

2024

REGISTRATION YEAR

10th

GLOBAL REGISTRY REPORT

Metabolic Bariatric Surgery
Worldwide



38

NATIONAL
REGISTRIES

55.4%

SLEEVE
GASTRECTOMY

581,120

PROCEDURES
REPORTED

0.039%

PRIMARY
MORTALITY



The International Federation for the
Surgery and Other Therapies for Obesity

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Executive Summary

The tenth report describes metabolic bariatric surgery for the 2024 registration year. It is the fourth edition built entirely on aggregated data from national and regional registries, and the first in which four consecutive years of data (2021–2024) can be read as a continuous series rather than as separate annual pictures. As before, the figures for the United States relate to the previous registration year (2023), because the size of that dataset does not allow it to be processed within the global timetable.

On the integrity of the data.

The 2024 returns were audited before this text was written. The great majority of the submissions are sound. A small number of country-level entries are incomplete or internally inconsistent, and these have been set aside as Not Reliable (NR) rather than reported at face value. One of them bears on the headline messages and is flagged throughout: the United States primary-mortality count is far out of line with every other registry and almost certainly reflects a reading error in the source MBSAQIP data. This could not be corrected before this report closed, so the value is qualified as Not Reliable (NR) and the global mortality figure is reported with it permanently excluded, not weighted into any total. Stating these limitations openly is part of the registry's purpose, not a qualification of it.

Participation

581,120 procedures were reported for 2024 from 40 registries (38 countries plus the two regional registries of Michigan, USA and Ontario, Canada), again about 91% of the registries known to IFSO. Five registries are new or rejoining the disaggregated dataset: Egypt, Greece, Ecuador and Japan are new, and Malaysia returns after an absence. Procedure type is known for 580,898 of these (99.96%), and that is the denominator used for every type-based percentage in this report. The 2024 volume sits a little below the 2023 figure of 597,267.

Procedures

Sleeve gastrectomy remained the most frequent primary operation, at 55.4% of all procedures (56.8% the year before). One-anastomosis gastric bypass rose to 7.0% (from 6.0%), and the residual "other" group to 5.4% (from 4.3%). The share of Roux-en-Y gastric bypass was essentially unchanged at 31.7%, and it remained the commonest revisional operation. Revisional procedures made up 7.5% of the total (43,527 of 581,120), down from 8.4%.

Patients

Women accounted for 77.6% of primary and 82.6% of revisional procedures. The median age at surgery was again about 42 years, youngest in China (around 32) and oldest in Spain (around 48.5). Most registries reported a median pre-operative BMI between 40 and 45 kg/m².

Obesity-related disease

Type 2 diabetes was again the condition most often recorded, generally between about 8% and the high-40s per cent among the well-populated registries; Japan and Ecuador recorded the highest all-patient prevalences, at 48.2% and 48.1%, with Uzbekistan next at 43%. South Africa returned a higher figure still (65.8%) on 76 primary procedures, too small a cohort to read as a country rate. The sex pattern held: diabetes, hypertension, sleep apnoea and dyslipidaemia were more common in men, and depression in women, while reflux showed no consistent difference between the sexes.

Safety

With the United States value not included, global primary mortality was about 0.039% (88/227,891), against about 0.046% in the prior year, very low and broadly unchanged. Revisional procedures again carried a higher reoperation rate than primary ones. On the reliable data, metabolic bariatric surgery remained a safe intervention across very different health systems.

Headline-volume

The 2024 dataset records 581,120 procedures, of which 537,593 were primary and 43,527 revisional. Procedure type is known for 580,898 of them (99.96%), and that figure is the denominator for every type-based percentage in this report; the residual 222 records, which carry no procedure type, are disclosed rather than distributed across the procedure categories. The by-type breakdown itself covers 577,542 procedures, the shortfall reflecting incomplete domain-level registration in a small number of registries rather than a counting error; the coverage is stated with the affected figures and in Appendix 5.

Important caveats

Because every contributing dataset is a national or regional registry rather than a single centre speaking for a whole country, the figures in this report carry less of the selection bias that limited earlier collections. The trade-off is breadth: a registry-only approach admits fewer countries than the survey era did, but each one that qualifies stands for a much larger share of real practice, and the number meeting the inclusion criteria continues to grow edition on edition. The same caution that applies to any aggregated source applies here, and four points should be kept in view.

- **Incomplete case ascertainment.** Few registries capture every individual who undergoes a metabolic bariatric procedure within their borders, so the counts reported here are floors rather than exhaustive tallies, and the degree of under-capture differs from one country to the next.
- **Incomplete perioperative follow-up.** A complication that occurs after discharge can be missed where follow-up is partial, so the safety counts depend heavily on how completely each registry traces its patients to thirty or ninety days.
- **Variable auditing.** The checks each registry runs to confirm its own accuracy are not the same from country to country, which means that two identical-looking figures may rest on very different degrees of verification.
- **Differing definitions.** Key variables, the obesity-associated diseases above all, are not defined identically across registries, so cross-country comparison is indicative rather than exact; wherever a definition diverges in a way that affects the reading, the difference is noted in the relevant chapter and in Appendix 4.

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 bariatric surgery worldwide.”

Key Outcomes in this Report

Registry coverage and participation

- **Volume.** 581,120 procedures captured for the 2024 registration year (537,593 primary; 43,527 revisional). Procedure type is known for 580,898 of them (99.96%), and that is the denominator for all type-based percentages; the residual 222 records without a type are disclosed in Appendix 5.
- **Participants.** 40 registries from 38 countries plus the two regional registries of Michigan (USA) and Ontario (Canada), about 91% (40 of 44) of the registries known to IFSO.
- **New or rejoining this year.** Egypt, Greece, Ecuador and Japan join for the first time, and Malaysia returns after an absence. This is the largest single intake since the move to registry-only reporting.
- **United States timing.** As in earlier editions, the United States figures relate to the previous registration year (2023), because the MBSAQIP dataset cannot be processed within the global timetable.

Patient demographics

- **Sex.** Most patients were women, consistent across registries: 77.6% of primary and 82.6% of revisional procedures (female of female-plus-male).
- **Age.** Median age at primary surgery was again about 42 years, youngest in China (about 32) and oldest in Spain (about 48.5).
- **Baseline BMI.** Among the reliable datasets the all-patient median ran from about 37 kg/m² (South Korea) to about 46 kg/m² (Germany); most registries lay between 40 and 45 kg/m².

Preoperative obesity-related disease

- **Most common condition.** Type 2 diabetes. Among the well-populated registries all-patient prevalence ran from about 8% (Norway) to about 48% (Japan and Ecuador), with Uzbekistan next (43%) and India in the high-30s; South Africa's 65.8% rests on 76 primary procedures and is not comparable as a country rate.
- **Sex pattern.** Diabetes, hypertension, obstructive sleep apnoea and dyslipidaemia were recorded more often in men; depression more often in women; reflux showed no consistent difference between the sexes.

Types and techniques of procedures

- **Most common primary procedure.** Sleeve gastrectomy, at 55.4% of all procedures (56.8% the prior year), with regional variation.
- **Most common revisional procedure.** Roux-en-Y gastric bypass, which made up well over half of revisional cases; sleeve gastrectomy under a fifth.
- **Emerging techniques.** One-anastomosis gastric bypass rose to 7.0% (from 6.0%) and the residual "other" group to 5.4% (from 4.3%).
- **Surgical approach.** Laparoscopy remained the predominant route, at 80.2% of the primary procedures for which approach was recorded, with robotic assistance at 18.2% and commoner in revisional surgery (24.2%). Approach was recorded for 75.8% of primary and 89.2% of revisional procedures; the registries that do not record it are shown as NRep (Not Reported), are excluded from both the numerator and the denominator, and are named with the figures (see Appendix 5).

Length of stay and readmission

- **Primary procedures.** Median length of stay after primary surgery ran from one day (Canada, Egypt, El Salvador, Iran, the Netherlands, Norway, Sweden, the United States and Michigan) to about six days in China.
- **Revisional procedures.** Generally associated with stays as long as, or longer than, primary ones.
- **Interpretation.** The spread reflects local discharge practice and the availability of community support more than complication rates; the registries with the most complete follow-up are not necessarily those with the lowest recorded event rates.

Safety

- **Mortality.** With the United States primary-death count excluded as an outlier, global primary mortality on the reliable submissions was about 0.039% (88 deaths / 227,891 procedures), in keeping with the very low rates of earlier editions.
- **Reoperation and ICU.** Revisional procedures again carried a higher reoperation rate than primary ones, consistent with their greater technical complexity; unplanned ICU admission stayed uncommon across all chapters.
- **Flagged outlier.** The United States recorded 1,331 primary deaths for 2023, roughly ten times its prior-year count and an order of magnitude above every comparator. The value is incorrect, almost certainly a reading error in the source MBSAQIP data. It is therefore qualified as Not Reliable (NR) and permanently excluded from the global figure and from every weighted total. The cell is shown as NR in Table 16 rather than printed as a value, so that the United States contributes no primary-mortality figure to this edition. Global primary mortality is ~0.039% (88 deaths / 227,891)
- **Conclusion.** On the reliable data, metabolic bariatric surgery remained a very safe intervention across health systems that differ in nearly every other respect.



Foreword

It is my great pleasure to present the 10th IFSO Global Registry Report, a milestone that reflects more than a decade of international collaboration, scientific commitment and shared responsibility toward improving the care of people living with obesity.

The IFSO Global Registry has become one of our Federation's most valuable strategic initiatives. More than a collection of numbers, it represents a global commitment to transparency, quality improvement and evidence-based practice. Every participating registry, every contributing society and every data manager plays a vital role in building an increasingly accurate picture of metabolic bariatric care around the world.

This tenth report is particularly significant. It is the fourth edition based entirely on aggregated national and regional registry data, and for the first time it allows us to observe four consecutive years of worldwide practice using a consistent methodology. As participation continues to grow, so does the reliability of our understanding of how metabolic bariatric interventions are evolving across different healthcare systems.

The report confirms once again that metabolic bariatric surgery remains one of the safest and most effective treatments for severe obesity and its associated diseases. At the same time, it demonstrates how surgical practice continues to evolve, with changes in procedure selection, expanding geographical participation and the emergence of new therapeutic approaches.

We are also witnessing one of the most important transformations in obesity care in decades. The rapid expansion of effective obesity management medications is reshaping the treatment landscape. Rather than viewing surgery and pharmacotherapy as competing approaches, IFSO embraces a future in which all evidence-based therapies work together to provide personalised, multidisciplinary care for people living with obesity. This vision is reflected not only in our new name - the International Federation for the Surgery and Other Therapies for Obesity - but also in our continued commitment to collaboration among surgeons, obesity physicians, endoscopists, integrated health professionals and all specialists involved in obesity management.

As obesity treatment becomes increasingly integrated, the importance of high-quality registries becomes even greater. Reliable real-world data will allow us to understand how different therapies complement one another, how patient pathways evolve over time, and ultimately how we can deliver better outcomes for millions of patients worldwide.

This report also reminds us that a registry is only as strong as the collective commitment behind it. I warmly thank every national society, registry team, clinician and data manager who contributed to this edition. Their dedication enables the international community to learn from one another and to continuously improve standards of care.

My sincere appreciation goes to Ronald Liem, Chair of the IFSO Global Registry Committee, Vice Chair Professor Mehran Anvari, every member of the Committee, the Monash University/ANZMOSS Registry team, and the IFSO Secretariat for their outstanding work in producing this report. Their expertise and commitment have transformed the Global Registry into one of the Federation's flagship scientific resources.

Finally, I encourage every IFSO member society that has not yet established or contributed to a national registry to join this important global effort. Every additional registry strengthens our collective knowledge, improves benchmarking, advances research and, most importantly, contributes to better care for patients living with obesity.

As we celebrate this tenth report, we also look ahead with confidence. Together, through collaboration, innovation and a shared commitment to excellence, we will continue building the world's most comprehensive picture of metabolic bariatric care.

A handwritten signature in black ink, reading "K. Gawdat". The signature is fluid and cursive, with the first letter "K" being large and prominent.

Dr. Khaled Gawdat

President of the International Federation for the Surgery and Other Therapies for Obesity.



Message from the Chair

With this tenth report the Global Registry holds four consecutive years of comparable data. This is the point at which a registry ceases to be an annual census and begins to serve as a measuring instrument: it becomes possible to look past the yearly count and to ask whether practice is changing, and in which direction. The trends chapter is where that change first becomes legible, and its resolution will improve with every year that is added.

A word is owed on the data themselves. A small number of 2024 submissions proved unreliable: a United States mortality count an order of magnitude above every comparator, almost certainly a reading error in the source MBSAQIP data, identified too late in the production timetable to correct; an obesity-associated disease denominator equal to its own numerator; and a group of medians that fall outside their own interquartile ranges. These values were identified and excluded rather than reconciled into figures that only appeared complete. What remains has been judged dependable.

The substantive findings are stable, and their stability is itself informative. Sleeve gastrectomy remains the operation most frequently performed, although it no longer commands the share it once held, while one-anastomosis gastric bypass and several newer techniques continue to gain ground. The patients are, year on year, predominantly women in their early forties. Among the figures we consider reliable, perioperative mortality remains below one per thousand, across health systems that differ in nearly every other respect.

One influence runs beneath several of this year's figures while appearing in none of them. The registry records nothing on obesity management medications, yet their effect on the demand for surgery is by now considerable, and in some countries, it is already evident in the operative counts. Whether that effect proves durable or in part temporary cannot yet be said. What is certain is that the surgical figures can no longer be read apart from it, and the editions ahead will have to keep the two in view together.

A final point concerns what registries are for. A clinical quality registry does not improve care of itself. Its primary function is to measure processes and outcomes reliably and in a standardised way, with risk-adjustment and comparison between centres. Improvement becomes plausible only when that information is fed back in good time, interpreted together, and translated into targeted action. [1,2]

The large surgical quality programmes, the Veterans Affairs National Surgical Quality Improvement Program foremost among them, have shown that sustained registration, risk-adjusted benchmarking and feedback over time accompany improved surgical outcomes. Because such programmes have several components, that improvement cannot be attributed to registration or feedback alone.

Within metabolic bariatric surgery, national registries such as DATO, SOReg and MBSAQIP provide an essential infrastructure for quality monitoring, benchmarking, research and improvement. The introduction of MBSAQIP was associated with more favourable short-term outcomes, though the observation must be read with caution: the programme is more than registration alone, and its observational design does not establish an isolated causal effect of registry feedback. [2–4]

The greatest return on a quality registry therefore lies not in data collection but in the translation of valid, risk-adjusted outcome information into timely feedback, shared reflection and demonstrable local cycles of improvement. A registry is a necessary infrastructure for learning and improvement; it is not, on its own, a guarantee of better outcomes for patients. This is the invitation I wish to extend with this edition: to the registries already contributing, to draw more from what they hold by closing the loop between measurement and improvement at home; and, above all, to the countries that do not yet have a registry, to establish one for precisely this reason. The case for a registry is not the report it feeds but the patients it can help.

The registry depends wholly on the readiness of national and regional groups to share what they hold; the more complete that participation, the greater the value of the report to all who use it. I hope to welcome the registries still outside it in the eleventh edition.



Ronald Liem
Chair, IFSO Registry Committee

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Introduction

Purpose

The Global Registry exists to give the most dependable account it can of metabolic bariatric surgery worldwide: how many procedures are performed, how the use of surgery for obesity and metabolic disease is changing, and how procedures and devices behave once they are in routine use.

Mission and scope

IFSO is the global federation of national societies for metabolic bariatric surgery and the integrated health professionals who work alongside them. Founded in 1995, it now brings together 72 member societies. The Global Registry is one of its central instruments: by drawing together what national and regional registries already hold, it offers a federation-wide view of caseload, the uptake of surgery and outcomes, and a base of real-world evidence from which disparities in access can be identified and addressed.

From inception to aggregated reporting

The registry began in 2014 with around 100,000 procedures from 18 countries. By the sixth report it had grown to more than 500,000 procedures across some fifty countries, but it still relied in part on single-centre submissions and on individual-level records, an uncertain stand-in for national practice and, after the European General Data Protection Regulation took effect in 2018, an increasingly difficult one for an organisation to sustain across borders. From the 2022 edition the registry therefore accepts only aggregated returns from established national and regional registries; individual-level data are no longer transferred, which keeps it within data-protection law while still giving a credible global view.

The current model

Three features define that model. Returns are aggregated mean or median values rather than individual records. Each registry reports its own data completeness, so the reader can see how much of each country has been captured. And a standardised core dataset of twelve demographic and procedural variables, developed with the University of Bristol [5], holds every return to a common shape even though each registry keeps its own definitions. On this basis the registry now assembles close to 580,000 procedures a year from 40 national and regional registries.

This edition

The tenth report keeps that minimum dataset and the trends chapter introduced in the previous edition, now spanning four registration years. It adds an explicit data-integrity appendix (Appendix 5), which sets out how the data were audited and records every country-level value set to NR or NRep.



Data Guide

The data items are those of the established minimum dataset. Because each registry works to its own definitions, exact alignment with the common dictionary is not achievable; where a definition differs in a way that matters, it is noted in the relevant section. When a registry did not collect an item, its data are left out of that section and shown as NRep (Not Reported). Throughout this report two distinct codes are used and must not be conflated: NRep (Not Reported) marks an item a registry did not collect or submit, so that no value exists; whereas NR (Not Reliable) marks an item a registry did submit but which did not survive the data audit, for example an internally inconsistent or implausible value and which has therefore been set aside. The country-level values set to NR are listed in Appendix 5.

Why these items

The items collected here were chosen to capture three things across very different health systems: who is being operated on (sex, age and pre-operative BMI, together with six obesity-related conditions), what operation they undergo (procedure type and operative approach, primary or revisional), and how safely the early postoperative course passes (length of stay, unplanned readmission, reoperation, ICU admission and death). Collected the same way in every registry, they let the report show both what the federation has in common and where its practice diverges. The full dictionary is in Appendix 3, and the registry-specific obesity-associated disease definitions, which differ in ways that matter for comparison, are set out in Appendix 4.

Collection and collation

All known metabolic bariatric registries were invited to contribute through the IFSO Secretariat. The data dictionary and the secure REDCap database that holds the returns are maintained by the Monash University / ANZMOSS Bariatric Surgery Registry team in Melbourne, Australia. Most registries submitted directly through REDCap; a few supplied spreadsheets that were entered for them. Every return was checked for completeness and internal consistency, and for this edition the 2024 returns were audited cell by cell; the country-level values that did not survive that check are recorded in Appendix 5. The finished graphs were circulated to the Global Registry Committee for confirmation before release.

Reporting and authorship

Database management, data cleaning and the figures were the work of Robin Thompson at Monash University, with the registry team led by Jennifer Holland and Ellie James. The descriptive text was contributed by the Registry Committee under its Chair, Ronald Liem, with editorial support from the IFSO Secretariat. The visual style first introduced in the seventh report, and refined since, continues here.

Contributors to the Tenth Report

The International Federation for the Surgery and Other Therapies for Obesity brings together 72 national societies of metabolic bariatric surgeons and the integrated health professionals who work with them. Since 1995 it has worked to unite the international scientific, clinical and multidisciplinary communities, to share knowledge and to develop common standards of care for people living with obesity. The Global Registry is one of the important means by which it pursues that aim: by collecting and analysing aggregated returns from national and regional registries it offers a federation-wide view of caseload, of the uptake of surgery, and of outcomes, and a base of real-world evidence from which inequities in access can be identified and acted upon. The registry works only with aggregated, pre-analysed data, which keeps it within data-protection law and suits the larger contributors who can more readily share summary statistics than individual records. Procedure volume and the number of contributors have both continued to grow, even though case ascertainment still varies from one registry to the next.

Participation

Forty registries contributed for 2024; 38 countries together with the Michigan and Ontario regional registries, again about 91% of the 44 registries known to IFSO. Four countries join the aggregated dataset for the first time (Egypt, Greece, Ecuador and Japan) and one returns after an absence (Malaysia), the largest single intake since the move to registry-only reporting.

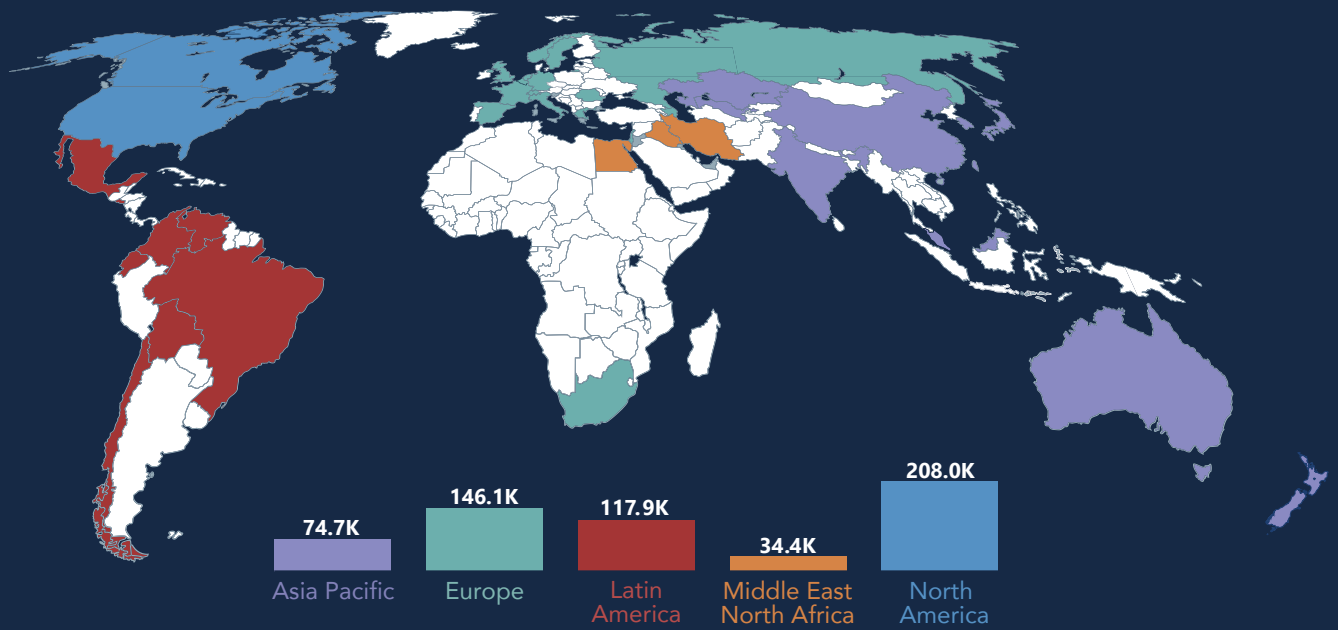
Relative to the previous registration year, four registries that contributed then did not contribute for 2024: Ireland, Lebanon, Thailand and Venezuela did not submit.

The ambition remains full participation from the 44 registries already known to IFSO in a future edition, and in time from all 72 member societies; the Committee continues to support member states that have not yet established a registry. A consistent data dictionary (Appendix 3) underlies the report, though national definitions still vary in places, and these differences are noted in the text and in Appendix 4. For the full list of participating member states and regional registries, see Appendix 2.

Volume by IFSO chapter

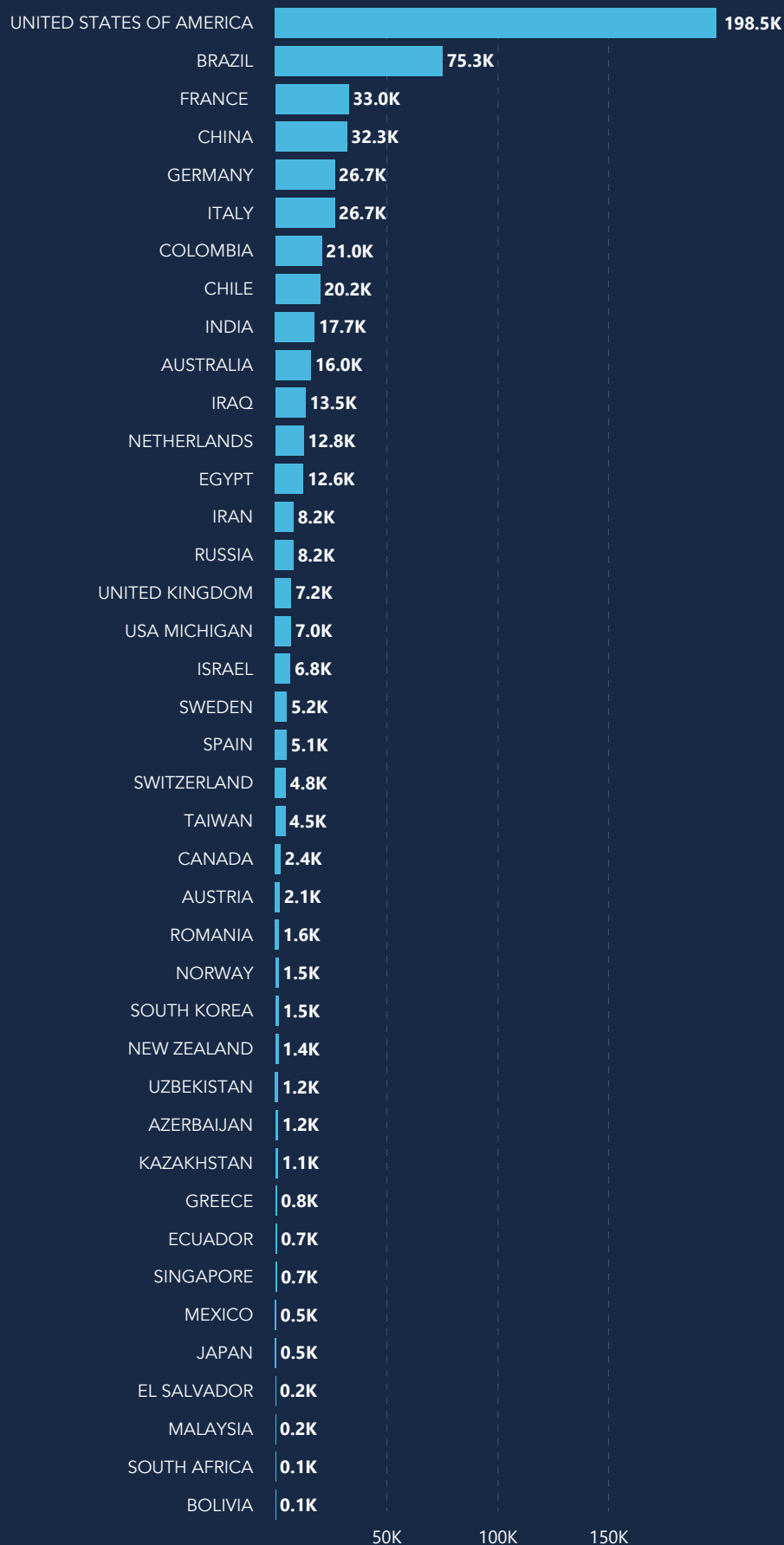
Volume by IFSO chapter moved unevenly between the prior year and 2024. The European Chapter grew from 140.0K to 146.1K and the Middle East & North-African Chapter rose from 21.0K to 34.4K, the latter mainly through Egypt's arrival. The Latin-American Chapter (133.4K to 117.9K), the North American Chapter (217.4K to 208.0K, on 2023 United States data) and the Asia-Pacific Chapter (85.5K to 74.7K) each fell, in part because the set of contributing registries is not identical from year to year.

Figure 1. Geographic distribution of contributors and total procedure count by IFSO chapter (2024)



Australia	Australian & New Zealand Obesity Surgery Society
China	Chinese Society for Metabolic & Bariatric Surgery
India	Obesity Surgery Society of India (OSSI)
Japan	Japanese Society for the Study of Obesity (JSSO)
Malaysia	Malaysian Society for Metabolic and Bariatric Surgery
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)
Austria	Österreichische Gesellschaft für Adipositas- und metabolische Chirurgie
Azerbaijan	Azerbaijan Bariatric and Metabolic Surgery Association (ABMSA)
France	Société Française et Francophone de Chirurgie de l'Obésité et des Maladies Métaboliques (SOFFCOMM)
Germany	Chirurgische Arbeitsgemeinschaft Adipositas therapie und metabolische Chirurgie (CA-ADIP)
Greece	Greek Society for Obesity Surgery and Metabolic Diseases
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)
South Africa	South African Association for Obesity and Metabolism (SASSO)
Spain	Sociedad Española de Cirugía de la Obesidad (SECO)
Sweden	Svensk Förening för Metabol och Obesitas Kirurgi (SFOK)
Switzerland	Swiss Multidisciplinary Obesity Society (SMOB)
United Kingdom	British Obesity & Metabolic Specialist Society (BOMSS)
Uzbekistan	Association of Bariatric and Metabolic Surgeons of Uzbekistan (UZAMBS)
Bolivia	Sociedad Boliviana de Cirugía Comite Cirugía Bariátrica Y Metabólica (SBCCCM)
Brazil	Sociedade Brasileira de Cirurgia Bariátrica e Metabólica (SBCBM)
Chile	Departamento de Cirugía Bariátrica Y Metabólica Sociedad de Cirujanos de Chile (DCBM)
Colombia	Asociación Colombiana de Obesidad y Cirugía Bariátrica (ACOCIB)
El Salvador	Asociación de cirugía endoscópica de El Salvador (ACEDES)
Ecuador	Sociedad Ecuatoriana de Cirugía Bariátrica y Metabólica (SECBAMET)
Mexico	Colegio Mexicano de Cirugía para la Obesidad y enfermedades metabólicas
Egypt	Egyptian Society for Bariatric Surgery (ESBS)
Iran	Iranian Society of Metabolic & Bariatric Surgery (IRSMBS)
Iraq	Iraqi Society for Metabolic and Bariatric Surgery (IQSMBS)
Canada	Canadian Association of Bariatric and Physicians and Surgeons (CABPS)
USA	American Society for Metabolic and Bariatric Surgery (ASMBS)
USA Michigan	Michigan Medicine

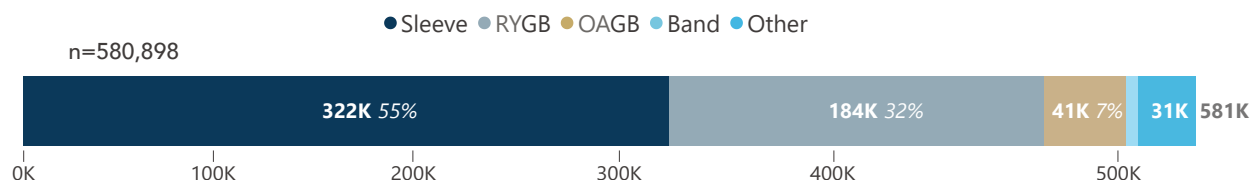
Figure 2 - Total procedures by country 2024



Procedures and Operative Approach

The 2024 dataset records 581,120 procedures. Some duplication is possible where the Michigan and United States (MBSAQIP) registries overlap, and Ontario stands in for Canada, which has no national registry. Sleeve gastrectomy was again the operation most often performed, ahead of Roux-en-Y gastric bypass and one-anastomosis gastric bypass; the smaller “other” category (single-anastomosis duodenoileal bypass with sleeve, biliopancreatic diversion, adjustable banding, single-anastomosis sleeve ileal bypass, transit bipartition and endoscopic procedures) continued its slow rise.

Figure 3. Total procedures by operative type (2024)



Primary procedures. 537,593 of the procedures (about 92.5% of the total) were primary, an individual’s first metabolic bariatric operation. Sleeve gastrectomy (313,914) remained the leading primary choice in almost every reporting country, with RYGB (157,232) and OAGB (36,737) next; the “other” group accounted for 23,718 and bands for 2,638. These by-type counts sum to 534,239, which is 3,354 short of the primary total because a few registries record a procedure count without a usable type breakdown; the type coverage is 99.4%.

Figure 4. Total primary procedures by operative type (2024)

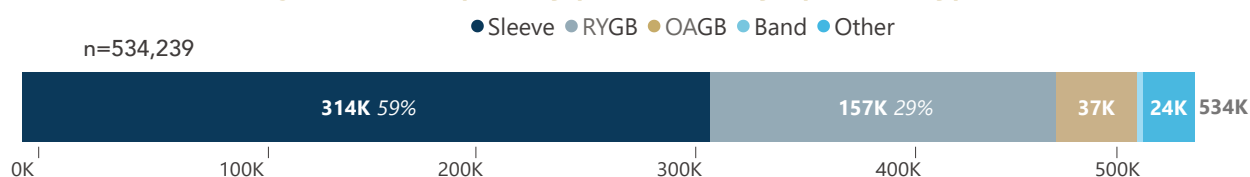


Figure 5a. Primary procedure count and operative-type breakdown by country (2024)

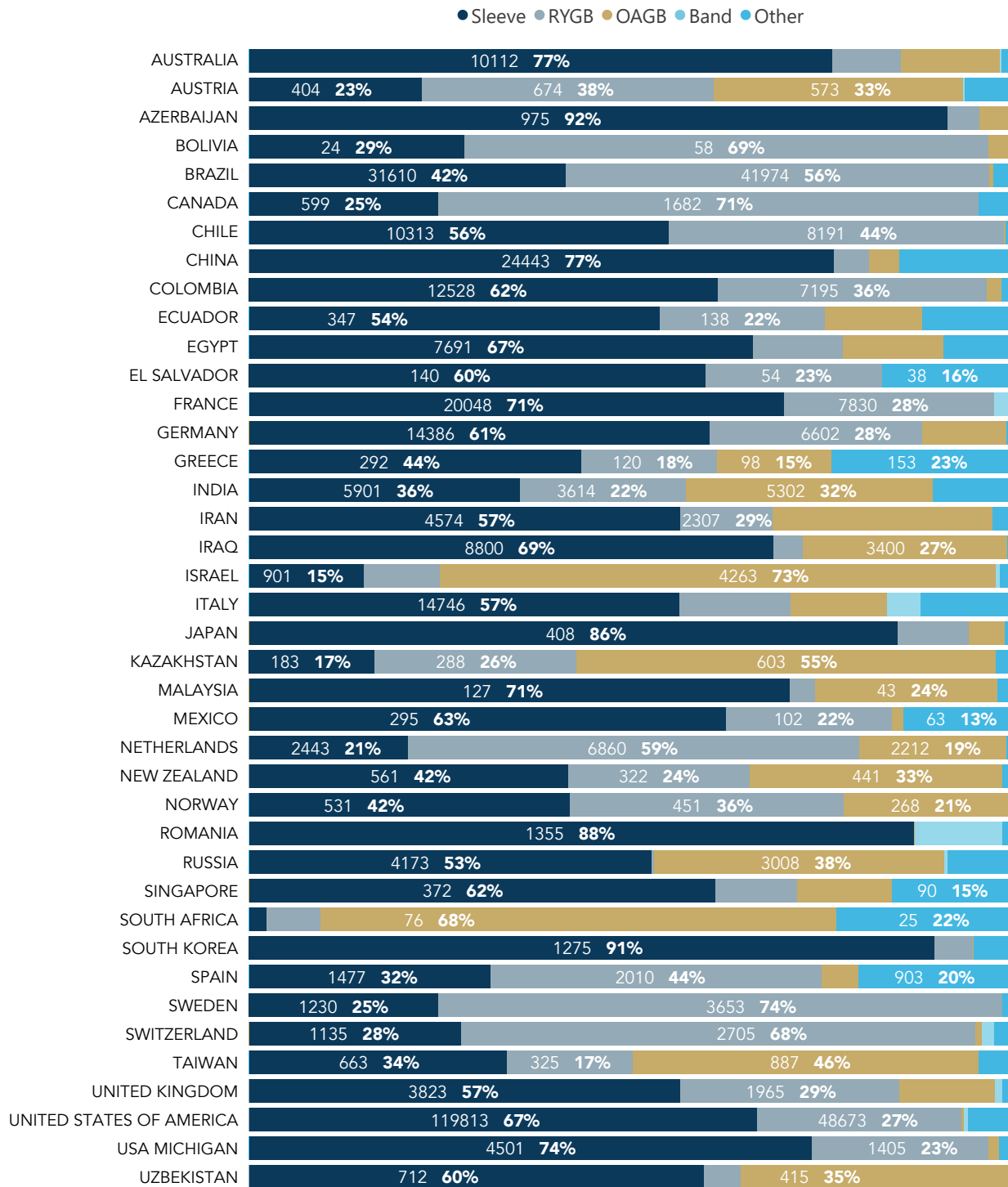
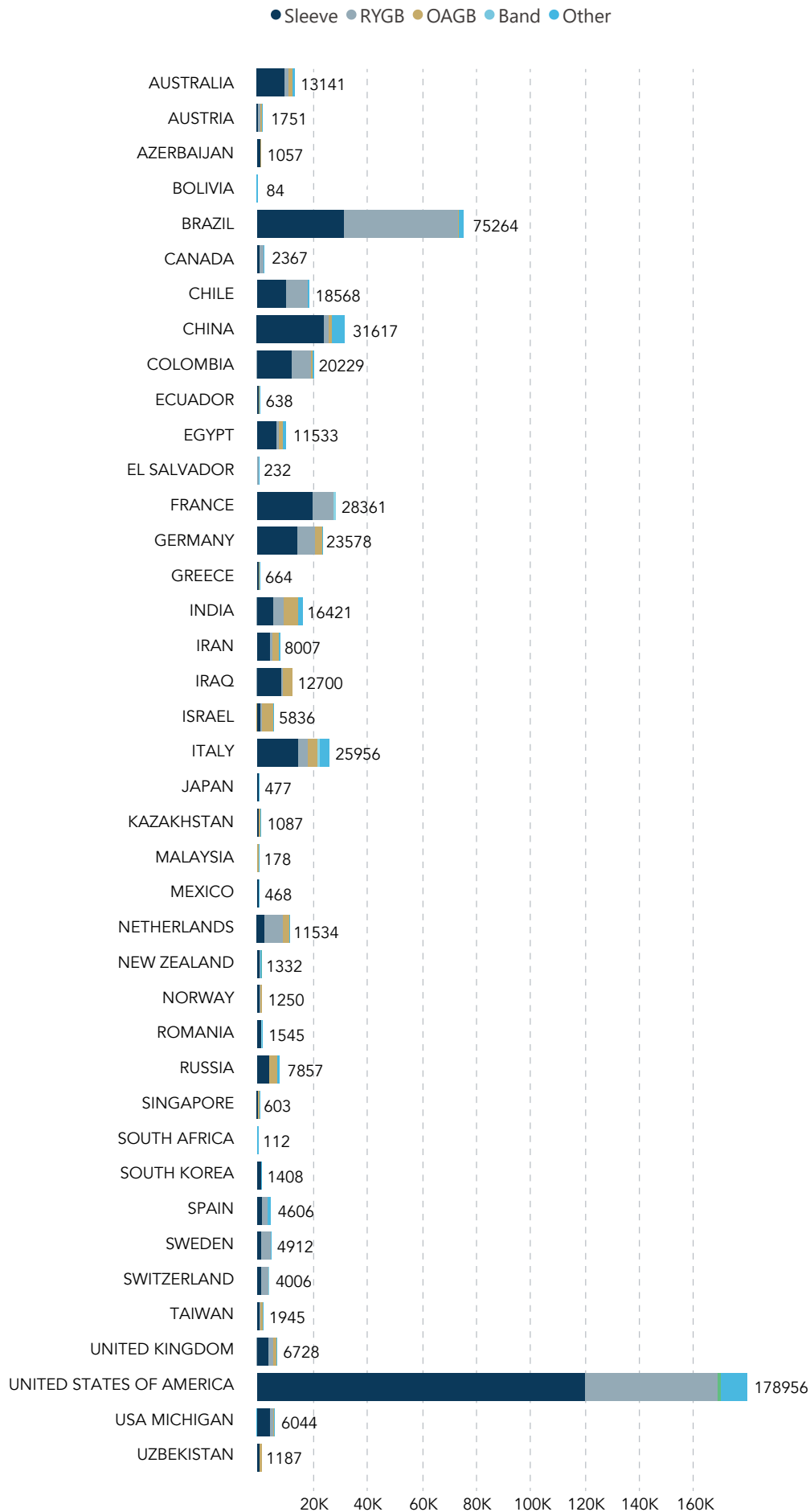


Figure 5b. Primary procedure count and operative-type breakdown by country (2024)



Revisional procedures. 43,527 revisional procedures were recorded, 7.5% of the total against 8.4% the prior year. These cover conversions from one procedure to another, for recurrent weight gain, recurrent metabolic disease or adverse events and corrective operations such as repair of an internal hernia. Reported rates ranged from a few per cent to the high tens of per cent, a spread that reflects differing first-procedure habits, follow-up and, in some settings, cross-border surgery. Roux-en-Y gastric bypass was again the commonest revisional operation, at well over half of cases; sleeve gastrectomy made up under a fifth. Some registries do not report revisional data (shown as NRep, Not Reported).

Figure 6. Total revisional procedures by operative type (2024)

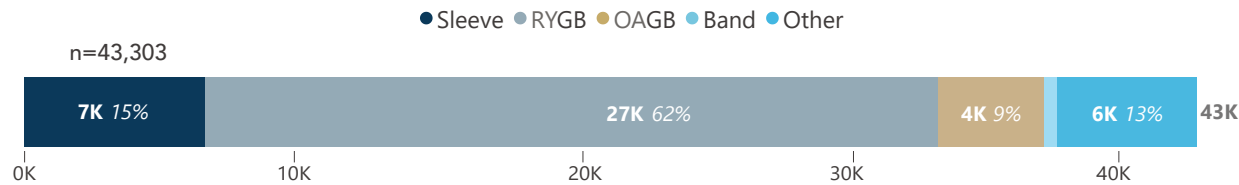


Figure 7. Revisional procedure count and operative-type breakdown by country (2024)

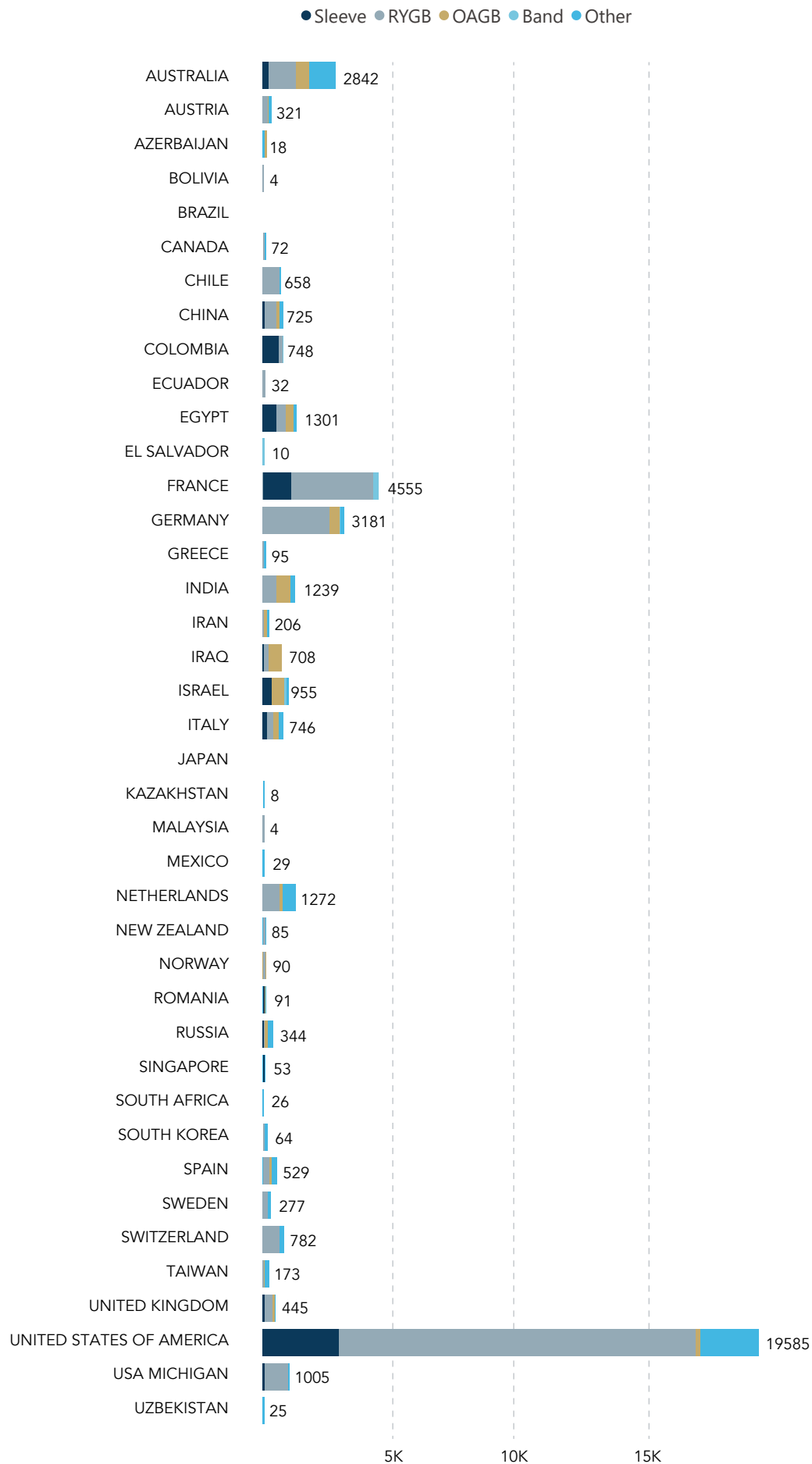


Figure 8. Revisional operative-type breakdown by country, percentage view (2024)

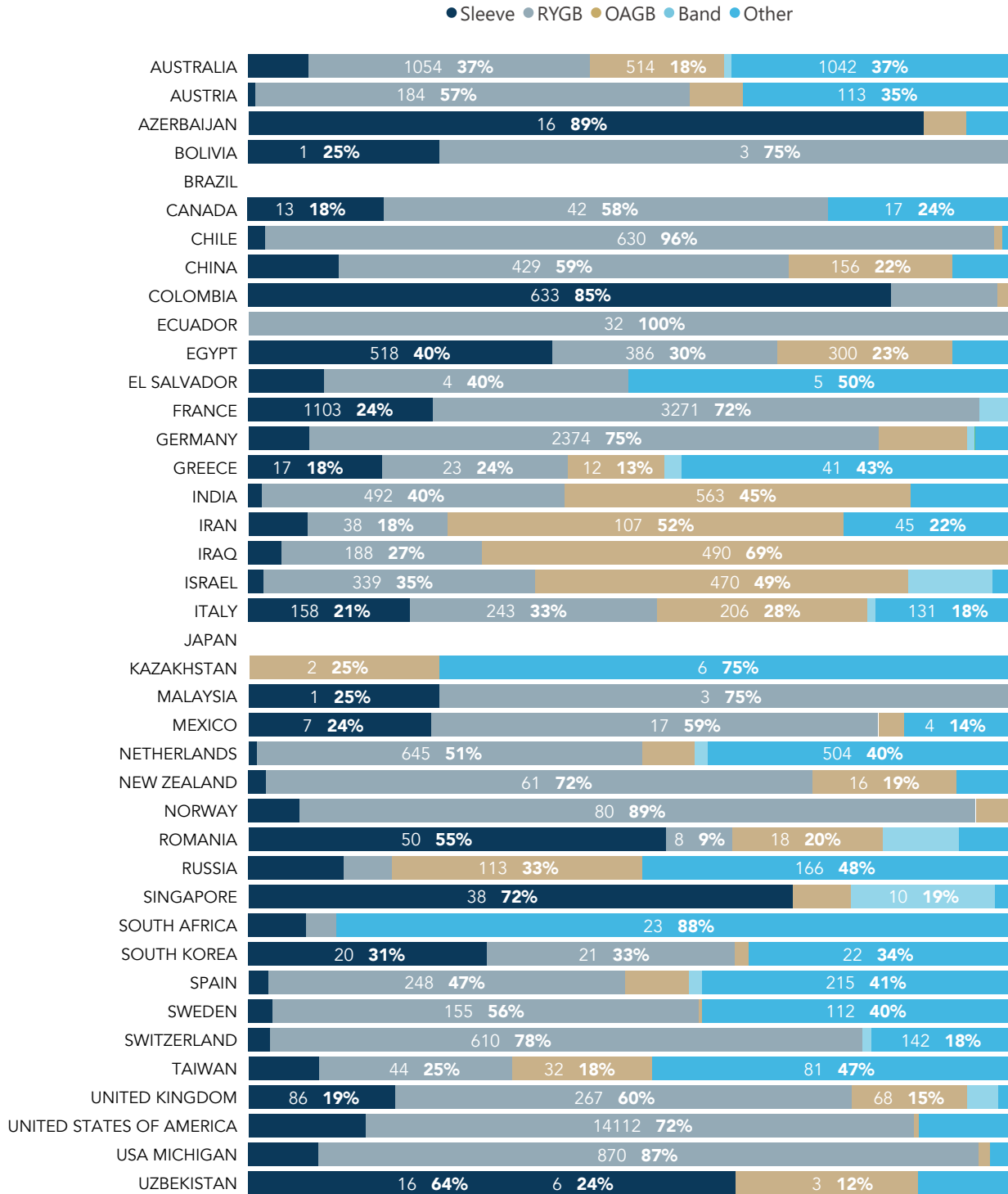


Table 1. Primary and revisional procedures by country (2024)

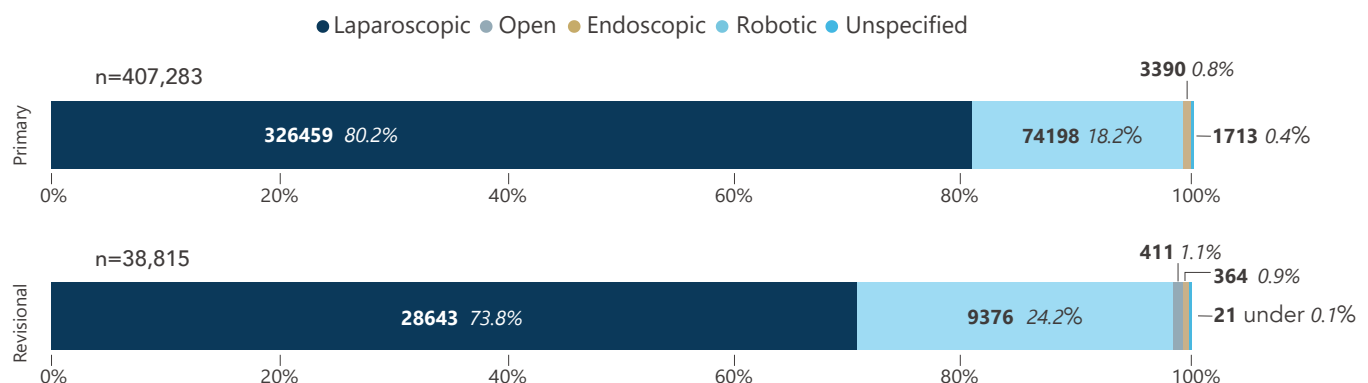
	Operations by Country, Primary and Revisional				Primary & Revision	
	Primary (All)	Rev (All)	% Primary	% Revision	Primary	Revision
AUSTRALIA	13141	2842	82.2%	17.8%	13141	82%
AUSTRIA	1751	321	84.5%	15.5%	1751	85%
AZERBAIJAN	1134	32	97.3%	2.7%	1134	97%
BOLIVIA	87	4	95.6%	4.4%	87	96%
BRAZIL	75264	0	100.0%	0.0%	75264	100%
CANADA	2367	72	97.0%	3.0%	2367	97%
CHILE	19549	617	96.9%	3.1%	19549	97%
CHINA	31617	725	97.8%	2.2%	31617	98%
COLOMBIA	20229	748	96.4%	3.6%	20229	96%
ECUADOR	638	32	95.2%	4.8%	638	95%
EGYPT	11341	1301	89.7%	10.3%	11341	90%
EL SALVADOR	232	10	95.9%	4.1%	232	96%
FRANCE	28384	4610	86.0%	14.0%	28384	86%
GERMANY	23564	3179	88.1%	11.9%	23564	88%
GREECE	664	95	87.5%	12.5%	664	87%
INDIA	16421	1239	93.0%	7.0%	16421	93%
IRAN	8007	206	97.5%	2.5%	8007	97%
IRAQ	12800	708	94.8%	5.2%	12800	95%
ISRAEL	5836	955	85.9%	14.1%	5836	86%
ITALY	25956	746	97.2%	2.8%	25956	97%
JAPAN	477	0	100.0%	0.0%	477	100%
KAZAKHSTAN	1087	8	99.3%	0.7%	1087	99%
MALAYSIA	189	6	96.9%	3.1%	189	97%
MEXICO	468	29	94.2%	5.8%	468	94%
NETHERLANDS	11536	1304	89.8%	10.2%	11536	90%
NEW ZEALAND	1332	85	94.0%	6.0%	1332	94%
NORWAY	1358	120	91.9%	8.1%	1358	92%
ROMANIA	1549	96	94.2%	5.8%	1549	94%
RUSSIA	7857	344	95.8%	4.2%	7857	96%
SINGAPORE	603	53	91.9%	8.1%	603	92%
SOUTH AFRICA	76	47	61.8%	38.2%	76	62%
SOUTH KOREA	1410	64	95.7%	4.3%	1410	96%
SPAIN	4606	529	89.7%	10.3%	4606	90%
SWEDEN	4912	277	94.7%	5.3%	4912	95%
SWITZERLAND	4006	782	83.7%	16.3%	4006	84%
TAIWAN	4230	281	93.8%	6.2%	4230	94%
UNITED KINGDOM	6728	445	93.8%	6.2%	6728	94%
UNITED STATES OF AMERICA	178956	19585	90.1%	9.9%	178956	90%
USA MICHIGAN	6044	1005	85.7%	14.3%	6044	86%
UZBEKISTAN	1187	25	97.9%	2.1%	1187	98%

Operative Approach

Most primary procedures are performed laparoscopically, with robotic assistance commoner in revisional surgery, where the technical demands are greater; a few registries do not record approach at all (shown as NRep, Not Reported). The Netherlands is a case in point: from 2024 its national registry (DATO) no longer records operative approach, having retired it as a non-discriminating indicator to limit registration burden. Laparoscopy is the standard route, open surgery is rare and used only on indication, and robotic surgery accounts for a limited share within it; none of these bears on outcome, so the exact counts are unavailable, and the country is shown as NRep (Not Reported).

Operative approach — 2024 distribution. Approach was recorded for 407,283 primary procedures (75.8% of the primary total) and 38,815 revisional ones (89.2%). On that basis 80.2% of primary procedures were laparoscopic, 18.2% robotic, 0.8% endoscopic, 0.4% open and 0.4% unspecified; for revisional procedures the figures are 73.8%, 24.2%, 0.9%, 1.1% and under 0.1%. Azerbaijan, Brazil, Chile and the United Kingdom submitted no approach data, Egypt and Malaysia returned nothing but zeros for primary procedures, and the Netherlands returned all 11,536 primary and 1,304 revisional procedures as unspecified; all are shown as NRep (Not Reported) and are excluded from both numerator and denominator, so that the Dutch return is not read as a measured category. Taiwan recorded approach for 179 of its 4,230 primary procedures and is set to NR, its laparoscopic rate of 0% being an artifact of that coverage; Colombia reported no revisional approach against 748 revisions and is NRep for those. China (+183), Switzerland (+19) and South Korea (+13) return approach counts slightly above their primary totals; the difference is immaterial to the distribution and is footnoted rather than coded.

Figure 9. Total procedure count by operative approach, primary and revisional (2024)



Azerbaijan, Brazil, Chile, Egypt, Malaysia, the Netherlands, Taiwan and the United Kingdom are not included; approach was not reported or not reliable.

Table 2. Primary and revisional operative approach by country (2024)

n = 407,283
(75.8% of the 537,593 primary procedures)

n = 38,815
(89.2% of the 43,527 revisional procedures)

	Operative Approach - Primary Procedures							Operative Approach - Revisional Procedures						
	Lap	Open	Endo	Robotic	Unsp	Lap Rate	Robot Rate	Lap	Open	Endo	Robotic	Unsp	Lap Rate	Robot Rate
AUSTRALIA	13076	2	0	61	2	99.5%	0.5%	2717	8	57	56	4	95.6%	2.0%
AUSTRIA	1617	5	3	125	0	92.3%	7.1%	286	12	0	23	0	89.1%	7.2%
AZERBAIJAN	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep
BOLIVIA	84	0	0	0	0	96.6%	0.0%	4	0	0	0	0	100.0%	0.0%
BRAZIL	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep
CANADA	2360	7	0	0	0	99.7%	0.0%	68	0	0	0	4	94.4%	0.0%
CHILE	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep
CHINA	31459	0	158	183	0	99.5%	0.6%	710	3	0	12	0	97.9%	1.7%
COLOMBIA	20093	0	18	28	0	99.3%	0.1%	NRep	NRep	NRep	NRep	NRep	NRep	NRep
ECUADOR	638	0	0	0	0	95.2%	0.0%	32	0	0	0	0		
EGYPT	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep
EL SALVADOR	198	0	33	0	1	85.3%	0.0%	10	0	0	0		100.0%	0.0%
FRANCE	26671	85	0	1628	0	94.0%	5.7%	4048	200	0	362	0	87.8%	7.9%
GERMANY	22091	40	0	1252	8	93.7%	5.3%	2964	33	0	130	5	93.2%	4.1%
GREECE	656	2	0	6	0	98.8%	0.9%	95	0	0	0	0	100.0%	0.0%
INDIA	14674	5	510	1232	0	89.4%	7.5%	1035	0	112	92	0	83.5%	7.4%
IRAN	7998	9	0	0	0	99.9%	0.0%	205	1	0	0	0	99.5%	0.0%
IRAQ	12800	0	0	0	0	100.0%	0.0%	702	6	0	0	0	99.2%	0.0%
ISRAEL	5833	3	0	0	0	99.9%	0.0%	951	4	0	0	0	99.6%	0.0%
ITALY	21802	1	2336	1817	0	84.0%	7.0%	620	3	68	55	0	83.1%	7.4%
JAPAN	477	0	0	0	0	100.0%	0.0%	0	0	0	0	0		
KAZAKHSTAN	1081	6	0	0	0	99.4%	0.0%	5	1	0	0	0	62.5%	0.0%
MALAYSIA	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep
MEXICO	444	0	23	1	0	94.9%	0.2%	25	1	2	1	0	86.2%	3.4%
NETHERLANDS	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep
NEW ZEALAND	1332	0	0	0	0	100.0%	0.0%	84	0	0	0	1	98.8%	0.0%
NORWAY	1355	2	0	0	0	99.8%	0.0%	117	2	0	0	0	97.5%	0.0%
ROMANIA	1541	0	0	4	0	99.5%	0.3%	92	0	0	1	0	95.8%	1.0%
RUSSIA	7281	519	51	0	6	92.7%	0.0%	293	14	32	0	5	85.2%	0.0%
SINGAPORE	508	0	90	5	0	84.2%	0.8%	51	0	0	1	1	96.2%	1.9%
SOUTH AFRICA	76	0	0	0	0	100.0%	0.0%	47	0	0	0	0	100.0%	0.0%
SOUTH KOREA	1377	1	0	1	44	97.7%	0.1%	61	0	0	0	1	95.3%	0.0%
SPAIN	3451	6	40	827	0	74.9%	18.0%	469	12	0	89	0	88.7%	16.8%
SWEDEN	4911	1	0	0	0	100.0%	0.0%	274	3	0	0	0	98.9%	0.0%
SWITZERLAND	3997	9	19	0	0	99.8%	0.0%	719	63	32	0	0	91.9%	0.0%
TAIWAN	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
UNITED KINGDOM	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep	NRep
UNITED STATES OF AMERICA	112302	820	109	64078	1647	62.8%	35.8%	11351	29	61	8144	0	58.0%	41.6%
USA MICHIGAN	3089	0	0	2950	5	51.1%	48.8%	579	16	0	410	0	57.6%	40.8%
UZBEKISTAN	1187	0	0	0	0	100.0%	0.0%	25	0	0	0	0	100.0%	0.0%
TOTAL	326459	1523	3390	74198	1713			28643	411	364	9376	21		

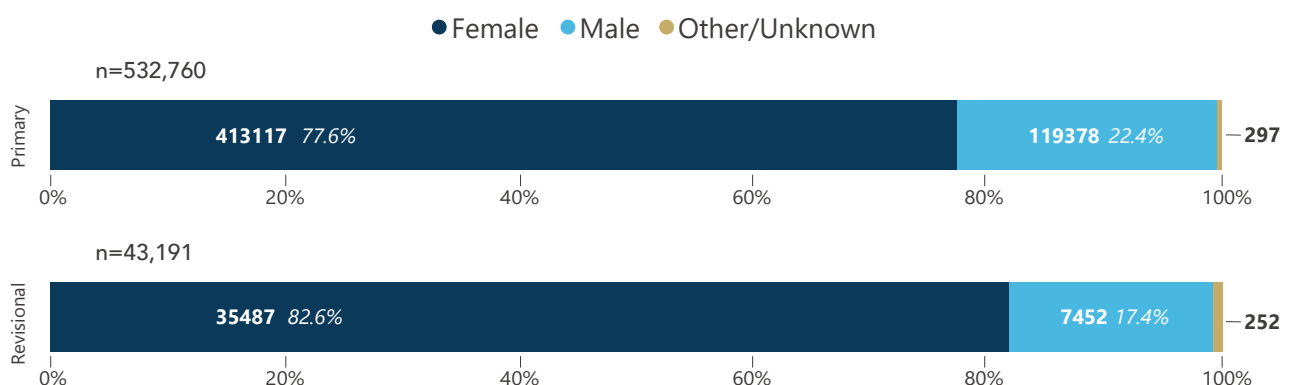
China (+183), Switzerland (+19) and South Korea (+13) return approach counts slightly above their primary totals; the difference is immaterial to the distribution.

Demographics

Sex

For the purposes of this report, participant sex is the biological distinction recorded at the time of surgery. Women outnumbered men in both primary and revisional surgery in every contributing registry and reporting on people outside the binary categories remained sparse. The female share was 77.6% of primary and 82.6% of revisional procedures. The sex table covers 532,760 primary procedures, 99.1% of the primary total; the remainder is accounted for entirely by Taiwan (4,230) and Singapore (603), which submitted no sex breakdown at all and are therefore shown as NRep rather than as a female share of zero. As in previous years, revisional cohorts were slightly more female than primary ones.

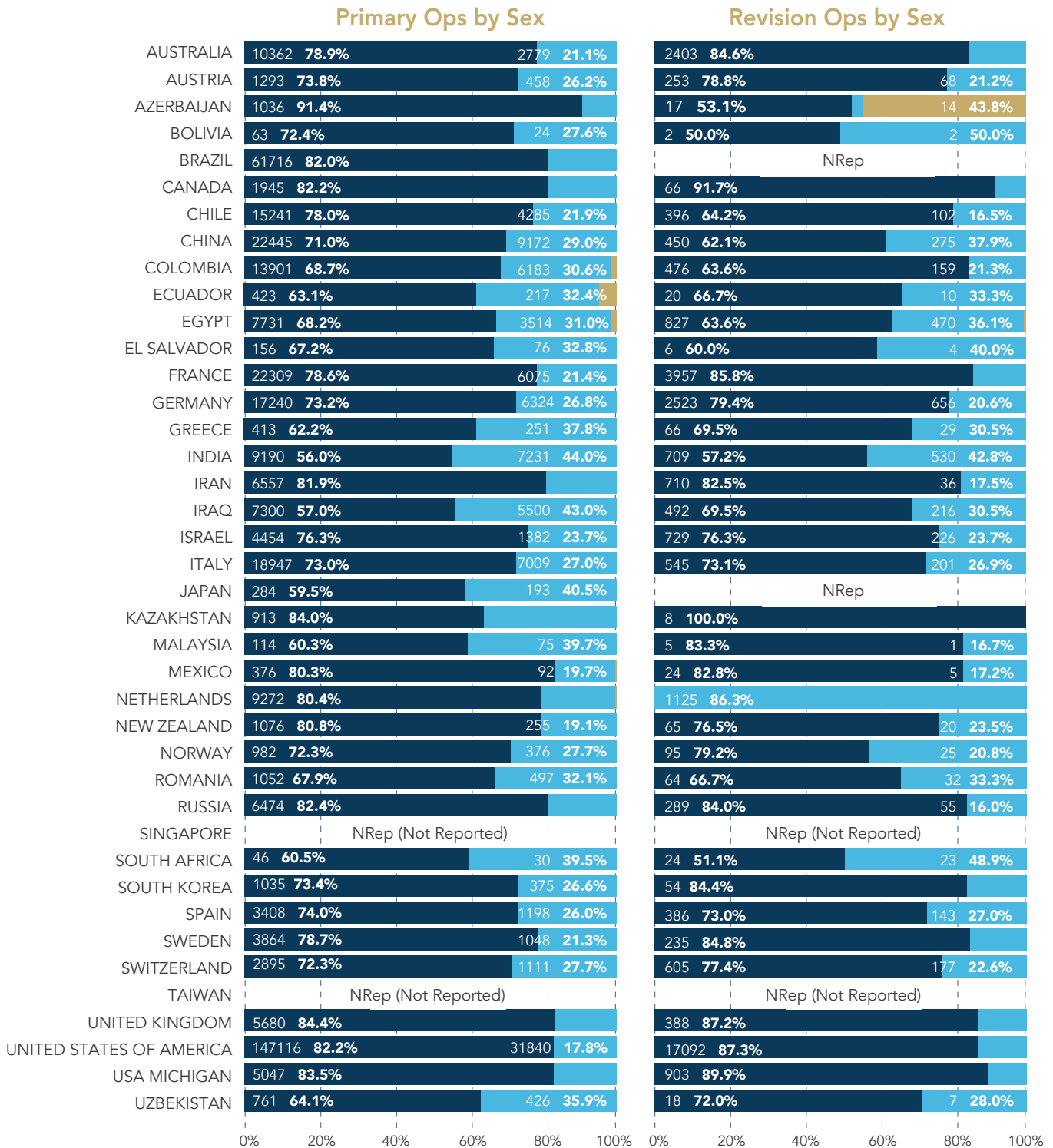
Figure 10. Total procedure count by sex, primary and revisional (2024)



Singapore and Taiwan submitted no sex breakdown and are shown as NRep.

Figure 11. Procedure count by country and sex, primary and revisional (2024)

● Female ● Male ● Other/Unknown



Age

The median age at the time of surgery sat close to 42 years across most countries. It was lowest in China (about 32) and highest in Spain (about 48.5), the widest spread again falling within the European and Asia-Pacific chapters. As expected, patients undergoing revisional surgery were older than those undergoing a first procedure.

Set to NR: the all-procedures median age lies outside its own interquartile range in the Mexican submission, while the South African age values are implausible (median 123 with IQR 93–167, apparently procedure-count values rather than ages); neither could be resolved with the data available, and both are shown as NR and excluded from the age analysis. South Africa’s primary all-patient value (74, IQR 50–107) is the sum of its female and male medians rather than an age and is likewise NR, though the sex-specific values stand. Two further registries report a minimum and maximum in the interquartile columns rather than an interquartile range: India and Italy, the Italian submission for revisional procedures as well; the medians are retained and the spread measures are shown as NR (Appendix 5). Kazakhstan’s revisional male age is shown as NRep, its eight revisional patients all being women. South Africa’s small numerator (around 80 patients) in any case makes its extremes unstable.

Table 3. Median age at time of surgery by country, all procedures (2024)

n = 493,499			
	Age - All operations		
	Med	Lower IQR	Upper IQR
AUSTRALIA	43.0	34.0	52.0
AUSTRIA	41.0	32.0	51.0
BOLIVIA	41.1	34.0	49.0
BRAZIL	41.0		
CANADA	44.3	36.1	52.3
CHINA	32.0	24.0	37.0
COLOMBIA	42.7	41.7	49.6
ECUADOR	41.0	32.0	47.0
EL SALVADOR	39.0	32.0	48.0
FRANCE	40.0	31.0	50.0
GERMANY	43.0	34.0	52.0
GREECE	40.0	32.0	49.0
INDIA	46.0	NR	NR
IRAN	38.0	30.0	45.0
ISRAEL	36.7	27.5	47.2
KAZAKHSTAN	39.0	33.0	45.0
MALAYSIA	40.5	36.5	50.0
MEXICO	NR	NR	NR
NETHERLANDS	44.0	34.0	54.0
NEW ZEALAND	46.0	37.0	54.0
NORWAY	42.6	33.3	52.2
ROMANIA	40.0	30.0	49.0
RUSSIA	40.0	33.0	47.0
SOUTH AFRICA	NR	NR	NR
SOUTH KOREA	37.0	30.0	45.0
SPAIN	48.5	46.2	50.2
SWEDEN	40.0	32.0	50.0
SWITZERLAND	43.0	34.0	53.0
UNITED STATES OF AMERICA	43.0	35.0	52.0
USA MICHIGAN	43.0	35.0	52.0
UZBEKISTAN	38.0	34.0	43.0

Table 4. Median age by sex and country, primary procedures (2024)

n = 432,228				Age - Primary Operations					
	Female			Male			All		
	Med	Lower IQR	Upper IQR	Med	Lower IQR	Upper IQR	Med	Lower IQR	Upper IQR
AUSTRALIA	41.0	33.0	50.0	43.0	35.0	52.0	41.0	33.0	51.0
AUSTRIA	38.0	30.0	49.0	42.0	33.0	52.0	39.0	31.0	50.0
BOLIVIA	40.4	35.0	48.0	42.3	38.0	52.0	41.0	34.0	52.0
CANADA	43.7	35.7	51.5	47.2	37.3	53.8	44.1	36.0	52.1
CHILE	38.0	31.0	47.0	40.0	32.0	46.0	39.0	30.0	46.0
CHINA	33.0	25.4	37.8	33.0	24.6	36.5	32.0	25.0	37.2
COLOMBIA	42.3	38.5	45.9	45.2	41.5	47.9	43.1	40.1	45.3
ECUADOR	30.0	25.0	40.0	35.0	27.0	42.0	32.0	26.0	41.0
EGYPT	NR	NR	NR	NR	NR	NR	36.5	35.0	39.2
EL SALVADOR	38.0	30.8	47.3	40.0	34.8	48.5	39.0	32.0	48.0
FRANCE	38.0	30.0	48.0	41.0	32.0	51.0	39.0	30.0	49.0
GERMANY	41.0	33.0	51.0	44.0	35.0	54.0	42.0	34.0	52.0
GREECE	38.0	30.0	47.0	42.0	33.0	50.0	39.0	31.0	48.0
INDIA	45.5	NR	NR	46.0	NR	NR	46.0	NR	NR
IRAN	37.0	30.0	45.0	37.0	30.0	44.0	37.0	30.0	45.0
ISRAEL	34.1	26.1	44.5	37.9	28.0	48.1	34.8	26.4	45.4
ITALY	44.0	NR	NR	43.5	NR	NR	43.9	NR	NR
JAPAN	47.0	39.0	55.0	45.0	31.0	58.0	46.0	32.0	56.0
KAZAKHSTAN	39.0	34.0	46.0	38.5	32.0	45.0	39.0	33.0	45.0
MALAYSIA	41.0	34.1	47.0	42.0	39.0	49.0	42.0	37.0	48.0
MEXICO	39.3	30.2	47.5	40.7	34.1	50.5	40.0	32.1	49.0
NETHERLANDS	43.0	33.0	53.0	48.0	37.0	56.0	44.0	33.0	53.0
NEW ZEALAND	45.0	36.0	53.0	46.0	39.0	54.0	45.0	36.0	53.0
NORWAY	41.3	31.9	50.9	44.3	35.4	54.2	41.9	32.9	51.7
ROMANIA	39.0	29.0	48.0	40.0	31.0	49.0	39.0	29.8	48.0
RUSSIA	39.0	33.0	47.0	42.0	34.0	49.0	39.0	33.0	48.0
SOUTH AFRICA	36.0	26.0	55.0	38.0	24.0	52.0	NR	NR	NR
SOUTH KOREA	37.0	30.0	45.0	34.0	29.0	41.5	36.0	30.0	44.0
SWEDEN	39.0	31.0	50.0	43.0	34.0	52.0	40.0	32.0	50.0
SWITZERLAND	NR	NR	NR	NR	NR	NR	42.0	33.0	51.0
UNITED STATES OF AMERICA	42.0	34.0	51.0	45.0	36.0	53.0	42.0	32.0	52.0
USA MICHIGAN	41.0	33.0	51.0	45.0	37.0	53.0	42.0	34.0	51.0
UZBEKISTAN	34.0	28.0	41.0	38.0	32.0	44.0	36.0	30.0	42.0

Egyptian medians and ranges describe the distribution of centre means, not of patients, and are not comparable with the other rows.

Table 5. Median age by sex and country, revisional procedures (2024)

n = 40,833				Age - Revisional Operations					
	Female			Male			All		
	Med	Lower IQR	Upper IQR	Med	Lower IQR	Upper IQR	Med	Lower IQR	Upper IQR
AUSTRALIA	50.0	41.0	59.0	53.0	44.0	61.0	51.0	42.0	59.0
AUSTRIA	48.0	39.0	56.0	49.0	42.0	58.0	48.0	40.0	56.0
BOLIVIA	50.7	43.0	56.0	27.0*	27.0*	27.0*	44.8	27.0	56.0
CANADA	51.2	41.4	56.9	52.1	44.5	53.7	51.3	41.9	56.7
CHINA	40.4	31.4	48.5	43.8	32.5	49.9	43.3	31.7	47.0
COLOMBIA	49.8	46.2	51.6	NR	NR	NR	NR	NR	NR
ECUADOR	45.0	35.0	55.0	42.0	37.0	48.0	43.0	36.0	51.0
EGYPT							39.0	35.0	40.0
EL SALVADOR	46.0	40.0	51.3	36.5	35.0	39.0	41.0	36.3	48.0
FRANCE	45.0	37.0	53.0	48.0	40.0	55.0	45.0	38.0	53.0
GERMANY	45.0	38.0	54.0	48.0	39.0	56.0	46.0	38.0	55.0
GREECE	45.0	39.0	53.0	49.0	41.5	56.5	46.0	40.0	54.0
INDIA	50.0	36.0	64.0	49.0	34.0	64.0	49.0	34.0	64.0
IRAN	40.0	34.0	48.0	40.0	33.5	46.5	40.0	34.0	48.0
ISRAEL	46.7	37.1	54.6	46.0	37.7	53.2	46.5	37.1	54.4
ITALY	45.2	NR	NR	45.2	NR	NR	45.2	NR	NR
KAZAKHSTAN	40.0	34.0	42.0	NRep	NRep	NRep	40.0	34.0	42.0
MALAYSIA	43.0	33.5	50.5	40.0	40.0	40.0	41.5	35.0	48.0
MEXICO	NR	NR	NR	NR	NR	NR	NR	NR	NR
NETHERLANDS	48.0	38.0	56.0	53.0	45.0	59.0	49.0	39.0	57.0
NEW ZEALAND	51.0	45.0	56.5	55.0	49.0	62.3	52.0	45.0	57.0
NORWAY	49.4	36.6	55.4	56.4	50.7	61.1	50.6	37.8	58.2
ROMANIA	44.0	34.0	53.5	45.0	41.0	50.0	44.0	36.0	52.0
RUSSIA	44.0	36.0	50.0	47.0	37.0	50.0	44.5	36.0	50.0
SOUTH AFRICA	48.0	44.0	61.0	49.0	42.0	59.0	49.0	43.0	60.0
SOUTH KOREA	42.0	38.3	46.8	40.0	32.5	46.8	42.0	37.0	47.0
SWEDEN	45.0	36.0	53.0	44.5	40.0	56.5	45.0	36.0	53.0
SWITZERLAND							48.0	38.0	57.0
UNITED STATES OF AMERICA	48.0	40.0	55.0	50.0	43.0	58.0	48.0	41.0	56.0
USA MICHIGAN	49.0	40.0	55.0	52.5	44.0	58.0	49.0	41.0	56.0
UZBEKISTAN	43.0	39.0	47.0	41.0	40.0	42.0	42.0	39.0	45.0

***Bolivia** - Male - A single case; median and both quartiles are the same value.

BMI

Median pre-operative BMI sat between 40 and 45 kg/m² in most registries. Among the reliable datasets the all-patient median ran from about 37 kg/m² (South Korea) to about 46 kg/m² (Germany). The smaller registries again lay at the upper end of that range, consistent with a referral pattern weighted toward the most severe cases, though with few patients behind each figure their medians are also the least stable and should be read with that in mind. Across the IFSO chapters the differences in BMI were modest, with the upper bounds broadly comparable and the lower bounds somewhat lower in the European and Asia-Pacific chapters than in the North American chapter

Set to NR: the median

BMI lies outside its own interquartile range in the Mexican and Bolivian submissions (shown as NR); the all-patient median exceeds its own upper interquartile bound in the Spanish submission (47.87 against 47.05, shown as NR); and the interquartile columns of the Italian, Japanese and Indian submissions hold a minimum and maximum rather than an interquartile range (upper bounds of 82.65, 86.5 and 64.5 kg/m²), so their medians are retained and their spread measures set to NR. Chile submitted no female BMI and no male interquartile range and is shown as NRep. None of the NR values could be resolved with the data available.

Table 6. Median pre-surgery BMI by sex and country, primary procedures (2024)

n = 432,141				BMI - Primary Operations					
	Female			Male			All		
	Med	Lower IQR	Upper IQR	Med	Lower IQR	Upper IQR	Med	Lower IQR	Upper IQR
AUSTRALIA	41.5	37.4	46.8	43.2	38.9	48.7	41.8	37.7	47.2
AUSTRIA	43.0	40.0	47.0	46.0	42.0	51.0	44.0	41.0	48.0
BOLIVIA	NR	NR	NR	NR	NR	NR	NR	NR	NR
CANADA	45.9	41.6	51.6	46.6	41.7	54.2	46.0	41.6	52.2
CHILE	NRep	NRep	NRep	38.6	NRep	NRep	37.8	34.6	41.8
CHINA	37.1	32.2	41.8	41.5	33.9	48.1	38.6	31.1	43.6
COLOMBIA	43.4	36.0	51.1	47.4	38.9	56.4	43.6	36.2	51.6
ECUADOR	37.0	33.0	41.0	41.0	36.0	48.0	39.0	34.0	46.0
EGYPT							44.0	42.0	45.0
EL SALVADOR	38.1	34.6	44.7	42.7	38.5	47.9	39.6	35.9	45.7
FRANCE	40.9	37.9	44.6	42.4	39.1	47.0	41.2	38.1	45.2
GERMANY	45.7	41.8	50.9	47.8	43.0	53.2	46.3	42.1	51.5
GREECE	44.1	39.6	50.7	47.8	43.9	52.6	45.6	40.4	51.4
INDIA	46.0	NR	NR	44.5	NR	NR	46.0	NR	NR
IRAN	40.9	37.6	44.3	43.1	40.0	46.8	41.3	38.1	44.9
ISRAEL	40.9	38.2	44.0	42.0	39.0	46.0	41.0	38.4	44.5
ITALY	42.8	NR	NR	44.6	NR	NR	43.7	NR	NR
JAPAN	39.6	NR	NR	41.2	NR	NR	40.4	NR	NR
KAZAKHSTAN	40.0	35.9	43.6	46.5	42.0	49.1	41.0	36.7	46.8
MALAYSIA	42.0	36.0	47.0	44.0	39.5	50.7	43.0	36.0	50.0
MEXICO	39.4	36.2	45.2	43.3	37.4	48.4	NR	NR	NR
NETHERLANDS	41.2	38.6	44.6	41.7	38.7	45.7	41.2	38.7	44.9
NEW ZEALAND	42.4	38.3	47.9	44.2	40.0	50.5	42.7	38.5	48.3
NORWAY	41.1	37.3	45.5	42.3	38.5	46.7	41.5	37.7	45.8
ROMANIA	40.0	35.0	45.0	43.0	39.8	48.0	41.0	36.0	46.0
RUSSIA	42.0	37.0	47.0	46.0	40.0	52.0	42.0	37.0	48.0
SOUTH AFRICA	45.6	40.6	50.2	44.3	40.2	55.2	44.9	40.4	52.7
SOUTH KOREA	36.7	33.0	41.0	38.8	34.8	44.4	37.3	33.5	42.0
SPAIN							NR	NR	NR
SWEDEN	40.9	37.4	44.8	42.8	39.3	47.2	41.2	37.8	45.3
SWITZERLAND							40.8	37.6	45.0
UNITED STATES OF AMERICA	43.6	39.6	49.0	44.6	40.2	50.5	43.7	39.7	49.3
USA MICHIGAN	45.5	41.2	51.6	47.7	42.4	54.3	45.8	41.4	52.1
UZBEKISTAN	42.5	38.2	47.8	44.1	40.5	49.2	43.2	39.1	48.5

Obesity-Related Diseases

Obesity contributes to morbidity and reduced well-being more than almost any other chronic condition, and weight loss, achieved through metabolic bariatric surgery, remains one of the most effective interventions available. More than a hundred conditions are known to improve with weight loss; six are collected here: type 2 diabetes, hypertension, obstructive sleep apnoea, dyslipidaemia, gastro-oesophageal reflux and depression. The IFSO Global Registry records a condition as present when the patient self-identifies as having it or is being treated for it at the time of surgery, but each registry applies its own definition, so the comparisons that follow are indicative rather than exact. The full set of registry-specific definitions is in Appendix 4.

On reliability. Azerbaijan returned a type 2 diabetes numerator equal to its own denominator (563 of 563). The value is set to NR rather than read as a prevalence of 100%, and the registry is excluded from the diabetes analysis; the correct denominator could not be recovered from the returns. France's dyslipidaemia all-patient row duplicates its reflux row and is shown as NR, as is China's dyslipidaemia sex split, whose sex denominators exceed the sex table. Egypt's obesity-associated disease denominators exceed its primary total because the registry supplies ratio-based estimates from centre means, as its own note explains; the figures are retained with that qualification rather than set aside, and are not comparable as a country rate.

A general note of caution applies throughout this chapter: very high or very low country figures often reflect how a condition is ascertained and recorded rather than a true difference in disease burden. Registries with rigorous verification tend to record higher prevalence, and registries that rely on self-report alone tend to record lower prevalence. The sex pattern, by contrast, is consistent enough across registries to be informative.

Type 2 diabetes

Type 2 diabetes was again the condition most often recorded. Among the well-populated registries, all-patient prevalence ran from about 8% (Norway) to about 48% (Japan 48.2%, Ecuador 48.1%), with Uzbekistan next (43%) and India in the high-30s. South Africa recorded 65.8%, but on 76 primary procedures, and is shown with that denominator rather than read as a country rate. In general men carried a higher prevalence than women, a pattern seen across nearly all reporting countries. Marked regional differences were again evident across the IFSO chapters.

Per-chapter ranges: the per-chapter prevalence ranges (NAC, LAC, EC, MENAC, APC) are given with Azerbaijan excluded, that being the only registry in this domain whose value could not be verified. Its exclusion is stated wherever the European range is quoted.

Figure 12. Percent of primary participants with type 2 diabetes by country (2024)

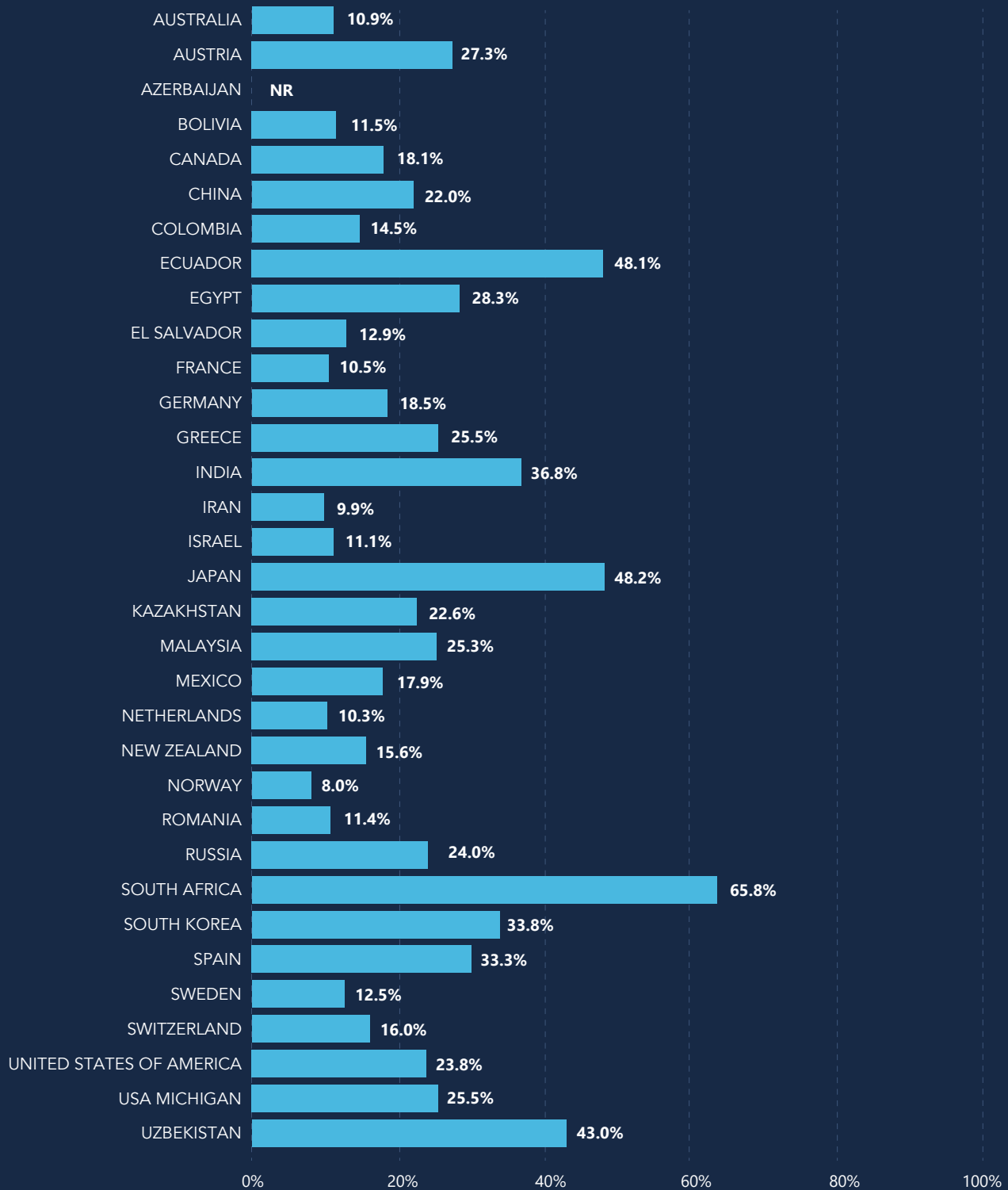


Figure 13. Sex distribution of patients with type 2 diabetes (2024)

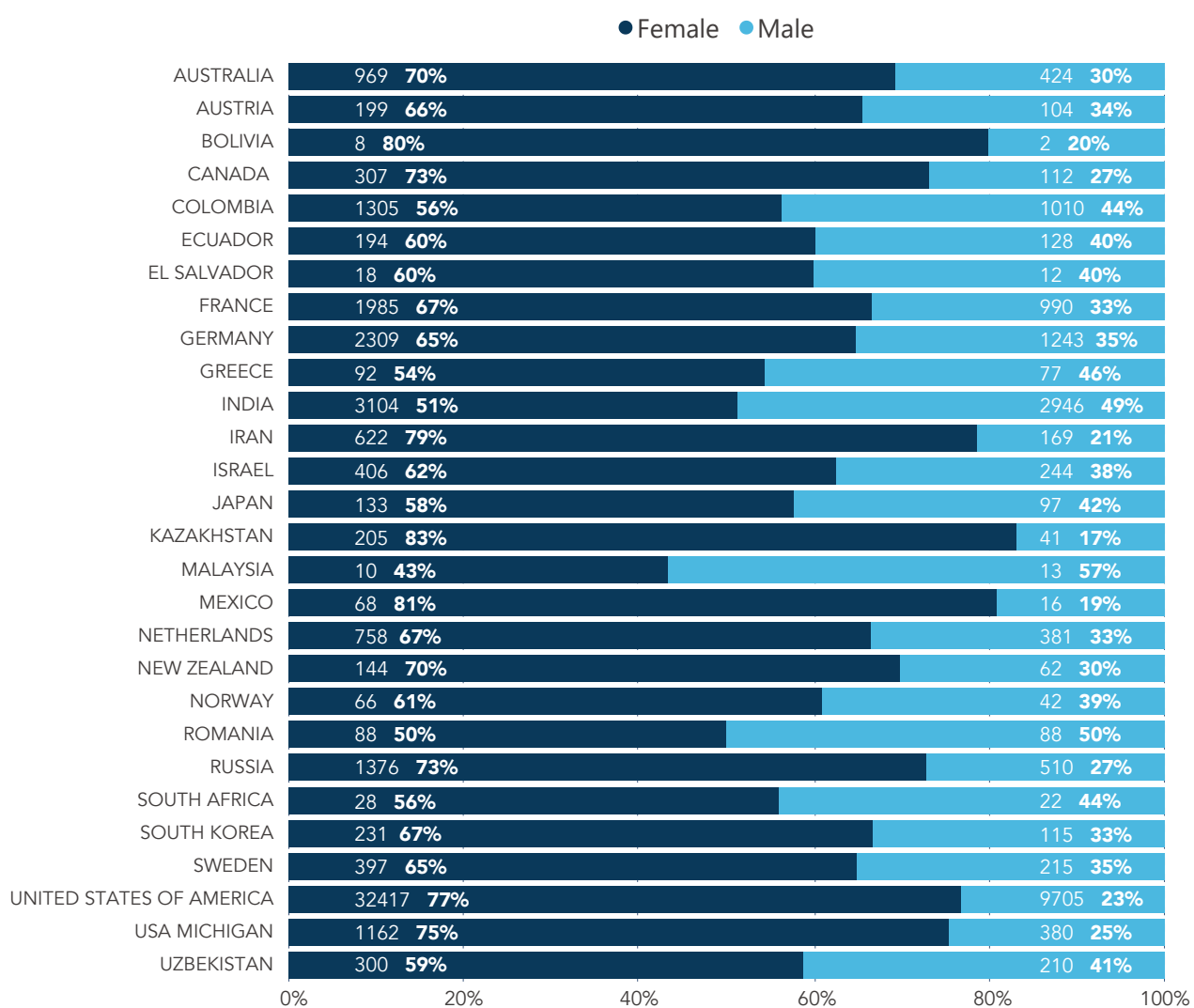


Table 7. Number with type 2 diabetes at primary procedure, by sex and country (2024)

	Female			Male			All		
	Diabetes (N)	Total (N)	% with Diabetes	Diabetes (N)	Total (N)	% with Diabetes	Diabetes (N)	Total (N)	% with Diabetes
AUSTRALIA	969	10038	9.7%	424	2695	15.7%	1393	12733	10.9%
AUSTRIA	199	816	24.4%	104	292	35.6%	303	1108	27.3%
AZERBAIJAN	NR	NR	NR	NR	NR	NR	NR	NR	NR
BOLIVIA	8	63	12.7%	2	24	8.3%	10	87	11.5%
CANADA	307	1901	16.1%	112	411	27.3%	419	2312	18.1%
CHINA							6955	31617	22.0%
COLOMBIA	1305	9593	13.6%	1010	6396	15.8%	2315	15989	14.5%
ECUADOR	194	443	43.8%	128	227	56.4%	322	670	48.1%
EGYPT							3576	*12657	28.3%
EL SALVADOR	18	156	11.5%	12	76	15.8%	30	232	12.9%
FRANCE	1985	22309	8.9%	990	6075	16.3%	2975	28384	10.5%
GERMANY	2309	14049	16.4%	1243	5110	24.3%	3552	19166	18.5%
GREECE	92	412	22.3%	77	250	30.8%	169	662	25.5%
INDIA	3104	9190	33.8%	2946	7231	40.7%	6050	16421	36.8%
IRAN	622	6557	9.5%	169	1450	11.7%	791	8007	9.9%
ISRAEL	406	4452	9.1%	244	1379	17.7%	650	5831	11.1%
JAPAN	133	284	46.8%	97	193	50.3%	230	477	48.2%
KAZAKHSTAN	205	913	22.5%	41	174	23.6%	246	1087	22.6%
MALAYSIA	10	54	18.5%	13	37	35.1%	23	91	25.3%
MEXICO	68	376	18.1%	16	82	19.5%	84	468	17.9%
NETHERLANDS	758	9136	8.3%	381	2184	17.4%	1139	11045	10.3%
NEW ZEALAND	144	1065	13.5%	62	253	24.5%	206	1319	15.6%
NORWAY	66	982	6.7%	42	376	11.2%	108	1358	8.0%
ROMANIA	88	1052	8.4%	88	497	17.7%	176	1549	11.4%
RUSSIA	1376	6473	21.3%	510	1382	36.9%	1886	7855	24.0%
SOUTH AFRICA	28	46	60.9%	22	30	73.3%	50	76	65.8%
SOUTH KOREA	231	733	31.5%	115	290	39.7%	346	1023	33.8%
SPAIN							1535	4606	33.3%
SWEDEN	397	3860	10.3%	215	1047	20.5%	612	4907	12.5%
SWITZERLAND							639	4006	16.0%
UNITED STATES OF AMERICA	32417	145310	22.3%	9705	31820	30.5%	42122	177130	23.8%
USA MICHIGAN	1162	5047	23.0%	380	997	38.1%	1544	6044	25.5%
UZBEKISTAN	300	761	39.4%	210	426	49.3%	510	1187	43.0%

* The Egyptian denominator of 12,657 exceeds its primary total of 11,341; the figures are ratio-based estimates from centre means and are not comparable as a country rate

Hypertension

Hypertension was again highly prevalent, exceeding 50% in some registries. Japan recorded the highest prevalence among the well-populated registries (60.8%), followed by Uzbekistan (about 59%) and Russia (about 53%), with Austria, Germany and China just above 50%; South Africa's cohort was smaller (76 primary procedures) but recorded a higher rate still (82.9%), consistent with the caution about small-cohort extremes noted elsewhere in this chapter. Within the population undergoing primary surgery, men consistently showed a higher prevalence than women, a pattern evident across nearly all reporting countries. Combined with the higher median BMI seen in men in many regions, this points to the more complex metabolic profile frequently presented by male candidates for surgery.

Figure 14. Percent of primary participants with hypertension by country (2024)

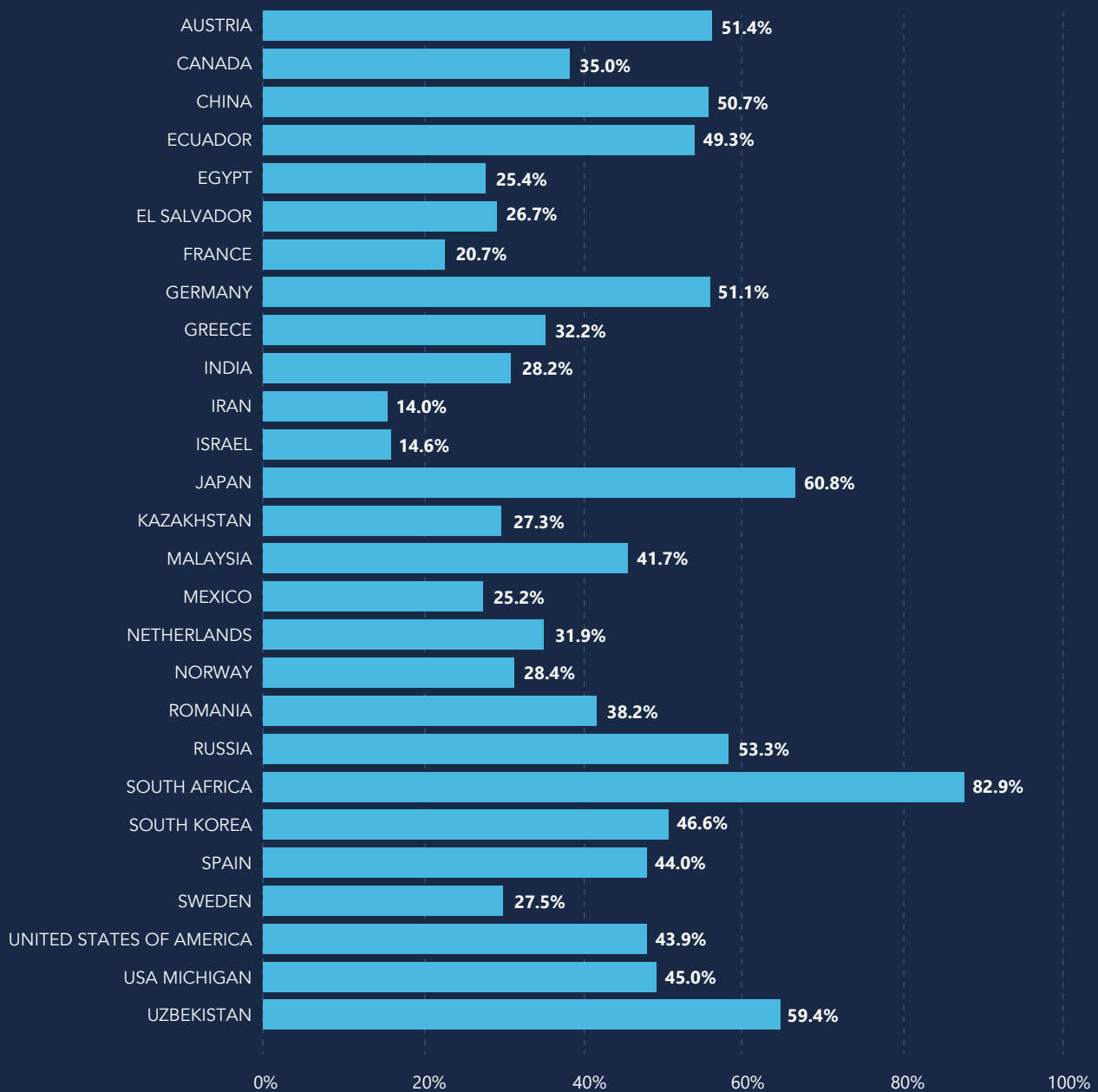


Figure 15. Proportion of male and female patients with hypertension (2024)

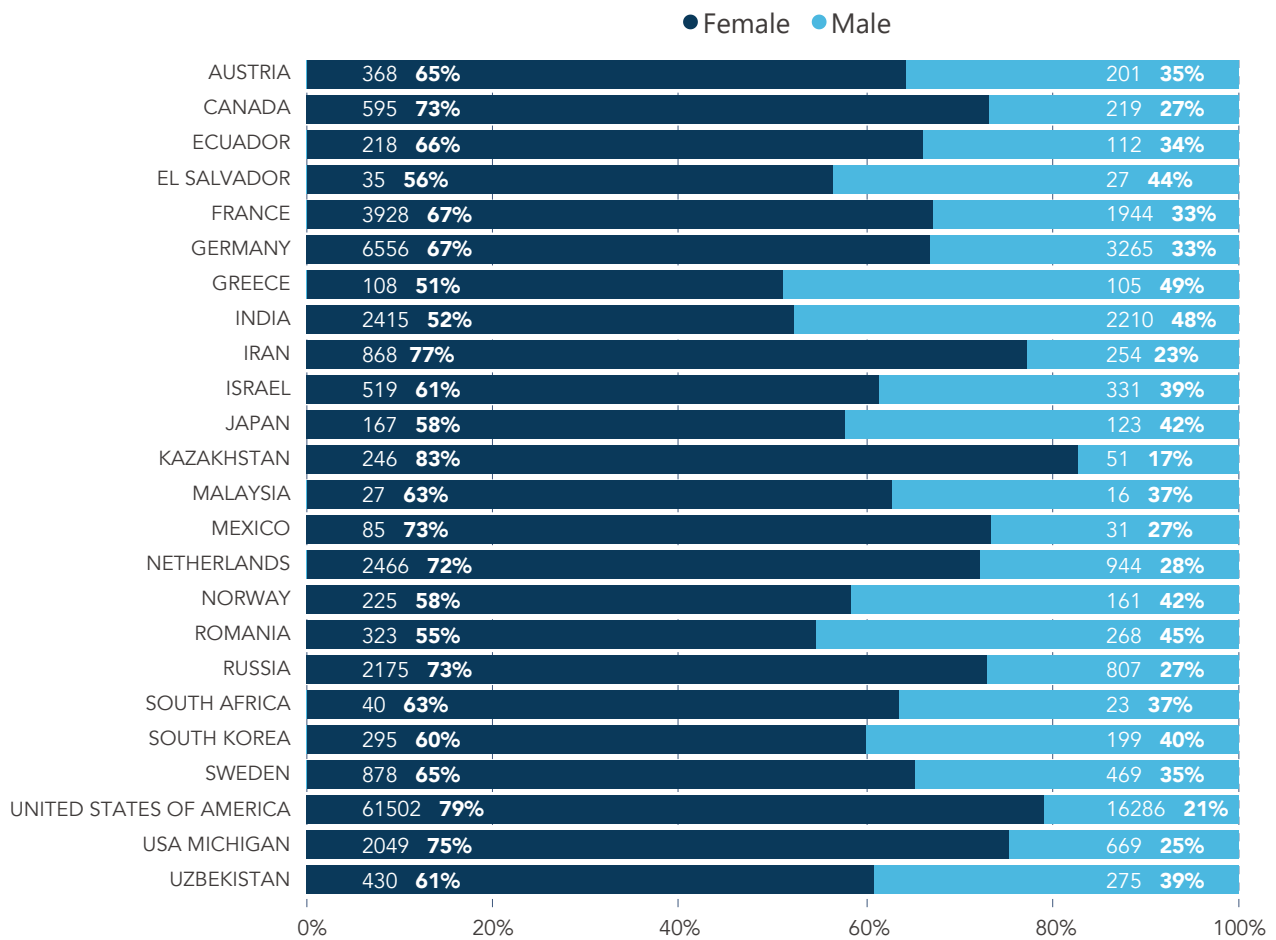


Table 8. Number with hypertension at primary procedure, by sex and country (2024)

	Female			Male			All		
	HT (N)	Total (N)	% with HT	HT (N)	Total (N)	% with HT	HT (N)	Total (N)	% with HT
AUSTRIA	368	816	45.1%	201	292	68.8%	569	1108	51.4%
CANADA	595	1911	31.1%	219	415	52.8%	814	2326	35.0%
CHINA							16029	31617	50.7%
ECUADOR	218	443	49.2%	112	227	49.3%	330	670	49.3%
EGYPT							3214	12657	25.4%
EL SALVADOR	35	156	22.4%	27	76	35.5%	62	232	26.7%
FRANCE	3928	22309	17.6%	1944	6075	32.0%	5872	28384	20.7%
GERMANY	6556	14091	46.5%	3265	5122	63.7%	9826	19221	51.1%
GREECE	108	413	26.2%	105	249	42.2%	213	662	32.2%
INDIA	2415	9190	26.3%	2210	7231	30.6%	4625	16421	28.2%
IRAN	868	6557	13.2%	254	1450	17.5%	1122	8007	14.0%
ISRAEL	519	4450	11.7%	331	1374	24.1%	850	5824	14.6%
JAPAN	167	284	58.8%	123	193	63.7%	290	477	60.8%
KAZAKHSTAN	246	913	26.9%	51	174	29.3%	297	1087	27.3%
MALAYSIA	27	55	49.1%	16	48	33.3%	43	103	41.7%
MEXICO	85	376	22.6%	31	92	33.7%	118	468	25.2%
NETHERLANDS	2466	8595	28.7%	944	2093	45.1%	3411	10690	31.9%
NORWAY	225	982	22.9%	161	376	42.8%	386	1358	28.4%
ROMANIA	323	1052	30.7%	268	497	53.9%	591	1549	38.2%
RUSSIA	2175	4480	48.5%	807	1110	72.7%	2982	5590	53.3%
SOUTH AFRICA	40	46	87.0%	23	30	76.7%	63	76	82.9%
SOUTH KOREA	295	749	39.4%	199	288	69.1%	487	1044	46.6%
SPAIN							298	678	44.0%
SWEDEN	878	3858	22.8%	469	1047	44.8%	1347	4905	27.5%
UNITED STATES OF AMERICA	61502	145309	42.3%	16286	31820	51.2%	77788	177129	43.9%
USA MICHIGAN	2049	5047	40.6%	669	997	67.1%	2718	6044	45.0%
UZBEKISTAN	430	761	56.5%	275	426	64.6%	705	1187	59.4%

Obstructive sleep apnoea

Obstructive sleep apnoea was a common obesity-associated disease whose reported prevalence varied substantially across countries. Among patients undergoing primary surgery, men showed a markedly higher prevalence than women, a sex disparity more pronounced than that seen for diabetes or hypertension. The highest prevalence among the larger registries was recorded in China (about 60%), with Canada also high (about 57%), while the United States sat mid-range (about 38%); South Africa returned 69.7% on 76 primary procedures and is shown with that denominator rather than read as a country rate. Latin-American registries were generally among the lowest, and the European and Asia-Pacific chapters spanned a wide range.

Figure 16. Percent of primary participants with obstructive sleep apnoea by country (2024)

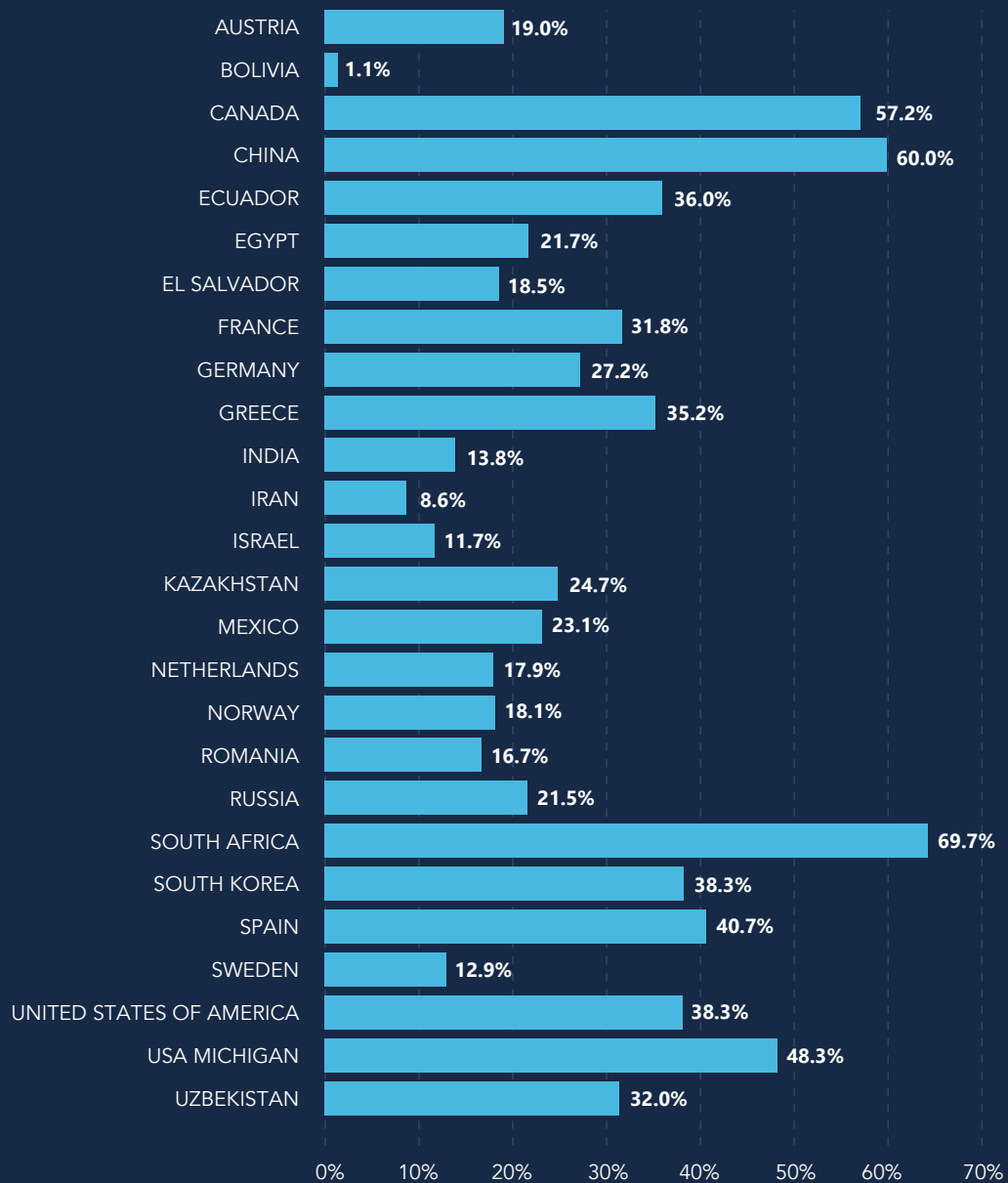


Figure 17. Proportion of male and female patients with OSA (2024)

● Female ● Male

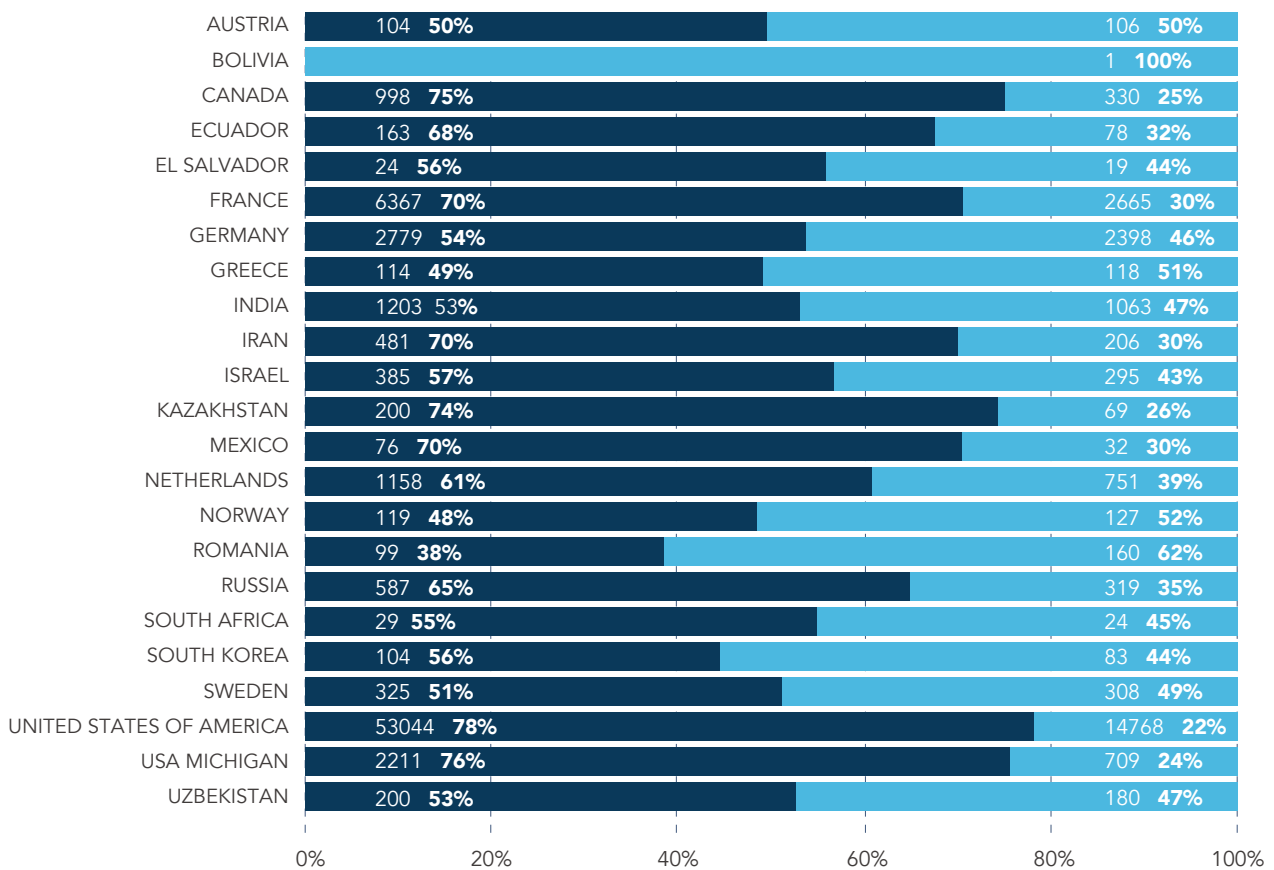


Table 9. Number with OSA at primary procedure, by sex and country (2024)

OSA Primary Operations									
	Female			Male			All		
	OSA (N)	Total (N)	% with OSA	OSA (N)	Total (N)	% with OSA	OSA (N)	Total (N)	% with OSA
AUSTRIA	104	816	12.7%	106	292	36.3%	210	1108	19.0%
BOLIVIA	0	63	0.0%	1	24	4.2%	1	87	1.1%
CANADA	998	1909	52.3%	330	411	80.3%	1328	2320	57.2%
CHINA							17373	28956	60.0%
ECUADOR	163	443	36.8%	78	227	34.4%	241	670	36.0%
EGYPT							2743	12657	21.7%
EL SALVADOR	24	156	15.4%	19	76	25.0%	43	232	18.5%
FRANCE	6367	22309	28.5%	2665	6075	43.9%	9032	28384	31.8%
GERMANY	2779	13926	20.0%	2398	5073	47.3%	5179	19007	27.2%
GREECE	114	409	27.9%	118	250	47.2%	232	659	35.2%
INDIA	1203	9190	13.1%	1063	7231	14.7%	2266	16421	13.8%
IRAN	481	6557	7.3%	206	1450	14.2%	687	8007	8.6%
ISRAEL	385	4444	8.7%	295	1378	21.4%	680	5822	11.7%
KAZAKHSTAN	200	913	21.9%	69	174	39.7%	269	1087	24.7%
MEXICO	76	376	20.2%	32	92	34.8%	108	468	23.1%
NETHERLANDS	1158	8590	13.5%	751	2093	35.9%	1909	10685	17.9%
NORWAY	119	982	12.1%	127	376	33.8%	246	1358	18.1%
ROMANIA	99	1052	9.4%	160	497	32.2%	259	1549	16.7%
RUSSIA	587	3384	17.3%	319	821	38.9%	906	4205	21.5%
SOUTH AFRICA	29	46	63.0%	24	30	80.0%	53	76	69.7%
SOUTH KOREA	104	339	30.7%	83	149	55.7%	187	488	38.3%
SPAIN							276	678	40.7%
SWEDEN	325	3858	8.4%	308	1047	29.4%	633	4905	12.9%
UNITED STATES OF AMERICA	53044	145310	36.5%	14768	31820	46.4%	67812	177130	38.3%
USA MICHIGAN	2211	5047	43.8%	709	997	71.1%	2920	6044	48.3%
UZBEKISTAN	200	761	26.3%	180	426	42.3%	380	1187	32.0%

Dyslipidaemia

The prevalence of dyslipidaemia varied widely between countries. In many of the reporting registries men carried a higher prevalence than women, though the difference was less consistent and less pronounced than for sleep apnoea.

Figure 18. Percent of primary participants with dyslipidaemia by country (2024)

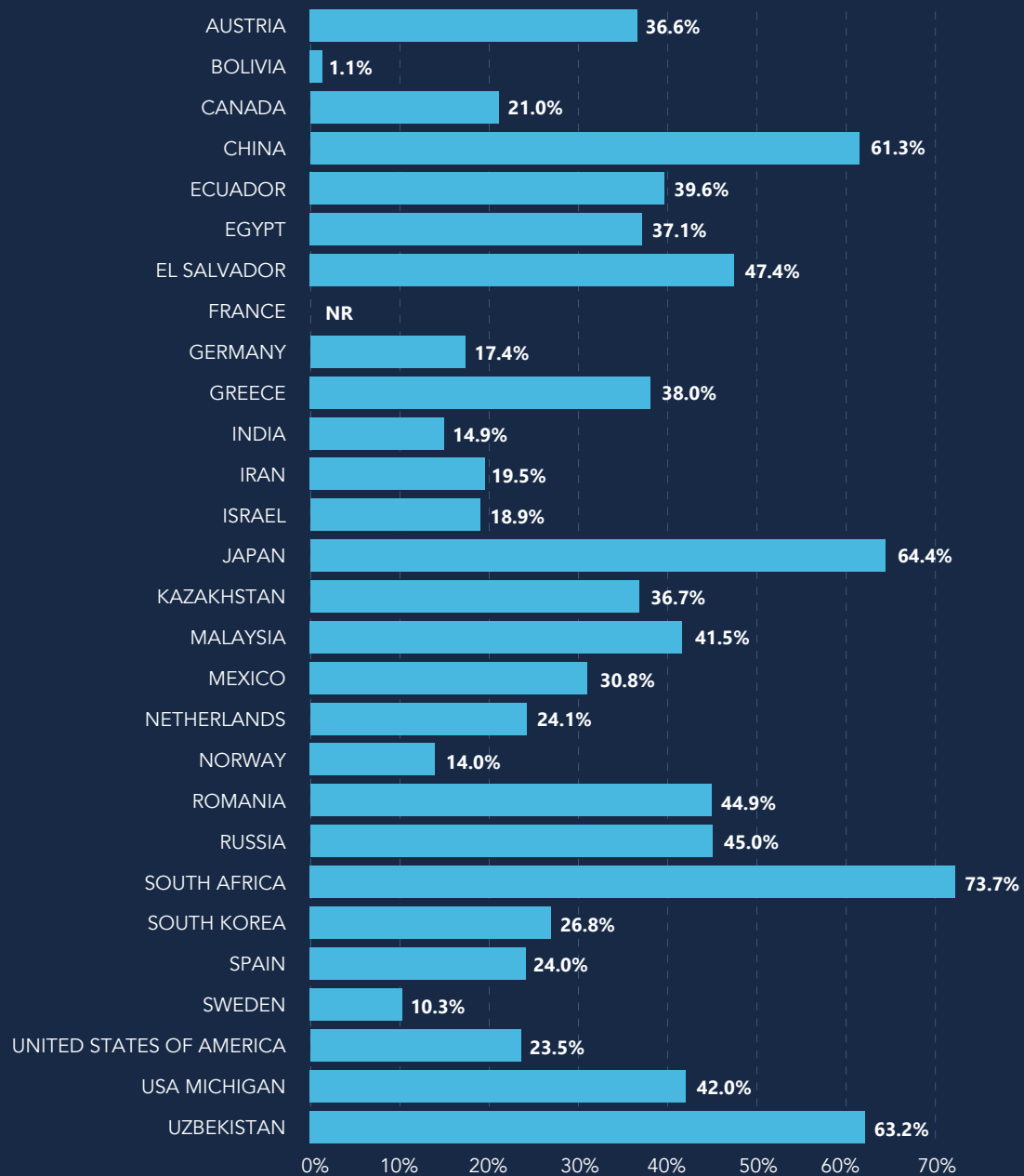
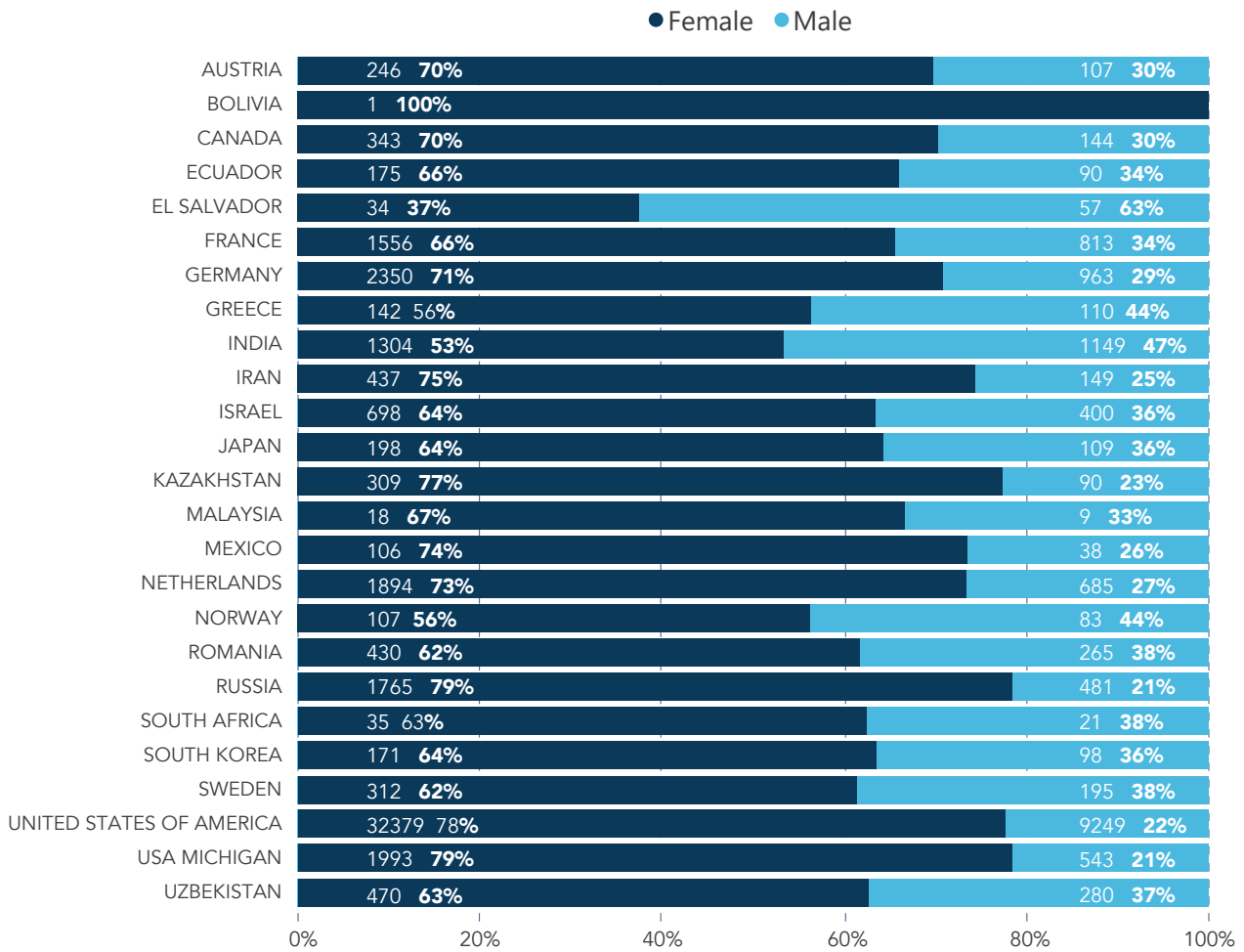


Figure 19. Proportion of male and female patients with dyslipidaemia (2024)



**Table 10. Number with dyslipidaemia
at primary procedure, by sex and country (2024)**

	Primary Operations								
	Female			Male			All		
	DL (N)	Total (N)	% with DL	DL (N)	Total (N)	% with DL	DL (N)	Total (N)	% with DL
AUSTRIA	246	706	34.8%	107	259	41.3%	353	965	36.6%
BOLIVIA	1	63	1.6%	0	24	0.0%	1	87	1.1%
CANADA	343	1903	18.0%	144	413	34.9%	487	2316	21.0%
CHINA	NR	NR	NR	NR	NR	NR	19380	31617	61.3%
ECUADOR	175	443	39.5%	90	227	39.6%	265	670	39.6%
EGYPT							4696	12657	37.1%
EL SALVADOR	34	156	21.8%	57	76	75.0%	110	232	47.4%
FRANCE	1556	22309	7.0%	813	6075	13.4%	NR	NR	NR
GERMANY	2350	13978	16.8%	963	5078	19.0%	3315	19063	17.4%
GREECE	142	413	34.4%	110	250	44.0%	252	663	38.0%
INDIA	1304	9190	14.2%	1149	7231	15.9%	2453	16421	14.9%
IRAN	437	2420	18.1%	149	582	25.6%	586	3002	19.5%
ISRAEL	698	4435	15.7%	400	1377	29.0%	1098	5812	18.9%
JAPAN	198	284	69.7%	109	193	56.5%	307	477	64.4%
KAZAKHSTAN	309	913	33.8%	90	174	51.7%	399	1087	36.7%
MALAYSIA	18	28	64.3%	9	37	24.3%	27	65	41.5%
MEXICO	106	376	28.2%	38	92	41.3%	144	468	30.8%
NETHERLANDS	1894	8594	22.0%	685	2091	32.8%	2579	10687	24.1%
NORWAY	107	982	10.9%	83	376	22.1%	190	1358	14.0%
ROMANIA	430	1052	40.9%	265	497	53.3%	695	1549	44.9%
RUSSIA	1765	4039	43.7%	481	951	50.6%	2246	4990	45.0%
SOUTH AFRICA	35	46	76.1%	21	30	70.0%	56	76	73.7%
SOUTH KOREA	171	723	23.7%	98	281	34.9%	269	1004	26.8%
SPAIN							163	678	24.0%
SWEDEN	312	3858	8.1%	195	1047	18.6%	505	4905	10.3%
UNITED STATES OF AMERICA	32379	145309	22.3%	9249	31820	29.1%	41628	177129	23.5%
USA MICHIGAN	1993	5047	39.5%	543	997	54.5%	2536	6044	42.0%
UZBEKISTAN	470	761	61.8%	280	426	65.7%	750	1187	63.2%

Gastro-oesophageal reflux disease

Reported prevalence of gastro-oesophageal reflux disease varied widely between countries. In contrast to diabetes, hypertension and sleep apnoea, reflux showed no consistent male predominance: prevalence was sometimes higher in women, sometimes in men, and in some registries comparable between the sexes. Prevalence also varied markedly by region, the North American chapter generally recording higher rates and the Latin-American chapter lower ones, with the European and Asia-Pacific chapters spanning a wide range.

Figure 20. Percent of primary participants with GERD by country (2024)

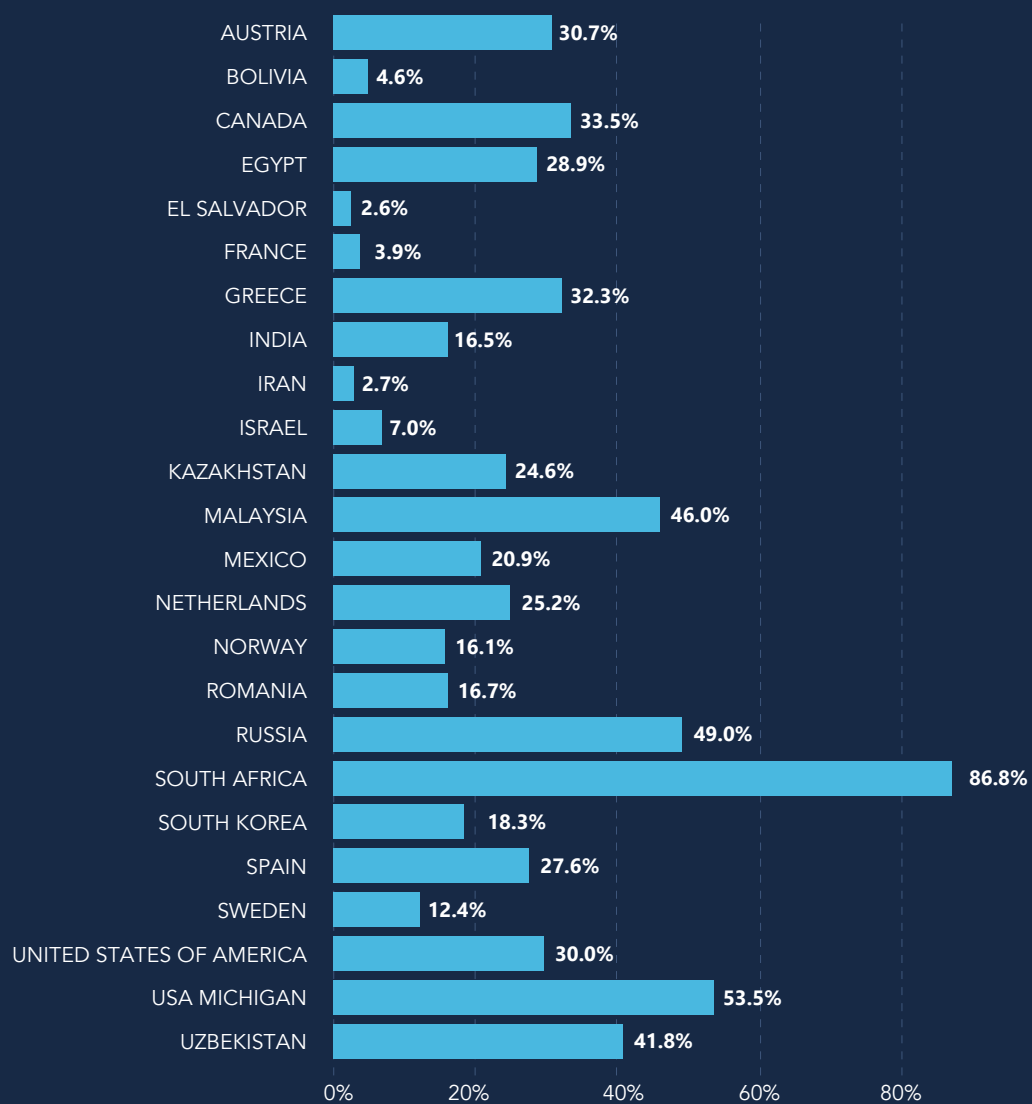


Figure 21. Proportion of male and female patients with GERD (2024)

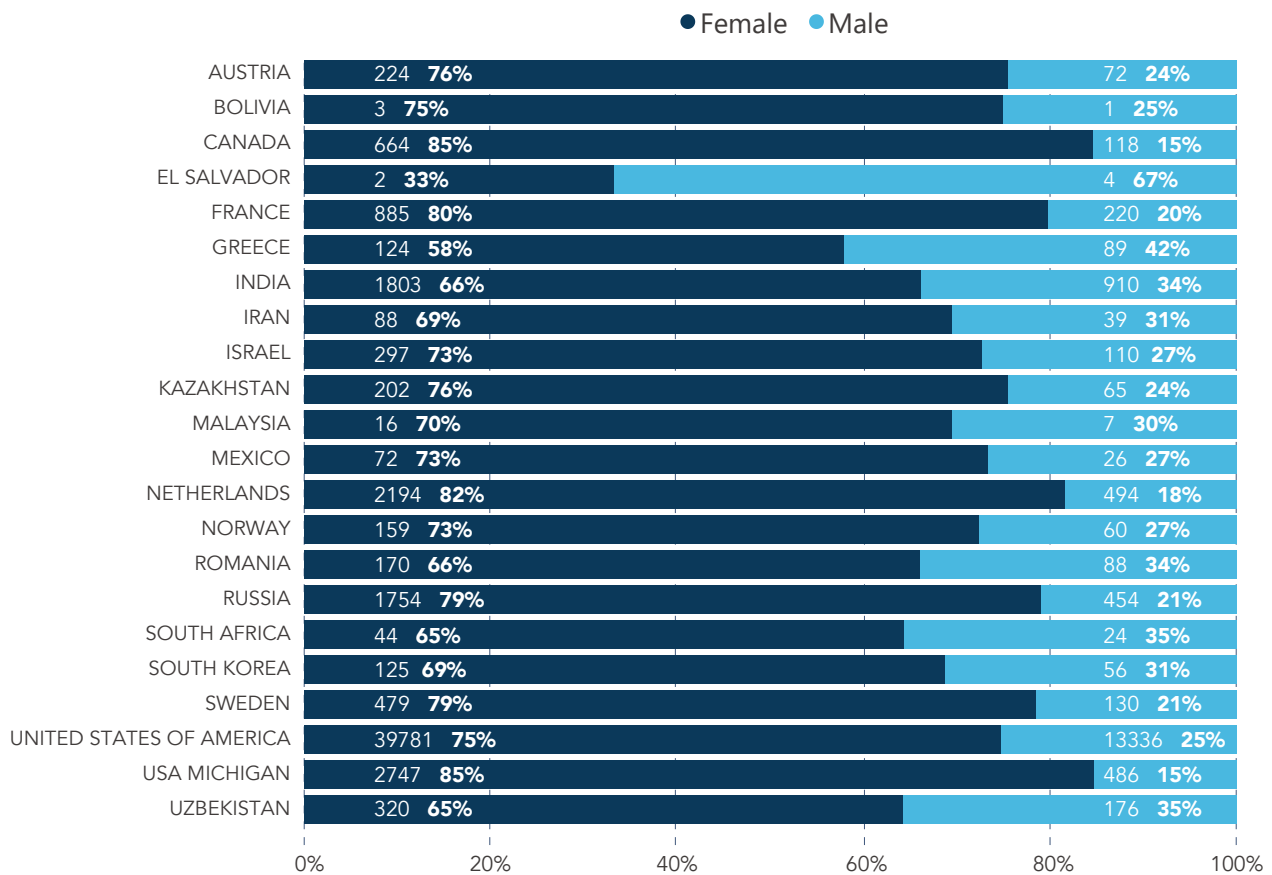


Table 11. Number with GERD at primary procedure, by sex and country (2024)

	Female			Male			All		
	GERD (N)	Total (N)	% with GERD	GERD (N)	Total (N)	% with GERD	GERD (N)	Total (N)	% with GERD
AUSTRIA	224	706	31.7%	72	259	27.8%	296	965	30.7%
BOLIVIA	3	63	4.8%	1	24	4.2%	4	87	4.6%
CANADA	664	1915	34.7%	118	416	28.4%	782	2331	33.5%
EGYPT							3653	12657	28.9%
EL SALVADOR	2	156	1.3%	4	76	5.3%	6	232	2.6%
FRANCE	885	22309	4.0%	220	6075	3.6%	1105	28384	3.9%
GREECE	124	410	30.2%	89	249	35.7%	213	659	32.3%
INDIA	1803	9190	19.6%	910	7231	12.6%	2713	16421	16.5%
IRAN	88	3812	2.3%	39	886	4.4%	127	4698	2.7%
ISRAEL	297	4454	6.7%	110	1382	8.0%	407	5836	7.0%
KAZAKHSTAN	202	913	22.1%	65	174	37.4%	267	1087	24.6%
MALAYSIA	16	30	53.3%	7	20	35.0%	23	50	46.0%
MEXICO	72	376	19.1%	26	92	28.3%	98	468	20.9%
NETHERLANDS	2194	8589	25.5%	494	2094	23.6%	2688	10685	25.2%
NORWAY	159	982	16.2%	60	376	16.0%	219	1358	16.1%
ROMANIA	170	1052	16.2%	88	497	17.7%	258	1549	16.7%
RUSSIA	1754	3657	48.0%	454	848	53.5%	2208	4505	49.0%
SOUTH AFRICA	44	46	95.7%	24	30	80.0%	66	76	86.8%
SOUTH KOREA	125	713	17.5%	56	276	20.3%	181	989	18.3%
SPAIN							187	678	27.6%
SWEDEN	479	3858	12.4%	130	1047	12.4%	609	4905	12.4%
UNITED STATES OF AMERICA	39781	145310	27.4%	13336	31820	41.9%	53117	177130	30.0%
USA MICHIGAN	2747	5047	54.4%	486	997	48.7%	3233	6044	53.5%
UZBEKISTAN	320	761	42.0%	176	426	41.3%	496	1187	41.8%

Depression

Depression was a common obesity-associated disease whose reported prevalence varied widely across countries. A notable and near-uniform pattern is that, in every reporting registry with sex-disaggregated data but one, depression was more prevalent among women than men; Bolivia is the exception, at 9.5% in women against 20.8% in men on a cohort of 87 primary procedures. This is the opposite of the pattern seen for diabetes, hypertension and dyslipidaemia, and similar to that seen for reflux.

Figure 22. Percent of primary participants with depression by country (2024)

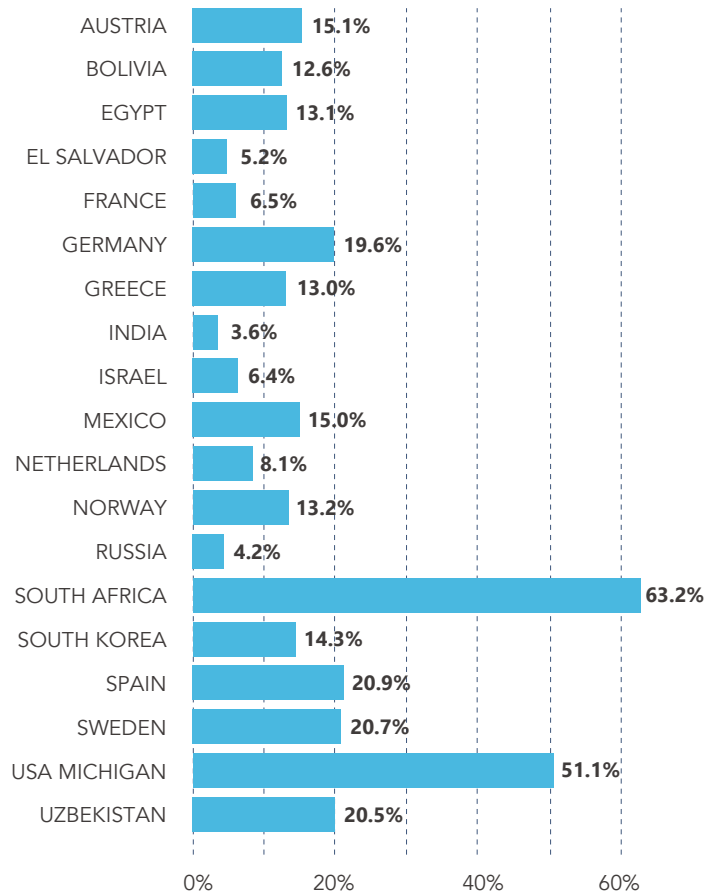


Figure 23. Proportion of primary participants with depression who are female and male (2024)

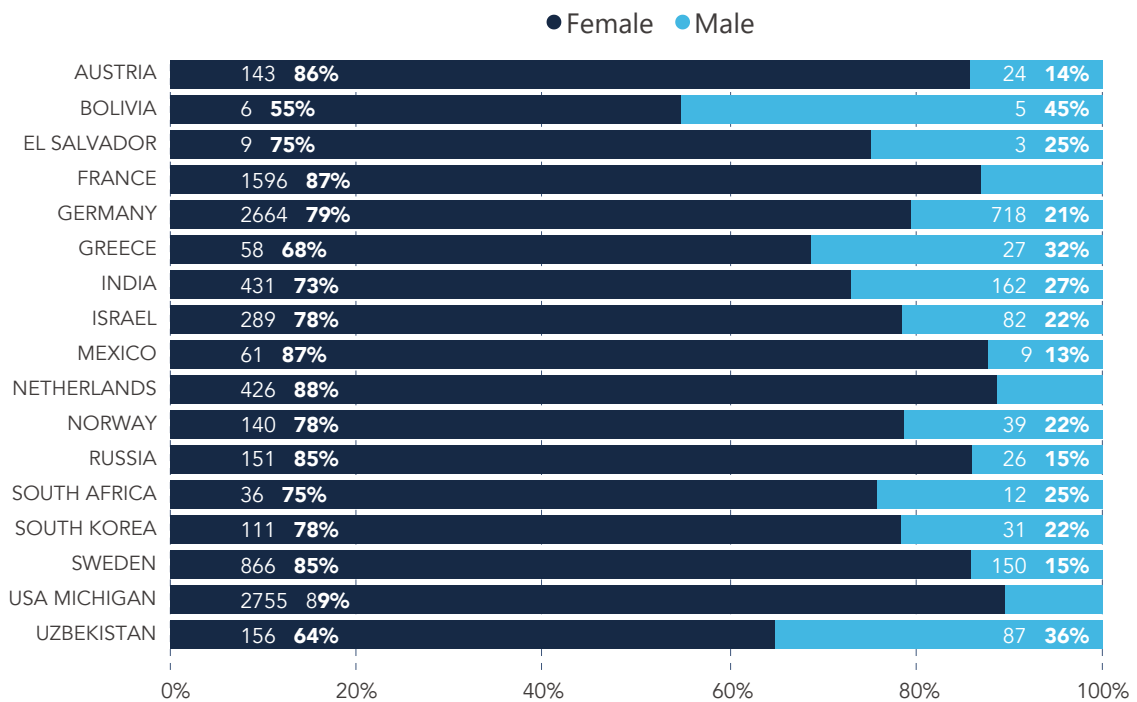


Table 12. Number with depression at primary procedure, by sex and country (2024)

	Female			Male			All		
	DSN (N)	Total (N)	% with DSN	DSN (N)	Total (N)	% with DSN	DSN (N)	Total (N)	% with DSN
AUSTRIA	143	816	17.5%	24	292	8.2%	167	1108	15.1%
BOLIVIA	6	63	9.5%	5	24	20.8%	11	87	12.6%
EGYPT							1656	12657	13.1%
EL SALVADOR	9	156	5.8%	3	76	3.9%	12	232	5.2%
FRANCE	1596	22309	7.2%	243	6075	4.0%	1839	28384	6.5%
GERMANY	2664	12562	21.2%	718	4697	15.3%	3383	17265	19.6%
GREECE	58	406	14.3%	27	247	10.9%	85	653	13.0%
INDIA	431	9190	4.7%	162	7231	2.2%	593	16421	3.6%
ISRAEL	289	4453	6.5%	82	1381	5.9%	371	5834	6.4%
MEXICO	61	376	16.2%	9	92	9.8%	70	468	15.0%
NETHERLANDS	426	4827	8.8%	57	1142	5.0%	483	5969	8.1%
NORWAY	140	982	14.3%	39	376	10.4%	179	1358	13.2%
RUSSIA	151	3464	4.4%	26	795	3.3%	177	4259	4.2%
SOUTH AFRICA	36	46	78.3%	12	30	40.0%	48	76	63.2%
SOUTH KOREA	111	714	15.5%	31	278	11.2%	142	992	14.3%
SPAIN							142	678	20.9%
SWEDEN	866	3858	22.4%	150	1047	14.3%	1016	4905	20.7%
USA MICHIGAN	2755	5047	54.6%	333	997	33.4%	3088	6044	51.1%
UZBEKISTAN	156	761	20.5%	87	426	20.4%	243	1187	20.5%

Summary of sex disparities

- **Type 2 diabetes** - Consistently higher in men across nearly all reporting countries.
- **Hypertension** - Consistently higher in men across nearly all reporting countries (Malaysia an exception).
- **Dyslipidaemia** - Predominantly higher in men across almost all countries with data, though less consistently so.
- **Obstructive sleep apnoea** - Markedly higher in men; the largest sex disparity of the six.
- **Gastro-oesophageal reflux** - No consistent male predominance; pattern varied between countries.
- **Depression** - Consistently higher in women across every reporting country with sex-disaggregated data except Bolivia.

Perioperative Outcomes

Long-term weight and obesity-associated disease resolution data are still beyond the reach of most registries, so the report continues to judge safety at the perioperative stage. Four indicators are monitored at 30 and/or 90 days, alongside length of stay: unplanned readmission, unplanned reoperation (Clavien-Dindo grade 3b), unplanned ICU admission (grade 4) and death (grade 5). These reflect clear deviations from the expected postoperative course. Perioperative mortality, though the most serious concern, is fortunately rare; non-fatal complications offer the richer opportunities for quality improvement.

Length of stay

No internationally agreed standard exists for length of stay after metabolic bariatric surgery, yet the range of hospitalisation is relatively narrow across most procedures. Median length of stay after primary surgery ran from one day (Canada, Egypt, El Salvador, Iran, the Netherlands, Norway, Sweden, the United States and Michigan) to about six days in China. The spread says more about local discharge practice and the availability of community support than about complication rates, though an unusually long stay can be an early sign of an adverse event. Revisional procedures were generally associated with stays as long as, or longer than, primary ones. Bolivia's revisional-procedure median (1 day) falls outside its reported interquartile range (2–3 days); this could not be resolved with the data available, and Bolivia is shown as NR and excluded from the length-of-stay figures.

Data integrity: follow-up and case ascertainment

Interpretation of the outcome tables requires attention to both follow-up completeness and case ascertainment. High follow-up rates lend confidence: several registries: France, Israel, the Netherlands and South Africa, again recorded complete (100%) 30/90-day follow-up for unplanned events, with the United States (about 99%), Norway (about 98% for readmission) and Sweden (about 87% for readmission, return-to-theatre and ICU) close behind, setting the benchmark for registry quality. Where ascertainment is incomplete, outcome rates can be distorted; a short stay coupled with thorough follow-up can itself raise the recorded readmission rate, so the registries with the most complete data are not necessarily those with the lowest event counts.

Readmission, reoperation and ICU admission

As in the prior year, unplanned reoperation was consistently more frequent after revisional than after primary surgery, in keeping with its greater complexity, and unplanned ICU admission was uncommon across all chapters, indicating that intensive-care resources are generally well planned and appropriately used. Each registry's own definition of these events is reproduced alongside its figures, because the definitions differ in ways that affect the rates.

Figure 24. Median length of stay by country, primary and revisional procedures (2024)

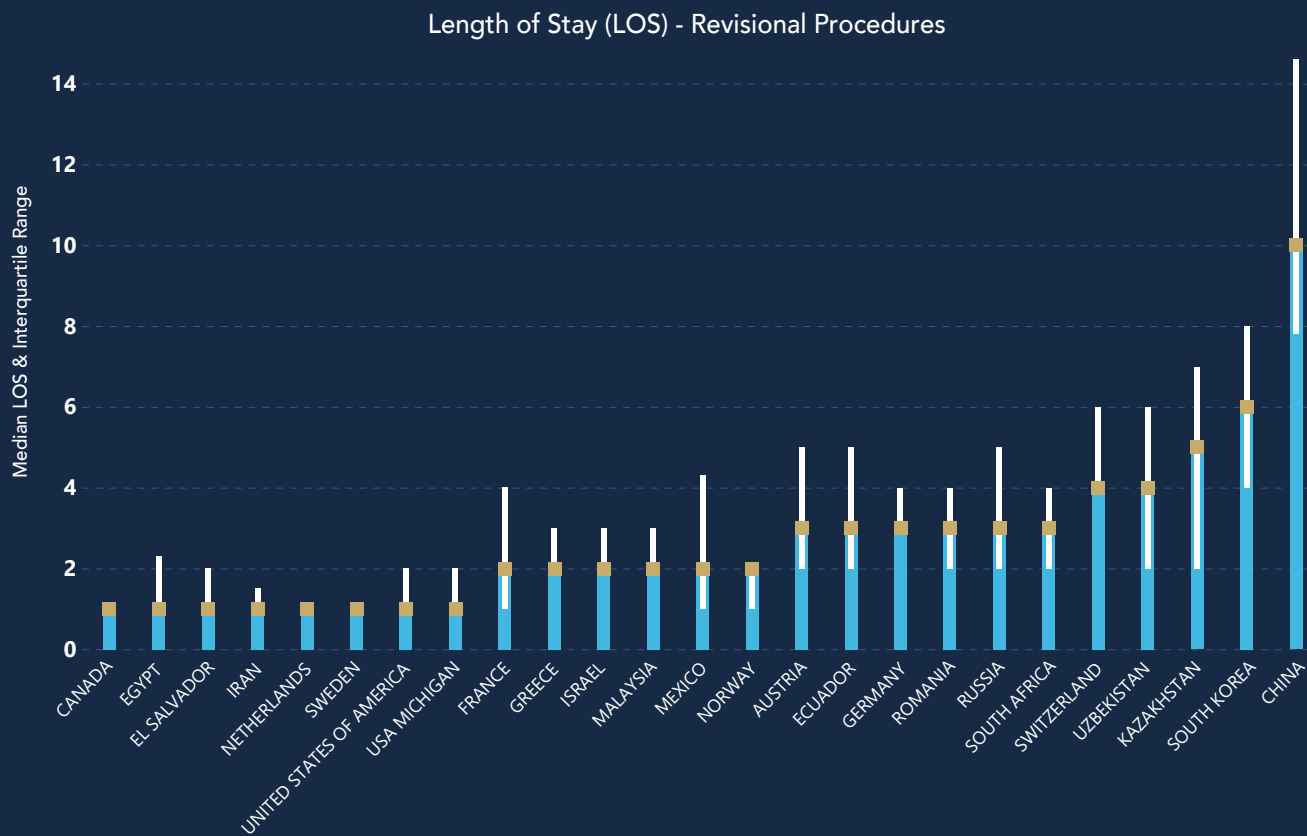
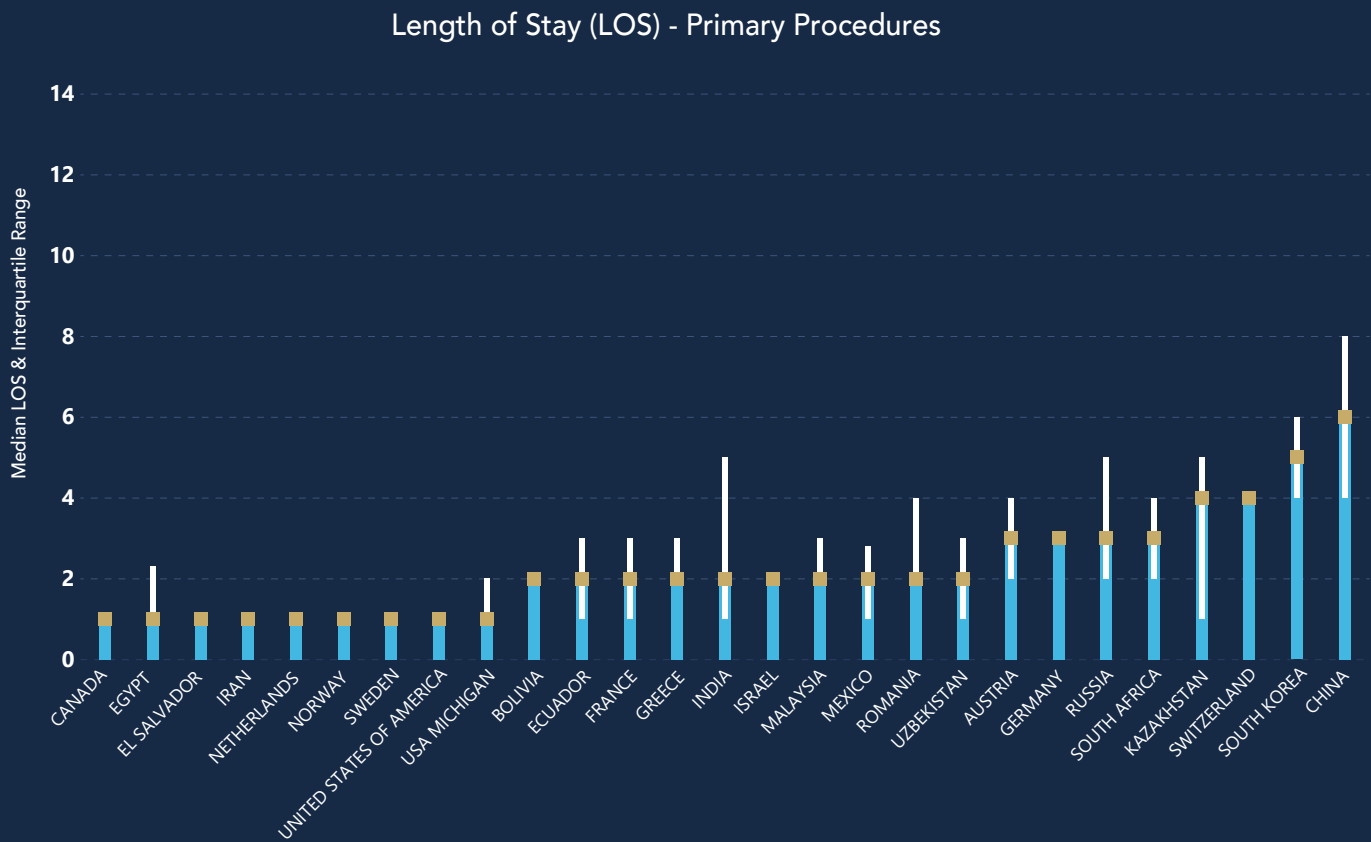


Table 13. Rate of postoperative unplanned readmission by country, primary and revisional (2024)

Unplanned Readmissions	Number of days measured from procedure	PRIMARY				REVISIONAL			
		Readm N	Total N	Readm Rate	Known Cases	Readm N	Total N	Readm Rate	Known Cases
AUSTRALIA Registry Definition An indicator to show whether the patient has had an unplanned readmission to hospital in the 90 days following their procedure (perioperative period). An unplanned readmission to hospital in the perioperative period is considered a defined adverse event by the Registry. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2023-24. N for known cases during FY 2023-24: Primary total: 14738 => %Known Prim = 82.18% Revision total: 3345=> %Known Rev = 77.40%	90	172	12111	1.4%	82.2%	75	2589	2.9%	77.4%
AUSTRIA Registry Definition Any unplanned readmission	90	33	1646	2.0%	94.0%	15	302	5.0%	94.1%
BOLIVIA	90	2	87	2.3%	100.0%	0	4	0.0%	100.0%
ECUADOR Registry Definition Readmission after discharge		2	670	0.3%	100.0%	NRep	NRep	NRep	
EL SALVADOR Registry Definition 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.	90	7	232	3.0%	100.0%	0	10	0.0%	100.0%
FRANCE Registry Definition Unplanned 30-day readmission after surgery	30	1848	28384	6.5%	100.0%	454	4610	9.9%	100.0%
GERMANY Registry Definition Applies to inpatient readmission in causal connection with the documented operation.	30	574	22172	2.6%	94.1%	133	2836	4.7%	89.2%
GREECE Registry Definition Unplanned admission to hospital within 90 days after surgery	90	31	664	4.7%	100.0%	9	95	9.5%	100.0%
INDIA		134	16421	0.8%	100.0%	37	1239	3.0%	100.0%
IRAN Registry Definition A defined adverse event was considered present if an unplanned hospital readmission related to the surgery occurred within 30 days postoperatively.	30	45	8007	0.6%	100.0%	5	206	2.4%	100.0%

Unplanned Readmissions	Number of days measured from procedure	PRIMARY				REVISIONAL			
		Readm N	Total N	Readm Rate	Known Cases	Readm N	Total N	Readm Rate	Known Cases
ISRAEL Registry Definition All patients who were readmitted within 90 days only to the surgical department	90	367	5836	6.3%	100.0%	93	955	9.7%	100.0%
KAZAKHSTAN	30	0	1087	0.0%	100.0%	0	8	0.0%	100.0%
MEXICO		7	468	1.5%	100.0%	3	29	10.3%	100.0%
NETHERLANDS Registry Definition In DATO, a readmission is defined as a patient being admitted (unplanned) to the hospital again after a previous discharge following a bariatric procedure	30	181	11536	1.6%	100.0%	36	1304	2.8%	100.0%
NEW ZEALAND Registry Definition An indicator to show whether the patient has had an unplanned readmission to hospital in the 90 days following their procedure (perioperative period). An unplanned readmission to hospital in the perioperative period is considered a defined adverse event by the Registry. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2023-24. N for known cases during FY 2023-24: Primary total: 1627 => %Known Prim = 84.82% Revision total: 99 => %Known Rev = 79.80%	90	45	1380	3.3%	*100.0%	7	79	8.9%	92.9%
**NORWAY Registry Definition Not defined	30	76	1331	5.7%	98.0%	12	112	10.7%	93.3%
ROMANIA Registry Definition Readmission for any postoperative complications (bleeding, leak and stenosis)		6	1549	0.4%	100.0%	2	96	2.1%	100.0%
RUSSIA Registry Definition If within 30 days after discharge a patient reports any significant issues to the surgeon, this is recorded in the registry as an 'early complication.' It may resolve with conservative management or require surgical intervention, but hospitalization does not always occur. Cases of unplanned return to the operating theater are documented separately	30	73	7857	0.9%	100.0%	3	344	0.9%	100.0%
SOUTH AFRICA		0	76	0.0%	100.0%	0	47	0.0%	100.0%
SPAIN Registry Definition Patients admitted to hospitalization after discharge due to complications	30	57	4606	1.2%	100.0%	17	529	3.2%	100.0%

Unplanned Readmissions	Number of days measured from procedure	PRIMARY				REVISIONAL			
		Readm N	Total N	Readm Rate	Known Cases	Readm N	Total N	Readm Rate	Known Cases
SWEDEN Registry Definition All readmissions to any clinic for any reason within 30 days	30	233	4266	5.5%	86.8%	20	244	8.2%	88.1%
UNITED STATES OF AMERICA Registry Definition mbsaqip standard	30	5270	177308	3.0%	99.1%	1224	19585	6.3%	100.0%
USA MICHIGAN	30	161	6044	2.7%	100.0%	86	1005	8.6%	100.0%
UZBEKISTAN Registry Definition Emergency or urgent readmission to any hospital within 30 days of discharge from index bariatric surgery, excluding elective procedures.	30	36	1187	3.0%	100.0%	1	25	4.0%	100.0%

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

*New Zealand, Known Cases - Outcomes cover financial year 2023/24 against calendar-2024 operative data

*Norway - about 98% for readmission

Table 14. Rate of postoperative unplanned reoperation by country, primary and revisional (2024)

Unplanned Return to Theatre (RTT)	Number of days measured from procedure	PRIMARY				REVISIONAL			
		RTT N	Total N	RTT Rate	Known Cases	RTT N	Total N	RTT Rate	Known Cases
AUSTRALIA Registry Definition An indicator to show whether the patient has had an unplanned return to an operating theatre in the 90 days following their procedure (peri-operative period). An unplanned return to theatre in the perioperative period is considered a defined adverse event by the Registry. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2023-24. N for known cases during FY 2023-24: Primary total: 14738 => %Known Prim = 82.18% Revision total: 3345=> %Known Rev = 77.40%	90	122	12111	1.0%	82.2%	189	2589	7.3%	77.4%
AUSTRIA Registry Definition Unplanned return to theatre related to the initial procedure	90	46	1646	2.8%	94.0%	25	302	8.3%	94.1%
BOLIVIA	90	2	87	2.3%	100.0%	0	4	0.0%	100.0%
ECUADOR Registry Definition Return after high suspicion of complication		5	670	0.8%	100.0%	NRep	NRep	NRep	
EL SALVADOR Registry Definition 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)	90	3	232	1.3%	100.0%	0	10	0.0%	100.0%
FRANCE Registry Definition Clavien 3b	30	809	28384	2.9%	100.0%	251	4610	5.4%	100.0%
GERMANY Registry Definition Re-op in case of post op complications	30	418	22177	1.9%	94.1%	122	2833	4.3%	89.1%
GREECE Registry Definition Unplanned return to theatre within 90 days after surgery procedure	90	10	664	1.5%	100.0%	6	95	6.3%	100.0%
INDIA		76	16421	0.5%	100.0%	23	1239	1.9%	100.0%
ISRAEL Registry Definition All patients who were readmitted within 90 days only to the surgical department procedure	90	367	5836	6.3%	100.0%	93	955	9.7%	100.0%
KAZAKHSTAN	30	2	1087	0.2%	100.0%	0	8	0.0%	100.0%
MEXICO		5	468	1.1%	100.0%	3	29	10.3%	100.0%

Unplanned Return to Theatre (RTT)	Number of days measured from procedure	PRIMARY				REVISIONAL			
		RTT N	Total N	RRT Rate	Known Cases	RTT N	Total N	RTT Rate	Known Cases
NETHERLANDS Registry Definition In DATO, a reintervention (RTT) is defined as a procedure performed within 30 days following a primary or secondary metabolic bariatric surgery, which is performed as a consequence of the original procedure	30	100	11536	0.9%	100.0%	24	1304	1.8%	100.0%
NEW ZEALAND Registry Definition An indicator to show whether the patient has had an unplanned return to an operating theatre in the 90 days following their procedure (peri-operative period). An unplanned return to theatre in the perioperative period is considered a defined adverse event by the Registry. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2023-24. N for known cases during FY 2023-24: Primary total: 1627 => %Known Prim = 84.82% Revision total: 99 => %Known Rev = 79.80%	90	8	1380	0.6%	*100.0%	1	79	1.3%	92.9%
ROMANIA Registry Definition Number of patients who suffered any reintervention (bleeding and leak)		4	1549	0.3%	100.0%	2	96	2.1%	100.0%
RUSSIA Registry Definition Reintervention is recorded if the patient develops complications within 30 days after discharge that require additional surgical intervention. If a complication or reintervention is not registered in the database, it is considered absent.	30	45	7857	0.6%	100.0%	2	344	0.6%	100.0%
SOUTH AFRICA		0	76	0.0%	100.0%	0	47	0.0%	100.0%
SOUTH KOREA Registry Definition 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.	30	2	1410	0.1%	100.0%	1	64	1.6%	100.0%
SPAIN Registry Definition Reoperations due to complications	30	69	4606	1.5%	100.0%	11	529	2.1%	100.0%
SWEDEN Registry Definition All Clavien 3b within 30 days	30	89	4262	2.1%	86.8%	12	243	4.9%	87.7%
SWITZERLAND Registry Definition Return to operation theater for any reason during same hospitalisation	30	63	4006	1.6%	100.0%	38	782	4.9%	100.0%

*New Zealand, Known Cases - Outcomes cover financial year 2023/24 against calendar-2024 operative data

Unplanned Return to Theatre (RTT)	Number of days measured from procedure	PRIMARY				REVISIONAL			
		RTT N	Total N	RTT Rate	Known Cases	RTT N	Total N	RTT Rate	Known Cases
UNITED STATES OF AMERICA Registry Definition mbsaqip standard	30	1562	177308	0.9%	99.1%	499	19585	2.5%	100.0%
USA MICHIGAN	30	47	6044	0.8%	100.0%	27	1005	2.7%	100.0%
UZBEKISTAN Registry Definition Any unscheduled return to the operating room within the same hospital admission or within 30 days of the index procedure for treatment of complications	30	24	1187	2.0%	100.0%	1	25	4.0%	100.0%

Total N - Number of procedures with known unplanned RTT status
RTT Rate - Percentage of patients unplanned RTT out of all procedures where RTT status is known.
Known Cases - Percentage of procedures where RTT status is known out of the total number of procedures.
 Excludes unknown/missing values

Table 15. Rate of postoperative unplanned ICU admission by country, primary and revisional (2024)

Unplanned ICU Admissions	Number of days measured from procedure	PRIMARY				REVISIONAL			
		ICU N	Total N	ICU Rate	Known Cases	ICU N	Total N	ICU Rate	Known Cases
AUSTRALIA Registry Definition An indicator to show whether the patient has had an unplanned admission to an intensive care unit (ICU) in the 90 days following their procedure (peri-operative period). An unplanned ICU admission in the perioperative period is considered a defined adverse event by the Registry. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2023-24. N for known cases during FY 2023-24: Primary total: 14738 => %Known Prim = 82.18% Revision total: 3345=> %Known Rev = 77.40%	90	20	12111	0.2%	82.2%	11	2589	0.4%	77.4%
AUSTRIA Registry Definition Any unplanned ICU	90	29	1646	1.8%	94.0%	14	302	4.6%	94.1%
BOLIVIA	90	2	87	2.3%	100.0%	0	4	0.0%	100.0%
CANADA Registry Definition Unplanned admission to an ICU (Intensive Care Unit) immediately postoperative as a consequence of the bariatric procedure (not collected during peri-op 30-90 day period)	30	2	2367	0.1%	100.0%	0	68	0.0%	94.4%
ECUADOR Registry Definition Unexpected admission to ICU		3	670	0.5%	100.0%	NRep	NRep	NRep	
EL SALVADOR Registry Definition 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	90	0	232	0.0%	100.0%	0	10	0.0%	100.0%
FRANCE Registry Definition Clavien 4	30	236	28384	0.8%	100.0%	54	4610	1.2%	100.0%
GREECE Registry Definition Unplanned ICU admission within 90 days after surgery procedure	90	6	664	0.9%	100.0%	3	95	3.2%	100.0%
INDIA		14	16421	0.1%	100.0%	6	1239	0.5%	100.0%
IRAN	30	12	8007	0.2%	100.0%	1	206	0.5%	100.0%
ISRAEL Registry Definition All patients who were readmitted within 90 days to the intensive care unit	90	13	5836	0.2%	100.0%	8	955	0.8%	100.0%

Unplanned ICU Admissions	Number of days measured from procedure	PRIMARY				REVISIONAL			
		ICU N	Total N	ICU Rate	Known Cases	ICU N	Total N	ICU Rate	Known Cases
KAZAKHSTAN	30	2	1087	0.2%	100.0%	0	8	0.0%	100.0%
MEXICO		2	468	0.4%	100.0%	1	29	3.5%	100.0%
NETHERLANDS Registry Definition In DATO, the definition for an ICU admittance is: If the patient is admitted to the intensive care unit (ICU) for unplanned observation and/or treatment. If the ICU admission was planned for observation purposes, it will not be classified as an unplanned ICU admission and will not be counted as a Clavien-Dindo Classification Grade IV or higher.	30	15	11536	0.1%	*100.0%	1	1304	0.1%	100.0%
NEW ZEALAND Registry Definition An indicator to show whether the patient has had an unplanned admission to an intensive care unit (ICU) in the 90 days following their procedure (peri-operative period). An unplanned ICU admission in the perioperative period is considered a defined adverse event by the Registry. Due to the delay in receiving this data is reported for procedures that took place during the financial year 2023-24. N for known cases during FY 2023-24: Primary total: 1627 => %Known Prim = 84.82% Revision total: 99 => %Known Rev = 79.80%	90	3	1380	0.2%	*100.0%	1	79	1.3%	92.9%
NORWAY Registry Definition Not defined. Figures below are Clavien-Dindo 3b or worse (patients might or might not have been to ICU).	30	17	1358	1.3%	100.0%	7	120	5.8%	100.0%
ROMANIA Registry Definition Patients admitted in the ICU for any post-operative complications (leak)		1	1549	0.1%	100.0%	2	96	2.1%	100.0%
RUSSIA Registry Definition The severity of complications (Clavien-Dindo) has been recorded in the registry only since October 11, 2024	30	NR	NR	NR	NR	NR	NR	NR	NR
SOUTH AFRICA		0	76	0.0%	100.0%	0	47	0.0%	100.0%
SOUTH KOREA Registry Definition 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.	30	3	1410	0.2%	100.0%	1	64	1.6%	100.0%

*New Zealand, Known Cases - Outcomes cover financial year 2023/24 against calendar-2024 operative data

Unplanned ICU Admissions	Number of days measured from procedure	PRIMARY				REVISIONAL			
		ICU N	Total N	ICU Rate	Known Cases	ICU N	Total N	ICU Rate	Known Cases
SPAIN Registry Definition Admission to ICU after surgery due to complications	30	21	4606	0.5%	100.0%	5	529	1.0%	100.0%
SWEDEN Registry Definition Clavien grade IV within 30 days	30	4	4262	0.1%	86.8%	0	243	0.0%	87.7%
UNITED STATES OF AMERICA Registry Definition mbsaqip standard	30	850	177308	0.5%	99.1%	204	19585	1.0%	100.0%
UZBEKISTAN Registry Definition Unplanned admission to intensive care unit (ICU) or high dependency	30	12	1187	1.0%	100.0%	1	25	4.0%	100.0%

Total N - Number of procedures with known unplanned ICU status.
ICU Rate - Percentage of patients with unplanned ICU out of all procedures where ICU status is known.
Known Cases - Percentage of procedures where ICU status is known out of the total number of procedures.
 Excludes unknown/missing values

Mortality

On reliability. The United States recorded 1,331 primary deaths among 177,308 procedures (0.75%) for 2023. That is roughly ten times its prior-year count of 142 and an order of magnitude above the rate seen elsewhere; the value is incorrect, almost certainly a reading error in the source MBSAQIP data, and this could not be resolved before this report closed. It is qualified as Not Reliable (NR). The cell is shown as NR in Table 16 rather than printed, so that no reader takes 0.75% for a measured rate, and it is excluded from the global figure and from every weighted total; the United States contributes no primary-mortality figure to this edition. Ecuador is also left out of the global primary figure, its death denominator being the country total (670) rather than its primary count (638). On the remaining submissions global primary mortality was about 0.039% (88/227,891), against about 0.046% the prior year, very low and broadly unchanged. Among the reliable submissions, primary mortality stayed below 0.1% in nearly every registry. Revisional mortality was typically higher and stayed below 0.5% in nearly every registry, the exceptions being Iraq (9/708, 1.27%) and the United States (218/19,585, 1.11%), both genuine findings on reasonably sized cohorts rather than data-quality concerns; the American revisional data are unaffected by the primary-mortality error. Ecuador reported its revisional outcomes on its primary denominator with primary numerators and is shown as NRep for those outcomes, so it contributes no revisional outcome data to this edition. Within the limits of registry follow-up, the operation remains a safe one.

Caution applies to countries with small sample sizes or limited follow-up, where an apparently high rate may reflect a small denominator rather than genuinely elevated risk. The most reliable mortality estimates come from the registries with comprehensive data and robust follow-up. Mortality was consistently lower for primary than for revisional procedures, reflecting the greater volume and lower complexity of first operations.

Table 16. Rate of postoperative death by country, primary and revisional procedures (2024)

	Number of days measured within procedure	PRIMARY				REVISIONAL			
		Deaths (N)	Total (N)	Mortality Rate	Known Cases	Deaths (N)	Total (N)	Mortality Rate	Known Cases
AUSTRALIA	90	2	13141	0.0%	100.0%	3	2842	0.1%	100.0%
AUSTRIA	90	0	1646	0.0%	94.0%	0	302	0.0%	94.1%
BOLIVIA	90	0	87	0.0%	100.0%	0	4	0.0%	100.0%
CANADA	30	1	2367	0.0%	100.0%	0	72	0.0%	100.0%
CHINA		3	31617	0.0%	100.0%	1	725	0.1%	100.0%
*ECUADOR		0	670	0.0%	100.0%	NRep	NRep	NRep	
EGYPT	90	7	11341	0.1%	100.0%	2	1301	0.2%	100.0%
EL SALVADOR	90	0	232	0.0%	100.0%	0	10	0.0%	100.0%
FRANCE	30	17	28384	0.1%	100.0%	4	4610	0.1%	100.0%
GERMANY	30	20	22176	0.1%	94.1%	5	2830	0.2%	89.0%
GREECE	90	1	664	0.2%	100.0%	0	95	0.0%	100.0%
INDIA		3	16421	0.0%	100.0%	1	1239	0.1%	100.0%
IRAN	30	0	8007	0.0%	100.0%	0	206	0.0%	100.0%
IRAQ		6	12800	0.1%	100.0%	9	708	1.3%	100.0%
ISRAEL	90	3	5836	0.1%	100.0%	2	955	0.2%	100.0%
ITALY		4	25956	0.0%	NRep	1	746	0.1%	NRep
JAPAN		0	477	0.0%	100.0%				
KAZAKHSTAN	30	1	1087	0.1%	100.0%	0	8	0.0%	100.0%
MALAYSIA	90	0	189	0.0%	NRep	0	6	0.0%	NRep
MEXICO		2	468	0.4%	100.0%	0	29	0.0%	100.0%
NETHERLANDS	30	2	11536	0.0%	100.0%	1	1304	0.1%	100.0%
NEW ZEALAND	90	1	1332	0.1%	100.0%	0	85	0.0%	100.0%
NORWAY	30	0	1358	0.0%	100.0%	0	120	0.0%	100.0%
ROMANIA		0	1549	0.0%	NRep	0	96	0.0%	NRep
RUSSIA	30	4	6979	0.1%	88.8%	0	311	0.0%	90.4%
SOUTH AFRICA		0	76	0.0%	100.0%	0	47	0.0%	100.0%
SOUTH KOREA	30	1	1410	0.1%	100.0%	0	64	0.0%	100.0%
SPAIN	30	2	4606	0.0%	100.0%	0	529	0.0%	100.0%
SWEDEN	30	2	4912	0.0%	100.0%	0	277	0.0%	100.0%
SWITZERLAND	30	3	4006	0.1%	100.0%	2	782	0.3%	100.0%
UNITED STATES OF AMERICA	30	NR	NR	NR	NR	218	19585	1.1%	100.0%
USA MICHIGAN	30	1	6044	0.0%	100.0%	1	1005	0.1%	100.0%
UZBEKISTAN	30	2	1187	0.2%	100.0%	0	25	0.0%	100.0%

Total N - Number of procedures with known death status.
Mortality Rate - Percentage of patients who died out of all procedures where mortality status is known.
Known Cases - Percentage of procedures where death status is known out of the total number of procedures.
NS - Not Stated

*Ecuador - The denominator of 670 is the country total rather than the primary count of 638; the row is excluded from the global figure.

Trends in Metabolic Bariatric Surgery (2021 – 2024)

Since its inception over thirty years ago, IFSO has tracked the number and types of bariatric procedures performed across its member societies, first through global surveys and now through the aggregated registry dataset. With four registration years now in hand (2021–2024), each measure can be read as a continuous series. The set of contributing registries is not identical from year to year, so a single year's movement should be read with care; the value of the series is in the direction it shows once that caveat is allowed for. Three observations hold across the four years.

- **Sleeve gastrectomy is no longer expanding its share.** Across the four years it has held in the mid-to-high 50s per cent (60.8%, 54.0%, 56.8%, 55.4%) and sits well below its 2021 figure. It remains the single most common operation, but its earlier dominance has levelled off.
- **One-anastomosis gastric bypass and "other" techniques are gaining.** OAGB moved from 4.8% in 2021 to 7.0% in 2024, and the "other" group, which covers single-anastomosis duodenoileal bypass with sleeve, biliopancreatic diversion, single-anastomosis sleeve ileal bypass, transit bipartition and endoscopic procedures, from 4.3% to 5.4% between the prior year and 2024, continuing a gradual rise as newer procedures enter routine practice.
- **The patients and the safety record are stable.** The female share (around 78% of primary procedures), the median age (around 42 years) and reliable-registry mortality (around 0.04%) barely move from year to year, even as volume shifts between registries.
- **Total volume fell slightly** between the prior year and 2024, from 597,267 to 580,898 procedures. In several parts of the world this decline reflects the rapid uptake of obesity management medications, which now divert a proportion of patients who would earlier have proceeded to surgery.

This is an effect the registry cannot see directly. It records nothing on obesity management medications, so their influence appears as no variable of its own; it can only be inferred from what surgery itself does, its volume, and in time the make-up of the patients who still come to it. The fall recorded here almost certainly understates that influence, because it is greatest in the United States, whose figures in this edition still relate to 2023, ahead of the steepest part of the uptake. As the United States moves to its 2024 registration year, and as a further year is added for every registry, the signal should sharpen in the next edition along two lines: a lower operative volume, and possibly a shift in case mix. If medications absorb the less complex candidates first, the patients who still proceed to surgery may, on average, carry more obesity-associated disease and higher acuity than before, a change the registry would pick up through its BMI and obesity-related-disease fields, even though the medications driving it remain unrecorded. Whether that shift proves real, and whether the overall effect is durable or in part temporary, cannot yet be said; it is precisely what the coming editions are positioned to show.

Figure 25. Total procedures by procedure type and year (2021–2024)

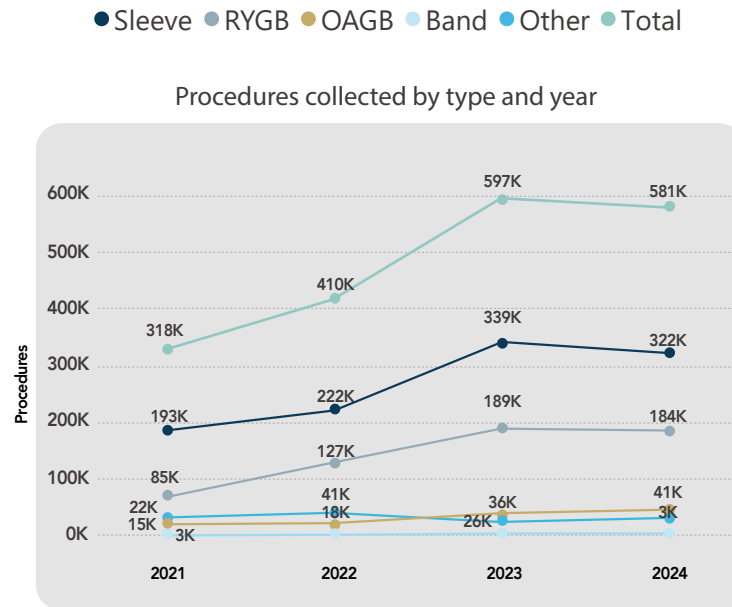


Figure 26. Procedure-type breakdown by year (2021–2024)

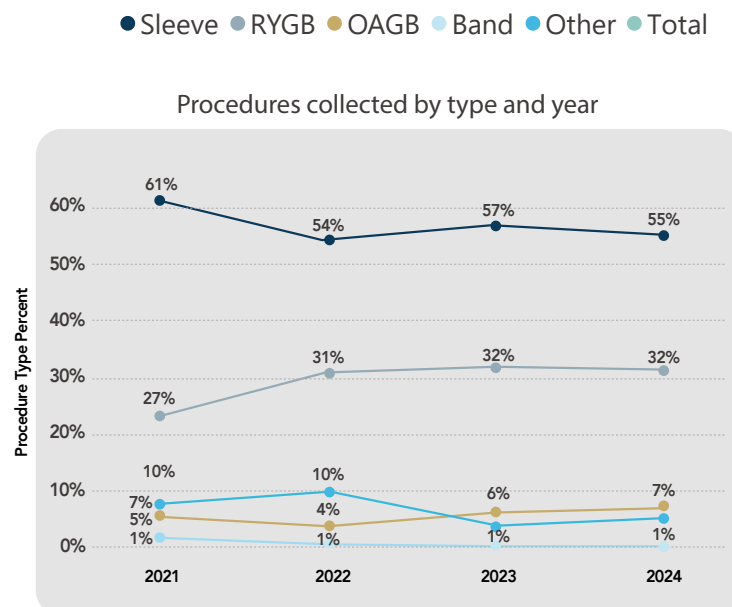


Figure 27. Procedure-type breakdown by IFSO chapter and year

● Sleeve ● RYGB ● OAGB ● Band ● Other



Conclusions and future perspective

The tenth report, the fourth drawn solely from aggregated national and regional registries, repeats the picture of its predecessors and lengthens the view to four years. Sleeve gastrectomy is still the operation most often performed but is gradually giving ground to one-anastomosis gastric bypass and newer techniques; patients are predominantly women in their early forties; and, on the data we trust, perioperative safety is excellent and steady.

What is new in this edition is the explicit attention to data quality. The 2024 returns were audited cell by cell, and the entries that did not survive that audit have been set aside rather than printed: the United States mortality count, almost certainly a reading error in the source MBSAQIP data; one obesity-associated disease denominator equal to its own numerator; and a group of medians and interquartile ranges that are internally impossible, chiefly in the Mexican, South African and Bolivian returns. Each is recorded in Appendix 5 with the basis on which it was coded. Improving case ascertainment, denominator capture and source verification is the work that matters most for the eleventh edition. We continue to aim at full participation from the 44 registries already known to IFSO, and in time from all 72 member societies.

Future perspective

The setting in which these data are collected is changing quickly, and the coming editions will have to take account of it. In several regions the recent decline in operative volume reflects the rapid adoption of obesity management medications rather than any fall in the underlying burden of disease. Surgery and pharmacological treatment increasingly act on the same population, and the registry will need to describe operative activity against that background rather than in isolation.

Broadening the modalities recorded.

For that reason, we are preparing to extend the registry beyond the current metabolic bariatric operations to other treatment modalities, and the newer and emerging procedures; among them surgical techniques such as transit bipartition variants, and endoscopic interventions. Each will be admitted on a single condition: that it can be captured as reliably as the modalities already held in the Global Registry and its underlying national and regional registries.

Coverage, ascertainment and feedback.

The established aims continue alongside this: wider participation, toward all 44 registries already known to IFSO and, in time, all 72 member societies; better case ascertainment, so that the denominator in each country is known with greater confidence; and clearer feedback to contributors and to the IFSO chapters, including work toward an online view of the Global Report data. The attention to data integrity in this edition belongs to the same effort, since broader coverage is worth having only when each figure added to it can be trusted.

Acknowledgements

This report rests on the work of many hands. The Chair is indebted to his colleagues on the Global Registry Committee, and to the contributing registries and their data managers, for the work that underlies this edition. We thank the Monash University / ANZMOSS team, in particular Robin Thompson, Jennifer Holland, Sherin Renchi and Ellie James, whose collection, collation and cleaning of the aggregated returns made the edition possible, and we acknowledge the earlier contributions, through previous editions, of Jenifer Cottrell, Angus Campbell and Dianne Brown to the data dictionary and database. The report's visual approach was conceived and introduced by Sara Maria Sprinkhuizen of the Data Vision Lab for the seventh report; since the eighth edition its design has been the work of Meaghan Thomson of Owl Graphic Design, the present one included. We are grateful to the IFSO leadership and, above all, to Manuela Mazarella of the IFSO Secretariat, whose engagement with registries worldwide remains central to the project. Most of all we thank the contributing registries and the patients whose data underpin the whole undertaking.

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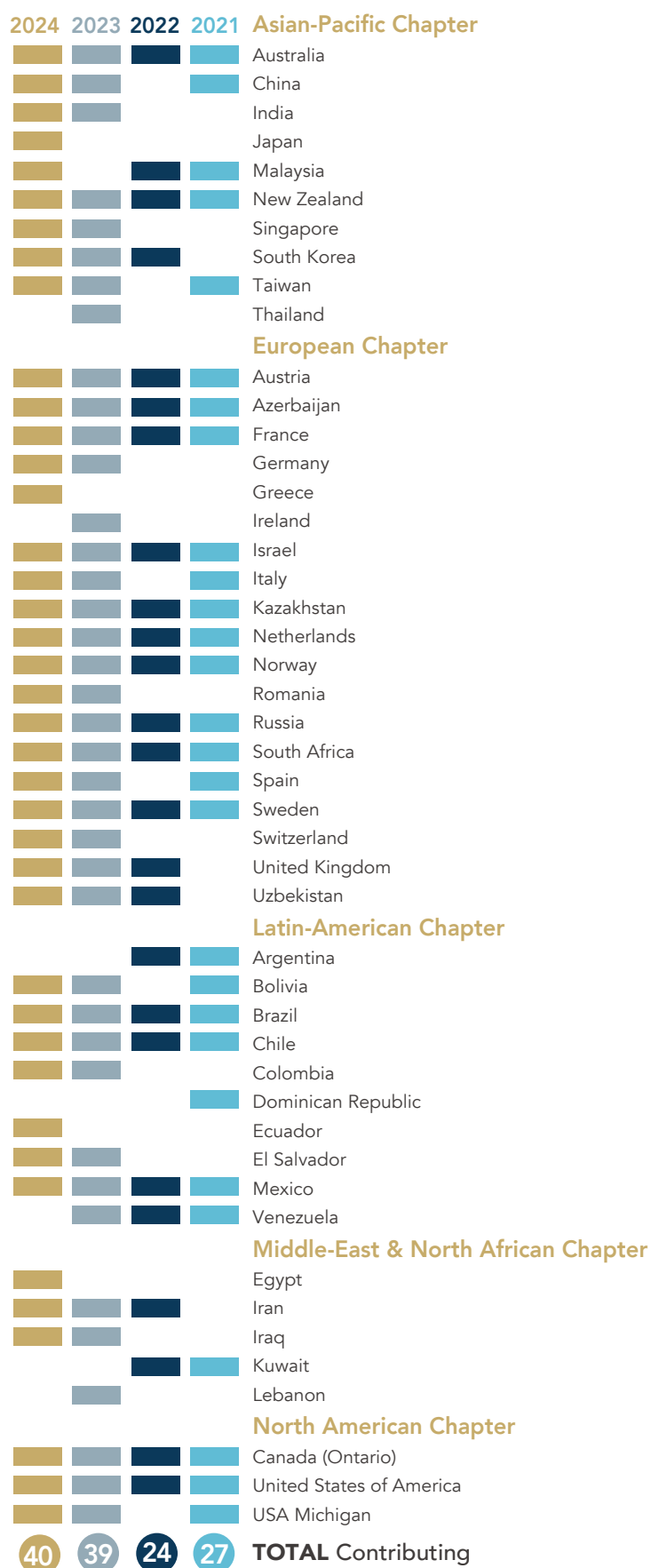
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Known National/Regional Registries Participating to the IFSO Global Report



Data Dictionary (abbreviated)

The abbreviated data dictionary defines each of the twelve demographic and procedural items in the Bristol-IFSO minimum dataset and the perioperative outcome measures, together with the purpose each serves.

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 - i.e. on a virgin stomach that has never had a bariatric procedure performed - or revisional, i.e. a conversion procedure that changes 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 relative to height before their metabolic 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	History of pharmacotherapy for type 2 diabetes mellitus and/or clinical evidence of high blood glucose levels over time	To identify differences in the prevalence of Type 2 Diabetes between countries and sexes
Hypertension	History of pharmacotherapy for hypertension and/or clinical evidence of high blood pressure	To identify differences in the prevalence of Hypertension between countries and sexes
Depression	History of pharmacotherapy for depressive disorder and/or a diagnosis of depressive disorder	To identify differences in the prevalence of Depression between countries and sexes
Sleep Apnoea	History of sleep apnoea syndrome	To identify differences in the prevalence of Sleep Apnoea between countries and sexes
GERD	History of pharmacotherapy for gastroesophageal reflux disease and/or clinical evidence of disease	To identify differences in the prevalence of GERD between countries and sexes
Dyslipidemia	History of pharmacotherapy for dyslipidemia and/or clinical evidence of high blood cholesterol/triglycerides	To identify differences in the prevalence of Dyslipidemia between countries and sexes

Label	Definition	Purpose
Sleeve Gastrectomy	The number of sleeve gastrectomies completed	To understand the procedure types undertaken in primary vs revisional context by country
One Anastomosis Gastric Bypass	The number of OAGB completed (also Single Anastomosis Gastric Bypass / Mini Gastric Bypass)	To understand the 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 procedure types undertaken in primary vs revisional context by country
Other Procedures	All other bariatric procedures (excluding Sleeve, OAGB, RYGB): gastric band, duodenal switches, BPD, SADI, SIPS, gastric imbrication, gastropasty	To understand the procedure types undertaken in primary vs revisional context by country
Laparoscopic	Procedures where the operative approach was just laparoscopic	To understand the surgical approaches used in primary vs revisional context by country
Laparotomy (Open)	Procedures where the approach was open (including those that began laparoscopically, endoscopically or robotically)	To understand the surgical approaches used in primary vs revisional context by country
Endoscopic	Procedures where the approach was just endoscopic	To understand the surgical approaches used in primary vs revisional context by country
Robotic	Procedures where the approach included robotic assistance	To understand the surgical approaches used in primary vs revisional context by country
Unplanned readmission rate	Unplanned readmission in the perioperative period (30–90 days) as a consequence of the procedure	To understand outcomes in primary vs revisional context by country
Unplanned return to theatre rate	Unplanned return to theatre in the perioperative period (30–90 days)	To understand outcomes in primary vs revisional context by country
Unplanned ICU rate	Unplanned ICU admission in the perioperative period (30–90 days)	To understand outcomes in primary vs revisional context by country
Death Rate	Mortality (30–90 days) after the bariatric procedure	To understand 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 outcomes in primary vs revisional context by country

Definitions Used by Various Registries for Obesity-Related Diseases

Each registry applies its own definitions, which is why cross-country comparison is indicative rather than exact. Definitions on record from prior editions have been carried over for the registries that also reported then.

Diabetes	Definition
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	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.
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 diagnosis of type 2 diabetes and with medication for hyperglycemia.
USA Michigan	Type I or Type II diabetes treated with (any that apply): Diet, Oral Medications, Insulin-dependent, Non-Insulin Injectables.
Uzbekistan	Established type 2 diabetes mellitus before surgery, treated with diabetes medications.

Hypertension	Definition
Canada	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.
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 Korotkoff 1 and 4 sounds. ADA criteria for DM/pre-diabetes and gestational DM.
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.
USA Michigan	Treated hypertension (HTN): clinical diagnosis of elevated BP AND treatment with daily anti-hypertensive medication.
Uzbekistan	An established diagnosis, and when the patient takes pills for hypertension.

Obstructive Sleep Apnoea	Definition
Canada	Sleep Apnoea at baseline is determined by the patient's primary care physician at baseline or following the presurgical sleep study.
China	Polysomnography: AHI greater than 5.
Iran	Sleep apnea status at baseline is determined by the patient identifying themselves as having frequently stops breathing during sleep or confirmed by polysomnogram at the time of the operation.
Israel	Self-reported by the patient before surgery.

Obstructive Sleep Apnoea	Definition
Netherlands	Symptoms with positive poly(somno)graphy (PSG), with or without an 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.
USA Michigan	Sleep apnea, nocturnal upper airway obstruction, or sleep disordered breathing.
Uzbekistan	Patient using CPAP mask.

Dyslipidemia	Definition
Canada	The Ontario Bariatric Registry records hyperlipidemia, determined by the patient's primary care physician at baseline.
China	Hyperlipemia defined by serum triglycerides > 1.70 mmol/L, total cholesterol > 5.7 mmol/L, LDL > 3.76 mmol/L, HDL < 0.91 mmol/L, or/and the use of lipid-lowering agents.
Iran	Dyslipidemia status determined by history of previous diagnosis or treatment, or lab tests (Total Cholesterol > 200 or Triglyceride > 150) at the time of operation.
Israel	Self-reported by the patient before surgery.
Netherlands	An abnormal lipid spectrum (LDL > 8.0 mmol/L, HDL < 1.1 mmol/L, Triglycerides > 2.2 mmol/L), or primary hypercholesterolemia with mean total cholesterol of at least 6.5 mmol/L on three samples.
Norway	Use of lipid-lowering medication.
Russia	Dyslipidaemia status determined by the patient having abnormal lipid blood tests or taking antilipid drugs.
South Africa	Framingham Risk Assessment tool.

Dyslipidemia	Definition
South Korea	Having a treatment for dyslipidemia at the time of the operation.
Sweden	Patients under medication for dyslipidemia.
USA Michigan	Clinical diagnosis of hypercholesterolemia/hypertriglyceridemia/dyslipidemia, OR treatment with statins, niacin, fibrates, or bile acid sequestrants/CAIs.
Uzbekistan	A blood test for a lipid profile when receiving a pill for dyslipidemia.

Gastroesophageal Reflux Disease (GERD)	Definition
Canada	GERD at baseline is determined by the patient's primary care physician at baseline.
Iran	GERD status determined based on patient report of heartburn or endoscopy report of esophagitis at the time of operation.
Israel	Self-reported by the patient before surgery.
Netherlands	Anamnestic signs of GERD, with or without a positive 24-48h pH-measurement and/or gastro-duodenoscopy.
Norway	Use of medication.
Russia	GERD status determined by the patient self-reporting symptoms of GERD or having antireflux therapy.
South Africa	Gastrosocopy and histological evidence.
South Korea	Confirmed GERD at the time of the operation.
Sweden	Patients under medication with PPI (proton pump inhibitor).
USA Michigan	Chronic heartburn, acid regurgitation, acid reflux disease, esophagitis, reflux laryngitis, Barrett's esophagus, or reflux-induced cough/asthma.
Uzbekistan	Established diagnosis endoscopically and the patient took pills for GERD.

Depression	Definition
Israel	Self-reported by the patient before surgery.
Norway	Use of medication.
Russia	Depression status 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.
USA Michigan	Clinical depression and depressive disorder, treated with medication, electroconvulsive therapy, and/or psychotherapy.
Uzbekistan	Patient taking pills for depression.

Data integrity and corrections (2024)

The 2024 returns held in the Global Registry's REDCap database were audited cell by cell before the text of this report was written. Six classes of check were applied: internal arithmetic, whether components sum to their own totals and whether each reported percentage equals its own numerator over its own denominator; cross-table consistency, whether each domain reconciles with the procedure table, which is treated as the leading source for every total, for the primary and revisional split and for every denominator; denominator provenance, whether the denominator a registry used is the primary cohort, the country total or a subsample; distributional possibility, whether a median falls inside its own interquartile range, whether an interquartile range is in fact a minimum and maximum, and whether a numerator can exceed or equal its denominator; clinical plausibility, judged against the registry's own prior year and against the rest of the cohort; and contributor status. Nothing was estimated or imputed, and no value was adjusted in order to make a total agree.

Two codes are used in this report and must be kept distinct. NR (Not Reliable) marks a value a registry did submit but which did not survive the audit: arithmetically impossible, such as a numerator equal to its own denominator; internally contradictory, such as a median lying outside its own interquartile range or a spread reported as a minimum and maximum in columns labelled as quartiles; contradicted by the rest of the same submission, such as a denominator larger than the cohort it is drawn from; or clinically implausible by an order of magnitude against the registry's own prior year. An NR value is excluded from the figure, from the global total and from every weighted calculation, and is not replaced by an estimate. NRep (Not Reported) marks an item a registry did not collect or did not submit, so that no value exists; the distinction matters because a missing item and a genuine zero look identical in a table and are read very differently. An NRep registry is excluded from both the numerator and the denominator of the affected figure, is named wherever that figure appears, and the resulting coverage is stated alongside it. Where a registry submitted only zeros, or returned every case as unspecified, the item is treated as not reported rather than as a measurement of zero, and a return covering only part of a cohort is not promoted to a country rate. Where only part of a submission failed, only that part is coded: a registry whose interquartile range is unusable but whose median is sound keeps its median, and a registry whose sex split fails but whose all-patient figure holds keeps the all-patient figure.

Two situations that resemble a data error are not treated as one. A domain total lower than the procedure table reflects incomplete registration within that domain rather than a counting error; the figure is retained and the coverage stated. Measured against the by-type breakdown, type is known for 99.4% of primary and 99.5% of revisional procedures; operative approach for 75.8% of primary and 89.2% of revisional procedures; and sex for 99.1% of primary procedures. A documented difference of period or definition is likewise not an error: the Australian and New Zealand outcome data cover the financial year 2023/24 because of the ninety-day reporting lag, and the Egyptian returns are ratio-based estimates from centre means, as that registry's own note sets out; both are retained with a footnote. A domain total higher than the procedure table, by contrast, cannot be explained by incomplete registration and was treated as an error in every case. Where an item could not be resolved from the returns held in the REDCap database, that classification is treated as final for this edition and is not expected to be revisited before the eleventh report. The values set out below have not been carried into the figures and tables.

Four inconsistencies remain within the 2024 returns themselves. They are set out here rather than resolved, the correct values not being recoverable from the data. The South Korean depression counts appear one way round in the country table and the other way round in the sex-split table (111 women and 31 men against 31 and 111); the country table is taken as authoritative. The South African diabetes denominator appears both as 76 and as 82; 76, the primary count, is the one used. The Chinese dyslipidaemia sex split is set to NR in one place while values remain in another, and it is left out of the sex-split figures throughout. And the by-type breakdown carries small over-counts against the procedure table for Germany (+16), South Africa (+15) and Egypt (+192); like the approach over-counts recorded below, these are immaterial to the distributions and are footnoted rather than coded.

Table 17. Summary of 2024 data-integrity actions

Domain	Registries affected	Action taken in this report
Operative approach	NRep (Not Reported): Azerbaijan, Brazil, Chile and the United Kingdom (no approach data submitted); Egypt and Malaysia (all primary approach fields returned as zero); the Netherlands (approach retired from DATO in 2024, all 11,536 primary and 1,304 revisional procedures returned as unspecified). NRep, revisional approach: Colombia (no revisional approach against 748 revisions), Egypt and the Netherlands. NR (Not Reliable): Taiwan (approach recorded for 179 of 4,230 primary and 6 of 281 revisional procedures, printed as 0% laparoscopic). Small over-counts against the primary total: China (+183), Switzerland (+19), South Korea (+13)	The NRep and NR registries are excluded from both the numerator and the denominator of the approach analysis and are named wherever the distribution is shown. On that basis approach is known for 407,283 primary procedures (75.8% of the primary total) and 38,815 revisional ones (89.2%). The Dutch procedures returned as unspecified are not counted as a recorded approach and are excluded with the rest, since carrying them in the unspecified column would present the absence of a field as a category of surgery. Partial returns are not promoted to a country rate: Taiwan's laparoscopic rate of 0% is an artifact of its coverage and no Taiwanese distribution is shown, and Malaysia's revisional return covers 4 of 6 procedures and is likewise set aside. The over-counts in China, Switzerland and South Korea are immaterial to the distribution and are retained with a footnote rather than coded.
Obesity-associated diseases denominators	Azerbaijan (type 2 diabetes numerator equal to its denominator, 563 of 563; sex denominators summing to 548); France (dyslipidaemia all-patient row identical to the reflux row, female plus male 2,369 against 1,105); China (dyslipidaemia sex denominators exceed the sex table); Egypt (denominator of 12,657 above its primary total of 11,341)	Azerbaijan is set to NR rather than read as a prevalence of 100%, and is excluded from the diabetes analysis; the denominator could not be recovered from the returns. France's dyslipidaemia all-patient row is NR and its sex-specific rows are retained; China's dyslipidaemia sex split is NR and its all-patient row is retained. Egypt supplies ratio-based estimates from centre means, as its own note explains; the figures are retained with that qualification and footnoted as not comparable with a country rate.
Demographics - age	South Africa (all-procedure median 123 with IQR 93–167; primary all-patient median 74 against female 36 and male 38); Mexico (all-procedure median 33 with IQR 7.5–12.3; revisional male median 10.4); Colombia (revisional male median 51.2 and all-patient median 50.1 above their own IQR upper bounds); India and Italy (interquartile columns hold a minimum and maximum, 11 to 78 years); Kazakhstan (revisional male age reported as 0)	South Africa, Mexico and Colombia are set to NR for the values named and excluded from the age analysis: 123 is the country's procedure count and 74 the sum of the two sex medians, so South Africa's sex-specific medians are retained, as are Mexico's primary ages. For India and Italy only the spread measures are NR and the medians are retained; the Japanese age values are sound and are not affected, the min–max problem there being confined to BMI. Kazakhstan is shown as NRep for revisional male age: all eight revisional patients are women, so no male revisional cohort exists.

Domain	Registries affected	Action taken in this report
Demographics - BMI	Mexico (all-patient median 31.3 with IQR 17.7–23.1 against female 39.4 and male 43.3); Bolivia (all three medians below their own IQR lower bounds, 31 against 41–48); Spain (all-patient median 47.87 above its own IQR upper bound of 47.05); India, Italy and Japan (interquartile columns hold a minimum and maximum, 30 to 86.5 kg/m ²); Chile (no female BMI and no male interquartile range)	Mexico (all-patient value only), Bolivia and Spain are set to NR and excluded from the BMI analysis; Mexico's sex-specific values are retained. For India, Italy and Japan only the spread measures are NR and the medians are retained. Chile is shown as NRep for the items it did not submit.
Mortality	United States primary deaths (1,331 among 177,308 procedures, 0.75%, against 142 among 191,416 the prior year); Ecuador (revisional outcomes reported on the primary denominator with primary numerators; primary deaths reported on a denominator of 670, its country total, against 638 primary procedures); Italy, Malaysia and Romania (no follow-up completeness reported)	The United States value is an order of magnitude above every comparator and above its own prior year, almost certainly a reading error in the source MBSAQIP data, identified too late to correct. It is set to NR, printed as NR in Table 16 rather than as a value, and excluded from the global figure and from every weighted total; the United States contributes no primary-mortality figure to this edition. Ecuador is shown as NRep for all revisional outcomes, since nothing usable was reported rather than something unreliable, and its primary death row is excluded as well because the denominator is the country total. Italy, Malaysia and Romania are shown as NRep for follow-up completeness and their rates are computed on the full procedure count and labelled accordingly. Table 16 lists 228,561 primary procedures in all; global primary mortality is computed on the 227,891 that remain once the Ecuadorean row is set aside, and is 0.039% (88/227,891).
Coverage / follow-up	Russia (ICU denominator of 4 against about 7,857 primary procedures); Chile (national annual total recorded as 30 against 20,166 registered procedures); Australia (case ascertainment of 81.1% referring to 14,033 of 17,294 MBS-funded private procedures rather than to the 15,983 registered); Australia and New Zealand (perioperative outcomes covering financial year 2023/24 against calendar-2024 operative data)	Russia is set to NR for ICU admission and excluded from the ICU analysis; the registry's own note records that Clavien-Dindo grading was introduced only on 11 October 2024, and a value was submitted, so the code is NR rather than NRep. Chile's ascertainment figure is a unit error or the wrong field and is set to NR; no ascertainment rate is given. The Australian ascertainment denominator and the Australian and New Zealand reporting period are documented differences rather than errors and are retained with a footnote; the latter also explains New Zealand's coverage of 103.6%.

Domain	Registries affected	Action taken in this report
Headline totals	222 records (0.04% of the total) carry no procedure type; the by-type breakdown covers 534,239 of 537,593 primary and 43,303 of 43,527 revisional procedures	581,120 is used as the number of operations and 580,898, the total for which procedure type is known (99.96%), as the denominator for every type-based percentage. The 222 records without a type are disclosed rather than distributed across the procedure categories, since distributing them would create a precision the data do not support. A domain total lower than the procedure table reflects incomplete registration within that domain rather than a counting error: measured against the by-type breakdown, type coverage is 99.4% of primary and 99.5% of revisional procedures, operative approach 75.8% and 89.2%, and sex 99.1% of primary procedures.
Trend series	Year-table 2021 total of 130,271, not reproducible against the chapter data (317,651)	Set to NR. The same value appears in the previous year's data, so this is a persistent defect in the year table rather than a retrieval fault; the World series is used for the trend instead.
Sex	Singapore and Taiwan (no sex breakdown submitted, against 603 and 4,230 primary procedures); Ecuador (32 patients in the primary block that belong to its revisional cohort)	Singapore and Taiwan are shown as NRep and are named wherever the sex distribution is shown. Ecuador's primary and revisional split within the sex table is not recoverable and is disclosed rather than adjusted.
Length of stay and population prevalence	Bolivia (revisional median of 1 day with IQR 2–3 days); Spain (16% of adults with BMI above 40, against 10.3% in the United States and inconsistent with its own reported 37.6% above BMI 30)	Bolivia's revisional length of stay is set to NR and excluded from the length-of-stay figures. The Spanish population-prevalence figure is retained with a footnote.

