evidence-based care, equity in treatment access, and continuous improvement in patient outcomes. Each data point is not just a surgical intervention, but a human story of health transformation, underscoring the need for our field to remain grounded in compassion, science, and accountability.

On behalf of IFSO, I extend my gratitude to all contributors, registries, clinicians, researchers, and patients, whose dedication and transparency have made this report possible. Your commitment strengthens our collective ability to advocate for better care and support global policy efforts that recognize obesity as a chronic, relapsing disease deserving of structured, multidisciplinary treatment.

As we look ahead, the Global Registry will continue to serve as both a compass and a catalyst guiding innovation and anchoring it in real-world evidence. We encourage all member societies to engage actively in this initiative and help us expand the reach and impact of this global resource.

Dr. Ricardo V. Cohen
President
International Federation for the Surgery for Obesity and Metabolic Disorders

Mission and purpose

The IFSO Global Registry is committed to providing the most reliable and transparent data on metabolic and bariatric surgery worldwide. Its primary objectives include monitoring global procedure volumes, evaluating the uptake of surgical interventions for obesity and metabolic disease, and facilitating real-world, post-approval surveillance of surgical procedures and devices.

From inception to global reach

Since its launch in 2014, the Registry has expanded considerably. Initially, it included 100,000 procedures from 18 countries, encompassing both single-centre data and comprehensive national datasets (e.g., Sweden and the UK). By the sixth report, the dataset had grown to over 500,000 procedures across 50 countries, incorporating data from 10 national or regional registries. However, the inclusion of individual-level data introduced significant legal and logistical challenges, particularly considering Europe's General Data Protection Regulation (GDPR).

Adapting to regulatory and data quality challenges

With GDPR enforcement in 2018, the regulatory landscape became more stringent, demanding enhanced consent procedures, ethical oversight, and robust data security. For IFSO, a relatively small organization managing these requirements proved increasingly challenging. Furthermore, early reports were affected by variability in data definitions and the limited representativeness of single-centre contributions.

A new approach: aggregated national and regional data

Beginning with the 2022 report, the Registry transitioned to a new model that includes only aggregated data from established national and regional registries. This shift ensures compliance with GDPR by eliminating the transfer of individual-level data while maintaining a credible overview of global surgical activity.

Key elements of the revised model include:

- Use of aggregated (mean/median) values to enhance data security
- Registry-level reporting on data completeness to improve transparency and reduce bias
- A standardized core dataset comprising 12 demographic and procedural variables to ensure consistency Inclusion in the current (ninth) report of 600,000 procedures from 37 national and 2 regional registries, covering over 89% of known registries worldwide
- Introduction of a new trends chapter from the ninth report onward, enabled by the growing longitudinal dataset

Looking ahead

The finalized IFSO/Bristol dataset has been published and is now publicly accessible. Supporting documentation, including consent forms, data-sharing agreements, and ethics templates, is available to assist new registries in their development. Training and outreach initiatives will continue, and the Registry Committee plans to provide more tailored feedback to contributors and IFSO Chapters based on the Global Report.

Preliminary efforts are also underway to create an online dashboard that leverages data from the Global Reports. The Registry Committee remains committed to engaging existing national registries in global reporting and will continue to invite their participation. IFSO member states without a national registry will be approached to assess interest in developing one. Where interest exists, IFSO will offer support in establishing new registries, or help to identify and foster such needs.

Acknowledgments and thanks

We express our sincere gratitude to all contributors, registry leaders, the IFSO leadership, and Manuela Mazzarella for their continued trust and support. Special thanks also go to Meaghan Thomson of Owl Graphic Design and Robin Thompson of Monash University for their efforts in collating and presenting data from across the globe. Most importantly, we acknowledge the patients whose data underpin this global initiative. The Registry is well positioned to fulfill its mission of delivering the most accurate descriptive data on metabolic and bariatric surgery worldwide

On behalf of the IFSO Registry Committee,
Ronald Liem
Chair

Data Collection and Collation Process

A word about the data included

The data items presented in this ninth report build upon the foundation laid in the seventh and eight editions. They were selected to capture the demographics of individuals with obesity undergoing metabolic bariatric procedures, the types of procedures performed, and indicators of perioperative safety. By collecting these items across national and regional registries, the report highlights both similarities and differences across the IFSO Federation. The data dictionary is available in Appendix 3, and Appendix 4 outlines the specific definitions used by each registry, especially for comorbidities.

As all participating registries are well established and use their own definitions, full alignment with the common data dictionary was not feasible. Where notable differences in data definitions exist between countries or regions, these are described within the main body of the report. Furthermore, not all registries collected every selected data item; when a particular item was absent, that registry's data was excluded from the relevant outcome sections (not reported (NR).

Process for collecting data from national and regional registries

In this ninth edition, several registries have returned, including China, Taiwan, Italy, Spain, Bolivia, and Michigan, USA. In addition, new countries have joined the Global Registry: India, Singapore, Thailand, Germany, Ireland, Kazakhstan, Romania, Switzerland, Colombia, El Salvador, Iraq, and Lebanon. Their inclusion is met with great appreciation, and this edition features the highest number of participating countries since the introduction of the new reporting methodology. All known metabolic and bariatric surgical registries were invited to contribute to this report by the IFSO Secretariat, under the leadership of Manuela Mazzarella. Of the 44 known registries, 39 agreed to participate. It is hoped that these countries will continue their engagement with the Global Registry and that future editions will welcome both new registries and the return of previous participants.

The submitted data pertains to the registration year 2023 for all registries, with the exception of the United States. Due to the size of the U.S. registry, it is not feasible to process the data for the registration year in time to meet the submission deadline for the global registry. Therefore, the data for the United States presented in this report reflects the registration year 2022. This was also the case in the previous two editions before the 9th report, where the United States consistently lagged one year behind.

The Australia and New Zealand Bariatric Surgery Registry (ANZBSR) team updated the data dictionary and managed a REDCap™ database to collect data from participating registries. This system is securely hosted at Monash University in Melbourne, Australia.

Most registries submitted their data directly via the REDCap™ platform. In some instances, data was submitted through Excel™ spreadsheets and manually entered REDCap™ by the ANZBSR team. All data were reviewed for completeness, and the final report was compiled by the Global Registry Committee, chaired by Ronald Liem. Before finalization, all graphs were circulated to the IFSO Global Registry Committee for confirmation of data accuracy.

Reporting

Meaghan Thomson of Owl Graphic Design, Australia, was responsible for formatting the report. Database management and graphs were provided by Robin Thompson, Database Business Analyst at Monash University, Australia. The descriptive text was contributed by Ronald Liem, Wendy Brown, and Ricardo Cohen, with editorial support from Manuela Mazzarella.

Acknowledgments and thanks

The collection and collation of data for this report would not have been possible without the essential support of the Australian and New Zealand Bariatric Surgery Registry (ANZBSR). Jennifer Holland (Executive Officer), Jenifer Cottrell (Operations Manager), Angus Campbell (Data Services Manager), Robin Thompson (Database Business Analyst), and Dianne Brown (Consultant) made substantial contributions through the development of the data dictionary, establishment of data definitions, and construction of the Redcap™ database.

Sara Maria Sprinkhuizen, from the Data Vision Lab, introduced a novel approach to data visualization in the 7th report, which has since been further refined in the 8th and now the 9th report. For this current edition, Robin Thompson was responsible for the collection, collation, and cleaning of aggregated data from both national and regional registries. His considerable effort is gratefully acknowledged.

We are also indebted to Meaghan Thomson for her continued contributions in producing high-quality visual representations for the report.

Finally, special thanks are due to Manuela Mazzarella, whose pivotal role in engaging registries worldwide, supporting the Global Registry Committee, and advocating for the importance of the global registry has been fundamental. Her unwavering commitment and encouragement have been instrumental to this work, and the present report could not have been realized without her efforts.

Contributors to the Ninth Report

The International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) is a global organization that comprises 72 official national societies in 2023 representing metabolic and bariatric surgeons as well as integrated health professionals. Since its establishment in 1995, IFSO has been committed to unifying the international scientific, clinical, and multidisciplinary health communities. Its overarching goals are the dissemination of knowledge, promotion of collaboration, and the development of universal standards of care for individuals living with adiposity-based chronic disease.

A central initiative supporting this mission is the IFSO Global Registry. By collecting and analyzing data from national and regional registries, the Global Registry offers a comprehensive view of caseloads, procedural uptake, and outcomes of metabolic and bariatric surgery across the globe. These data-driven insights are instrumental in identifying disparities in care access and underpin evidence-based advocacy efforts aimed at enhancing healthcare delivery and ensuring equitable access to treatment.

The registry operates using aggregated, pre-analyzed data supplied by participating national and regional registries. This methodological shift away from individual-level data addresses growing concerns regarding data protection and privacy regulations (e.g., GDPR), while also aligning with the operational constraints and preferences of many large contributors, who are better positioned to share summary statistics within their respective legal contexts. The continued increase in both procedural volume and contributing entities reflects a strong positive trend in participation and data quality. However, case ascertainment remains variable across contributors.

Over the past three editions, national and regional registries have contributed to the Global Reports in varying compositions. In the 7th edition, 27 registries participated. This number slightly declined to 24 in the 8th edition but has increased significantly in the current 9th edition, with contributions from 39 registries. We are pleased to welcome 12 new registries in this edition. Additionally, five registries have resumed participation after a period of absence, while three registries were unable to contribute this time. Looking ahead, we aspire for full participation from all 44 registries in the upcoming 10th edition of the Global Registry. In the meantime, the Registry Committee will continue to support IFSO member states that have not yet implemented a registry in establishing one and contribute to this initiative. For a comprehensive overview of the participating Member States and regional registries, please refer to Appendix 2. Over time, longitudinal comparison will enable identification of practice trends and outcome evolution across diverse health systems.

Data standardization and definitions

A consistent data dictionary (Appendix 3) is used in the report. Despite ongoing harmonization efforts, slight variations in national definitions persist; these are explicitly noted in the main text and in Appendix 4, particularly in relation to comorbidities. Achieving fully standardized reporting remains a key objective for future iterations of the registry.

Future directions

The IFSO Registry Committee remains committed to engaging all 72 member societies, though it recognizes that a significant part still lack a functioning national registry.

To help address these gaps, IFSO, in partnership with Bristol University, has developed a minimum dataset, a standardized data dictionary, and a comprehensive registry toolkit. This toolkit, supported by mentorship and guidance in navigating jurisdictional challenges, aims to equip member societies to establish and sustain effective national registries.

By making registry activity a core function of every member society, IFSO seeks to enhance the quality, comparability, and global impact of its data, ultimately advancing care for people affected by obesity and metabolic disorders worldwide.

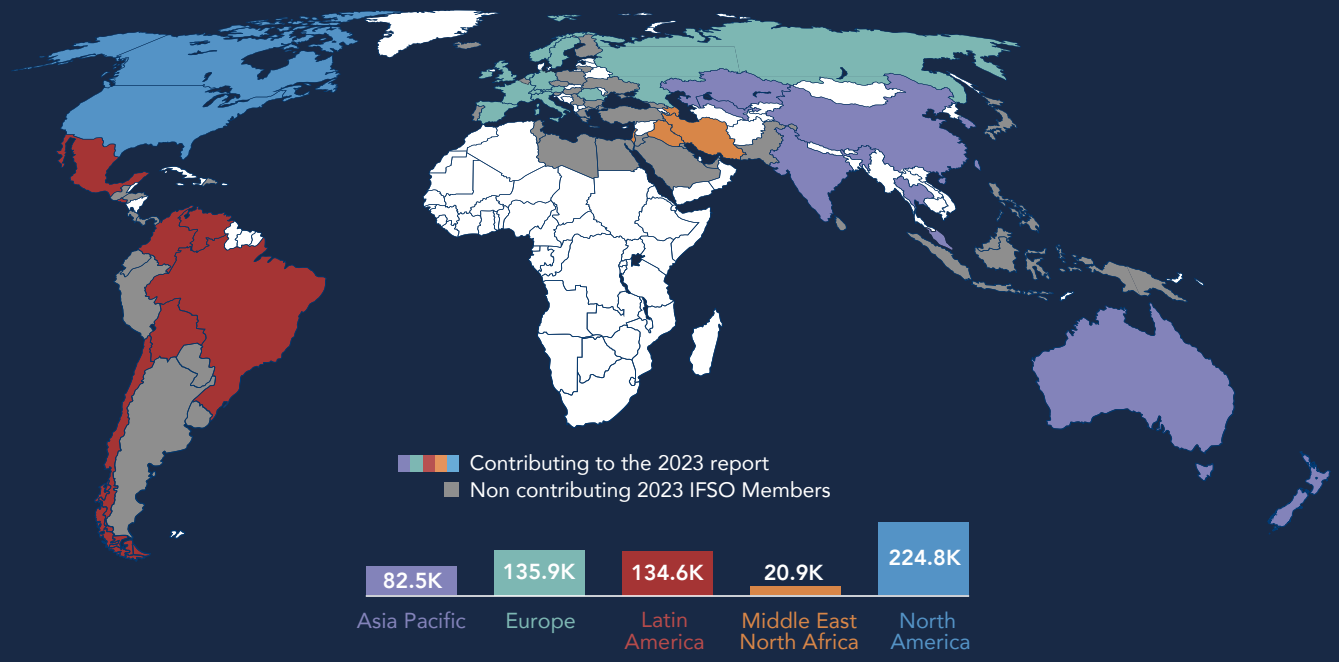
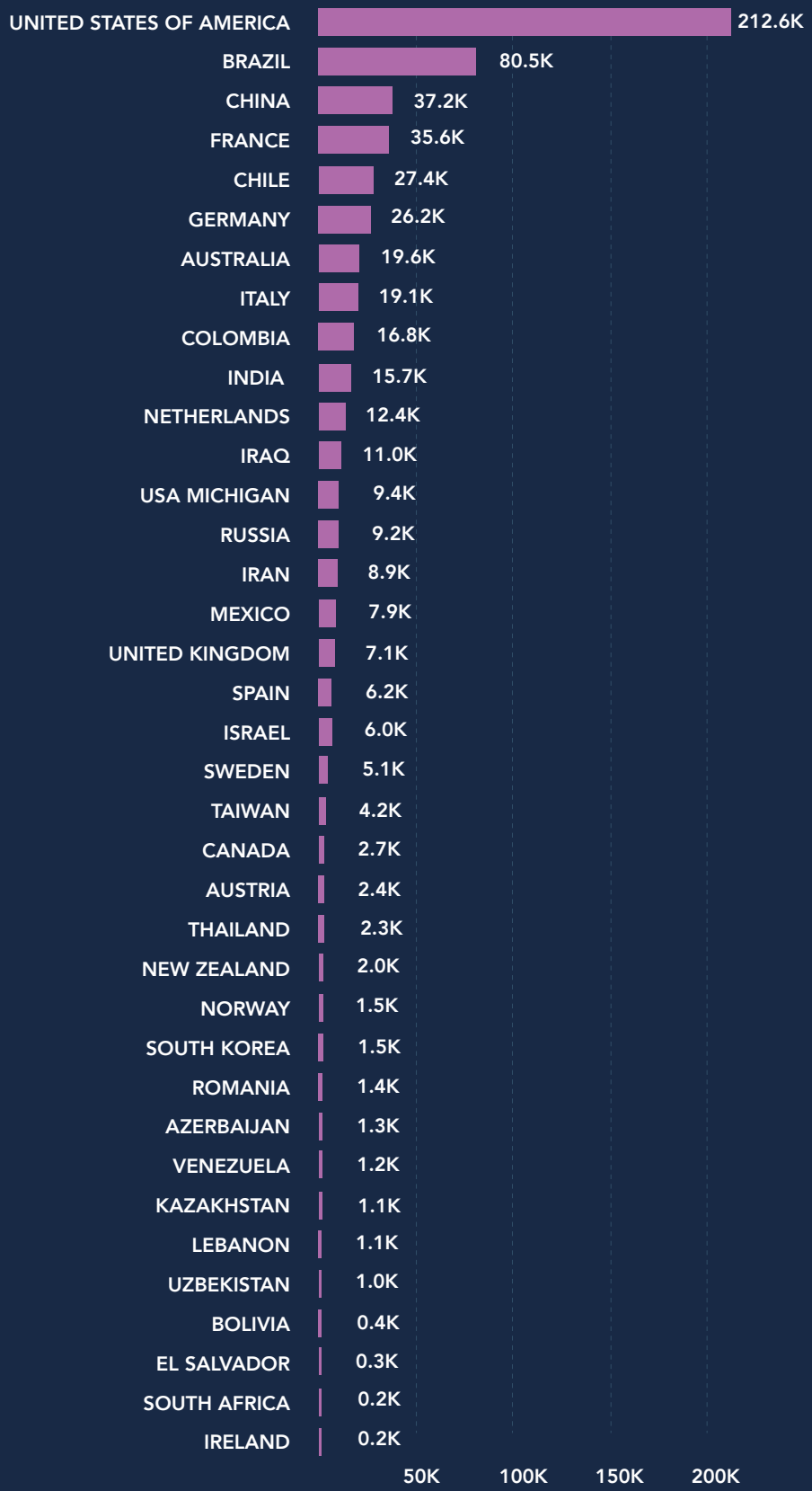


FIGURE 1. Geographic distribution of contributors to the 9th IFSO global registry report and total procedure count by IFSO chapter (2023)

Australia	Australian & New Zealand Obesity Surgery Society (ANZMOSS)
China	Society for Metabolic & Bariatric Surgery (CSMBS)
India	Obesity Surgery Society of India (OSSI)
New Zealand	Obesity Surgery Society of Australia and New Zealand (ANZMOSS)
Singapore	Obesity and Metabolic Surgery Society of Singapore (OMSSS)
South Korea	Korean Society for Metabolic and Bariatric Surgery
Taiwan	Taiwan Society for Metabolic and Bariatric Surgery (TSMBS)
Thailand	Thai Society for Metabolic & Bariatric Surgery (TSMBS)
Austria	Österreichische Gesellschaft für Adipositas- und metabolische Chirurgie
France	Société Française et Francophone de Chirurgie de l'Obésité et des Maladies Metaboliques (SOFFCOMM)
Germany	Surgical Working Group of Obesity Therapy (CA-ADIP)
Ireland	Royal College of Surgeons in Ireland
Israel	Israeli Society for Metabolic and Bariatric Surgery (ISMBS)
Italy	Società Italiana di Chirurgia dell'Obesità e delle malattie metaboliche (SICOB)
Kazakhstan	Society of Bariatric and Metabolic Surgeons of Kazakhstan (SBMSK)
Netherlands	Dutch Society for Metabolic and Bariatric Surgery (DSMBS)
Norway	Norwegian Society for the Surgery of Obesity
Romania	Romanian Society for Metabolic Surgery (RSMS)
Russia	Society of Bariatric Surgeons of Russia (SBSR)
Spain	Sociedad Española de Cirugia de la Obesibad (SECO)
Sweden	Swedish Association for Bariatric Surgery (SABS)
Switzerland	Swiss Society for the Study of Morbid Obesity and Metabolic Disorders (SMOB)
United Kingdom	British Obesity Metabolic Surgery Society (BOMSS)
	Association of bariatric and metabolic surgeons of Uzbekistan
Bolivia	Sociedad Boliviana de Cirugia Comite Cirugia Bariatrica Y Metabolica (SBCCCM)
Brazil	Sociedade Brasileira de Cirurgia Bariátrica e Metabólica (SBCBM)
Chile	Departamento de Cirugia Bariatrica Y Metabolica Sociedad de Cirujanos de Chile (DCBM)
Colombia	Asociación Colombiana de Obesidad y Cirugía Bariátrica (ACOCIB)
El Salvador	Asociacion de cirugia endoscopica de El Salvador (ACEDES)
Mexico	Colegio Mexicano de Cirugía para la Obesidad y enfermedades metabólicas
Venezuela	Venezuelan Society Of Obesity Surgery
Azerbaijan	Azerbaijan Bariatric and Metabolic Surgery Association (ABMSA)
Iran	Iranian Society Metabolic and Bariatric Surgery (IRSMBS)
Iraq	Iraqi Society for Metabolic and Bariatric Surgery (IQSMBS)
Lebanon	Lebanese Group for Bariatric Surgery
Canada	Canadian Association of Bariatric and Physicians and Surgeons (CABPS)
USA	American Society for Metabolic and Bariatric Surgery (ASMBS)

Figure 2. Total procedures by country, n=598,736* (2023)

*As reported by each country - total counts may differ from operative type and approach breakdowns due to reporting differences between countries.



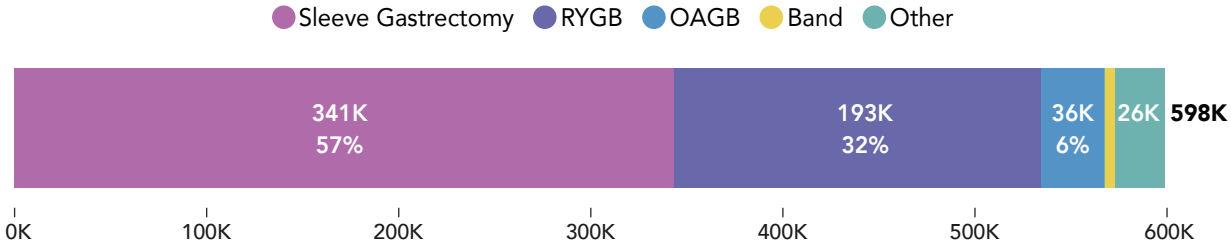
Procedures & Operative Approach

During the current reporting period, 593,500 metabolic bariatric procedures were documented across participating registries. It should be noted that overlap between registries, such as the Michigan, USA Registry and USA (MBSAQIP) Registry, may result in minor data duplication, potentially affecting the reported totals for the United States. While Ontario is a regional registry, it currently represents Canada, which lacks a national bariatric surgery registry.

Procedure trends

Sleeve Gastrectomy (SG) continues to be the most performed metabolic bariatric procedure worldwide, followed by Roux-en-Y Gastric Bypass (RYGB) and One Anastomosis Gastric Bypass (OAGB). Procedures categorized as "other" are not increasing in frequency and include Single Anastomosis Duodeno-Ileal Bypass with Sleeve Gastrectomy (SADI-S), Biliopancreatic Diversion (BPD), Adjustable Gastric Banding (AGB), Single Anastomosis Sleeve Ileal Bypass (SASI), Transit Bipartition, and endoscopic interventions. Given the slowly growing relevance of these techniques, future editions of this report aim to provide separate, more detailed analyses of these emerging procedures.

Figure 3. Total procedures by operative type, n=598,137 (2023)



Primary procedures

Primary procedures—defined as the initial metabolic bariatric surgery an individual undergoes—accounted for 543,000 interventions. SG remains the predominant choice in nearly all reporting countries. However, procedures categorized as "other" are gaining traction in specific regions, reflecting an evolving treatment landscape. Differentiating and consistently reporting these newer techniques within registry datasets will be essential for accurate monitoring and evaluation.

Revisional procedures

A total of 50,500 revisional procedures were reported, comprising 8.5% of all recorded interventions. These include conversional procedures (in which one surgical type is changed to another due to weight recurrence, adverse events, or recurrence of metabolic disease) and corrective procedures (e.g., internal hernia repair or stricture dilation). Reported rates vary considerably by country, ranging from 1% in China and Thailand to 29% in Colombia, reflecting differences in initial procedural preferences, expertise, follow-up protocols, and potentially the impact of medical tourism. Not all registries reported on revisional procedures (Brazil, South Africa).

RYGB is the most frequently performed revisional procedure, accounting for 58% of such cases, whereas SG constitutes fewer than 20%. Notably, not all registries record the indications for revision, limiting the ability to assess long-term treatment trajectories. Ongoing efforts are focused on enhancing data completeness to better capture patient outcomes over extended periods of care.

Table 1. Primary and revisional procedures by country (2023)

	PRIMARY (All)	PRIMARY %	REVISION (All)	REVISION %
AUSTRALIA	15985	81.6%	3614	18.4%
AUSTRIA	2040	86.8%	310	13.2%
AZERBAIJAN	1265	97.5%	32	2.5%
BOLIVIA	426	96.2%	17	3.8%
BRAZIL	80524	100.0%	NR	
CANADA	2661	96.9%	84	3.1%
CHILE	26952	98.3%	471	1.7%
CHINA	36864	99.0%	385	1.0%
COLOMBIA	12002	71.3%	4830	28.7%
EL SALVADOR	258	96.6%	9	3.4%
FRANCE	30939	86.9%	4671	13.1%
GERMANY	23167	88.5%	3025	11.5%
INDIA	14860	94.4%	885	5.6%
IRAN	8687	98.1%	165	1.9%
IRAQ	10530	96.0%	440	4.0%
IRELAND	146	94.2%	9	5.8%
ISRAEL	4986	83.6%	975	16.4%
ITALY	17268	90.6%	1798	9.4%
KAZAKHSTAN	1113	97.8%	25	2.2%
LEBANON	951	86.5%	148	13.5%
MEXICO	7079	90.0%	787	10.0%
NETHERLANDS	11175	90.2%	1213	9.8%
NEW ZEALAND	1866	94.4%	110	5.6%
NORWAY	1457	94.1%	92	5.9%
ROMANIA	1351	94.9%	73	5.1%
RUSSIA	8882	96.4%	333	3.6%
SINGAPORE	690	96.0%	29	4.0%
SOUTH AFRICA	169	100.0%	NR	
SOUTH KOREA	1464	97.8%	33	2.2%
SPAIN	5607	90.7%	578	9.3%
SWEDEN	4824	93.7%	324	6.3%
SWITZERLAND	3840	85.1%	675	14.9%
TAIWAN	3903	93.1%	289	6.9%
THAILAND	2241	99.2%	19	0.8%
UNITED KINGDOM	6559	92.7%	518	7.3%
UNITED STATES OF AMERICA	191416	90.0%	21209	10.0%
USA MICHIGAN	8441	89.4%	1005	10.6%
UZBEKISTAN	956	98.4%	16	16%
VENEZUELA	1135	92.3%	95	7.7%

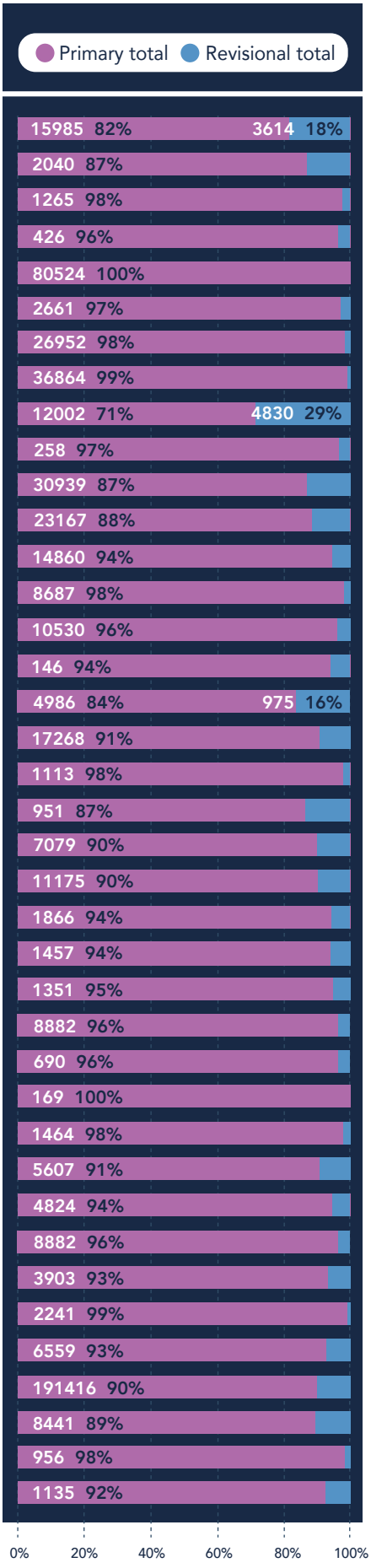


Figure 4. Total primary procedures by operative type, n=547,959 (2023)

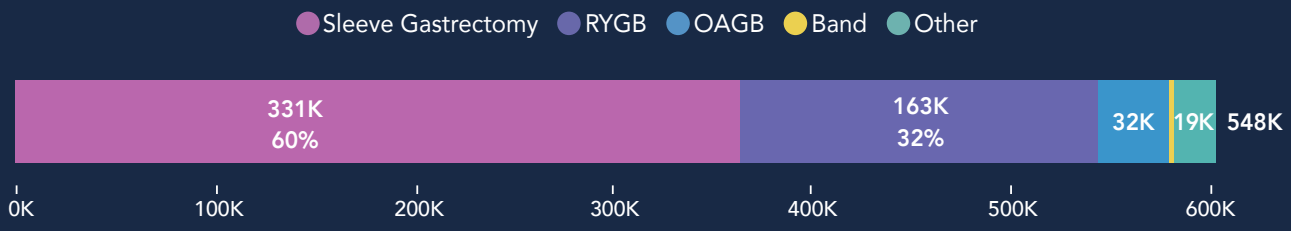


Figure 5. Primary procedure count and operative type breakdown by country (2023)

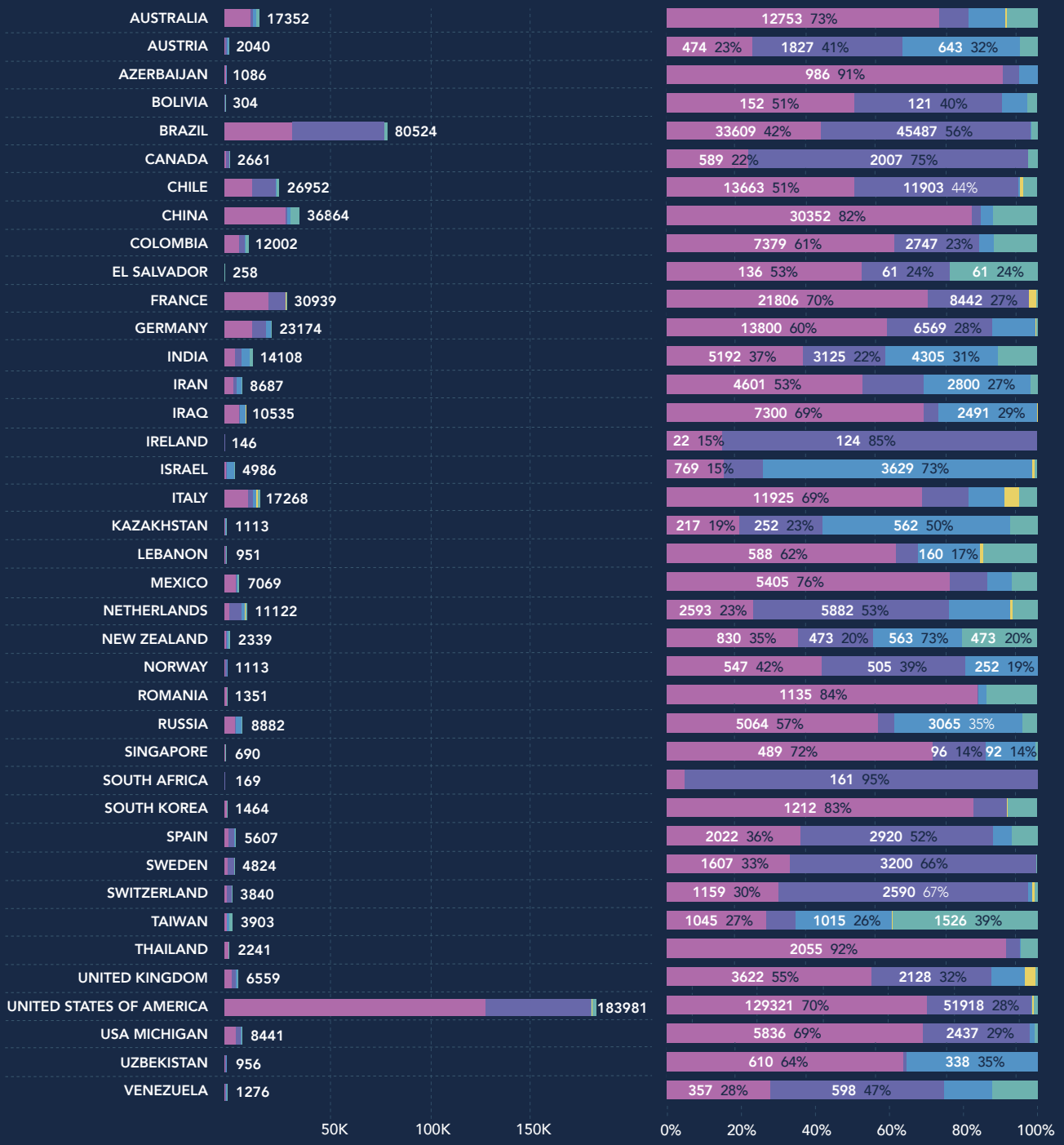


Figure 6. Total revisional procedures by operative type, n=50,100 (2023)

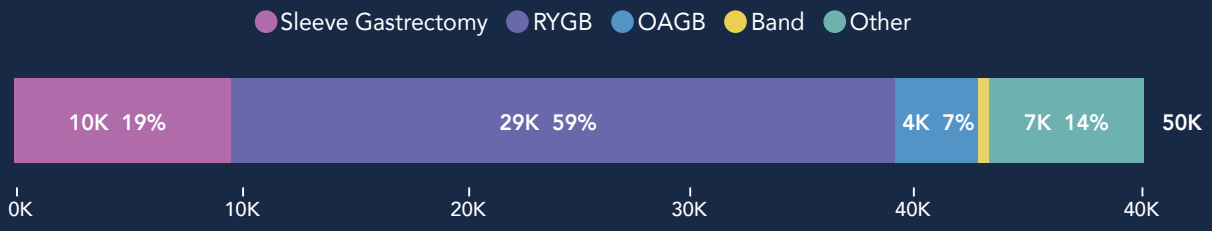


Figure 7. Revisional procedure count and operative type breakdown by country (2023)

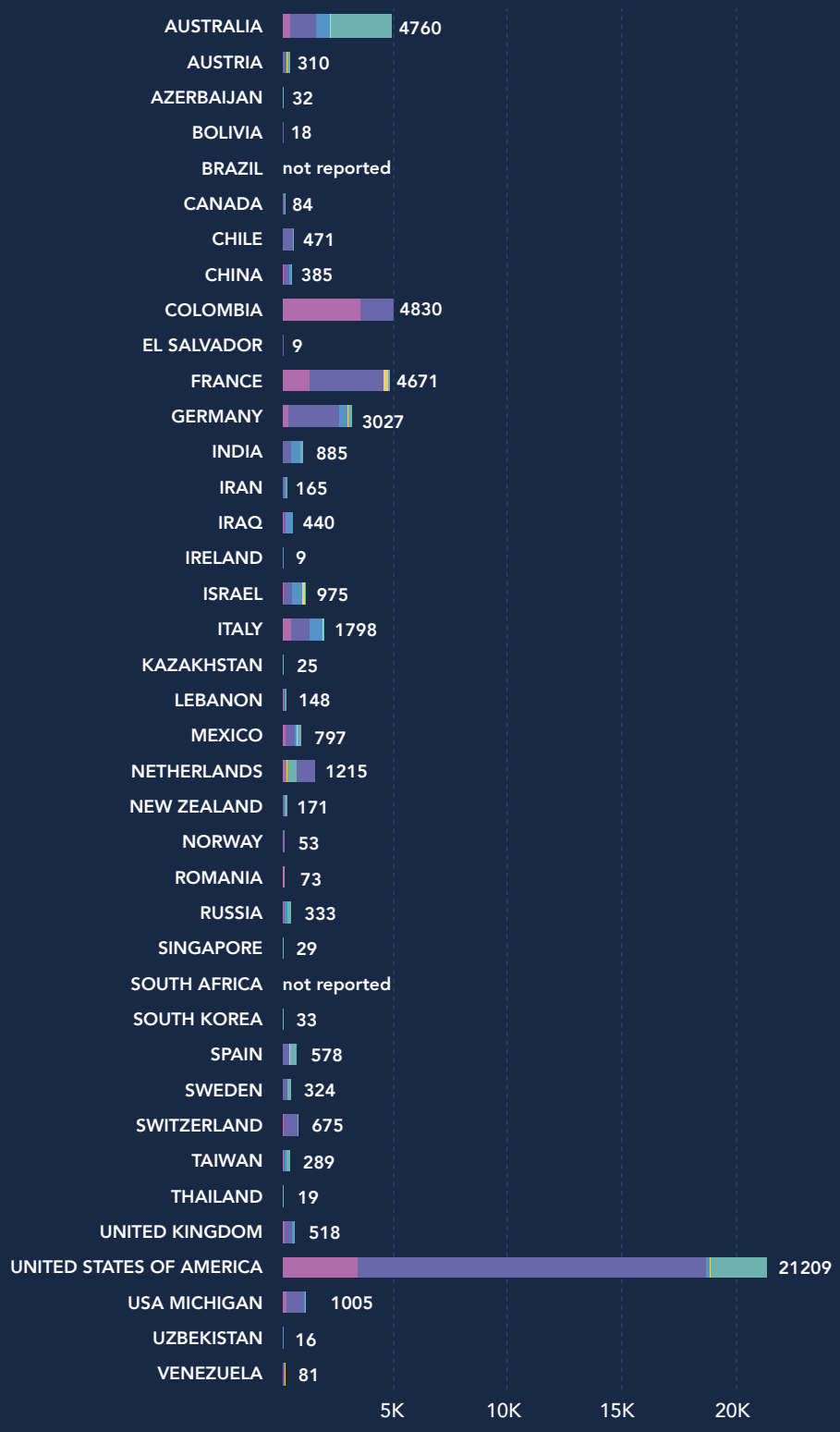
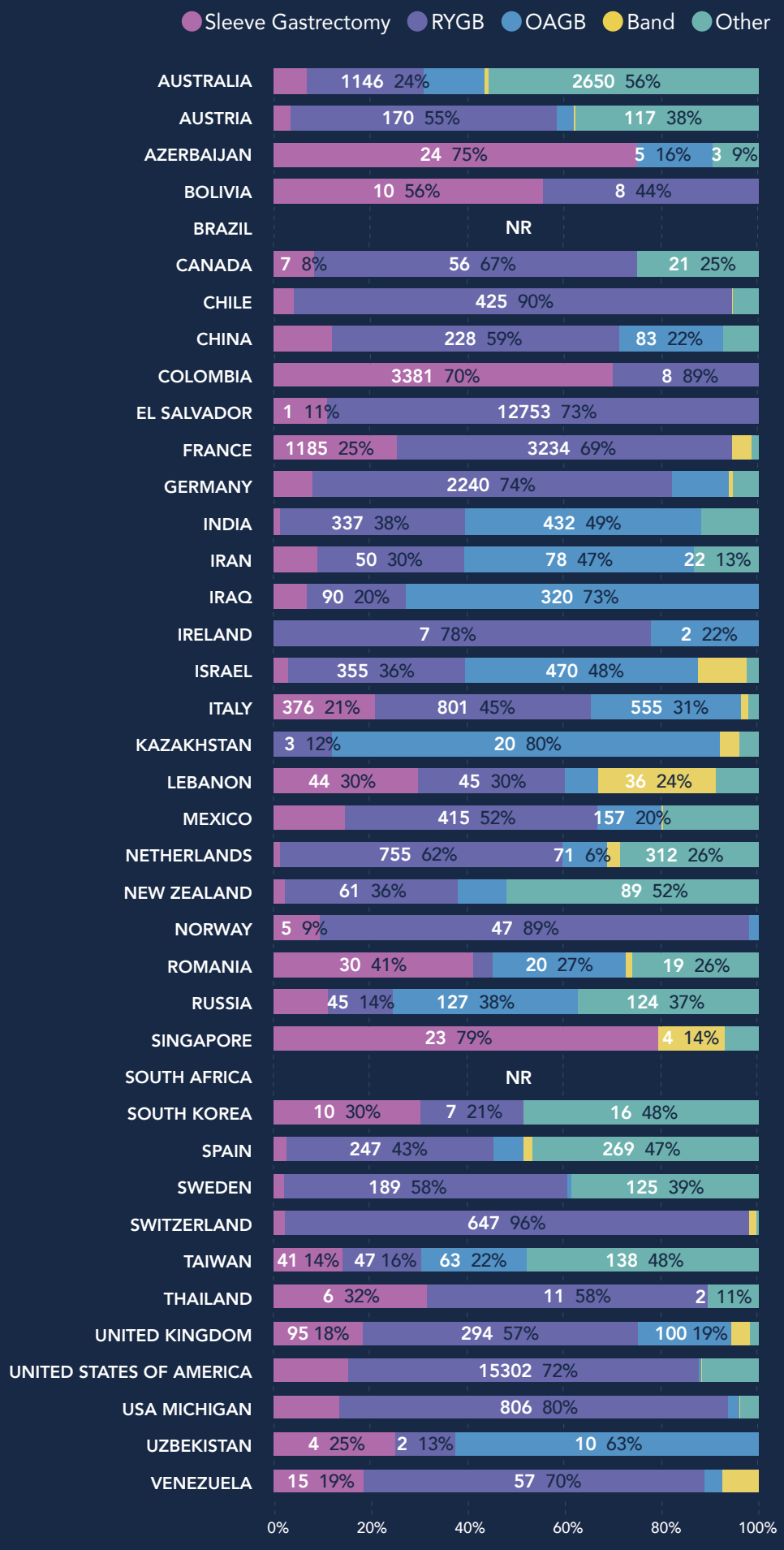


Figure 8. Revisional procedure count and operative type breakdown by country (2023)



Operative Approach

Most procedures continue to be performed laparoscopically. In contrast, revisional surgeries show a higher incidence of open or robot-assisted approaches, underscoring their increased technical complexity. Some registries did not report data on operative approach, and innovative techniques, such as robotic or endoscopic methods, may be underrepresented, particularly in non-traditional surgical settings. Standardized and detailed reporting of operative methods will be essential to track the adoption and outcomes of emerging technologies in future reports.

Figure 9. Total procedure count by operative approach, primary and revisional, n = 515,526 (2023)

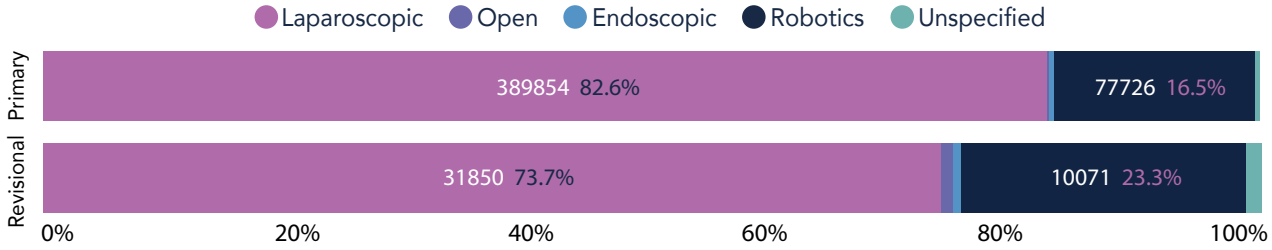


Table 2. Primary and revisional operative approach by country (2023)

	Primary Procedures							Revisional Procedures						
	Lap	Open	Endo	Robotic	Unsp	Lap Rate	Robot Rate	Lap	Open	Endo	Robotic	Unsp	Lap Rate	Robot Rate
AUSTRALIA	15886	3	2	90	5	99.4%	0.6%	3433	23	127	34	8	95.0%	0.9%
AUSTRIA	1966	6	11	57	0	96.4%	2.8%	295	12	1	2	0	95.2%	0.6%
BOLIVIA	426	0	0	0	0	100.0%	0.0%	17	0	0	0	0	100.0%	0.0%
CANADA	2645	13	0	0	0	99.4%	0.0%	82	2	0	0	0	97.6%	0.0%
CHILE	26936	0	0	16	0	99.9%	0.1%	471	0	0	0	0	100.0%	0.0%
CHINA	36560	0	21	283	0	99.2%	0.8%	354	9	12	10	0	91.9%	2.6%
COLOMBIA	16833	21	0	0	0	99.9%	0.1%	NR	NR	NR	NR	NR	NR	NR
EL SALVADOR	202	0	56	0	0	78.3%	0.0%	9	0	0	0	0	100.0%	0.0%
FRANCE	28816	83	0	2040	0	93.1%	6.6%	4169	78	0	424	0	89.3%	9.1%
GERMANY	22252	33	0	605	5	96.1%	2.6%	2865	26	0	76	4	94.7%	2.5%
INDIA	13490	3	752	615	0	90.8%	4.1%	741	0	84	60	0	89.3%	6.8%
IRAN	8674	13	0	0	0	99.9%	0.0%	165	0	0	0	0	100.0%	0.0%
IRAQ	10530	0	0	0	0	100.0%	0.0%	425	15	0	0	0	96.6%	0.0%
IRELAND	146	0	0	0	0	100.0%	0.0%	9	0	0	0	0	100.0%	0.0%
ISRAEL	4986	0	0	0	0	100.0%	0.0%	972	3	0	0	0	99.7%	0.0%
ITALY	15511	5	0	114	1638	89.8%	0.7%	1160	17	10	95	516	64.5%	5.3%
KAZAKHSTAN	1110	3	0	0	0	99.7%	0.0%	25	0	0	0	0	100.0%	0.0%
LEBANON	310	0	0	0	62	32.6%	0.0%	24	3	0	0	5	16.2%	0.0%
MEXICO	6758	1	300	15	0	95.5%	0.2%	738	8	36	10	0	93.85	1.3%
NETHERLANDS	10977	0	2	0	196	98.2%	0.0%	1170	9	1	0	33	96.5%	0.0%
NEW ZEALAND	1866	0	0	0	0	100.0%	0.0%	110	0	0	0	NR	100.0%	0.0%
NORWAY	1457	0	0	0	0	100.0%	0.0%	90	1	1	0	0	97.8%	0.0%
ROMANIA	1349	0	0	2	0	99.9%	0.1%	69	0	0	4	0	94.5%	5.5%
RUSSIA	8844	26	3	0	0	99.6%	0.0%	301	28	2	0	0	90.4%	0.0%
SINGAPORE	680	0	111	6	0	99.2%	0.8%	29	0	0	0	0	100.0%	0.0%
SOUTH AFRICA	168	1	0	0	0	99.4%	0.0%	NR	NR	NR	NR	NR	NR	NR
SOUTH KOREA	1432	2	0	0	30	97.8%	0.0%	32	1	0	0	0	97.0%	0.0%
SPAIN	4845	12	0	750	0	96.4%	13.4%	426	16	0	136	0	73.7%	23.5%
SWEDEN	4817	5	0	0	2	99.9%	0.0%	316	8	0	0	0	97.5%	0.0%
TAIWAN	3903	0	69	113	0	100.0%	2.9%	NR	NR	NR	NR	NR	NR	NR
THAILAND	2200	0	6	35	0	98.2%	1.6%	13	0	5	1	0	68.4%	5.3%
UNITED KINGDOM	6455	9	22	72	1	98.4%	1.1%	500	5	4	9	0	96.5%	1.7%
UNITED STATES OF AMERICA	220897	186	873	69460	0	63.2%	36.3%	12215	120	32	8842	0	57.6%	41.7%
USA MICHIGAN	4971	17	0	3453	0	58.9%	40.9%	609	13	0	368	0	60.6%	36.6%
UZBEKISTAN	956	0	0	0	0	100.00%	0.0%	16	0	0	0	0	100.00%	0.0%

Demographics

Sex

For the purposes of this report, participant sex is defined based on biological characteristics, including chromosomes, hormones, and reproductive organs, as recorded at the time of undergoing a metabolic bariatric procedure. Data on sex were available from 34 registries. Across all contributing registries, a higher number of females than males underwent both primary and revisional metabolic bariatric procedures. Information on individuals outside the binary male and female categories was limited.

Figure 10. Total procedure count by sex, primary and revisional, n = 598,736 (2023)

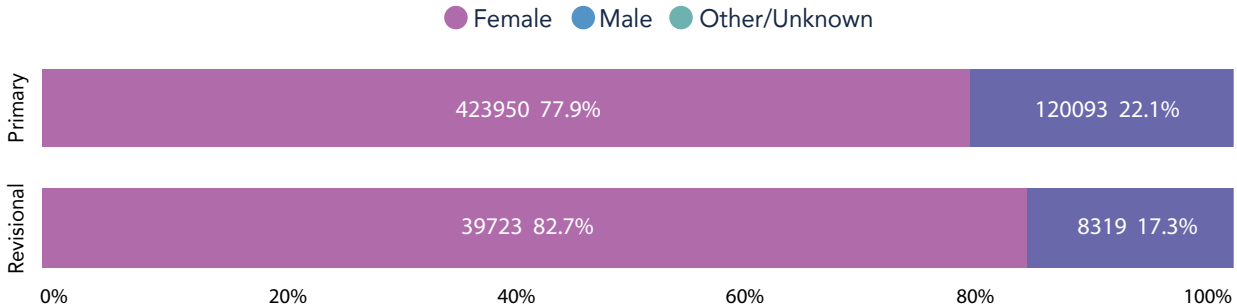
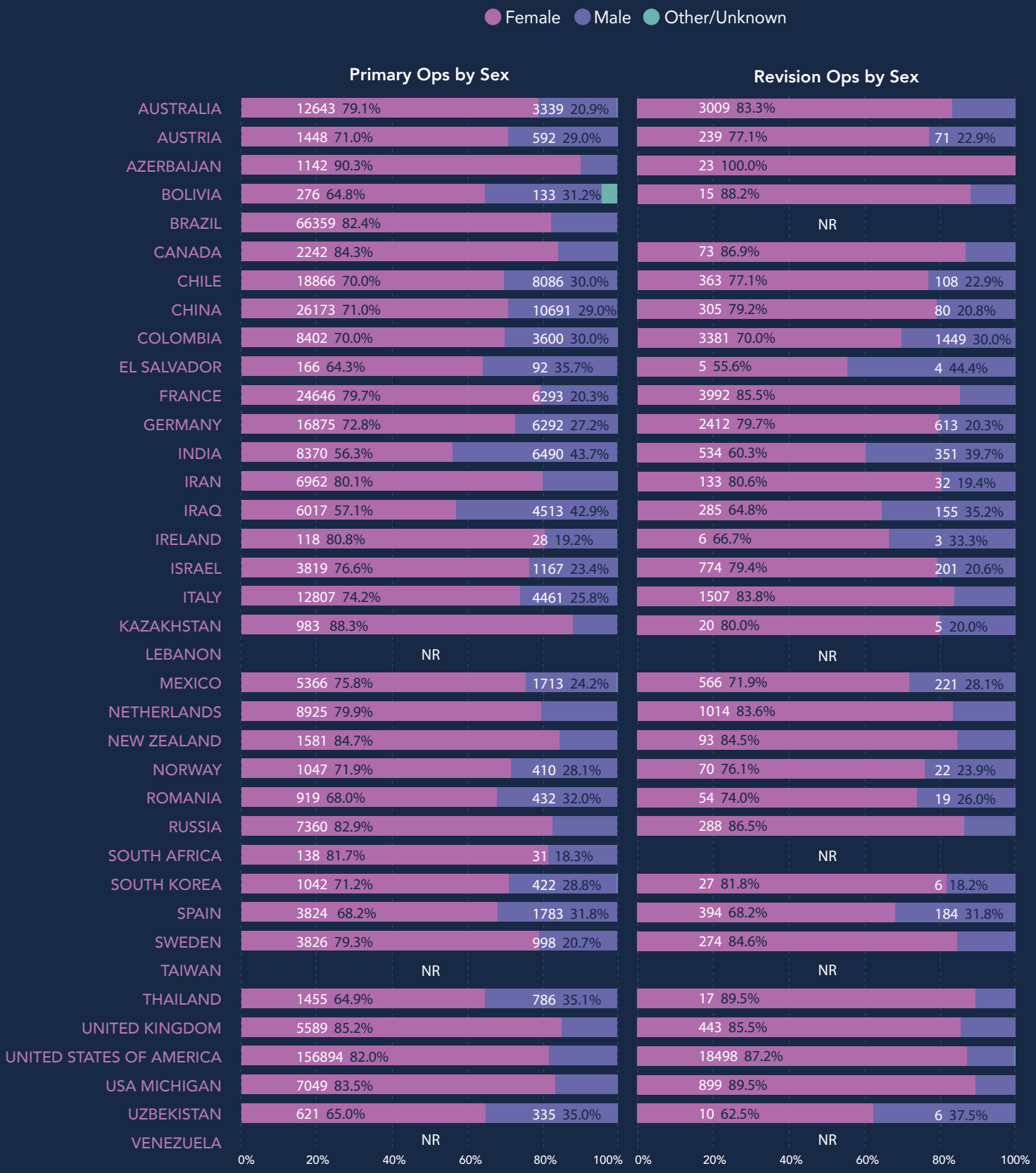


Figure 11. Procedure count by country and sex, primary and revisional (2023)



Age

The median age at the time of surgery ranged from 32 to 49 years across countries. The youngest median age was reported in China, while the oldest was observed in Spain. Notable differences in median age were evident across the IFSO chapters, with particularly lower median ages in the MENAC and APC chapters. The EC chapter demonstrated the widest age variability, also including the oldest patients undergoing surgery. As expected, the median age for revisional procedures (38.0–50.0 years) was higher than that for primary procedures (32.0–45.4 years).

Table 3. Median age at time of surgery by country, all procedures (2023)

	MEDIAN	LOWER IQR	UPPER IQR
AUSTRALIA	43	34	52
AUSTRIA	41	32	51
BOLIVIA	39.24	12	70
BRAZIL	42	NR	NR
CANADA	44.18	35.67	51.87
CHINA	32	25	37
EL SALVADOR	38	30	47
FRANCE	40	31	49
GERMANY	43	34	53
INDIA	41	13	74.5
IRAN	37	30	45
IRELAND	45.53	39.06	52.49
ISRAEL	36.71	27.32	47.07
ITALY	45	35	52
KAZAKHSTAN	39.5	28	52
MEXICO	39.2	24	46
NETHERLANDS	44	34	54
NEW ZEALAND	45	36	53
NORWAY	42.3	32.4	51.2
ROMANIA	41	31	50
RUSSIA	40.4	33.9	48.2
SOUTH AFRICA	40	0	0
SOUTH KOREA	37	30	44
SPAIN	48.58	46.05	49.26
SWEDEN	41	33	51
THAILAND	38.85	27.52	49.89
UNITED KINGDOM	43.71	35.35	53.02
UNITED STATES OF AMERICA	43	35	52
USA MICHIGAN	43.9	35.31	52.82
UZBEKISTAN	40.4	36.5	44.3

Table 4. Median age by sex and country, primary procedures (2023)

	FEMALE			MALE			ALL		
	Median	Lower IQR	Upper IQR	Median	Lower IQR	Upper IQR	Median	Lower IQR	Upper IQR
AUSTRALIA	41	33	50	43	35	52	41	33	50
AUSTRIA	40	30	49	41	32	51	40	30.75	50
BOLIVIA	38.17	12	58	41.22	19	70	39.16	12	70
CANADA	43.59	35.25	51.12	47.83	37.75	53.99	44.06	35.56	51.75
CHILE	38.2	30.4	45.9	37.9	30.7	45.1	38.1	30.5	45.7
CHINA	33	26	38	32	23	36	32	25.3	36.8
EL SALVADOR	37	29	46	41	32	47	38	30	46.25
FRANCE	38	30	48	41	32	51	39	31	49
GERMANY	41	33	51	44	35	54	42	34	52
INDIA	41	12	73	40	14	76	40.5	13	74.5
IRAN	38	30	45	37	30	43	37	30	45
IRAQ	29	NR	NR	31	NR	NR	NR	NR	NR
IRELAND	44.71	38.91	52.46	47.91	41.18	53.28	45.39	39.1	52.54
ISRAEL	34.02	25.8	44.13	37.03	26.99	46.63	34.7	25.97	44.75
ITALY	44	34	52	36	45	52	44	34	52
KAZAKHSTAN	39	31	53	37	25	50	38.5	27	51
MEXICO	37	30	46	40	30	46	38.5	30	45.8
NETHERLANDS	42	32	53	48	37	56	43	33	53
NEW ZEALAND	44	35	52	47	38	53	44	36	52
NORWAY	40.1	31.4	50.1	45.2	34.3	53.4	41.9	32.1	50.9
ROMANIA	41	31	50	41	31	50	41	31	50
RUSSIA	39.9	33.6	47.6	42	35	49.5	40.2	33.8	47.9
SOUTH AFRICA	40	34	50	42.5	26	49.5	40	34	50
SOUTH KOREA	38	30	45	35	29	43	37	30	44
SWEDEN	40	32	50	44	35	53	41	33	50
THAILAND	36.86	26.74	48.22	40.82	32.78	49.67	37.4	28.82	48.2
UNITED KINGDOM	42.8	34.76	52.24	46.54	37.3	55.02	43.31	35.05	52.66
UNITED STATES OF AMERICA	42	34	51	45	36	53	42	34	52
USA MICHIGAN	42.57	34.19	52	46.12	37.7	53.8	43.2	34.69	52.43
UZBEKISTAN	37.5	33	42	39.5	35	44	38.5	34	43

Table 5. Median age by sex and country, revisional procedures (2023)

	FEMALE			MALE			ALL		
	Median	Lower IQR	Upper IQR	Median	Lower IQR	Upper IQR	Median	Lower IQR	Upper IQR
AUSTRALIA	50	41	58	52	43	60	50	42	58
AUSTRIA	47	40	57	48	36.75	56.25	48	39	57
BOLIVIA	41.8	46.2	51.63	41.8	25	50	41.66	40	45
CANADA	48.26	40.47	53.19	49.83	40.74	53.9	48.51	40.62	53.33
CHINA	42.56	32.45	48.76	43.8	34.56	48.9	44.32	34.68	46.94
EL SALVADOR	48	34	51	40	36	43.25	42	37	49
FRANCE	45	37	52	47	39	55	45	37	53
GERMANY	46	37	54	48	39	56	47	38	55
INDIA	42.5	32	67	56.5	36	69	45.5	34	68
IRAN	42	36	50	39	33	47	42	36	50
IRAQ	36	NR	NR	38	NR	NR	NR	NR	NR
IRELAND	48.34	38.67	54.32	35.38	34.61	52.61	47.72	34.99	51.91
ISRAEL	46.85	38.46	54.63	44.93	38.64	53.21	46.85	38.46	54.63
ITALY	45	32	57	48	39	57	45	32	57
KAZAKHSTAN	42	30	49	45	40.5	50	38	29	45
MEXICO	38	33.5	44	41.7	29	34	39.9	31.5	43.5
NETHERLANDS	50	39	56	53	44	58	50	39	56
NEW ZEALAND	51	43	57	49	41	52	50	43	56
NORWAY	47.5	36.7	53.8	50.4	47.1	57.5	48.7	40.2	54.7
ROMANIA	37	31	50	41	31	50	40	31	50
RUSSIA	45.2	38.3	51.8	47.2	41.4	54.3	45.4	38.7	52.4
SOUTH AFRICA	NR	NR	NR	NR	NR	NR	NR	NR	NR
SOUTH KOREA	40	37.5	50.5	46	38	61.5	40	38	52
SWEDEN	45	37	54	52	43	60	47	38	55
THAILAND	42.2	39.89	49.42	44.32	47.78	52.32	44.28	41.8	50.02
UNITED KINGDOM	49.18	39.83	56.23	49.52	42.75	57.43	49.23	40.24	56.4
UNITED STATES OF AMERICA	48	40	55	50	43	58	48	41	56
USA MICHIGAN	48.2	40.36	55.7	50.09	43.48	61.03	48.34	40.67	56.33
UZBEKISTAN	41.5	38	45	43	40	46	42.3	39	45.5

BMI

The median BMI among surgical patients varied from 36.0 kg/m² in Romania to 47.9 kg/m² in Thailand. Among females, the median BMI ranged from 36.0 kg/m² in Romania to 46.0 kg/m² in both Germany and South Africa. Among males, values ranged from 39.8 kg/m² in South Korea to 49.7 kg/m² in Thailand. Notably, Ireland recorded the highest mean BMI values, at 48.47 kg/m² for females and 50.04 kg/m² for males; however, operative volume in Ireland is low compared with other registries, suggesting a likely selection bias toward operating on the most severe cases. Across IFSO chapters, differences in BMI were relatively modest. The upper bounds of median BMI were broadly comparable, whereas the lower bounds appeared somewhat lower in the European (EC) and Asia–Pacific (APC) chapters compared with the North American (NAC) chapter. Due to insufficient data, meaningful comparisons could not be made for the Latin American (LAC) and Middle East–North Africa (MENAC) chapters.

Table 6. Median pre-surgery BMI by sex and country, primary procedures (2023)

	FEMALE			MALE			ALL		
	Median	Lower IQR	Upper IQR	Median	Lower IQR	Upper IQR	Median	Lower IQR	Upper IQR
AUSTRALIA	41.38	37.37	46.62	43.34	39.29	48.97	41.77	47.06	37.77
AUSTRIA	43.3	40.4	47.5	44.7	41.1	50	43.7	48	40.7
BOLIVIA	39.9	29	60.52	41.31	32	53.17	40.29	60.52	29
CANADA	45.88	42.03	51.33	47.14	42.72	53.01	46.09	51.64	42.13
CHINA	36.8	32.1	41	40.9	35.9	46.1	37.9	42.9	33.1
EL SALVADOR	37	32.98	43	41.3	37.3	44.9	39.3	43.5	34.35
GERMANY	46	42	51	48	43	53	47	52	42
INDIA	42.29	27.6	62.15	42.13	27.7	59.725	42.19	61.49	27.65
IRAN	41	37	44	43	40	46	41	45	38
IRAQ	39	NR	NR	38	NR	NR	38.5	NR	NR
IRELAND	48.47	44.68	54.89	50.04	45.61	54.19	48.8	54.75	44.84
ISRAEL	40.8	38.3	44	42.3	39.2	46.5	41	44.6	38.5
ITALY	41	38	45	43	39	48	42	46	38
KAZAKHSTAN	42.1	34.4	48.1	44.4	36.1	49.2	42.4	48.7	35.3
MEXICO	38	35	44.3	42	36.3	46	40	45	33.3
NETHERLANDS	41.26	38.82	44.71	41.82	38.79	45.71	41.37	44.9	38.82
NEW ZEALAND	42.62	38.62	48	44.82	40.3	50.5	42.91	48.39	38.89
NORWAY	41	37.5	45.4	42.6	39.1	46.3	41.3	45.7	37.9
ROMANIA	36	30	42	36	30	42	36	42	30
RUSSIA	41.3	36.8	46.8	45	39.9	50.6	41.9	47.6	37.2
SOUTH AFRICA	46	41.5	42.65	45.9	52.48	49.69	46	52	41.63
SOUTH KOREA	36.9	33.6	41.5	39.75	35.8	45.175	37.6	42.6	34.15
SPAIN	NR	NR	NR	NR	NR	NR	45.44	46.66	44.31
SWEDEN	40.5	37	44.4	42	38.7	46.1	40.8	44.8	37.3
THAILAND	45.26	42.48	54.02	49.72	42.35	54.77	47.86	54.42	42.4
UNITED KINGDOM	45.54	40.94	51.02	45.78	41.17	52.34	45.57	51.21	40.97
UNITED STATES OF AMERICA	43.5	39.56	48.89	44.93	40.39	51.07	43.74	49.27	39.68
USA MICHIGAN	45.56	41.36	51.32	48.38	43.25	54.27	46	51.91	41.64
UZBEKISTAN	40.3	36.4	44.2	43.2	39.8	46.6	41.8	45.3	38.1

Obesity Related Diseases

Diseases related to obesity and improvement with weight loss

Obesity contributes more significantly to morbidity and diminished well-being than any other chronic disease globally. Weight loss, particularly when achieved through metabolic and bariatric surgery (MBS), remains one of the most effective health-improving interventions available to clinicians. A shift from BMI-based criteria toward condition-specific, person-centered indications may better inform surgical decision-making.

- More than 100 diseases and conditions are known to improve with weight loss. Most national and regional registries report data on key obesity-related conditions, including:
- Type 2 diabetes
- Gastroesophageal reflux disease
- Obstructive sleep apnea
- Dyslipidemia
- Hypertension
- Depression

Definitions and data collection

Definitions of obesity-related diseases vary across registries, complicating international comparisons. For instance, diabetes may be defined based on self-report, clinical diagnosis, treatment status, or laboratory criteria (e.g., HbA1c). The IFSO Global Registry defines diabetes as present when a patient self-identifies as having diabetes or is receiving treatment for diabetes at the time of surgery. A comprehensive list of disease definitions employed by individual registries is provided in Appendix 4.

It is important to recognize that not all registries report on all conditions. Despite heterogeneity in definitions that impedes direct comparison, consistent trends across datasets and registries, particularly at higher levels of data aggregation, offer valuable insights into disease burden and help identify areas for improvement.

While many countries report high prevalence rates for specific conditions (e.g., Canada for obstructive sleep apnea or India for type 2 diabetes), the state of Michigan, USA, consistently reports elevated prevalence across a wide range of comorbidities associated with primary MBS. This pattern likely reflects a registration bias linked to the Michigan registry's robust data verification processes, which are comparable to those in Sweden and the Netherlands.

Conversely, some countries consistently report low prevalence rates for most comorbidities analyzed. This may indicate a registration bias due to systematic underreporting. Both phenomena highlight the critical need for reliable and well-validated data to accurately assess the burden of obesity-related disease in candidates for metabolic and bariatric surgery.

Key conditions

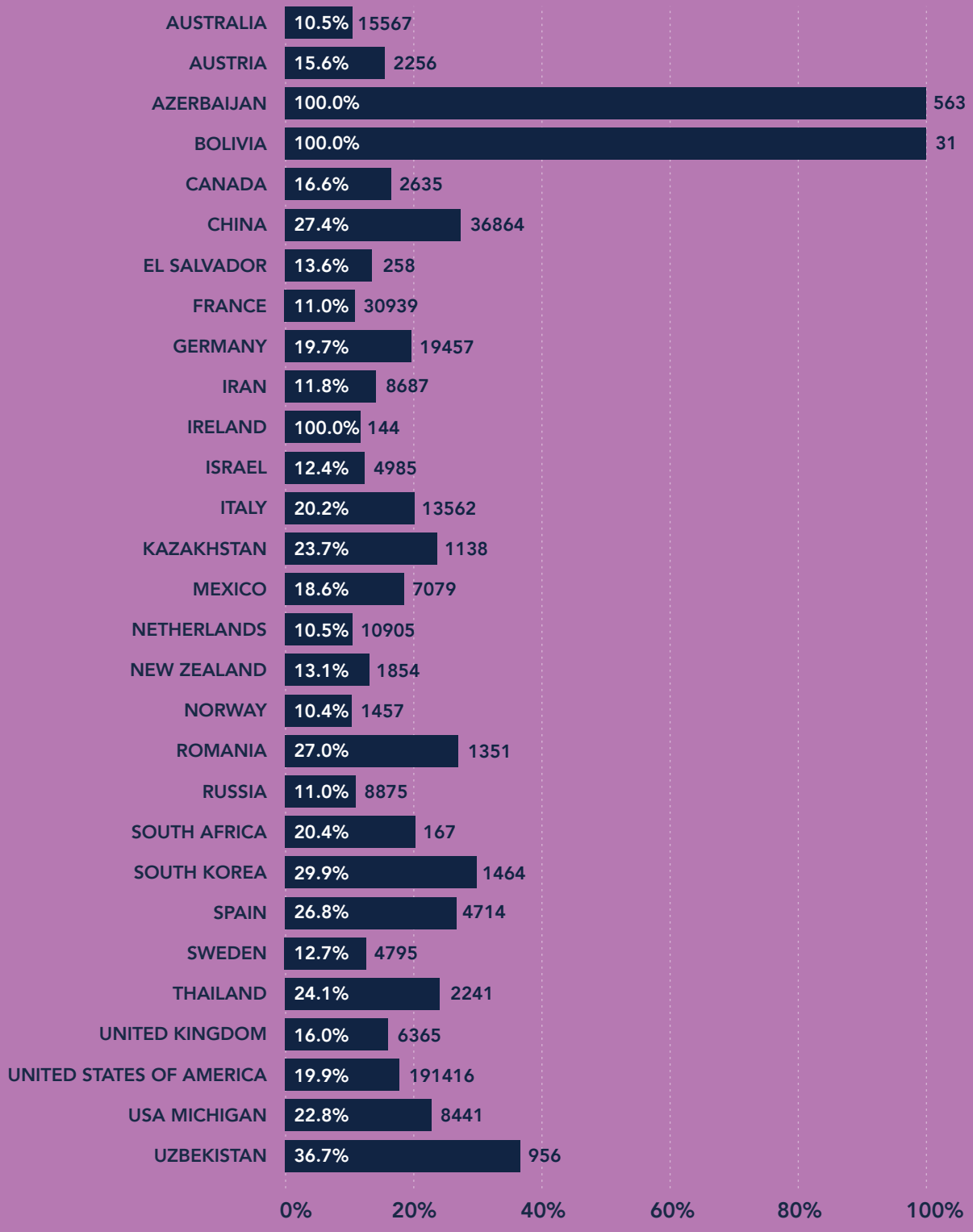
Type 2 diabetes (T2D) is a common comorbidity among patients who underwent primary metabolic bariatric surgery in 2023. Only cases of T2D present at the time of primary surgery are included in the analysis.

- T2D is a significantly prevalent comorbidity in this population. The prevalence among all patients varies considerably across reporting countries, ranging from 10.4% in Norway to 36.7% in Uzbekistan. This variation excludes countries reporting 100% of cases, such as Bolivia and Azerbaijan.
- In general, men exhibit a higher prevalence of T2D than women among patients undergoing primary metabolic bariatric surgery. A notable exception to this pattern is observed in Uzbekistan, where 40.6% of women had T2D compared to 29.6% of men.
- Marked regional differences in reported T2D prevalence are evident across IFSO chapters. In the North American Chapter (NAC), prevalence ranges from 16.6% to 22.8%. In the Latin American Chapter (LAC), it ranges from 13.6% in El Salvador to 18.6% in Mexico, excluding Bolivia (100.0%). The European Chapter (EC) reports a range from 10.4% in Norway to 27.0% in Romania. From the Middle East–North Africa Chapter (MENAC), only Iran submitted data (14.1%). The Asia–Pacific Chapter (APC) reports prevalence ranging from 10.5% in Australia to 36.7% in Uzbekistan.

Table 7. Number with type 2 diabetes at time of primary procedure by sex and country (2023)

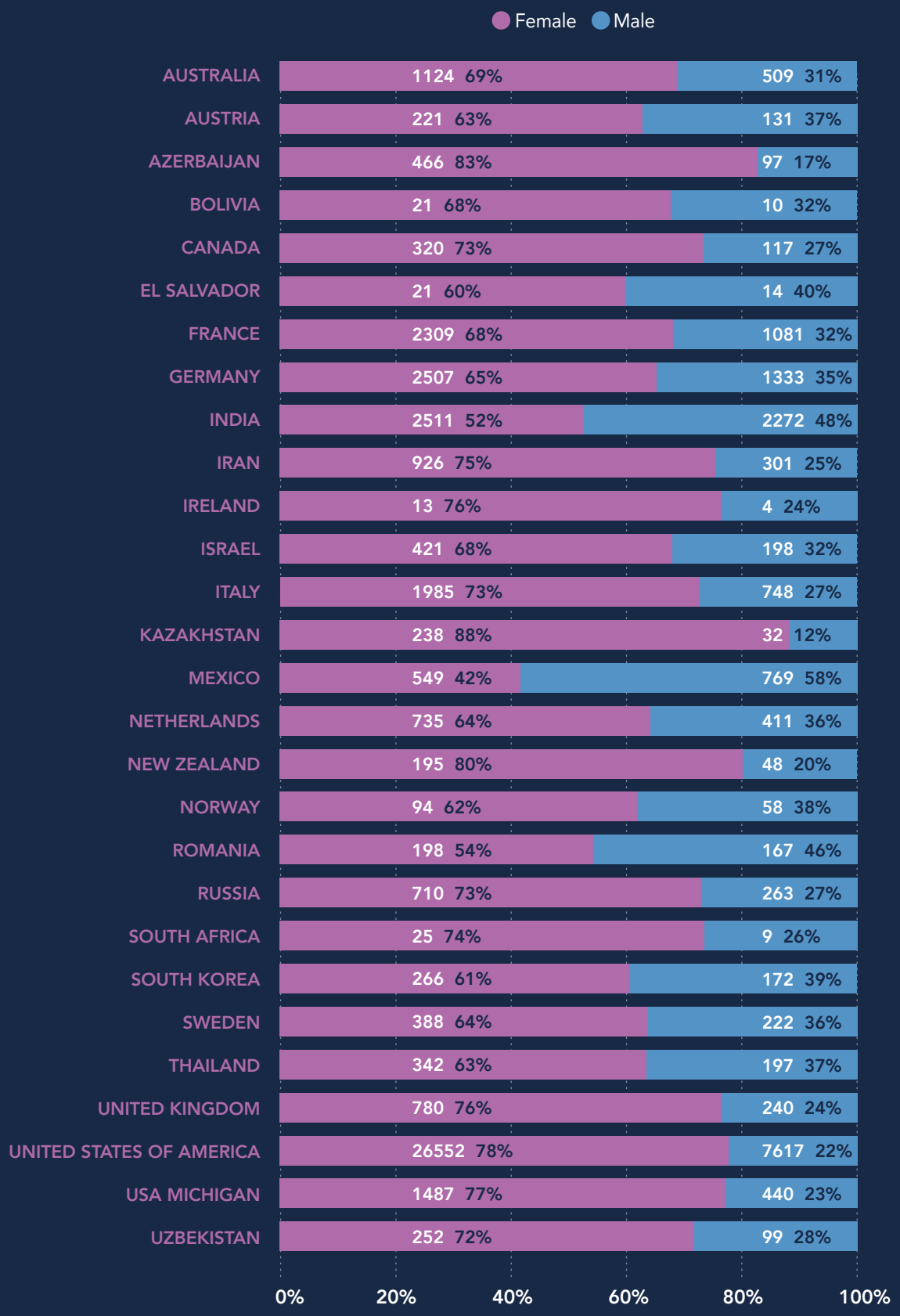
	FEMALE			MALE			ALL		
	T2D (n)	Total (n)	% with T2D	T2D (n)	Total (n)	% with T2D	T2D (n)	Total (n)	% with T2D
AUSTRALIA	1124	12327	9.1%	509	3237	15.7%	1633	15567	10.5%
AUSTRIA	221	1615	13.7%	131	641	20.4%	352	2256	15.6%
AZERBAIJAN	466	466	100.0%	97	97	100.0%	563	563	100.0%
BOLIVIA	21	21	100.0%	10	10	100.0%	31	31	100.0%
CANADA	320	2220	14.4%	117	415	28.2%	437	2635	16.6%
CHINA	NR	NR	NR	NR	NR	NR	10100	36864	27.4%
EL SALVADOR	21	166	12.7%	14	92	15.2%	35	258	13.6%
FRANCE	2309	24646	9.4%	1081	6293	17.2%	3390	30939	11.0%
GERMANY	2507	14184	17.7%	1333	5268	25.3%	3841	19457	19.7%
INDIA	2511	8370	30.0%	2272	6490	35.0%	4783	14860	32.2%
IRAN	926	6962	13.3%	301	1725	17.4%	1227	8687	14.1%
IRELAND	13	117	11.1%	4	27	14.8%	17	144	11.8%
ISRAEL	421	3819	11.0%	198	1166	17.0%	619	4985	12.4%
ITALY	1985	10159	19.5%	748	3403	22.0%	2733	13562	20.2%
KAZAKHSTAN	238	1003	23.7%	32	135	23.7%	270	1138	23.7%
MEXICO	549	5366	10.2%	769	1713	44.9%	1318	7079	18.6%
NETHERLANDS	735	8735	8.4%	411	2170	18.9%	1146	10905	10.5%
NEW ZEALAND	195	1571	12.4%	48	283	17.0%	243	1854	13.1%
NORWAY	94	1047	9.0%	58	410	14.1%	152	1457	10.4%
ROMANIA	198	919	21.5%	167	432	38.7%	365	1351	27.0%
RUSSIA	710	7358	9.6%	263	1517	17.3%	973	8875	11.0%
SOUTH AFRICA	25	137	18.2%	9	30	30.0%	34	167	20.4%
SOUTH KOREA	266	1042	25.5%	172	422	40.8%	438	1464	29.9%
SPAIN	NR	NR	NR	NR	NR	NR	1263	4714	26.8%
SWEDEN	388	3804	10.2%	222	991	22.4%	610	4795	12.7%
THAILAND	342	1455	23.5%	197	789	25.0%	539	2241	24.1%
UNITED KINGDOM	780	5421	14.4%	240	944	25.4%	1020	6365	16.0%
UNITED STATES OF AMERICA	26552	156894	16.9%	7617	34426	22.1%	34191	191416	17.9%
USA MICHIGAN	1487	6158	24.1%	440	1284	34.3%	1928	8441	22.8%
UZBEKISTAN	252	621	40.6%	99	335	29.6%	351	956	36.7%

Figure 12. Percent of primary participants with type 2 diabetes by country (2023)



Caution is warranted when comparing countries; disease definitions vary considerably (see Appendix 4).

Figure 13. Sex distribution of patients with type 2 diabetes at the time of surgery



Hypertension (HT) is a highly prevalent comorbidity among patients undergoing primary metabolic bariatric surgery in 2023, with reported prevalence rates exceeding 50% in countries such as Germany and China.

- Within the population undergoing primary surgery, men consistently exhibit significantly higher prevalence rates of hypertension compared to women. This pattern is evident across nearly all reporting countries.
- Combined with the higher median BMI observed in men in many regions, these findings highlight the more complex metabolic health challenges frequently seen in male candidates for metabolic bariatric surgery.

Table 8. Number with hypertension at time of primary procedure by sex and country (2023)

	FEMALE			MALE			ALL		
	HT (N)	Total (N)	% with HT	HT (N)	Total (N)	% with HT	HT (N)	Total (N)	% with HT
AUSTRIA	529	1615	32.8%	283	641	44.1%	812	2256	36.0%
CANADA	609	2226	27.4%	207	418	49.5%	816	2644	30.9%
CHINA	NR	NR	NR	NR	NR	NR	19058	36864	51.7%
EL SALVADOR	21	166	12.7%	27	92	29.3%	48	258	18.6%
FRANCE	4315	24646	17.5%	2032	6293	32.3%	6347	30939	20.5%
GERMANY	6749	14206	47.5%	3335	5276	63.2%	10087	19487	51.8%
INDIA	1842	8370	22.0%	1688	6490	26.0%	3530	14860	23.8%
IRAN	901	6962	12.9%	263	1725	15.2%	1164	8687	13.4%
IRELAND	39	117	33.3%	14	28	50.0%	53	145	36.6%
ISRAEL	455	3816	11.9%	251	1166	21.5%	706	4982	14.2%
ITALY	1681	4744	35.4%	1139	4089	27.9%	2820	8833	31.9%
KAZAKHSTAN	395	1003	39.4%	54	135	40.0%	449	1138	39.5%
MEXICO	1201	5366	22.4%	506	1713	29.5%	1707	7079	24.1%
NETHERLANDS	2222	8619	25.8%	929	2177	42.7%	3151	10797	29.2%
NORWAY	223	1047	21.3%	160	410	39.0%	383	1457	26.3%
ROMANIA	264	919	28.7%	255	439	58.1%	519	1351	38.4%
RUSSIA	2373	5215	45.5%	801	1220	65.7%	3174	6435	49.3%
SOUTH AFRICA	47	138	34.1%	16	30	53.3%	63	168	37.5%
SOUTH KOREA	333	1042	32.0%	229	422	54.3%	562	1464	38.4%
SPAIN	NR	NR	NR	NR	NR	NR	2228	4714	47.3%
SWEDEN	841	3804	22.1%	444	991	44.8%	1285	4795	26.8%
UNITED KINGDOM	1276	5443	23.4%	382	947	40.3%	1658	6390	25.9%
UNITED STATES OF AMERICA	63402	156894	40.4%	20635	34426	59.9%	84071	191416	43.9%
USA MICHIGAN	2903	7049	41.2%	883	1392	63.4%	3786	8441	44.9%
UZBEKISTAN	196	621	31.6%	143	335	42.7%	339	956	35.5%

Figure 14 - Percent of primary participants with hypertension by country (2023)

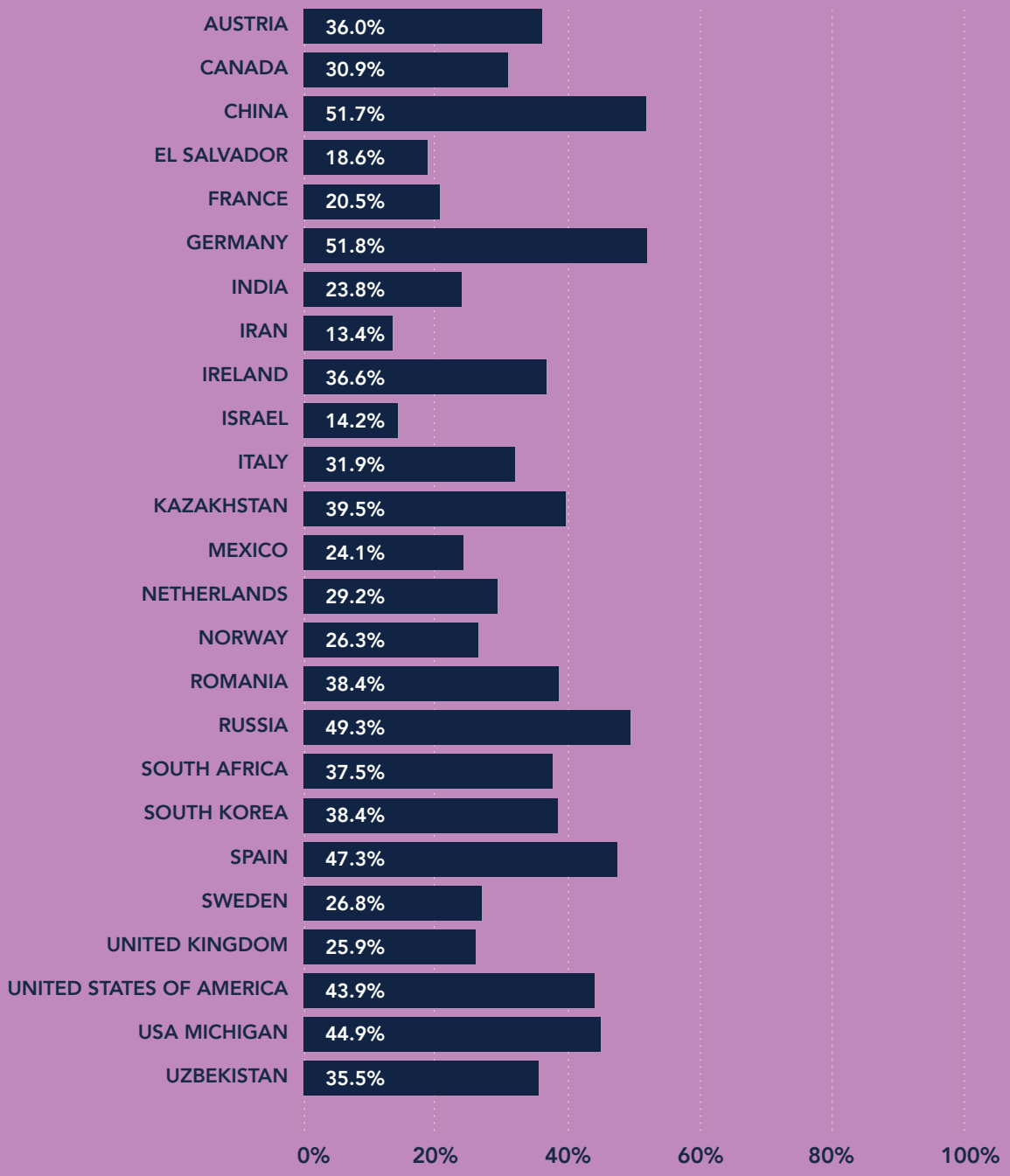
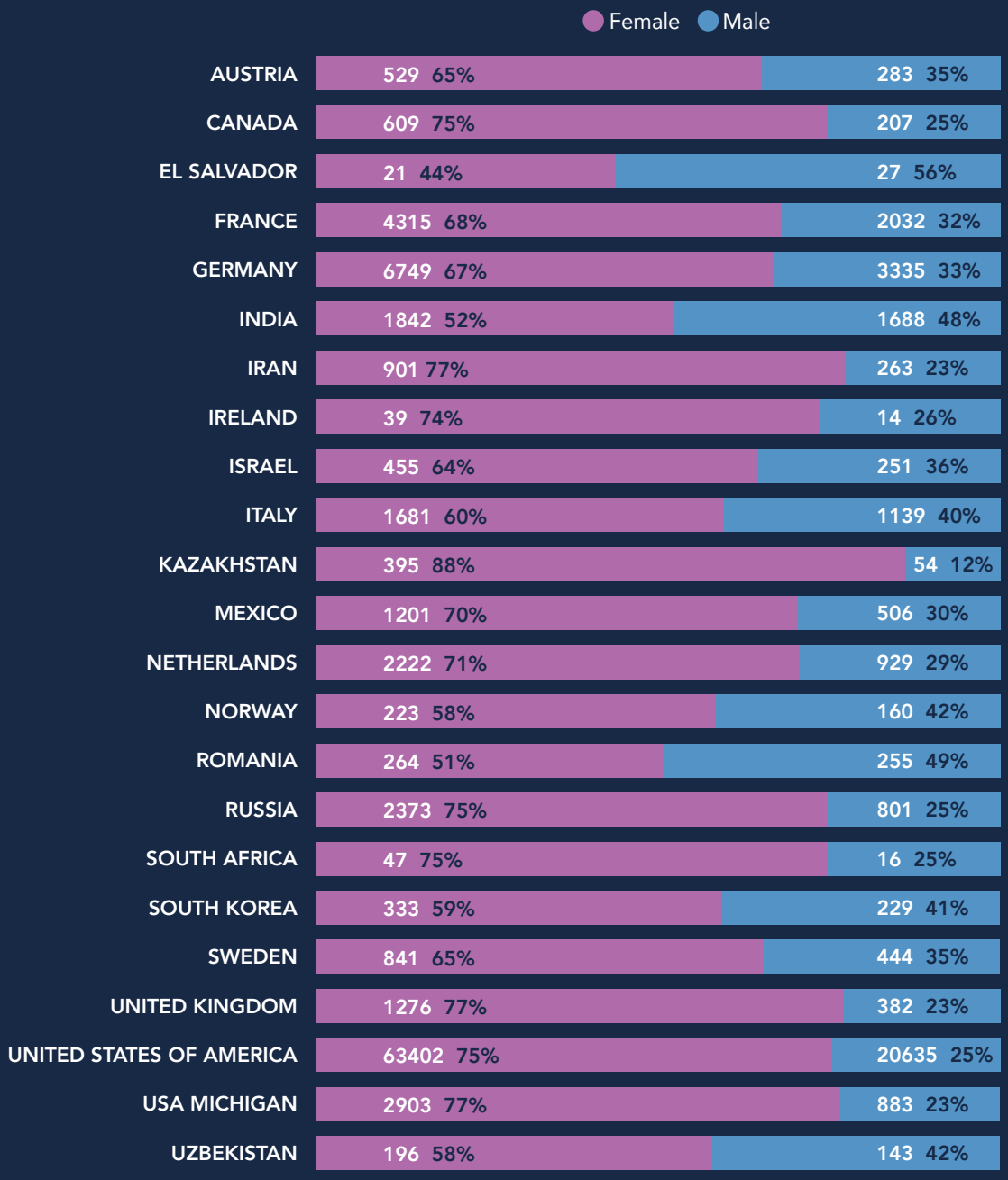


Figure 15. Proportion of male and female patients with hypertension at surgery; binary sex only



Obstructive sleep apnea (OSA) is also a common comorbidity among patients undergoing primary metabolic bariatric surgery; however, its reported prevalence varies substantially across countries.

- Reported rates range from as low as 4.3% in El Salvador and 7.1% in Austria to as high as 57.3% in China and 54.3% in Canada.
- Among patients undergoing primary surgery, men exhibit a markedly higher prevalence of OSA compared to women, with substantial differences in prevalence between sexes. This sex disparity is even more pronounced than that observed for type 2 diabetes or hypertension.
- Countries in the NAC chapter generally report very high prevalence rates, ranging from 38.3% (USA) to 54.3% (Canada). In contrast, countries in the LAC chapter report much lower prevalence rates, such as 9.7% in El Salvador and 16.0% in Mexico. Countries in the EC chapter and the APC chapter report a wide range of prevalence percentages.

Table 9. Number with obstructive sleep apnea at time of primary procedure by sex and country (2023)

	FEMALE			MALE			ALL		
	OSA (N)	Total (N)	% with OSA	OSA (N)	Total (N)	% with OSA	OSA (N)	Total (N)	% with OSA
AUSTRIA	115	1615	7.1%	120	640	18.8%	235	2255	10.4%
CANADA	1120	2223	50.4%	314	416	75.5%	1434	2639	54.3%
CHINA	NR	NR	NR	NR	NR	NR	14786	25804	57.3%
EL SALVADOR	8	166	4.8%	17	92	18.5%	25	258	9.7%
FRANCE	6563	24646	26.6%	2723	6293	43.3%	9286	30939	30.0%
GERMANY	2866	14035	20.4%	2526	5223	48.4%	5393	19263	28.0%
INDIA	930	8370	11.1%	890	6490	13.7%	1820	14860	12.2%
IRAN	650	6962	9.3%	302	1725	17.5%	952	8687	11.0%
IRELAND	52	117	44.4%	15	28	53.6%	67	145	46.2%
ISRAEL	280	3812	7.3%	254	1164	21.8%	534	4976	10.7%
ITALY	922	4210	21.9%	784	1736	45.2%	1706	5946	28.7%
KAZAKHSTAN	93	1003	9.3%	48	135	35.6%	141	1138	12.4%
MEXICO	660	5366	12.3%	472	1713	27.6%	1132	7079	16.0%
NETHERLANDS	1257	8620	14.6%	743	2177	34.1%	2001	10798	18.5%
NORWAY	133	1047	12.7%	152	410	37.1%	285	1457	19.6%
ROMANIA	204	919	22.2%	233	432	53.9%	437	1351	32.3%
RUSSIA	812	3913	20.8%	395	922	42.8%	1207	4835	25.0%
SOUTH AFRICA	21	135	15.6%	10	28	35.7%	31	163	19.0%
SOUTH KOREA	168	1042	16.1%	149	422	35.3%	317	1454	21.8%
SPAIN	NR	NR	NR	NR	NR	NR	2108	4714	44.7%
SWEDEN	270	3804	7.1%	279	991	28.2%	549	4795	11.4%
UNITED KINGDOM	849	5435	15.6%	401	948	42.3%	1250	6383	19.6%
UNITED STATES OF AMERICA	52238	156894	33.3%	21076	34426	61.2%	73354	191416	38.3%
USA MICHIGAN	2764	7049	39.2%	980	1392	70.4%	3744	8441	44.4%
UZBEKISTAN	61	621	9.8%	88	335	26.3%	149	956	15.6%

Figure 16. Percent of primary participants with obstructive sleep apnea by country (2023)

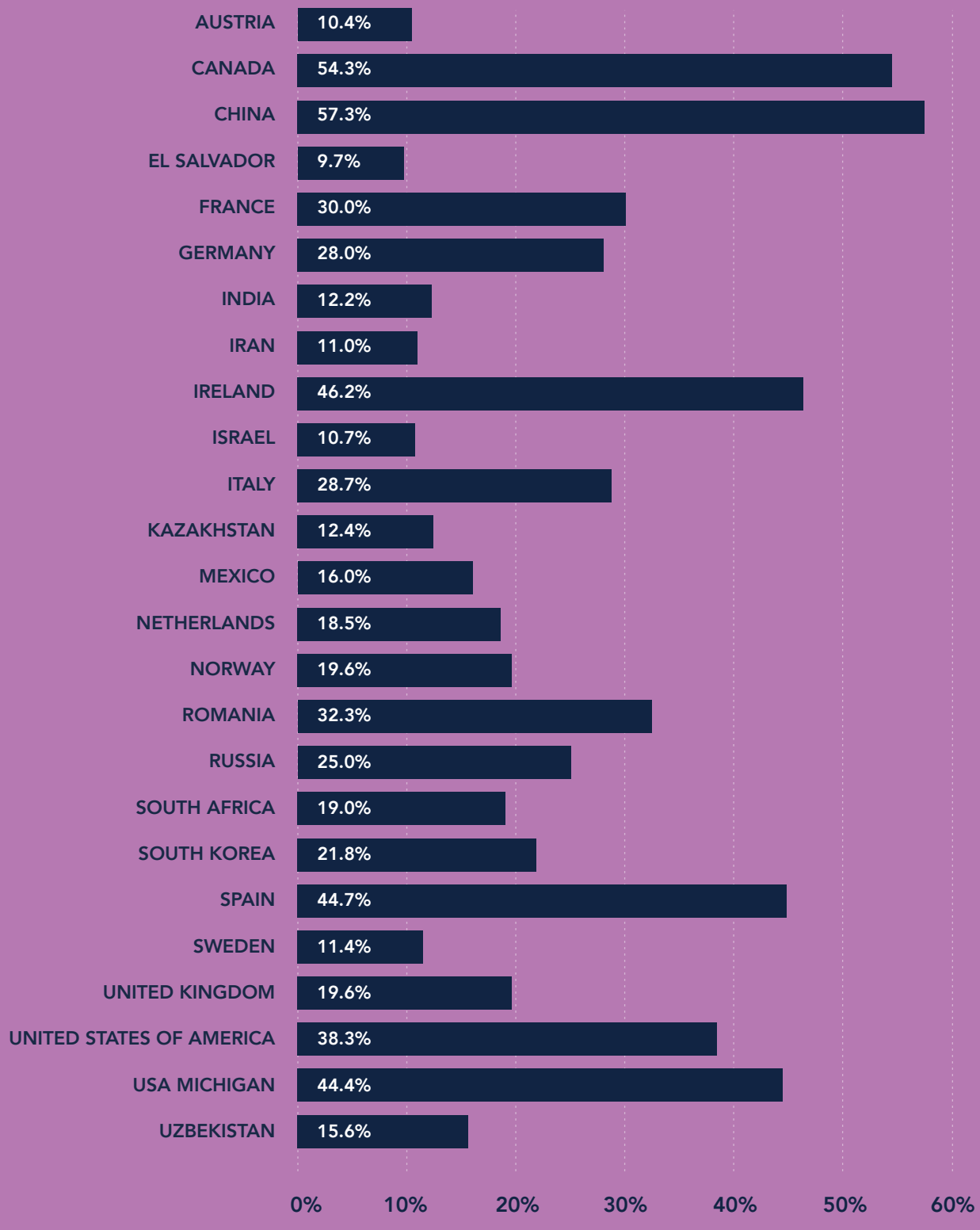
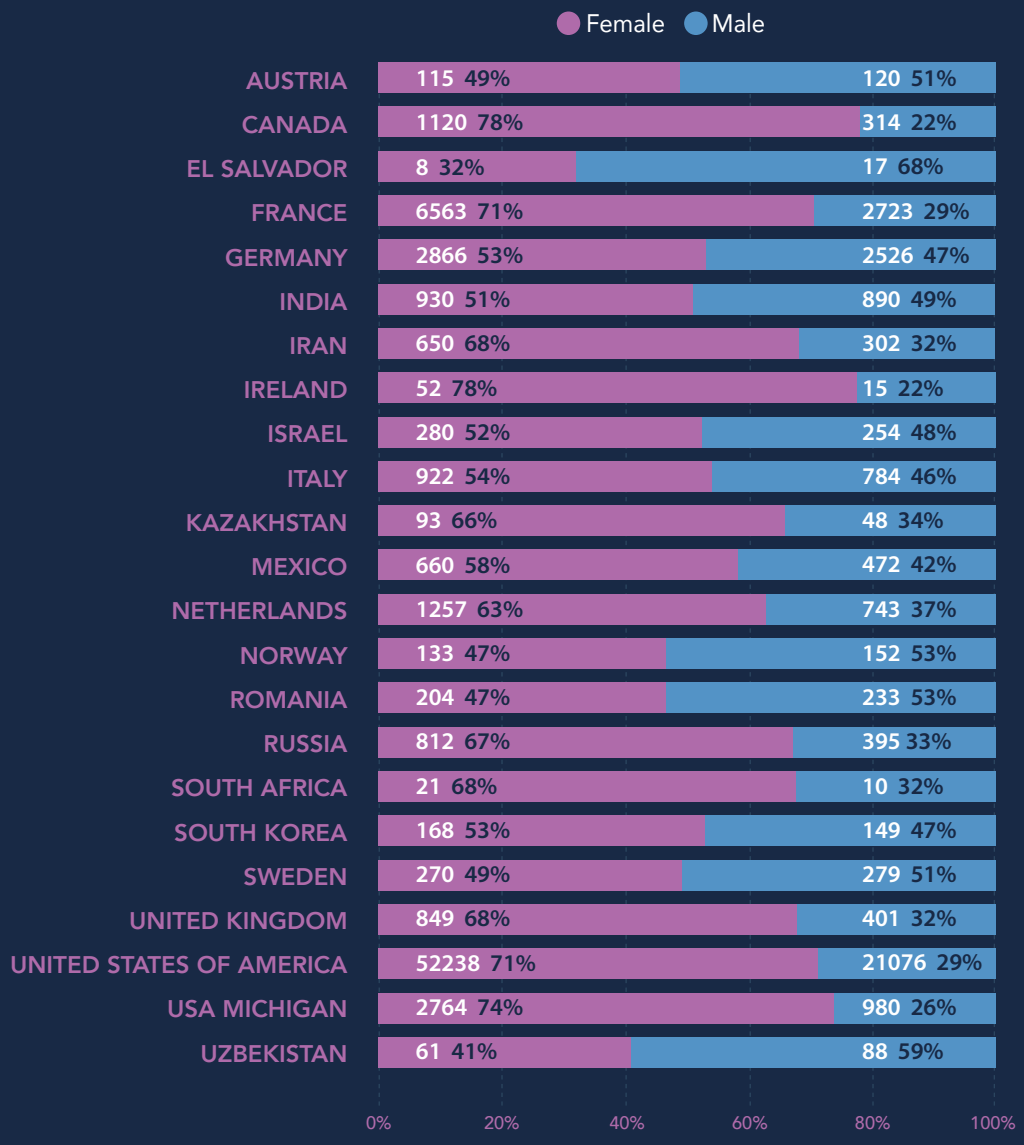


Figure 17. Proportion of male and female patients with OSA at surgery; binary sex only



The prevalence of ***dyslipidemia (DL)*** varies greatly between countries and is also a common comorbidity among patients undergoing primary metabolic bariatric surgery.

- Reported rates range from very low—such as 7.6% in India, 8.8% in France, 9.1% in Mexico, and 11.6% in Sweden—to extremely high, including 61.3% in China, 62.8% in Romania, and 66.2% in Kazakhstan.
- In many countries reporting such data, men exhibit a higher prevalence of dyslipidemia than women within the population undergoing primary surgery, although this difference appears to be less consistent and less pronounced than what is observed with OSA.

Table 10 - Number with dyslipidemia at time of primary procedure by sex and country (2023)

	FEMALE			MALE			ALL		
	DL (N)	Total (N)	% with DL	DL (N)	Total (N)	% with DL	DL (N)	Total (N)	% with DL
AUSTRIA	295	1614	18.3%	147	641	22.9%	442	2255	19.6%
CANADA	342	2222	15.4%	134	417	32.1%	476	2639	18.0%
CHINA	14133	26173	54.0%	6413	10691	60.0%	22597	36864	61.3%
EL SALVADOR	42	166	25.3%	29	92	31.5%	71	258	27.5%
FRANCE	1722	24646	7.0%	900	6293	14.3%	2622	30939	8.5%
GERMANY	2390	14047	17.0%	1016	5210	19.5%	3407	19262	17.7%
INDIA	590	8370	7.0%	540	6490	8.3%	1130	14860	7.6%
IRAN	2681	6962	38.5%	766	1725	44.4%	3447	8687	39.7%
ISRAEL	621	3814	16.3%	319	1161	27.5%	940	4975	18.9%
ITALY	1562	11205	13.9%	672	3901	17.2%	2234	15106	14.8%
KAZAKHSTAN	599	1003	59.7%	135	154	87.7%	753	1138	66.2%
MEXICO	425	5366	7.9%	221	1713	12.9%	646	7079	9.1%
NETHERLANDS	1345	8621	15.6%	557	2177	25.6%	1902	10799	17.6%
NORWAY	119	1047	11.4%	84	410	20.5%	203	1457	13.9%
ROMANIA	548	919	59.6%	300	432	69.4%	848	1351	62.8%
RUSSIA	2074	4382	47.3%	541	987	54.8%	2615	5369	48.7%
SOUTH AFRICA	23	136	16.9%	11	30	36.7%	34	166	20.5%
SOUTH KOREA	363	1042	34.8%	197	422	46.7%	560	1454	38.5%
SPAIN	NR	NR	NR	NR	NR	NR	1502	4714	31.9%
SWEDEN	361	3804	9.5%	196	991	19.8%	557	4795	11.6%
UNITED STATES OF AMERICA	32755	156894	20.9%	12236	34426	35.5%	45006	191416	23.5%
USA MICHIGAN	2740	7049	38.9%	769	1392	55.2%	3509	8441	41.6%
UZBEKISTAN	242	621	39.0%	148	335	44.2%	390	956	40.8%

Figure 18. Percent of primary participants with dyslipidemia by country (2023)

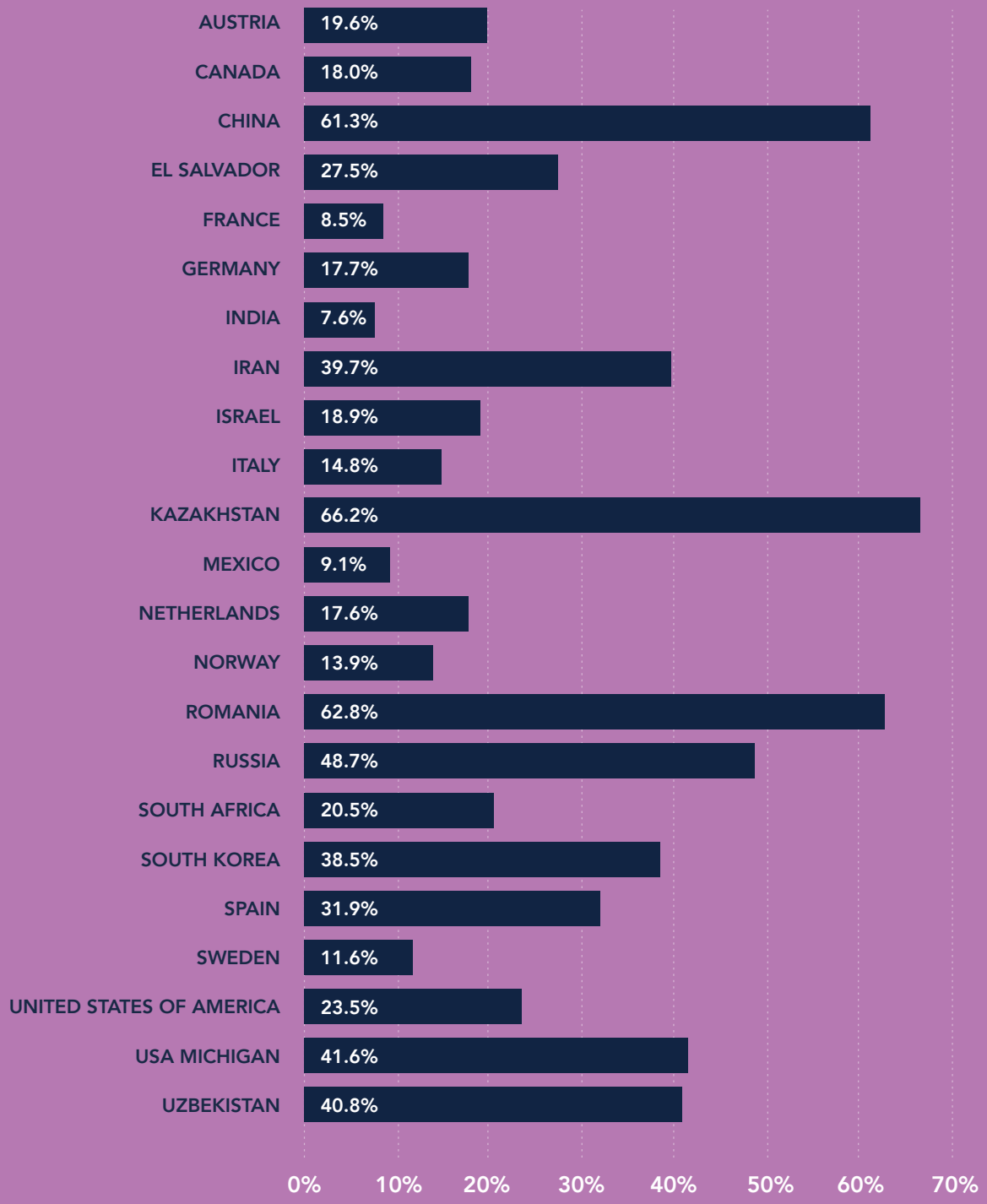
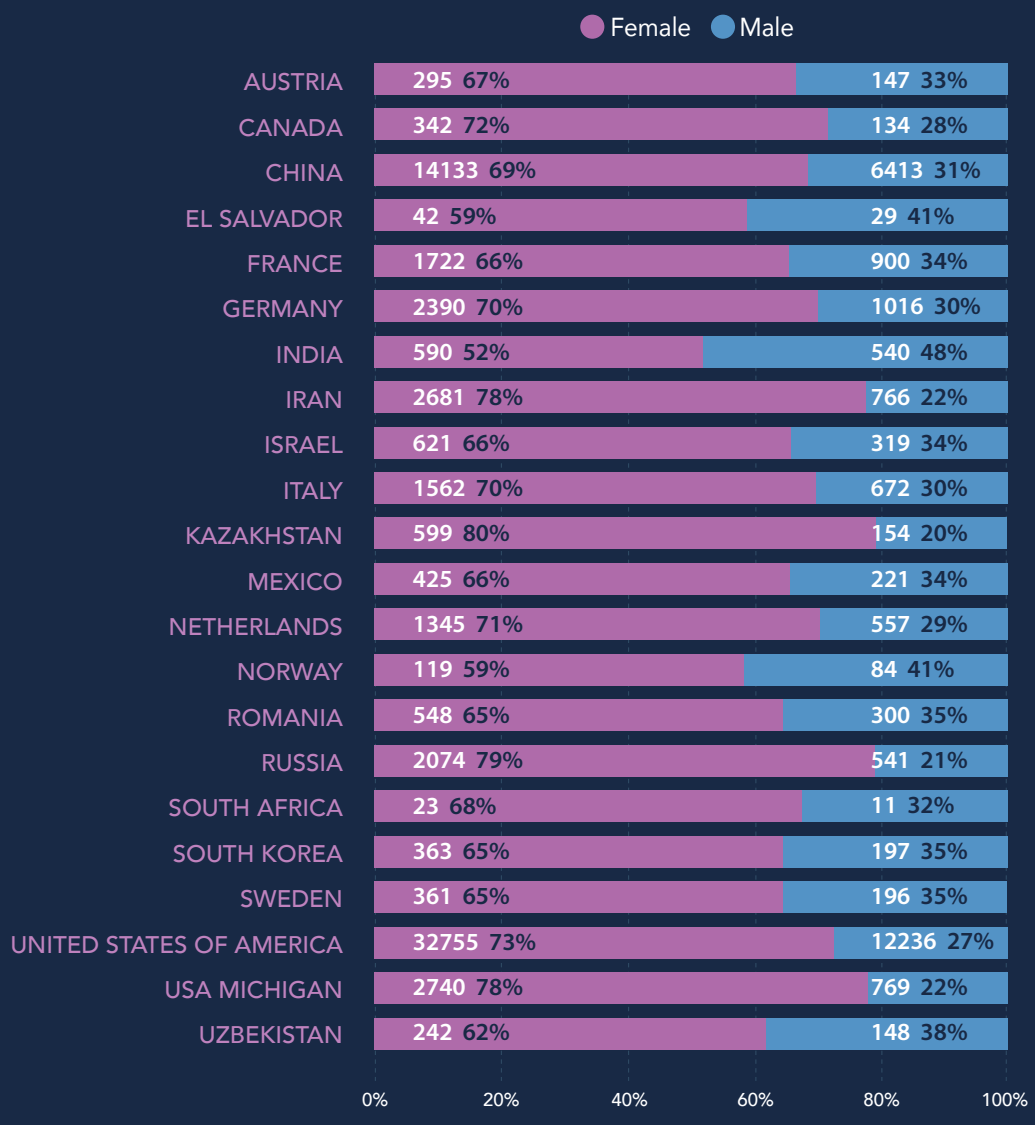


Figure 19. Proportion of male and female patients with DL at surgery; binary sex only



The most notable findings regarding ***gastroesophageal reflux disease (GERD)*** at primary metabolic bariatric surgery in 2023, as reported by participating countries, pertain to the highly variable prevalence rates of GERD:

- Reported prevalence rates range widely, from very low figures such as 4.3% in El Salvador and 7.7% in India, to significantly higher rates such as 52.5% in Russia, 50.5% in the USA (Michigan), and 40.0% in South Africa.
- In contrast to other comorbidities, such as OSA, T2D, and hypertension, which consistently show higher prevalence in men across these datasets, the pattern for GERD is less uniform. GERD prevalence is sometimes higher in women, sometimes in men, and in some cases comparable between sexes. This represents a noteworthy divergence in pattern from the other analyzed comorbidities.
- GERD prevalence also varies markedly by geographic region. The NAC chapter generally reports higher prevalence rates (30.0–50.5%), while the LAC chapter reports lower rates (4.3–8.9%). The EC chapter (8.2–52.5%) and the APC chapter (7.7–25.5%) show a wide range of variation.

Table 11 - Number with gastroesophageal reflux disease at time of primary procedure by sex and country (2023)

	FEMALE			MALE			ALL		
	GERD (N)	Total (N)	% with GERD	GERD (N)	Total (N)	% with GERD	GERD (N)	Total (N)	% with GERD
AUSTRIA	328	1531	21.4%	103	608	16.9%	431	2139	20.1%
CANADA	807	2235	36.1%	126	418	30.1%	933	2653	35.2%
CHINA	NR	NR	NR	NR	NR	NR	4700	18432	25.5%
EL SALVADOR	6	166	3.6%	5	92	5.4%	11	258	4.3%
FRANCE	933	24646	3.8%	192	6293	3.1%	1125	30939	3.6%
INDIA	840	8370	10.0%	310	6490	4.8%	1150	14860	7.7%
IRAN	1635	6962	23.5%	491	1725	28.5%	2126	8687	24.5%
IRELAND	35	115	30.4%	9	28	32.1%	44	143	30.8%
ISRAEL	312	3815	8.2%	95	1165	8.2%	407	4980	8.2%
ITALY	578	4195	13.8%	196	1729	11.3%	774	5924	13.1%
KAZAKHSTAN	236	1003	23.5%	38	135	28.1%	274	1138	24.1%
MEXICO	429	5366	8.0%	200	1713	11.7%	629	7079	8.9%
NETHERLANDS	2183	8620	25.3%	478	2177	22.0%	2661	10798	24.6%
NORWAY	180	1047	17.2%	84	410	20.5%	264	1457	18.1%
ROMANIA	225	919	24.5%	141	432	32.6%	366	1351	27.1%
RUSSIA	2214	4168	53.1%	446	897	49.7%	2660	5065	52.5%
SOUTH AFRICA	54	136	39.7%	13	30	43.3%	66	165	40.0%
SOUTH KOREA	141	1042	13.5%	41	422	9.7%	182	1454	12.5%
SPAIN	NR	NR	NR	NR	NR	NR	1211	4714	25.7%
SWEDEN	489	3804	12.9%	122	991	12.3%	611	4795	12.7%
UNITED KINGDOM	1200	5406	22.2%	192	936	20.5%	1392	6342	21.9%
UNITED STATES OF AMERICA	47774	156894	30.4%	9636	34426	28.0%	57446	191416	30.0%
USA MICHIGAN	4052	7049	57.5%	712	1392	51.1%	4764	9441	50.5%
UZBEKISTAN	92	621	14.8%	66	335	19.7%	158	956	16.5%

Figure 20. Percent of primary participants with gastroesophageal reflux disease by country (2023)

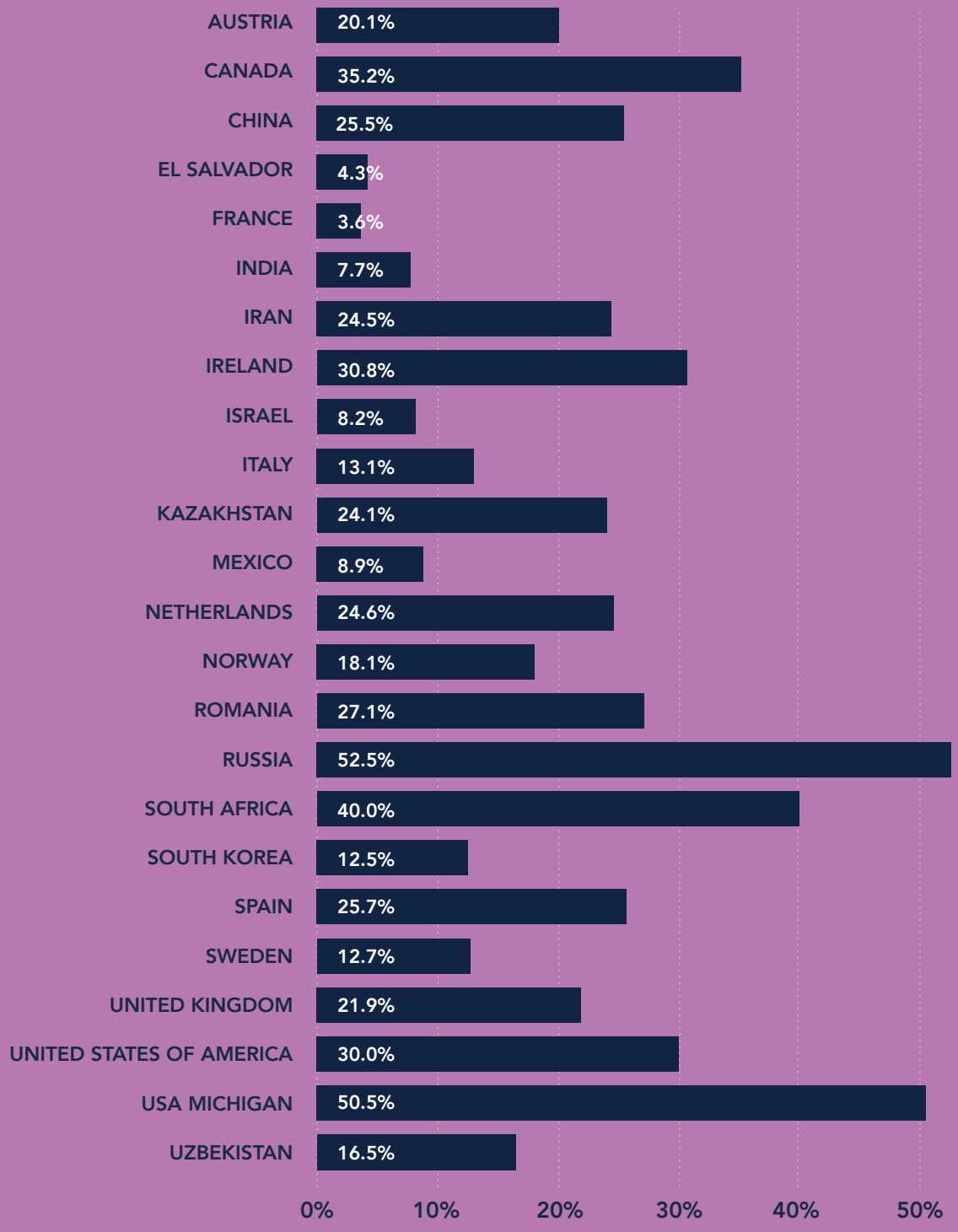
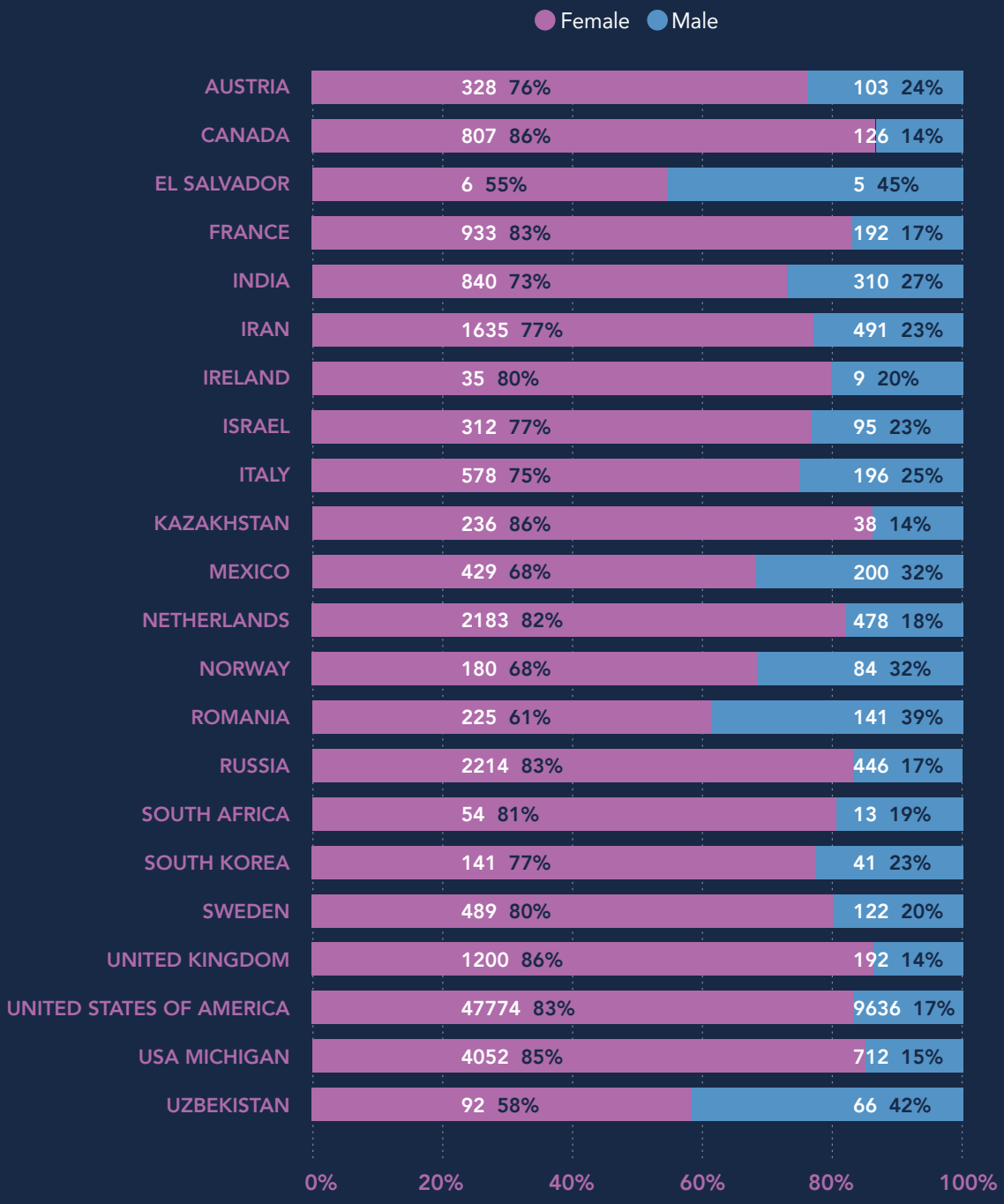


Figure 21. Proportion of male and female patients with GERD at surgery; binary sex only



Depression (MDD) is a common comorbidity among patients who underwent primary metabolic bariatric surgery in 2023. However, the reported prevalence of depression among these patients varies widely across the reporting countries:

- Prevalence rates range from very low—such as 2.4% in India, 5.4% in El Salvador, 5.5% in Russia, 6.0% in Israel, and 6.5% in France—to significantly higher figures, including 21.2% in Sweden, 22.7% in Ireland, 30.2% in the United Kingdom, 34.3% in South Africa, and exceptionally high at 48.1% in Michigan, USA.
- A notable and consistent pattern is that in all reporting countries with sex-disaggregated data, the prevalence of depression is higher among women than men. This stands in contrast to the prevalence patterns observed for T2D, hypertension, and dyslipidemia, which are typically more common in men. However, the pattern is like that observed for GERD, which also tends to show higher prevalence among women.
- The differences between chapters align with this previously described pattern.

Table 12 - Number with depression at time of primary procedure by sex and country (2023)

	FEMALE			MALE			ALL		
	MDD (N)	Total (N)	% with MDD	MDD (N)	Total (N)	% with MDD	MDD (N)	Total (N)	% with MDD
AUSTRIA	247	1615	15.3%	43	640	6.7%	290	2255	12.9%
EL SALVADOR	10	166	6.0%	4	92	4.3%	14	258	5.4%
FRANCE	1696	24646	6.9%	313	6293	5.0%	2009	30939	6.5%
GERMANY	2717	12618	21.5%	681	4850	14.0%	3398	17471	19.4%
INDIA	235	8370	2.8%	120	6490	1.8%	355	14860	2.4%
IRELAND	29	113	25.7%	3	28	10.7%	32	141	22.7%
ISRAEL	231	3813	6.1%	66	1167	5.7%	297	4980	6.0%
ITALY	95	605	15.7%	25	310	8.1%	120	915	13.1%
MEXICO	904	5366	16.8%	245	1713	14.3%	1149	7079	16.2%
NORWAY	171	1047	16.3%	39	410	9.5%	210	1457	14.4%
RUSSIA	208	3532	5.9%	29	776	3.7%	237	4308	5.5%
SOUTH AFRICA	54	137	39.4%	5	29	17.2%	59	172	34.3%
SOUTH KOREA	152	1042	14.6%	39	422	9.2%	191	1454	13.1%
SPAIN	NR	NR	NR	NR	NR	NR	945	4714	20.0%
SWEDEN	879	3804	23.1%	136	991	13.7%	1015	4795	21.2%
UNITED KINGDOM	1681	5207	32.3%	166	907	18.3%	1847	6114	30.2%
USA MICHIGAN	3577	7049	50.7%	481	1392	34.6%	4058	8441	48.1%
UZBEKISTAN	121	621	19.5%	32	335	9.6%	153	956	16.0%

Figure 22. Percent of primary participants with depression by country (2023)

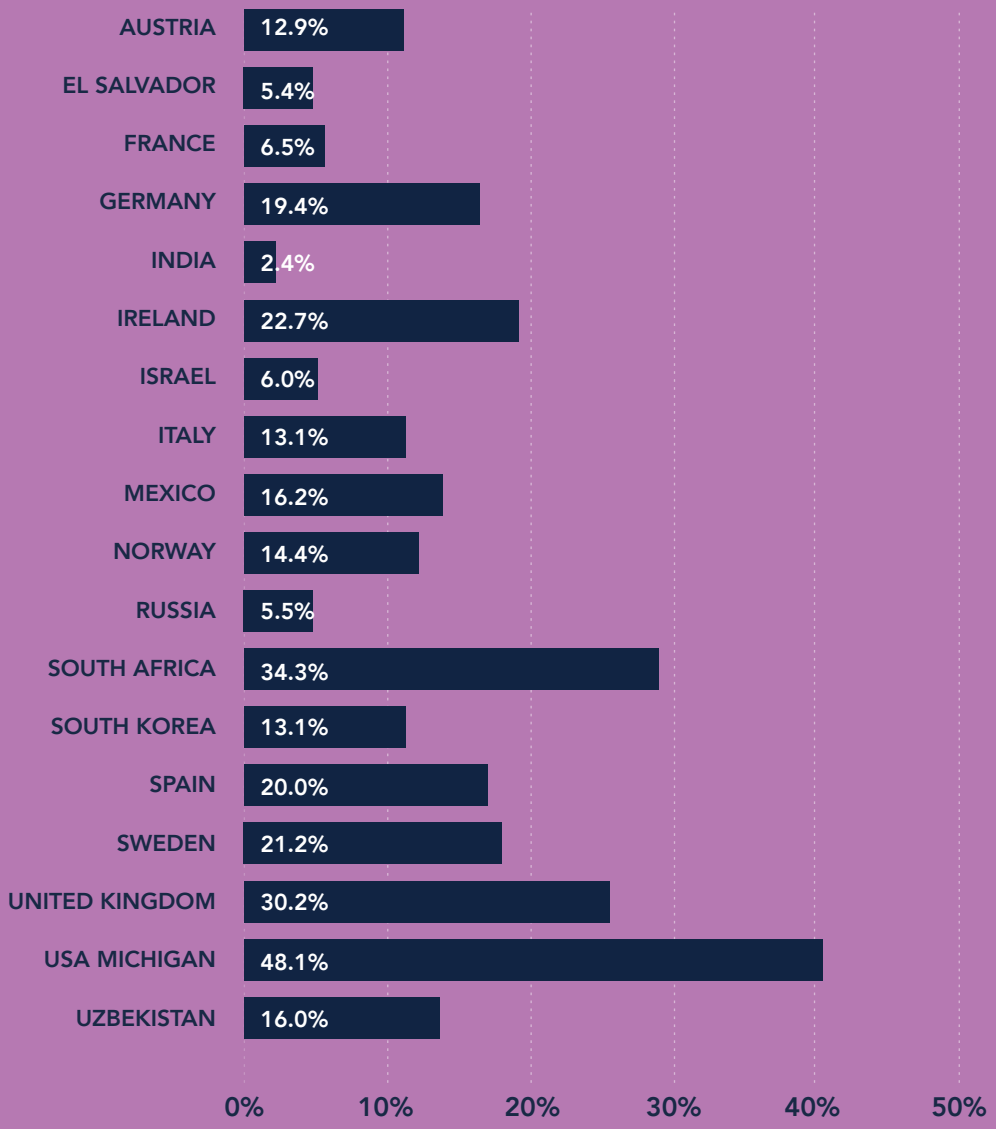
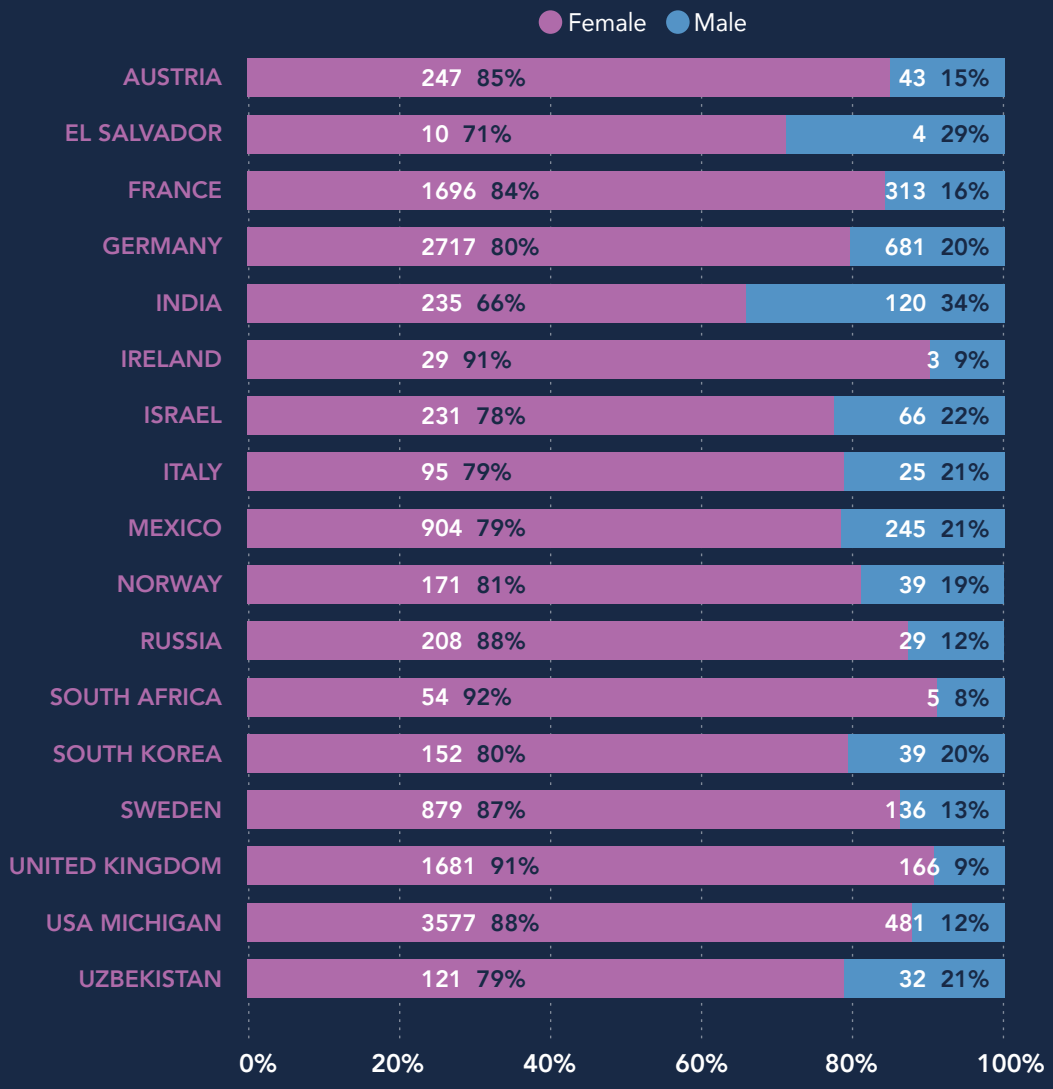


Figure 23. Proportion of primary participants with depression who are female and male (2023)



The **main sex disparities** identified are as follows::

- Type 2 Diabetes: The prevalence of T2D was consistently higher in men compared to women across nearly all reporting countries.
- Hypertension: Like T2D, hypertension demonstrated a consistently higher prevalence in men than in women in all reporting countries.
- Dyslipidemia: The pattern for dyslipidemia mirrored that of T2D and hypertension, with a predominantly higher prevalence in men across almost all countries with available data.
- Gastroesophageal Reflux Disease: The pattern for GERD was less consistent. Prevalence varied widely between countries, and no clear male predominance was observed.
  Depression: A highly consistent pattern was observed for depression, with all reporting countries indicating a significantly higher prevalence in women compared to men.

Peri-operative outcomes

Few registries worldwide are equipped to provide robust long-term data on weight loss and comorbidity resolution. As a result, the IFSO Global Registry continues to emphasize perioperative outcomes, which serve as critical indicators of procedural safety. These metrics offer timely and actionable insights into the quality and safety of bariatric-metabolic surgery.

Length of Stay (LOS)

While no internationally accepted standard exists for length of stay following metabolic bariatric surgery, data consistently reveal a relatively narrow range of hospitalization days across most procedures. LOS varies across countries and regions, likely influenced by healthcare logistics, clinical protocols, provider expertise, and cultural expectations.

Importantly, LOS can serve as a valuable surrogate marker for postoperative complications. A hospital stays exceeding the national or regional average often signals the occurrence of an adverse event or clinical concern. Some trade-offs are evident: countries with shorter LOS may experience higher readmission rates, potentially due to earlier discharge practices as is the case in Norway, Sweden, the USA, and Michigan. It is important to emphasize that these are precisely registries in which robust data verification procedures are in place. Therefore, a registration bias may be present, often not due to underreporting, but rather the opposite.

Indicators of perioperative complications

To evaluate surgical safety and quality, registries routinely monitor the following outcomes at both 30 and/or 90 days postoperatively:

- Unplanned readmission rate (readm)
- Unplanned reoperations (reop); Clavien-Dindo grade 3b complication (CD3b)
- Unplanned Intensive Care Unit (ICU) admission; Clavien-Dindo grade 4 complication (CD4)
- Mortality; Clavien-Dindo grade 5 complication (CD5)

These indicators are selected because they reflect clear deviations from the expected postoperative course, typically arising from complications. While perioperative mortality remains the most serious concern, it is fortunately rare. Non-fatal complications (morbidity), however, provide critical opportunities for quality improvement and systems learning.

Unplanned reoperations occurs more frequently in revisional procedures, underscoring the increased technical complexity of these operations. ICU admission rates remain consistently low across the chapters, indicating that ICU resources are generally well-planned and appropriately utilized.

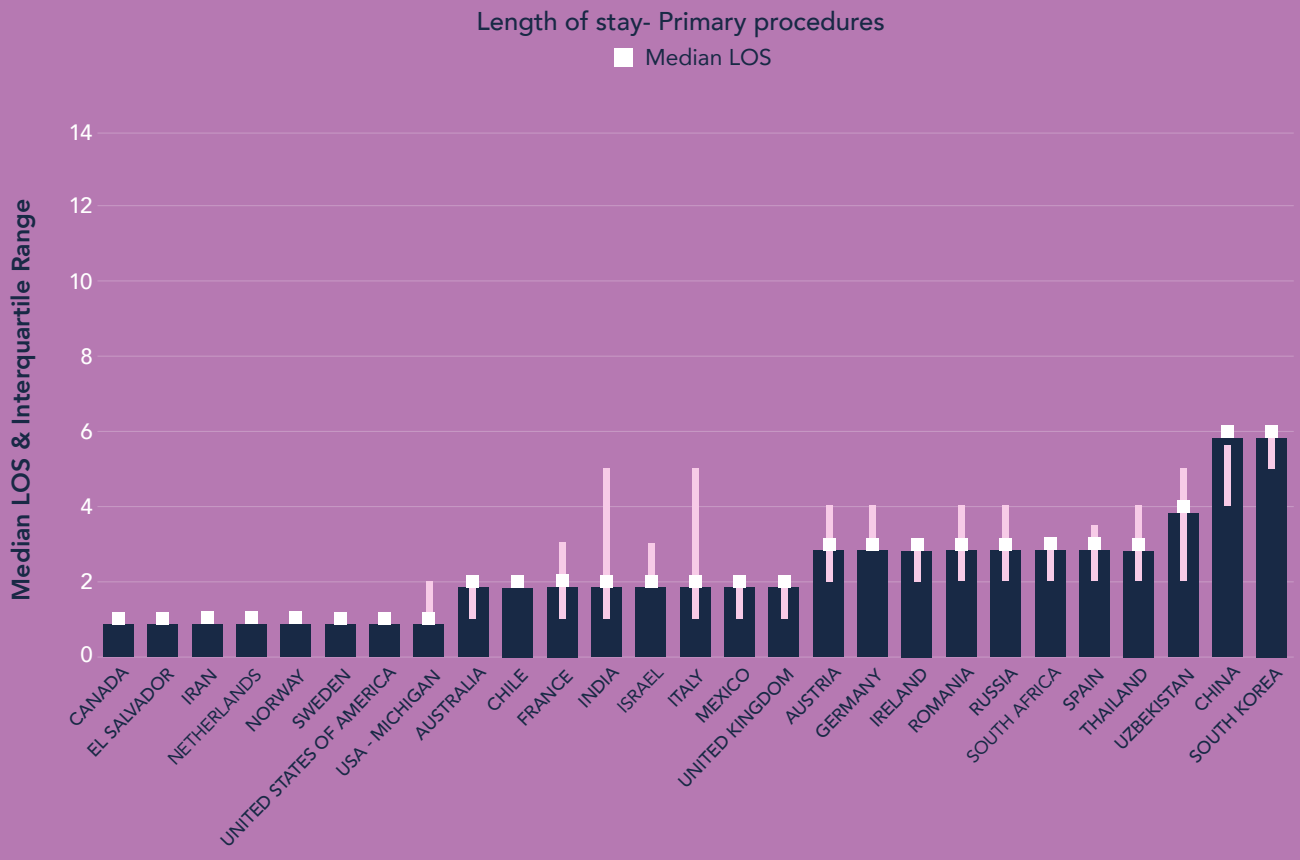
Data integrity: follow-up and registry coverage

Interpretation of registry data requires careful consideration of both follow-up rates and the extent of case ascertainment:

- Follow-up rates ("known cases"): High follow-up rates enhance confidence in data validity. Countries such as France, Israel, the Netherlands, Sweden, Norway, South Africa and the USA have a 30/90-day follow-up rates for all unplanned events of 100%, setting a global benchmark for registry quality.
- Case ascertainment: Some registries do not achieve complete inclusion of all eligible patients, raising concerns about selection bias. Systematic under capture can significantly distort outcome data. Future reports should prioritize improved quantification of the actual volume of metabolic bariatric procedures in each country to enhance interpretability.

Despite these limitations, it is reassuring that perioperative safety outcomes are notably consistent across diverse regions and healthcare systems.

Figure 24. Median length of stay by country, primary and revisional procedures (2023)



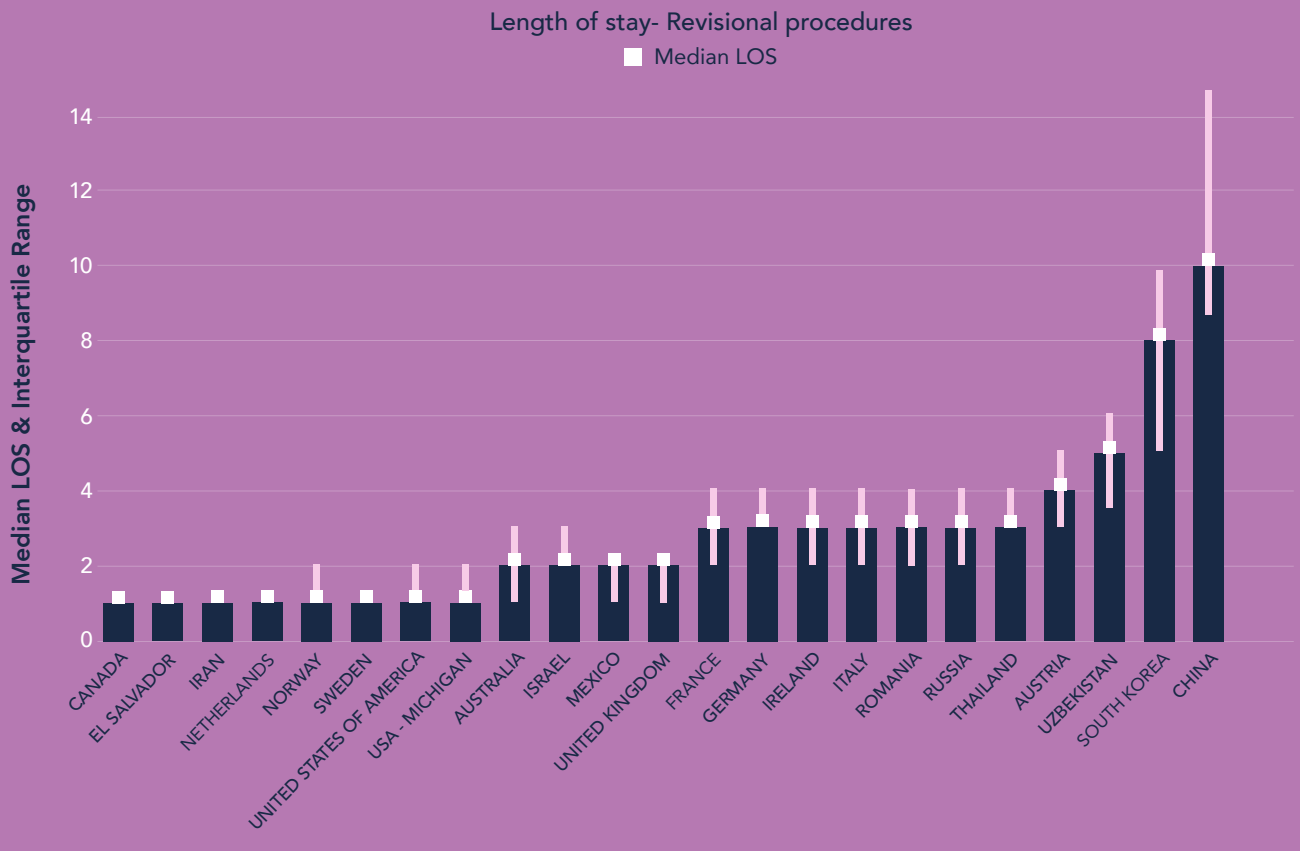


Table 13 - Rate of postoperative unplanned readmission by country, primary and revisional procedures (2023)

Country	Measured within (n) Days from procedure	Registry Definition	PRIMARY				REVISIONAL			
			readm (n)	Total* (n)	readm rate	Known cases	readm (n)	Total (n)	readm rate	Known cases
AUSTRALIA	90	A defined adverse event can be indicated by the presence of a particular event (unplanned re-admission to hospital) occurring in the peri-operative phase (up to 90 days) in the healthcare setting. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2022-2023.	186	14635	1.3%	91.6%	88	3256	2.7%	90.1%
AUSTRIA	90		87	1857	4.7%	91.0%	16	287	5.6%	92.6%
CHILE	90	A defined adverse event can be indicated by the presence of a particular event (unplanned re-admission to hospital) occurring in the peri-operative phase (up to 30 days) in the healthcare setting.	158	158	100.0%	0.6%				
EL SALVADOR	90	A defined adverse event can be indicated by the presence of a particular event (unplanned re-admission to hospital) occurring in the peri-operative phase (up to 90 days) in the healthcare setting.	4	258	1.6%	100.0%	0	9	0.0%	100.0%
FRANCE	30 from procedure unplanned 30-day readmission after surgery.		2119	30939	6.9%	100.0%	472	4671	10.1%	100.0%
GERMANY	30	Applies to inpatient readmission in causal connection with the documented operation.	522	21499	2.4%	92.8%	127	2647	4.8%	87.5%
INDIA			96	14860	0.7%	100.0%	22	885	2.5%	100.0%
IRAN	90	In case of hospitalization based on the diagnosis of the treatment team.	48	8687	0.6%	100.0%	3	165	1.8%	100.0%
IRELAND	30 days from any re-admission to hospital within 30 of the patient's operation procedure		0	15	0.6%	10.3%	0	0		0.0%
ISRAEL	90	All patients who were readmitted within 90 days only to the surgical department.	269	4986	5.4%	100.0%	91	975	9.3%	100.0%
KAZAKHSTAN	90		3	1138	0.3%	102.2%	0	25	0.0%	100.0%
MEXICO			18	7079	0.3%	100.0%	5	787	0.6%	100.0%
NETHERLAND	90	Readmission to the ward within 30 days.	234	11175	2.1%	100.0%	46	1213	3.8%	100.0%

Country	Measured within (n) Days from procedure	Registry Definition	PRIMARY				REVISIONAL			
			readm (n)	Total* (n)	readm rate	Known cases	readm (n)	Total (n)	readm rate	Known cases
NEW ZEALAND	90	A defined adverse event can be indicated by the presence of a particular event (unplanned re-admission to hospital) occurring in theperi-operative phase (up to 90 days) in the healthcare setting. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2022-2023.	50	1931	2.6%	103.5%	7	110	6.4%	100.0%
NORWAY		Not defined	90	1264	7.1%	86.8%	14	76	18.4%	82.6%
ROMANIA	30	Readmission for any postoperative complications	28	1351	2.1%	100.0%	3	73	4.1%	100.0%
SOUTH AFRICA	30	A patient who is admitted at any time for a condition (medical/surgical)	10	169	5.9%	100.0%	0	0		
SPAIN	30		23	1361	1.7%	24.3%				
SWEDEN	All readmissions to any clinic for any reason within 30 days		194	4559	4.3%	95.5%	21	288	7.3%	88.9%
THAILAND	30	A defined adverse event can be indicated by the presence of a particular event (unplanned re-admission to hospital) occurring in the peri-operative phase (up to 30 days) in the healthcare setting.	9	2241	0.4%	100.0%	2	19	10.5%	100.0%
UNITED KINGDOM	30	Any re-admission to hospital within 30 of the patient's operation	19	2598	0.7%	39.6%	2	174	1.2%	33.6%
UNITED STATES OF AMERICA	30	Definition: Patients who were discharged from their index hospital stay or encounter (whether inpatient or outpatient basis) after their primary procedure, and are subsequently formally admitted by a qualified practitioner as an inpatient to an acute care bed, or have a subsequent hospital (or facility-based) encounter (receiving outpatient, emergency department or observation services) that crosses at least two midnights. Criteria: Patients who are formally admitted by a qualified practitioner as an inpatient to an acute care bed. OR Otherwise have a subsequent hospital (or facility-based) encounter (receiving outpatient or observation services) that crosses at least two midnights.	5698	191416	3.0%	100.0%	1318	21209	6.9%	100.0%
UZBEKISTAN	30		9	956	0.9%	100.0%	1	16	6.3%	100.0%

LEGEND

Total N = 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.

Table 14 - Rate of postoperative unplanned reoperation by country, primary and revisional procedures (2023)

Country	Measured within (n) Days from procedure	Registry Definition	PRIMARY				REVISIONAL			
			reop (n)	Total (n)	reop rate	Known cases	reop (n)	Total (n)	reop rate	Known cases
AUSTRALIA	90	A defined adverse event can be indicated by the presence of a particular event (unplanned return to theatre) occurring in the peri-operative phase (up to 90 days) in the healthcare setting. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2022-2023.	140	14635	1.0%	91.6%	240	3256	7.4%	90.1%
AUSTRIA	90		70	1857	3.8%	91.0%	17	287	5.9%	92.6%
CHILE	30	A defined adverse event can be indicated by the presence of a particular event (unplanned return to theatre) occurring in the peri-operative phase (up to 30 days) in the healthcare setting.	88	88	100.0%	0.3%				
EL SALVADOR	90	A defined adverse event can be indicated by the presence of a particular event (unplanned return to theatre) occurring in the peri-operative phase (up to 90 days).	4	258	1.6%	100.0%	0	9	0.0%	100.0%
FRANCE	30	Clavien 3b.	806	30939	2.6%	100.0%	260	4671	5.6%	100.0%
GERMANY	30	Re-op in case of postop complications.	393	21508	1.8%	92.8%	136	2651	5.1%	87.6%
INDIA			62	14860	0.4%	100.0%	16	885	1.8%	100.0%
IRELAND	30	Return to theatre within 30 of the patient's operation.	0	144	0.0%	98.6%	0	9	0%	100.0%
ISRAEL	90	All patients who were readmitted within 90 days only to the surgical department.	269	4986	5.4%	100.0%	91	975	9.3%	100.0%
ITALY	30	Unplanned return to the operating room occurring in the perioperative phase (only up to 30 days) to resolve post-operative complications.	84	13673	0.6%	79.2%	15	1270	1.2%	70.6%
KAZAKHSTAN	90		5	1138	0.4%	102.2%	0	25	0.0%	100.0%
MEXICO			16	7079	0.2%	100.0%	11	787	1.4%	100.0%
NETHERLANDS	30	Return to OR within 30 days (exclusion of endoscopic and/or radiologic interventions).	118	11175	1.1%	100.0%	29	1213	2.4%	100.0%
NEW ZEALAND	90	A defined adverse event can be indicated by the presence of a particular event (unplanned return to theatre) occurring in the peri-operative phase (up to 90 days) in the healthcare setting. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2022-2023.	12	1931	0.6%	103.5%	11	110	10.0%	100.0%

Country	Measured within (n) Days from procedure	Registry Definition	PRIMARY				REVISIONAL			
			reop (n)	Total* (n)	reop rate	Known cases	reop (n)	Total (n)	reop rate	Known cases
ROMANIA	30	Number of patients who suffered any reintervention - surgical therapy for the postoperative complication.	14	1351	1.0%	100.0%	1	73	1.4%	100.0%
RUSSIA	30	Return to OT reported by the surgeon within 30 days from the index operation.	83	8882	0.9%	100.0%	3	333	0.9%	100.0%
SOUTH AFRICA	30	Surgery - elective or emergency - for complications directly related to the primary procedure. eg. lengthening of common channel for BPD -DS procedure.	8	169	4.7%	100.0%				
SOUTH KOREA	30	A defined adverse event can be indicated by the presence of a particular event (unplanned return to theatre) occurring in the peri-operative phase (up to 30 days) in the healthcare setting.	1	1454	0.1%	99.3%	0	33	0.0%	100.0%
SPAIN	30		13	1361	1.0%	24.3%				
SWEDEN	30	All Clavien IIIb within 30 days.	66	4541	1.5%	94.1%	12	287	4.2%	88.6%
THAILAND	30	A defined adverse event can be indicated by the presence of a particular event (unplanned return to theatre) occurring in the peri-operative phase (up to 30 days) in the healthcare setting.	1	2241	0.0%	100.0%	0	19	0%	100.0%
UNITED KINGDOM	30	Return to theatre within 30 of the patient's operation.	25	6127	0.4%	93.4%	5	453	1.1%	87.5%
UNITED STATES OF AMERICA	30	Definition: Any reoperations performed within 30 days of the assessed bariatric or metabolic surgical procedure. Create one Reoperation Event Form in the database for each encounter in the operating room (OR), procedure room, or other venue; even if more than one procedure was performed during that encounter. Criteria: A reoperation would only be entered in the MBSAQIP database at a minimum, procedural sedation or anesthesia was required for the procedure or if a metabolic or bariatric related procedure was performed.	1686	191416	0.9%	100.0%	215	21209	2.5%	100.0%
UZBEISTAN	30		6	956	0.6%	100.0%	0	16	0.0%	100.0%

LEGEND

Total N = Number of procedures with known reoperations.

readm rate = Percentage of patients who were reoperated out of all procedures where reaperations are known.

Known cases = Percentage of procedures where reoperation rates are known out of the total number of procedures. Excludes unknown/missing values.

Table 15 - Rate of postoperative unplanned ICU admission by country, primary and revisional procedures (2023)

Country	Measured within (n) Days from procedure	Registry Definition	PRIMARY				REVISIONAL			
			ICU (n)	Total (n)	ICU rate	Known cases	ICU (n)	Total (n)	ICU rate	Known cases
AUSTRALIA	90	A defined adverse event can be indicated by the presence of a particular event (unplanned re-admission to hospital) occurring in the peri-operative phase (up to 90 days) in the healthcare setting. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2022-2023.	10	14635	0.1%	91.6%	88	3256	0.3%	90.1%
AUSTRIA	90		47	1857	2.5%	91.0%	10	287	3.5%	92.6%
CANADA	30	Unplanned admission to an ICU (Intensive Care Unit) immediately post-operative as a consequence of the bariatric procedure (not collected during peri-op 30-90 day period).	7	2659	0.3%	99.9%	1	83	1.2%	98.8%
EL SALVADOR	90	A defined adverse event can be indicated by the presence of a particular event (unplanned ICU admission) occurring in the peri-operative phase (up to 90 days) in the healthcare setting.	1	258	0.4%	100.0%	0	9	0.0%	100.0%
FRANCE	30	Clavien 3b.	244	30939	0.8%	100.0%	69	4602	1.5%	98.5%
IRAN	90	In case of hospitalization in the ICU based on the diagnosis of the treatment team.	543	8687	6.3%	100.0%	16	165	9.7%	100.0%
IRELAND	30	Unexpected admission to the ICU in the patient's admission for surgery.	1	132	0.8%	90.4%	0	7	0.0%	77.8%
ISRAEL	90	All patients who were readmitted within 90 days to the intensive care unit.	8	4986	0.2%	100.0%	1	975	0.1%	100.0%
ITALY	30	ICU admission after surgery.	323	10166	3.2%	58.9%	45	1129	4.0%	62.8%
KAZAKHSTAN	90		7	1138	0.6%	102.2%	0	25	0.0%	100.0%
MEXICO										
NETHERLANDS	30	Unplanned ICU admission for single or multi-organ failure (ICU admission only for observation is excluded).	3	7079	0.0%	100.0%	5	787	0.6%	100.0%
NEW ZEALAND	90	A defined adverse event can be indicated by the presence of a particular event (unplanned ICU admission) occurring in the peri-operative phase (up to 90 days) in the healthcare setting.	18	11175	0.2%	100.0%	3	1213	0.3%	100.0%
NORWAY		Not defined. Figures below are Clavien-Dindo 3b or worse (patients might or might not have been to ICU).	0	1931	0.0%	103.5%	0	110	0.0%	100.0%

Country	Measured within (n) Days from procedure	Registry Definition	PRIMARY				REVISIONAL			
			ICU (n)	Total* (n)	ICU rate	Known cases	ICU (n)	Total (n)	ICU rate	Known cases
ROMANIA	30	Patients admitted to the ICU for any post-operative complications.	15	1351	1.1%	100.0%	1	73	1.4%	100.0%
SOUTH AFRICA	30	ICU admissions (surgical/medical) directly related to complications of the primary procedure.	8	169	4.7%	100.0%				
SOUTH KOREA	30	A defined adverse event can be indicated by the presence of a particular event (unplanned ICU admission) occurring in the peri-operative phase (up to 30 days) in the healthcare setting.	4	1454	0.3%	99.3%	1	33	3.0%	100.0%
SWEDEN		Clavien grade IV within 30 days	3	4541	0.1%	94.1%	0	287	0.0%	88.6%
THAILAND	30	A defined adverse event can be indicated by the presence of a particular event (unplanned ICU admission) occurring in the peri-operative phase (up to 30 days) in the healthcare setting.	3	2241	0.1%	100.0%	3	19	15.8%	100.0%
UNITED KINGDOM	30	Unexpected admission to the ICU in the patient's admission for surgery.	20	6127	0.3%	93.4%	5	466	1.1%	90.0%
UNITED STATES OF AMERICA	30	Definition: An unplanned admission to the intensive care unit (ICU) at any time within the 30-day postoperative period. Criteria: A patient that was admitted to the intensive care unit at any time within 30 days postoperatively which was not planned prior to or at the time of the primary procedure.	922	191416	0.5%	100.0%	215	21209	1.0%	100.0%
UZBEKISTAN	30		1	956	0.1%	100.0%	0	16	0.0%	100.0%

LEGEND

Total N = Number of procedures with known ICU admissions.

ICU rate = Percentage of patients who were admitted to the ICU out of all procedures where ICU admission rates are known.

Known cases = Percentage of procedures where ICU admission rates are known out of the total number of procedures. Excludes unknown/missing values.

Table 16 - Rate of postoperative death by country, primary and revisional procedures (2023)

	PRIMARY				REVISIONAL			
	Deaths (n)	Total* (n)	Mortality rate	Known cases	Deaths (n)	Total* (n)	Mortality rate	Known cases
AUSTRALIA	4	15985	0.03%	100.0%	1	3614	0.03%	100.0%
AUSTRIA	2	1857	0.11%	91.0%	1	287	0.35%	92.6%
CANADA	0	2661	0.00%	100.0%	0	84	0.00%	100.0%
CHINA	NR	9	NR	0.0%	NR	0	NR	0.0%
EL SALVADOR	0	258	0.00%	100.0%	0	9	0.00%	100.0%
FRANCE	14	30939	0.05%	100.0%	5	4671	0.11%	100.0%
GERMANY	10	21513	0.05%	92.9%	3	26	0.11%	87.6%
INDIA	3	14860	0.02%	100.0%	1	49	0.11%	100.0%
IRAN	NR	8687	NR	100.0%	NR	885	NR	100.0%
IRAQ	5	NR	NR	NR	NR	165	NR	0.5%
IRELAND	0	15	0.00%	10.3%	0	2	0.00%	11.1%
ISRAEL	0	4986	0.05%	100.0%	1	1	0.10%	100.0%
ITALY	3	17268	0.02%	100.0%	3	975	0.17%	100.0%
KAZAKHSTAN	5	1138	0.44%	102.2%	0	1798	0.00%	100.0%
MEXICO	5	7079	0.07%	100.0%	1	25	0.13%	100.0%
NETHERLANDS	6	11175	0.05%	100.0%	1	787	0.08%	100.0%
NEW ZEALAND	0	1866	0.00%	100.0%	0	1213	0.00%	100.0%
NORWAY	1	1457	0.07%	100.0%	0	110	0.00%	100.0%
ROMANIA	0	1351	0.00%	100.0%	0	92	0.00%	100.0%
RUSSIA	5	8882	0.06%	100.0%	0	73	0.00%	100.0%
SOUTH AFRICA	0	169	0.00%	100.0%	0	333	NR	NR
SOUTH KOREA	2	1454	0.14%	99.3%	0	0	0.00%	100.0%
SPAIN	10	5607	0.18%	100.0%	1	33	0.17%	100.0%
SWEDEN	0	4824	0.00%	100.0%	1	578	0.31%	100.0%
THAILAND	0	0	NR	0.0%	0	324	NR	0.0%
UNITED KINGDOM	2	2769	0.07%	42.2%	0	0	0.00%	37.1%
UNITED STATES OF AMERICA	142	191416	0.07%	100.0%	31	192	0.15%	100.0%
UZBEKISTAN	1	956	0.10%	100.0%	0	21209	0.00%	100.0%
VENEZUELA	3	1135	0.26%	100.0%	NR	16	NR	NR

LEGEND

Total N = Number of procedures with known death status.

Mortality rate = Percentage of patients who died 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.

NS = Not Stated

Mortality after metabolic bariatric surgery

The provided sources contain detailed data on unplanned deaths following metabolic bariatric procedures across various countries in 2023, categorized into primary and revisional procedures. For each country, the following metrics are reported:

- Deaths N: Number of reported deaths
- Total N: Number of procedures with known death status
- Mortality Rate: Percentage of deaths among procedures with known mortality status
- Known Cases: Proportion of procedures for which mortality status is known

Overall, most participating countries reported mortality data with high completeness (≥100% Known Cases) for both primary and revisional procedures. Exceptions included countries with lower completeness and countries with missing revisional data.

The number of reported deaths was notably higher for primary procedures (n=223) than for revisional procedures (n=50), reflecting the substantially greater global volume of primary procedures in 2023. Mortality rates varied by country and procedure type but remained low overall:

- Average Mortality Rate – Primary Procedures (≥90% Known Cases): ≈0.061%
- Average Mortality Rate – Revisional Procedures (≥90% Known Cases): ≈0.129%

Across all 37 contributing registries, reported mortality remained exceptionally low—typically under 0.1%, with no country exceeding 0.5%. Mortality was consistently lower for primary procedures compared to revisional ones.

However, caution is advised when interpreting data from countries with small sample sizes or limited follow-up. Outliers, such as a higher rate reported in Venezuela, may reflect small denominators rather than genuinely elevated risk. The most reliable mortality estimates come from countries with comprehensive data and robust follow-up.

Global findings reaffirm the strong safety profile of metabolic bariatric surgery. Continued efforts to enhance data completeness, standardize follow-up, and clarify variation in length of stay (LOS) and complication rates will further support clinical decision-making. The IFSO Global Registry remains committed to these goals by providing transparent, standardized data to inform practice and policy.

Trends in Metabolic and Bariatric Surgery Worldwide

Since its inception over 30 years ago, IFSO has championed the systematic collection of data on the number and types of bariatric procedures performed across its member societies. Early efforts took the form of global surveys, which revealed evolving patterns in surgical practice, such as the rise of sleeve gastrectomy (SG), the decline of adjustable gastric banding (AGB), and growing interest in one-anastomosis gastric bypass (OAGB). These surveys offered valuable snapshots of surgeon preferences and regional variations, laying the groundwork for ongoing global monitoring.

With the publication of this ninth Global Registry Report, the third to draw exclusively on aggregated data from national and regional metabolic bariatric surgery (MBS) registries, a more robust, longitudinal dataset has begun to emerge. This milestone enables the introduction of a dedicated trends chapter, which compares findings from this and the two preceding reports to identify changes over time in patient demographics, procedure volumes, operative techniques, and perioperative outcomes.

The Global Registry data are derived from established registries and reflect broader national or regional practice, thus minimizing selection bias. Although the current report includes fewer countries than past surveys, the growing number of qualifying registries ensures increasingly representative global coverage. With each new edition, the longitudinal scope of this dataset will expand, enhancing the reliability of observed trends and enabling a more nuanced understanding of global developments in MBS.

This chapter marks the beginning of a sustained effort to track and report on evolving trends in metabolic and bariatric surgery, offering IFSO members, clinicians, policymakers, and researchers' valuable insights into real-world practice patterns across regions and over time. In the upcoming report, once a new registration year has been added, greater emphasis will be placed on current trends, the emergence of novel IFSO-approved procedures, and the discontinuation of certain procedures.

Figure 25. Total procedures by procedure type and year

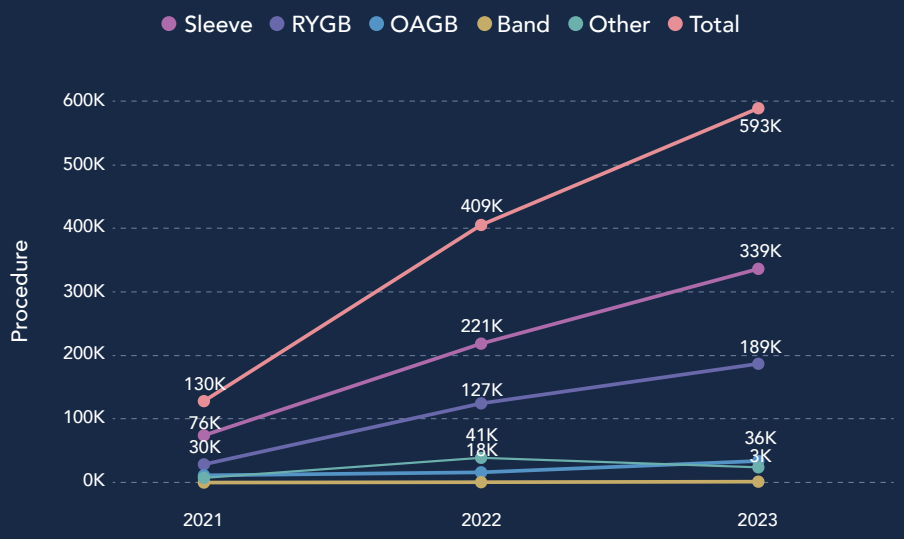


Figure 26. Procedure type breakdown by year

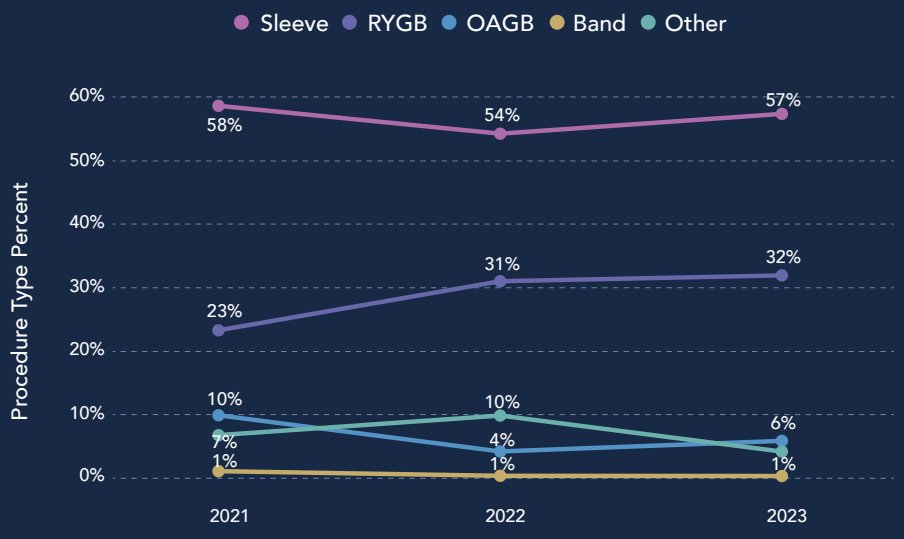
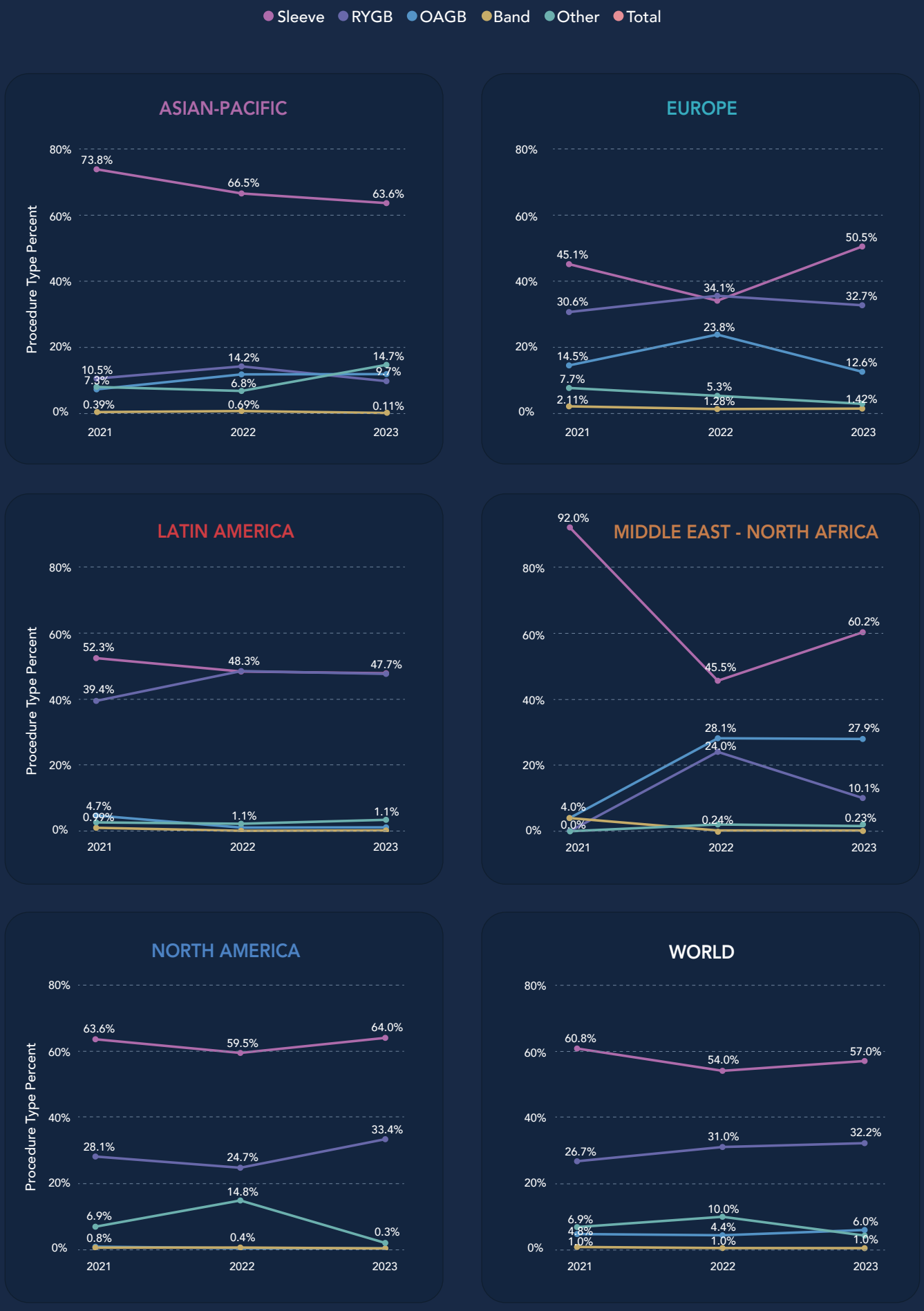


Figure 27. Procedure type breakdown by IFSO chapter and year



Conclusions

This is the ninth report of the IFSO Global Registry, and the third to contain exclusively data from national or regional registries. As with the previous editions, aggregated rather than individual-level data has been collected, ensuring compliance with both GDPR and local privacy regulations governing each contributing registry.

The central aim of this report remains the same: to provide an overview of the demographics of people with obesity undergoing bariatric and metabolic surgery, the types of procedures performed, and the safety profile of these interventions worldwide. Data collection continues to be guided by a relatively lean data dictionary, developed through the Bristol University–IFSO collaboration on the metabolic bariatric surgery registry minimum dataset. Although outcomes such as weight change and comorbidity resolution are highly desirable, they are still not consistently collected across registries. We remain committed to supporting efforts that will allow the inclusion of these vital data in future editions.

The quality of the data presented is of paramount importance. While earlier reports often included information from individual centers representing entire countries, this report—like the last two—relies only on registries aiming for population-level capture, resulting in a dataset that is more reliable and better representative of global surgical practice. We are pleased to report that even more registries have contributed data this year, further strengthening the value of the report.

To ensure ongoing improvements in data integrity, we emphasize the need for registries to report on both data acquisition rates and audit processes. This will be a continued area of focus in future iterations.

It is our ambition to include contributions from all 72 IFSO member societies, including those who currently lack a national or regional registry. We look forward to ongoing collaboration with these societies to help establish and support their registry infrastructure.

A truly coordinated global registry effort will not only allow us to document the real-world uptake and safety of bariatric metabolic surgery more accurately but also provide a platform to address important research questions that will drive clinical innovation and evidence-based care. With the momentum established by previous editions and the growing commitment of our global partners, the future of the IFSO Global Registry is exceptionally promising.

Appendix 1

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Known National/Regional Registries to IFSO

CHAPTERS Asian-Pacific · European · Latin-America · Middle-East & North African · North American

Known Registries to IFSO	2023	2022	2021
AUSTRALIA	AUSTRALIA	AUSTRALIA	AUSTRALIA
CHINA	CHINA		CHINA
INDIA	INDIA		
MALAYSIA		MALAYSIA	MALAYSIA
NEW ZEALAND	NEW ZEALAND	NEW ZEALAND	NEW ZEALAND
SINGAPORE	SINGAPORE		
SOUTH KOREA	SOUTH KOREA	SOUTH KOREA	
TAIWAN	TAIWAN		TAIWAN
THAILAND	THAILAND		
AUSTRIA	AUSTRIA	AUSTRIA	AUSTRIA
AZERBAIJAN	AZERBAIJAN	AZERBAIJAN	AZERBAIJAN
FRANCE	FRANCE	FRANCE	FRANCE
GERMANY	GERMANY		
GREECE			
IRELAND	IRELAND		
ISRAEL	ISRAEL	ISRAEL	ISRAEL
ITALY	ITALY		ITALY
KAZAKHSTAN	KAZAKHSTAN		
NETHERLANDS	NETHERLANDS	NETHERLANDS	NETHERLANDS
NORWAY	NORWAY	NORWAY	NORWAY
ROMANIA	ROMANIA		
RUSSIA	RUSSIA	RUSSIA	RUSSIA
SOUTH AFRICA	SOUTH AFRICA	SOUTH AFRICA	SOUTH AFRICA
SPAIN	SPAIN		SPAIN
SWEDEN	SWEDEN	SWEDEN	SWEDEN
SWITZERLAND	SWITZERLAND		
UNITED KINGDOM	UNITED KINGDOM	UNITED KINGDOM	
UZBEKISTAN	UZBEKISTAN	UZBEKISTAN	
ARGENTINA		ARGENTINA	ARGENTINA
BOLIVIA	BOLIVIA		BOLIVIA
BRAZIL	BRAZIL	BRAZIL	BRAZIL
CHILE	CHILE	CHILE	CHILE
COLOMBIA	COLOMBIA		
DOMINICAN REPUBLIC			DOMINICAN REPUBLIC
EL SALVADOR	EL SALVADOR		
MEXICO	MEXICO	MEXICO	MEXICO
VENEZUELA	VENEZUELA	VENEZUELA	VENEZUELA
IRAN	IRAN	IRAN	
IRAQ	IRAQ		
KUWAIT		KUWAIT	KUWAIT
LEBANON	LEBANON		
CANADA	CANADA	CANADA	CANADA
UNITED STATES OF AMERICA	UNITED STATES OF AMERICA	UNITED STATES OF AMERICA	UNITED STATES OF AMERICA
USA MICHIGAN	USA MICHIGAN		USA MICHIGAN
44 TOTAL	39 TOTAL	24 TOTAL	27 TOTAL

Data Dictionary (abbreviated)

LABEL	DEFINITION	PURPOSE
Country	Country designation as per IFSO specifications	To distinguish between countries
Primary or Revisional Surgery Designation	Designation of the bariatric procedure as primary - ie on a virginal stomach that has never had a bariatric procedure performed - or revisional - ie a conversion procedure that is changing the bariatric procedure from one type to another	To stratify outcomes according to the risk profile of the surgery
Sex	Sex is the biological distinction between male and female.	To identify differences between sexes
Body mass index prior to 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
Age at surgery	The age of the patient at the time of the operation in years	To identify differences in age at which patients come for treatment between countries, prim/rev and sexes
Type 2 Diabetes	The prevalence of patients who have a history of pharmacotherapy for type 2 diabetes mellitus and/ or clinical evidence of high blood glucose levels over time	To identify the differences in the prevalence of Type 2 Diabetes in those having bariatric surgery between countries and sexes
Hypertension	The prevalence of patients who have a history of pharmacotherapy for hypertension and/ or clinical evidence of high blood pressure	To identify the differences in the prevalence of Hypertension in those having bariatric surgery between countries and sexes
Depression	Patient has a history of pharmacotherapy for depressive disorder and/ or has received a diagnosis of depressive disorder	To identify the differences in the prevalence of Depression in those having bariatric surgery between countries and sexes

LABEL	DEFINITION	PURPOSE
Sleep Apnoea	Patient has a history of sleep apnoea syndrome	To identify the differences in the prevalence of Sleep Apnoea in those having bariatric surgery between countries and sexes
GERD	Patient has a history of pharmacotherapy for gastroesophageal reflux disease and/ or clinical evidence of disease	To identify the differences in the prevalence of GERD in those having bariatric surgery between countries and sexes
Dyslipidemia	Patient has a history of pharmacotherapy for dyslipidemia and/ or clinical evidence of high blood cholesterol/ triglycerides	To identify the differences in the prevalence of Dyslipidemia in those having bariatric surgery between countries and sexes
Sleeve Gastrectomy	The number of sleeve gastrectomies completed	To understand the different procedure types undertaken in primary vs revisional context by country
One Anastomosis Gastric Bypass	The number of One Anastomosis Gastric Bypass completed (also none as Single Anastomosis Gastric Bypass or Mini Gastric Bypass)	To understand the different procedure types undertaken in primary vs revisional context by country
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
Other Procedures	The number of all other bariatric procedures completed (excluding Sleeve, OAGB, RYGB) including but not limited to Gastric Band, Duodenal Switches, Bilio-pancreatic diversions, Single Anastomosis Duodeno-ileostomy, Stomach intestinal Pylorus Sparing, Gastric imbrication, Gastroplasty	To understand the different procedure types undertaken in primary vs revisional context by country
Laparoscopic	The number of completed procedures where the operative approach was just laparoscopic	To understand the different surgical approaches used in primary vs revisional context by country

LABEL	DEFINITION	PURPOSE
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
Endoscopic	The number of completed procedures where the operative approach was just endoscopic	To understand the different surgical approaches used in primary vs revisional context by country
Robotic	The number of completed procedures where the operative approach included the assistance of a robot to perform the surgery	To understand the different surgical approaches used in primary vs revisional context by country
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
Unplanned return to theatre rate	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
Unplanned ICU rate	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
Death Rate	The prevalence of mortality (between 30-90 days) after the bariatric procedure	To understand the outcomes in primary vs revisional context by country
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

Definitions Used by Various Registries for Obesity Related Diseases

Diabetes

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.
Canada - Ontario	Diabetes status at baseline is determined by the patient's primary care physician at baseline.
China	T2DM was defined as fasting blood glucose> 7.0 mmol/L, or/and random blood glucose >11.1 mmol/L, or/and 2-h blood glucose after a 75-g oral glucose tolerance test > 11.1 mmol/L, or/and the use of antihyperglycemic drugs.
Iran	Diabetes status at baseline is determined by the history of the previous diabetes diagnosis, receiving diabetes treatment or diagnosis based on lab tests (FBS> 126 or HbA1C>6.5) at the time of operation.
Israel	Self-reported by the patient before surgery.
Italy	Diabetes status is determined according to ADA (American Diabetes Association) Diabetes Care 2014; 37(S 1): S81-90.
Kuwait	Patients with type 2 diabetes.
Netherlands	> 42 mmol HbA1c/ mol HbA.
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.
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.
South Korea	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 diabetes.
Sweden	Patients with diagnose of type 2 diabetes and with medication for hyperglycemia.
United Kingdom	Patients with type 2 diabetes at surgery that are treated with diabetes medication.
USA - Michigan	Type I or 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) non-insulin-dependent diabetes mellitus (NIDDM), adult-onset diabetes mellitus treated with (please check all that apply): Diet, Oral Medications, Insulin-dependent, Non-Insulin Injectables.
Uzbekistan	Established type 2 diabetes mellitus before surgery, who are treated with diabetes medications.

Hypertension

Canada - Ontario	Hypertension at baseline is determined by the patient's primary care physician at baseline.
China	Hypertension was defined as systolic pressure > 140 mmHg, or/and diastolic pressure > 90 mmHg, or/and the use of antihypertensive drugs.
Iran	Hypertension status at baseline is determined by the history of the previous hypertension diagnosis or receiving treatment for hypertension at the time of operation.
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.
Kuwait	Hypertension.
Netherlands	Systolic blood pressure >120 mmHg and/or diastolic blood pressure > 80 mmHg.
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.
South Korea	Hypertensive status at baseline is determined by the patient identifying themselves as having hypertension at the time of the operation and having a treatment for hypertension.
Sweden	Patients under medication for hypertension.
United Kingdom	Patients with hypertension at surgery that are treated with anti-hypertensive medication
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. Please specify the number of different anti-hypertensive agents the patient is currently prescribed.
Uzbekistan	An established diagnosis, and when the patient takes pills for hypertension.

Obstructive Sleep Apnoea

Canada - Ontario	Sleep Apnoea at baseline is determined by the patient's primary care physician at baseline or following the presurgical sleep study.
China	Polysonography：AHI greater than 5.
Iran	Sleep apnea status at baseline is determined by the patient identifying themselves as having frequently stops breathing during his or her sleep or confirmed by polysomnogram at the time of the operation.
Israel	Self-reported by the patient before surgery.
Italy	Sleep apnoea status is determined according to The Lancet 2002;360(9328):237-45.
Kuwait	Sleep Apnoea.
Netherlands	Symptoms with postive poly(somno)graphy (PSG), with or without a apnea-hypopnea index (AHI) of >5.
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.
South Korea	Confirmed sleep apnea at the time of the operation.
Sweden	Patients using CPAP or BiPAP.
United Kingdom	Patient has a diagnosis of sleep apnoea at the time of surgery.
USA - Michigan	Sleep apnea, nocturnal upper airway obstruction, or sleep disordered breathing.
Uzbekistan	Patient using CPAP mask.

Dysplipidemia

Canada - Ontario	The Ontario Bariatric Registry records hyperlipidemia. Hyperlipidemia at baseline is determined by the patient's primary care physician at baseline.
China	Hyperlipemia was defined by serum triglycerides > 1.70 mmol/L, or/and serum total cholesterol > 5.7mmol/L, or/and serumlow-density lipoprotein (LDL) cholesterol > 3.76 mmol/L, serum high-density lipoprotein (HDL) cholesterol < 0.91 mmol/L, or/and the use of lipid lowering agents.
Iran	Dyslipidemia status at baseline is determined by the history of the previous dyslipidemia diagnosis or having treatment for dyslipidemia or diagnosis based on lab tests (Total Colestrol>200 or Triglyceride>150) at the time of operation.
Israel	Self-reported by the patient before surgery.
Italy	Dyslipidemia status is determined according to New England Journal of Surgery 2004;351:2683-2693.
Netherlands	An abnormal lipid spectrum (LDL, HDL, Triglycerides) LDL >8.0mmol/L HDL < 1.1 mmol/L Triglycerides > 2.2 mmol/L Primary hypercholesterolemia, with a mean total cholesterol of at least 6.5 mmol/L, based on measurements in three samples with intermittent period of taking blood of approximately 1 week.
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.
South Korea	Having a treatment for dyslipidemia at the time of the operation.
Sweden	Patients under medication for dyslipidemia.
United Kingdom	Not collected by UK NBSR.
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.
Uzbekistan	A blood test for a lipid profile when receiving a pill for dyslipidemia.

Gastroeosophageal Reflux Disease (GERD)

Canada - Ontario	GERD at baseline is determined by the patient's primary care physician at baseline.
Iran	GERD status at baseline is determined based on the patient report as having a Heartburn sign or the Endoscopy report as Esophagitis at the time of operation.
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.
Kuwait	GERD.
Netherlands	Anamnestic signs of GERD, with or without a positive 24-48uurs pH-measurement and/or gastro-duodenoscopy.
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.
South Korea	Confirmed GERD at the time of the operation.
Sweden	Patients under medication with PPI (proton pump inhibitor).
United Kingdom	Patient receiving anti reflux medication at the time of surgery.
USA - Michigan	Chronic heartburn, acid regurgitation, acid reflux disease, acid dyspepsia, esophageal reflux, esophagitis, reflux laryngitis, Barrett's esophagus, reflux-induced cough or asthma.
Uzbekistan	Established diagnosis endoscopically and the patient took pills for GERD.

Depression

Israel	Self-reported by the patient before surgery.
Italy	Depression status at baseline is determined according to peri-operative psychiatric counseling.
Kuwait	Depression.
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.
South Korea	Having a treatment for depression at the time of the operation.
Sweden	Patients under medication for depression.
United Kingdom	Patient receiving antidepressant medication at the time of surgery.
USA - Michigan	Including clinical depression and depressive disorder, treated with medication, electroconvulsive therapy, and/or psychotherapy.
Uzbekistan	Patient taking pills for depression.

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