



# Bariatric Surgery Worldwide 2013

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## Abstract

**Background** The first global survey of bariatric/metabolic surgery based on data from the nations or national groupings of the International Federation for the Surgery of Obesity and Metabolic Diseases (IFSO) was published in 1998, followed by reports in 2003, 2009, 2011, and 2012. In this survey, we report a global overview of worldwide bariatric surgery in 2013.

**Materials and Methods** A questionnaire evaluating the number and the type of bariatric procedure performed in 2013 was emailed to all members of bariatric societies belonging to IFSO. Trend analyses from 2003 to 2013 were also performed.

**Results** There were 49/54 (90.7 %) responders; 37 of the 49 with national registries. The total number of bariatric procedures performed worldwide in 2013 was 468,609, 95.7 % carried out laparoscopically. The highest number ( $n=154$ , 276) was from the USA/Canada region. The most commonly performed procedure in the world was Roux-en-Y gastric bypass (RYGB), 45 %; followed by sleeve gastrectomy (SG),

37 %; and adjustable gastric banding (AGB), 10 %. Most significant were the rise in prevalence of SG from 0 to 37 % of the world total from 2003 to 2013, and the fall in AGB of 68 % from its peak in 2008 to 2013.

**Conclusions** SG is currently the most frequently performed procedure in the USA/Canada and in the Asia/Pacific regions, and second to RYGB in the Europe and Latin/South America regions. The accuracy of the IFSO-based world survey of procedures would be enhanced if each nation or national group would create a national registry.

**Keywords** Obesity · Bariatric/metabolic surgery · IFSO

## Introduction

Bariatric surgery is currently considered the most effective treatment option for morbid obesity; it results in greater improvement in weight loss outcomes and obesity-related comorbidities when compared with non-surgical interventions, regardless of the type of surgical procedure used [1, 2]. Different surgical options are available, and they are continuously evolving, influenced by literature results, specific local conditions, and the experience of the surgical staff in each country.

Bariatric surgery worldwide surveys have previously been published. The first global survey of bariatric/metabolic surgery was reported by Scopinaro in 1998 [3], after which Buchwald presented follow-up reports for 2003, 2009, and 2011 [4–6]. In a book chapter, Angrisani [7] reported the bariatric surgery worldwide survey of 2012. As emphasized by Buchwald in his latest report [6], the periodic assessment of the state of bariatric/metabolic surgery is not only important for the surgical community but also useful to patients and can influence healthcare providers and their resource allocation issues, as well as government analyses.

In this survey, we report a global overview of worldwide bariatric surgery, describing the numbers and types

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of procedures performed in the nations or national groupings of the International Federation for the Surgery of Obesity and metabolic disorders (IFSO) in 2013. We also performed a trend analysis from 2003 to 2008 to 2011 to 2013 to evaluate how the choice of procedures has changed over the last 10 years.

## Methods

### Survey

A questionnaire (Table 1) was emailed to the President and Executive Board of each member of bariatric societies belonging to IFSO. If this first contact and request was unanswered, further reminders via email, telephone calls, and personal contacts were initiated. The questionnaire that was e-mailed to IFSO members did not ask to report the surgical revisions separately but suggested to consider them as primary procedures; in fact, the evaluation of the revisional procedures, was not the aim of this survey.

**Table 1** Questionnaire. Society/Country:

Procedures	Number of patients	
	Laparoscopy	Laparotomy
Adjustable gastric banding		
Roux-en-Y gastric bypass		
Sleeve gastrectomy		
Standard biliopancreatic diversion (Scopinaro)		
Duodenal switch diversion		
Gastric plication		
Mini gastric bypass		
Vertical banded gastroplasty		
Other procedure not listed above (please specify)		
TOTAL		
Number of centers		
Number of centers <50 operations annually		
Number of centers 50–100 operations annually		
Number of centers >100 operations annually		
TOTAL		

(Note: Revisions are to be considered and counted as a primary procedure. That is, a lap band converted to bypass is counted as a bypass)

### Data Analysis

Tables and graphic presentations were compiled for the obtained data.

The relative prevalence of specific procedures is provided as weighted averages to account for the wide ranges in the number of procedures performed by the different IFSO member nations or national groupings.

## Results

### Response Rate

Among the 54 national bariatric societies or groups contacted, there were 49 (90.7 %) responders. Table 2 lists the 49 responding societies; 37 out of 49 (75.5 %) provided data from their National Registries. Among them, 34 had recorded all the procedures performed in 2013 in their National Registries; three bariatric societies did not register all the operations in the National Registry but provided partially estimated data. The remaining 12 national bariatric societies had not any National Registries and their data are completely estimated.

### Number of Operations Performed

Figure 1 illustrates the number of bariatric procedures from the IFSO surveys that have been published to date. Table 3 showed the number of operations performed in all responding nations of the world. These data are divided into four regions: USA/Canada, Europe, Latin/South America, and Asia/Pacific.

The total population, total bariatric procedures per country, the percentage of procedures for the total population, the total number of bariatric centers, and their number of cases per year are presented in Table 4. The total number of bariatric procedures performed in 2013 was 468,609, 95.7 % of which were carried out laparoscopically. USA/Canada was the region with the highest number of bariatric procedures ( $n=154,276$ ).

Other nations or national grouping that reported 10,000 or more bariatric procedures were Brazil ( $n=86,840$ ), France ( $n=37,300$ ), Argentina ( $n=30,378$ ), Saudi Arabia ( $n=13,194$ ), Belgium ( $n=12,000$ ), Israel ( $n=11,452$ ), Australia-New Zealand ( $n=10,467$ ), and India ( $n=10,002$ ). The number of operations performed as a percentage of the national population never reached 1 %. For the total population of the 54 IFSO nations or national groupings of 4,700,023,295, the 468,609 bariatric/metabolic operations performed in 2013 and

**Table 2** The responder societies that reported data from their national registry, those that reported estimated data, and those that did not report any data

Responders societies	
Societies with a National Registry ( <i>n</i> =34)	Argentina, Australia, New Zealand, Azerbaijan, Bolivia, Chile, China, Czech Republic, Dominican Republic, Ecuador, Germany, Guatemala, Hong Kong, Iceland, Italy, Japan, Korea, Lithuania, Netherlands, Paraguay, Peru, Poland, Portugal, Russian Federation, Saudi Arabia, Serbia, Singapore, Slovenia, South Africa, Sweden, Switzerland, Taiwan, Ukraine, USA-Canada.
Societies with a National Registry but incomplete data ( <i>n</i> =3)	Spain, UK, United Arab Emirates
Societies with estimated data ( <i>n</i> =12)	Belgium, Brazil, Colombia, Egypt, Finland, France, Greece, India, Israel, Mexico, Romania, Turkey
Societies without any data ( <i>n</i> =5)	Costa Rica, Kuwait, Lebanon, Panama, Venezuela.

represented 0.01 % of the total population. The nation that showed the greatest number of bariatric/metabolic procedures as a function of the total population was Israel (0.14 %).

Table 4 also reports the centers of bariatric/metabolic surgery of each nation/national grouping weighted according to the number of bariatric procedure performed yearly. The highest total number of centers (*n*=1441) was in Latin America, but USA/Canada had the greater number of high volume centers (>100 cases/year) (*n*=488)

**Types of Procedures Performed**

The type of procedures reported by USA/Canada, Europe, Latin/South America, and Asia-Pacific was reported in Table 5.

The most commonly performed procedure in the world in 2013 was Roux-en-Y gastric bypass (RYGB), 45 %, followed by sleeve gastrectomy (SG), 37 %, and adjustable gas-

tric banding (AGB), 10 %. No other single procedure exceeded 2.5 %.

*Trends*

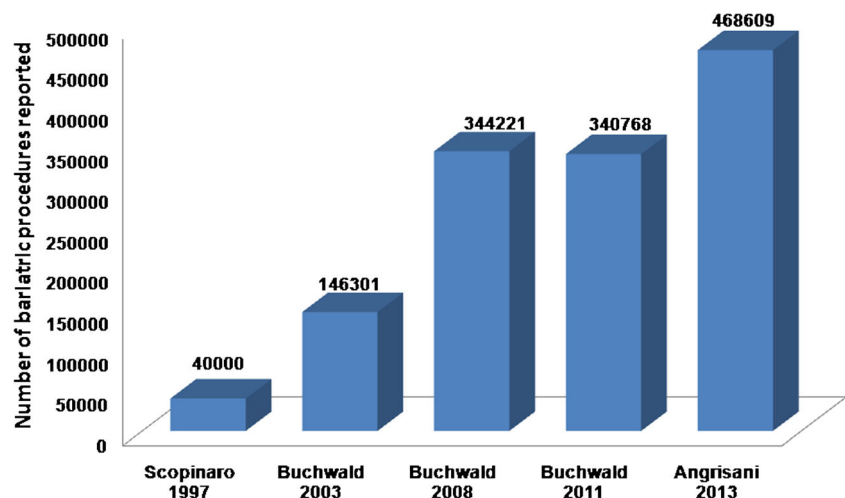
Trend analyses from 2003 to 2013 were performed and are based on the current results and previously published data [4–6].

**Worldwide**

The worldwide trends expressed as number and percentage of RYGB, SG, AGB, and biliopancreatic diversion/duodenal switch (BPD/DS) are shown in Figs 2 and 3, respectively.

RYGB decreased from 2003 to 2008 (–16 %) and continued to decrease slightly from 2011 to 2013 (–1.6 %). Nevertheless, it still represents the most performed bariatric/metabolic operation throughout the world.

**Fig. 1** Number of bariatric procedures reported by the bariatric surgery surveys published so far



**Table 3** The number of operations performed in all responding Nations of the world

Country	Total	Laparoscopy	%	AGB	RYGB	SG	BPD/DS	GP	MINI GB	VBG	OTHER
North America											
USA/Canada	154,276	154,276	97.2	155,23	54,420	67,021	1520	n.a.*	n.a.*	n.a.*	15,792
Total per area	154,276	154,276	97.2	15,523	54,420	67,021	1520	n.a.*	n.a.*	n.a.*	15,792
Europe											
Austria	2354	2330	98.98	115	1210	760	20	0	210	0	15
Azerbaijan	11	10	90.91	0	1	9	0	0	0	0	0
Belgium	12,000	11,500	95.83	1500	7000	3000	0	0	0	0	0
Czech Republic	1568	1521	97.00	420	120	280	50	650	1	0	0
Egypt	5875	4570	77.79	200	1300	2500	10	60	300	200	0
Finland	888	888	100.00	0	800	88	0	0	0	0	0
France	37,300	37,300	100.00	7000	8000	18,000	300	0	4000	0	0
Germany	7126	7126	100.00	228	3235	3285	7	15	107	0	249
Greece	1499	1418	94.60	234	262	622	23	78	191	8	0
Iceland	87	87	100.00	0	84	3	0	0	0	0	0
Israel	11,452	11,420	99.72	4400	1100	5800	40	0	20	0	60
Italy	8106	7785	96.04	2282	1733	2879	111	111	538	22	109
Lebanon	0	0		0	0	0	0	0	0	0	0
Lithuania	240	240	100.00	79	113	1	0	47	0	0	0
Netherlands	6807	6802	99.93	245	5388	1067	2	0	20	0	80
Poland	1658	1592	96.02	209	318	913	0	11	140	1	0
Portugal	2421	2371	97.93	128	1220	736	12	8	128	0	139
Romania	861	861	100.00	23	70	693	2	64	9	0	0
Russian Federation	1522	1343	88.24	446	114	719	4	13	3	0	44
Serbia	30	30	100.00	0	9	20	0	0	0	0	1
Slovenia	184	184	100.00	9	57	21	0	10	87	0	0
South Africa	703	664	94.45	0	519	102	43	0	0	0	0
Spain	2425	2380	98.14	28	1029	818	329	23	150	0	3
Sweden	7473	7294	97.60	5	6770	472	15	19	0	0	13
Switzerland	3427	3216	93.84	23	2544	419	15	0	3	0	212
Turkey	3250	3015	92.77	400	500	1500	115	150	200	0	150
Ukraine	360	174	48.33	45	27	72	0	0	12	0	18
United Kingdom	5558	5477	98.54	751	3079	1476	10	11	27	0	123
Total per area	125,185	121,598	97.13	18,770	46,602	46,255	1108	1270	6146	231	1216
Latin America											
Argentina	30,378	30,378	100.00	4000	17,504	6620	2229	0	25	0	0
Bolivia	321	259	80.69	0	53	106	0	94	0	0	6
Brazil	86,840	75,940	87.45	750	58,000	15,000	1150	40	500	0	500
Chile	5936	5935	99.98	4	1340	4245	0	4	0	0	342
Colombia	9200	9200	100.00	0	4500	4500	0	100	100	0	0
Costa Rica	0	0		0	0	0	0	0	0	0	0
Dominican Republic	989	989	100.00	0	16	926	8	11	6	0	22
Ecuador	734	734	100.00	0	300	400	0	4	10	0	20
Guatemala	253	220	86.96	9	36	143	0	32	0	0	0
Mexico	7850	7650	97.45	750	3500	3000	100	100	200	0	0
Panama	0	0		0	0	0	0	0	0	0	0
Paraguay	269	267	99.26	0	110	153	0	3	0	0	1
Peru	268	268	100.00	0	12	256	0	0	0	0	0
Venezuela	0	0		0	0	0	0	0	0	0	0
Total per area	143,038	131,840	92.17	5513	85,371	35,349	3487	388	841	0	891

**Table 3** (continued)

Country	Total	Laparoscopy	%	AGB	RYGB	SG	BPD/DS	GP	MINI GB	VBG	OTHER
<i>Asia/Pacific</i>											
Australia/New Zealand	10,467	10,467	100.00	3163	644	6660	0	0	0	0	0
China	4106	2406	58.60	36	1632	577	0	113	0	0	48
Hong Kong	95	95	100.00	2	5	80	0	2	0	0	6
India	10,002	10,000	99.98	1500	7000	0	0	0	700	0	800
Japan	192	192	100.00	10	15	137	1	0	0	0	29
Korea	1684	1684	100.00	1209	186	233	0	10	12	0	34
Kuwait	0	0		0	0	0	0	0	0	0	0
Saudi Arabia	13,194	13,194	100.00	243	1438	10,502	208	38	675	0	90
Singapore	279	278	99.64	3	69	189	2	1	14	0	0
Taiwan	1948	1944	99.79	37	170	964	0	24	110	0	639
UEA	4143	4143	100.00	254	423	3224	0	2	220	0	20
Total per area	46,110	44,403	96.30	6457	11,582	22,566	211	190	1731	0	1666
Total	<i>468,609</i>	<i>452,117</i>	<i>95.7</i>	<i>46,263</i>	<i>197,975</i>	<i>171,191</i>	<i>6326</i>	<i>1848</i>	<i>8718</i>	<i>231</i>	<i>19,565</i>

Italic data indicate the total number of each bariatric procedure in the 4 Regions of the world

\*Not available

SG showed a steep increase from 2003 to 2013 (+37 %), thus becoming the second most performed bariatric/metabolic procedure in the world. AGB peaked in 2008 (42.3 %), then had a significant decrease in 2011 (−24.5 %) and in 2013 (−7.8 %). There was a decrease also in BPD/DS: from 4.8 % in 2003 to 1.5 % in 2013.

### Regional

**USA/Canada** The regional trend in USA/Canada percentages is given in Fig. 4. There was a marked decrease in RYGB from 2003 to 2008 (−34 %), with a plateauing in 2011 (−3 %) and again a significant decrease in 2013 (−11.7 %). SG steadily rose from 2003 to 2011 (+19.2 %) and peaked in 2013 (+23.8 %), becoming the most performed bariatric/metabolic procedure in USA/Canada. From 2003 to 2008, AGB rose from 9.0 to 44.0 % and then fell to 27.2 % in 2011 and to 10 % in 2013.

**Europe** The regional trend in Europe in percentages is given in Fig. 5. The RYGB rose from 11.1 to 39.0 % between 2003 and 2008, then continued to slightly increase up to 43.5 % in 2011, and finally decreased in 2013 (38 %); however, RYGB still represents the most performed bariatric/metabolic procedure in Europe. SG rose significantly over the 10-year period from 0.0 to 37 %, becoming the second most performed bariatric/metabolic procedure in Europe. AGB fell down from 63.7 in 2003 to 17.8 % in 2011; a further slight reduction in 2013 (15 %) has been observed.

**Latin/South America** The regional trend in Latin/South America in percentages is given in Fig. 6. From 2003 to 2008, RYGB strongly increased, then plateaued: 57.9 % in 2011; 65 % in 2013; however, RYGB still represents by far the most performed bariatric/metabolic procedure in Latin/South America. SG climbed from 0.0 in 2003 to 9.2 in 2008 to 30.1 % in 2011, but it decreased in 2013 (−5.1 %). AGB fell from 61.5 % in 2003 to 20.4 % (−41.1 %) in 2008 and continued to decrease in 2011 (−15.1 %) and 2013 (−1.3 %).

**Asia/Pacific** The regional trend in the Asia/Pacific region percentages is given in Fig. 7. RYGB never rose to over 10 % prevalence in the Asia/Pacific region until 2013, when it had a significant increase (25 %) overtaking AGB and becoming the second most performed bariatric/metabolic procedure. SG climbed from 0.0 % in 2003 to 4.1 in 2008 to 55.1 % in 2011, and afterwards had a slight decrease in 2013 (49 %). AGB held steady from 2003 to 2008 (+2.1 %) and then fell in 2011 (−49.9 %) and again in 2013 (−18.6 %).

### Discussion

This survey indicates that there has been a constant increase, except for a plateauing in 2011, in the total number of bariatric procedures performed worldwide over the past 10 years. These data, however, must be interpreted with caution when considering the higher response rate of the current survey (90.7 %) when compared to previously published reports [3–6].

**Table 4** Population, procedures, and centers

Country	Total population	Total procedures per country	% of procedures for total population	Bariatric centers total	Bariatric centers <50 cases/year	Bariatric centers 50–100 cases/year	Bariatric centers >100 cases/year
North America							
USA/Canada	351,287,243	154,276	0.044 %	708	86	134	488
Total per area	351,287,243	154,276	0.044 %	708	86	134	488
Europe							
Austria	8,473,786	2354	0.0278 %	32	8	17	7
Azerbaijan	9,416,598	11	0.0001 %	1	1	0	0
Belgium	11,195,138	12,000	0.1072 %	–	–	–	–
Czech Republic	10,521,468	1568	0.0149 %	12	4	5	3
Egypt	82,056,378	5875	0.0072 %	70	40	10	20
Finland	5,439,407	888	0.0163 %	0	0	0	0
France	66,028,467	37,300	0.0565 %	380	250	100	30
Germany	80,621,788	7126	0.0088 %	124	85	28	11
Greece	11,032,328	1499	0.0136 %	21	15	3	3
Iceland	323,002	87	0.0269 %	1	0	1	0
Israel	8,059,400	11,452	0.1421 %	29	3	2	24
Italy	59,831,093	8106	0.0135 %	77	29	23	25
Lebanon	4,467,390	0	0.0000 %	0	0	0	0
Lithuania	2,956,121	240	0.0081 %	4	2	1	1
Netherlands	16,804,224	6807	0.0405 %	17	0	1	16
Poland	38,530,725	1658	0.0043 %	16	0	7	9
Portugal	10,459,806	2421	0.0231 %	26	7	8	11
Romania	19,963,581	861	0.0043 %	6	3	2	1
Russian Federation	143,499,861	1522	0.0011 %	23	18	2	3
Serbia	7,163,976	30	0.0004 %	–	–	–	–
Slovenia	2,060,484	184	0.0089 %	2	1	0	1
South Africa	50,281,991	703	0.0014 %	13	9	3	1
Spain	46,647,421	2425	0.0052 %	36	13	18	5
Sweden	9,592,552	7473	0.0779 %	40	7	13	20
Switzerland	8,081,482	3427	0.0424 %	53	25	15	13
Turkey	74,932,641	3250	0.0043 %	50	15	20	15
Ukraine	45,489,600	360	0.0008 %	7	2	5	0
United Kingdom	64,097,085	5558	0.0087 %	112	80	14	18
Total per area	898,027,793	125,185	0.0139 %	1152	617	298	237
Latin America							
Argentina	41,446,246	30,378	0.07329 %	23	7	3	13

**Table 4** (continued)

Country	Total population	Total procedures per country	% of procedures for total population	Bariatric centers total	Bariatric centers <50 cases/year	Bariatric centers 50–100 cases/year	Bariatric centers >100 cases/year
Bolivia	10,671,200	321	0.00301 %	10	8	2	0
Brazil	200,361,925	86,840	0.04334 %	1165	650	450	65
Chile	17,619,708	5,936	0.03369 %	15	0	0	15
Colombia	48,321,405	9,200	0.01904 %	120	60	40	20
Costa Rica	4,872,166	0	0.00000 %	0	0	0	0
Dominican Republic	10,403,761	989	0.00951 %	13	5	4	4
Ecuador	15,737,878	734	0.00466 %	9	3	2	4
Guatemala	15,468,203	253	0.00164 %	4	3	0	1
Mexico	122,332,399	7850	0.00642 %	72	0	60	12
Panama	3,864,170	0	0.00000 %	0	0	0	0
Paraguay	6,802,295	269	0.00395 %	6	6	0	0
Peru	30,375,603	268	0.00088 %	4	2	1	1
Venezuela	30,405,207	0	0.00000 %	0	0	0	0
Total per area	558,682,166	143,038	0.02560 %	1441	744	562	135
Asia/Pacific							
Australia./New Zealand	27,601,700	10,467	0.0379 %	–	–	–	–
China	1,357,380,000	4106	0.0003 %	102	80	18	4
Hong Kong	7,187,500	95	0.0013 %	6	6	0	0
India	1,252,139,596	10,002	0.0008 %	175	120	20	35
Japan	127,338,621	192	0.0002 %	14	13	0	1
Korea	50,219,669	1684	0.0034 %	29	22	2	5
Kuwait	3,368,572	0	0.0000 %	0	0	0	0
Saudi Arabia	28,828,870	13,194	0.0458 %	11	0	3	8
Singapore	5,399,200	279	0.0052 %	6	3	3	0
Taiwan	23,216,236	1948	0.0084 %	21	11	4	6
UAE	9,346,129	4143	0.0443 %	19	6	1	12
Total per area	2,892,026,093	46,110	0.0016 %	383	261	51	71
Total	4,700,023,295	468,609	0.010 %	3684	1708	1045	931

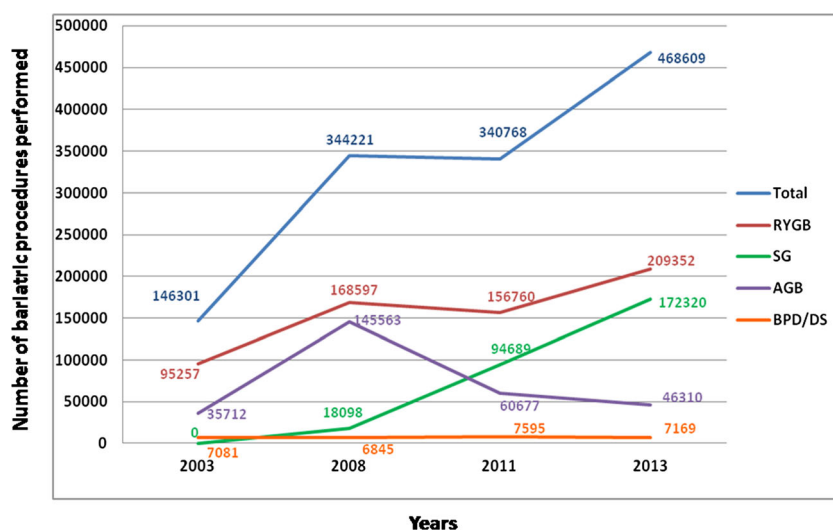
**Table 5** Types and trends of procedures

	Operations 2003 (%)	Operations 2008 (%)	Operations 2011 (%)	Operations 2013 (%)	2011 to 2013 change (%)
<b>USA/Canada</b>					
Total	103,000	220,000	101,645	154,276	+51 %
RYGB	87,550 (85)	112,200 (51)	47,791 (47)	54,420 (35.3)	+13 %
SG	0 (0)	8800 (4)	19,486 (19.2)	67,021 (43)	+244 %
AGB	9270 (5)	96,800 (44)	27,630 (27.2)	15,523(10)	-44 %
BPD/DS	4635 (4.5)	2200 (1)	770 (0.8)	1520 (1)	+1 %
<b>Europe</b>					
Total	33,771	66,769	112,843	125,185	+11 %
RYGB	3744 (11.1)	26,023 (39)	49,050 (43.5)	47,807 (38)	-2.5 %
SG	0(0)	4677 (7)	31418 (27.8)	46602 (37)	+48 %
AGB	21,496 (63.7)	28,843 (43.2)	20,044 (17.8)	18,817 (15)	-6.1 %
BPD/DS	2061 (6.1)	3270 (4.9)	2331 (2.1)	1651 (1.3)	-29 %
<b>Latin/South America</b>					
Total	2700	44,242	102,984	143,038	+39 %
RYGB	545 (20.2)	29,176 (65.9)	59,659 (57.9)	85,371 (59.7)	+43 %
SG	0 (0)	4076 (9.2)	30,949 (30.1)	35,349 (24.7)	+14 %
AGB	1660 (61.5)	9028 (20.4)	5418 (5.3)	5513 (3.8)	+2 %
BPD/DS	58 (2.2)	1370 (3.1)	4376 (4.3)	3487 (2.4)	-25 %
<b>Asia/Pacific</b>					
Total	2770	13,210	23,296	46,110	+98 %
RYGB	234 (8.4)	1198 (9.1)	2229 (9.6)	11,635 (25)	+422 %
SG	0 (0)	545 (4.1)	12,837 (55.1)	22,576 (49)	+75 %
AGB	2228 (80.4)	10,892 (82.5)	7585 (32.6)	6457 (14)	-14 %
BPD/DS	83 (3)	5 (0.04)	118 (0.5)	211 (0.5)	+7.8 %

Furthermore, a large number of the 54 IFSO member nations or national groupings reported data from their National Registries; whereas, in the previous surveys, data were mainly estimated. For these reasons, the steep

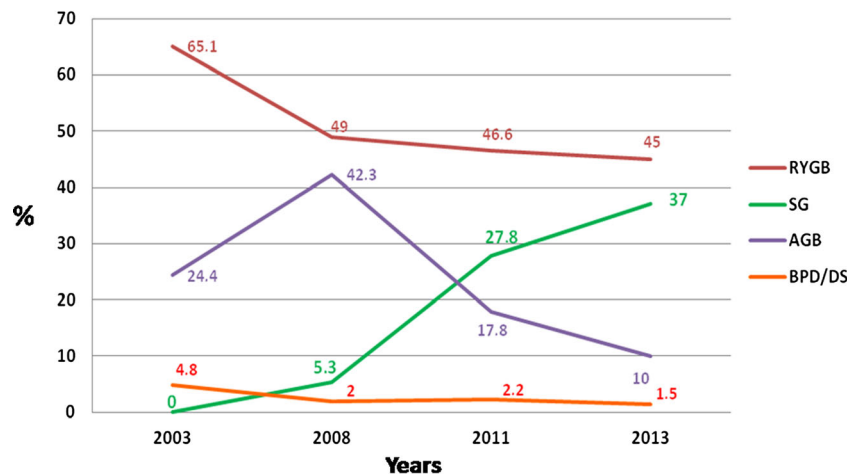
increase in the total number of procedures performed from 2011 to 2013 could be at least in part due to more accurate reporting by national societies and their registries.

**Fig. 2** Trends in number of procedures worldwide: from 2003 to 2008 to 2011 to 2013





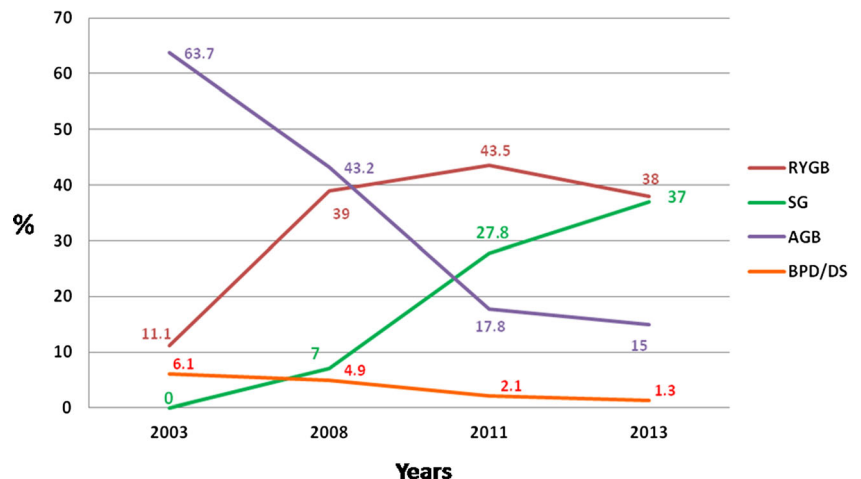
**Fig. 3** Trends in percentage of procedures worldwide: from 2003 to 2008 to 2011 to 2013



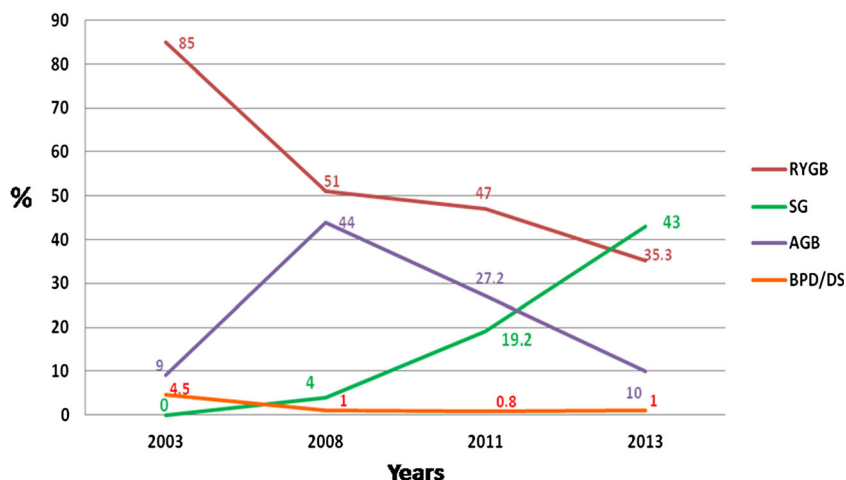
Our results show that about 0.01 % of the world’s population underwent bariatric surgery in 2013. This percentage appears extremely low if we take into account that the World Health Organization estimates that more than 10 % of the world’s adult population is obese [8]. To date, there is a robust body of literature to support the safety and efficacy of bariatric surgery not only in patients affected by morbid obesity but also in patients with class I obesity (body mass index (BMI) 30–35 kg/m<sup>2</sup>) [9]. Furthermore, our data demonstrate that about 95.7 % of bariatric procedures were performed laparoscopically in 2013, with less complications and shorter hospital stays compared to previous data with the open approach. The high percentage of minimally-invasive procedures could also be explained by the higher prevalence of centers of excellence and bariatric accreditation programs in the nations or national groupings of the survey.

Within the total number of procedures performed, there have been marked shifts in the relative percentages of the specific bariatric operations being done. Worldwide trends over the past 10 years show a decrease in the number of RYGB; nevertheless, this operation still represents the most performed bariatric/metabolic operation throughout the world. However, analysis of the regional trends demonstrate that only in Latin/South America, and less evidently in Europe, does RYGB remain the most performed bariatric/metabolic procedure; in the other regions (USA/Canada and Asia Pacific), it has been overtaken by SG, which has become the most frequently performed procedure in these regions. Our data indicate that SG worldwide climbed from 0 to 37 % of total procedures between 2003 and 2013. From 2011 to 2013, SG increased in all the analyzed geographic areas; in USA/Canada, a nearly 2.5-fold increase was observed. The easier surgical

**Fig. 4** Trends in percentage of procedures in USA/Canada from 2003 to 2008 to 2011 to 2013



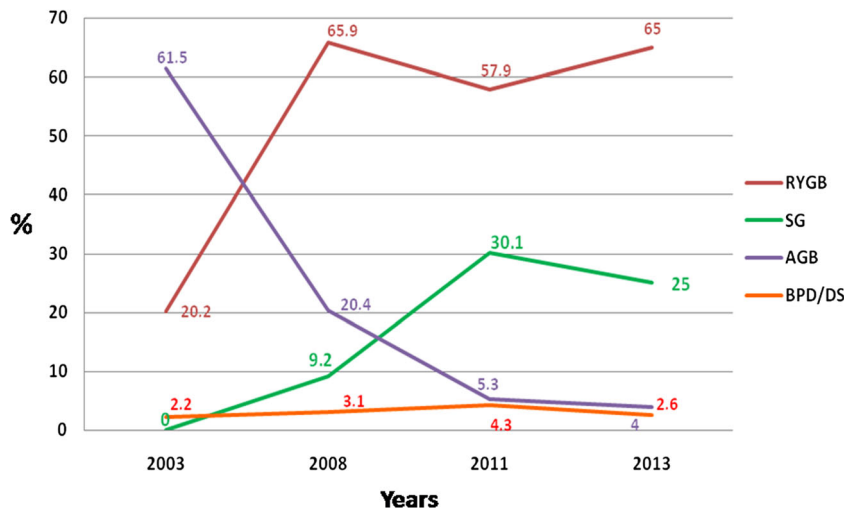
**Fig. 5** Trends in percentage of procedures in Europe from 2003 to 2008 to 2011 to 2013



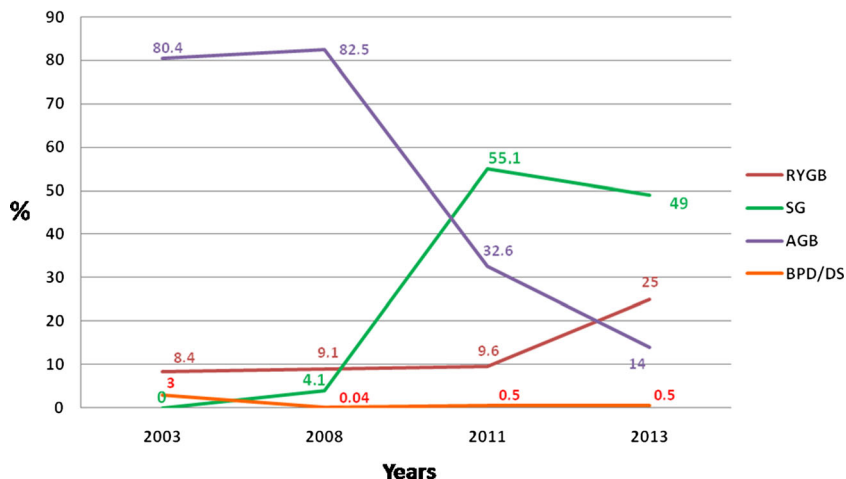
technique of SG compared to RYGB, together with the promise in short-term weight loss outcomes, could explain the steep increase of this procedure worldwide.

Long-term proof of the efficacy of SG is starting to be available [10]; however, they are still limited to small patient samples. At the same time, this survey

**Fig. 6** Trends in percentage of procedures in Latin/South America from 2003 to 2008 to 2011 to 2013



**Fig. 7** Trends in percentage of procedures in Asia-Pacific from 2003 to 2008 to 2011 to 2013



confirms the steep reciprocal decrease of AGB throughout the world, as previously reported in the bariatric surgery survey of 2011 [6].

There are several limitations in this survey. The first is that among the 49 responding nations or national groupings, 12 bariatric societies had no National Registries and provided completely estimated data, while three societies, although they had National Registries, declared that the procedures were only partially recorded. The second one was that we were not able to know how the member of the societies came up with the estimates and/or utilized the registries in developing their estimates. Moreover, the national registries often did not include the bariatric procedures performed in private healthcare. Therefore, the number of bariatric procedures actually performed in the world could be greater compared to the figures examined in the survey.

Finally, we reported as “others” the procedures that were not listed in the questionnaire. In fact, most national bariatric societies did not specify which were the procedures included as “others” and in some countries, such as USA/Canada, the total amount of procedures listed as others were enormous ( $n=15,792$ ).

National and International registries are very useful and accurate to analyze the procedure outcomes, but they require time and resources. National and International survey addressing number and type of Bariatric and Metabolic procedures are much simpler, less expensive, and provide some important information to the IFSO Bariatric Surgeons community.

Therefore, the report of this worldwide survey should encourage all the IFSO nations or national groupings to create a national registry and/or collect in detail all the bariatric procedures performed (including those in private healthcare) and improve the accuracy of the data.

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**Conflict of Interest Statement** L. Angrisani, A. Santonicola, P. Iovino, G. Formisano, H. Buchwald, N. Scopinaro have not any conflicts of interest to declare.

**Statement of Informed Consent** This is a survey in which we do not directly involve human beings but we just analyze the number of bariatric procedures performed around the world.

**Statement of Human and Animal Rights** This is a survey in which we do not directly involve human beings or animals but we just analyze the number of bariatric procedures performed around the world

## References

1. Picot JI, Jones J, Colquitt JL, Gospodarevskaya E, Loveman E, Baxter L, Clegg AJ. The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation. *Health Technol Assess.* 2009;13(41):1–190, 215–357, iii–iv. doi:10.3310/hta13410
2. Colquitt JL, Pickett K, Loveman E, et al. Surgery for weight loss in adults. *Cochrane Database Syst Rev.* 2014;8:CD003641.
3. Scopinaro N. The IFSO and obesity surgery throughout the world. *Obes Surg.* 1998;8:3–8.
4. Buchwald H, Williams SE. Bariatric surgery worldwide 2003. *Obes Surg.* 2004;14:1157–64.
5. Buchwald H, Oien DM. Metabolic/bariatric surgery worldwide 2008. *Obes Surg.* 2009;19(12):1605–11. doi:10.1007/s11695-009-0014-5.
6. Buchwald H, Oien DM. Metabolic/bariatric surgery worldwide 2011. *Obes Surg.* 2013;23(4):427–36. doi:10.1007/s11695-012-0864-0.
7. Angrisani L, Lorenzo M. *Bariatric Surgery Worldwide: Overview and Results.* Foletto, Rosenthal Springer-Verlag 2014
8. World Health Organization. Obesity and overweight fact sheet N° 311, August 2014. <http://www.who.int/mediacentre/factsheets/fs311/en/>. Accessed Oct 2014
9. Busetto L, Dixon J, De Luca M, et al. Bariatric surgery in class I obesity: a Position statement from the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO). *Obes Surg.* 2014;24(4):487–519. doi:10.1007/s11695-014-1214-1.
10. Diamantis T, Apostolou KG, Alexandrou A, et al. Review of long-term weight loss results after laparoscopic sleeve gastrectomy. *Surg Obes Relat Dis.* 2014;10(1):177–83. doi:10.1016/j.soard.2013.11.007.