

Supplementary materials

Real-world weight loss outcomes by obesity management approaches in Japan: Descriptive findings from the J-ORBIT database linked to electronic medical records (J-ORBIT2)

Authors: Yushi Hirota¹; Seiji Nishikage¹; Satoshi Osaga²; Ambrish Singh³; Tomotaka Shingaki²; Taisuke Kojima^{2*}; Masamichi Ishii⁴; Kengo Miyo⁴; Wataru Ogawa^{1,5}

¹Division of Diabetes and Endocrinology, Department of Internal Medicine, Kobe University Graduate School of Medicine, Kobe, Japan

²Eli Lilly Japan K.K., Kobe, Japan

³Eli Lilly Services India Private Limited, Bengaluru, India

⁴Center for Medical Informatics Intelligence, Japan Institute for Health Security, Tokyo, Japan

⁵Section of Metabolic Disease, Division of Translational Research, Kobe University Graduate School of Medicine, Kobe, Japan

***Corresponding author:**

Taisuke Kojima,
Japan Value Evidence and Outcomes,
Eli Lilly Japan K.K.
5-1-28 Isogami-dori, Chuo-ku,
Kobe 651-0086,
Japan.

E-mail: taisuke.kojima@lilly.com

Phone: +81 90-4439-1603

Supplementary table 1: Treatments included in the lifestyle intervention, pharmacotherapy, and bariatric surgery groups

Lifestyle interventions	Pharmacotherapy	Bariatric surgery
Exercise therapy	AOM - mazindol	Gastric banding
Behavioral therapy	Anti-T2D medications –	Sleeve gastrectomy
Diet plans	α-glucosidase inhibitors, biguanides, glucagon-like peptide-1 receptor agonists, and sodium-glucose cotransporter-2 inhibitors	Gastric bypass
	Traditional herbal medications (Kampo) - Bofu-tsusho-san, Dai-saiko-to, Kami-shoyo-san, and Boi-ogi-to	Sleeve gastrectomy + bypass
		Others

Abbreviations: AOM - anti-obesity medication, T2D – type 2 diabetes

Supplementary table 2: Obesity-related health problems and obesity-related complications among individuals with obesity disease, categorized by most advanced treatment received during the study period including index date

	Baseline			Latest follow-up		
	Lifestyle intervention (n=274)	Pharmacotherapy (n=487)	Bariatric surgery (n=21)	Lifestyle intervention (n=248)	Pharmacotherapy (n=487)	Bariatric surgery (n=17)
ORHD, n (%)						
Glucose intolerance	n=268	n=481	n=21	n=209	n=461	n=17
Yes	184 (68.7)	415 (86.3)	15 (71.4)	142 (67.9)	399 (86.6)	13 (76.5)
No	84 (31.3)	66 (13.7)	6 (28.6)	67 (32.1)	62 (13.4)	4 (23.5)
Dyslipidemia	n=242	n=476	n=11	n=211	n=458	n=11
Yes	157 (64.9)	346 (72.7)	5 (45.5)	142 (67.3)	339 (74.0)	6 (54.5)
No	85 (35.1)	130 (27.3)	6 (54.5)	69 (32.7)	119 (26.0)	5 (45.5)
Hypertension	n=273	n=485	n=21	n=217	n=477	n=17
Yes	158 (57.9)	324 (66.8)	12 (57.1)	124 (57.1)	330 (69.2)	9 (52.9)
No	115 (42.1)	161 (33.2)	9 (42.9)	93 (42.9)	147 (30.8)	8 (47.1)
NAFLD	n=269	n=460	n=20	n=210	n=443	n=17
Yes	130 (48.3)	187 (40.7)	14 (70.0)	98 (46.7)	193 (43.6)	13 (76.5)
No	79 (29.4)	144 (31.3)	3 (15.0)	63 (30.0)	123 (27.8)	2 (11.8)
Unknown	60 (22.3)	129 (28.0)	3 (15.0)	49 (23.3)	127 (28.7)	2 (11.8)
Hyperuricemia or gout	n=270	n=478	n=21	n=213	n=457	n=17
Yes	48 (17.8)	78 (16.3)	4 (19.0)	43 (20.2)	82 (17.9)	4 (23.5)
No	222 (82.2)	400 (83.7)	17 (81.0)	170 (79.8)	375 (82.1)	13 (76.5)
Coronary artery disease	n=272	n=485	n=21	n=217	n=476	n=17
Yes	23 (8.5)	56 (11.5)	0 (0.0)	22 (10.1)	58 (12.2)	0 (0.0)
No	248 (91.2)	426 (87.8)	21 (100)	193 (88.9)	416 (87.4)	17 (100)
Unknown	1 (0.4)	3 (0.6)	0 (0.0)	2 (0.9)	2 (0.4)	0 (0.0)
Cerebral infarction or TIA	n=272	n=469	n=21	n=216	n=460	n=17
Yes	11 (4.0)	20 (4.3)	1 (4.8)	8 (3.7)	22 (4.8)	1 (5.9)
No	260 (95.6)	449 (95.7)	20 (95.2)	207 (95.8)	438 (95.2)	16 (94.1)
Unknown	1 (0.4)	0 (0.0)	0 (0.0)	1 (0.5)	0 (0.0)	0 (0.0)
Menstrual abnormalities or female infertility	n=134	n=174	n=15	n=104	n=170	n=12
Yes	34 (25.4)	17 (9.8)	4 (26.7)	29 (27.9)	18 (10.6)	4 (33.3)
No	22 (16.4)	45 (25.9)	6 (40.0)	15 (14.4)	45 (26.5)	6 (50.0)
Post-menopausal	78 (58.2)	112 (64.4)	5 (33.3)	60 (57.7)	107 (62.9)	2 (16.7)

OSAS or OHS	n=255	n=447	n=21	n=203	n=430	n=17
Yes	53 (20.8)	66 (14.8)	8 (38.1)	39 (19.2)	64 (14.9)	8 (47.1)
No	183 (71.8)	362 (81.0)	10 (47.6)	156 (76.9)	346 (80.5)	8 (47.1)
Unknown	19 (7.5)	19 (4.3)	3 (14.3)	8 (3.9)	20 (4.7)	1 (5.9)
Musculoskeletal disorders	n=265	n=443	n=21	n=208	n=424	n=17
Yes	53 (20.0)	70 (15.8)	6 (28.6)	39 (18.8)	69 (16.3)	6 (35.3)
No	212 (80.0)	373 (84.2)	15 (71.4)	169 (81.3)	355 (83.7)	11 (64.7)
Obesity-related kidney disease	n=265	n=472	n=21	n=209	n=451	n=17
Yes	10 (3.8)	7 (1.5)	0 (0.0)	5 (2.4)	8 (1.8)	0 (0.0)
No	250 (94.3)	457 (96.8)	21 (100)	201 (96.2)	436 (96.7)	17 (100)
Suspected	5 (1.9)	8 (1.7)	0 (0.0)	3 (1.4)	7 (1.6)	0 (0.0)
ORC, n (%)						
Malignant disease	n=271	n=468	n=21	n=216	n=459	n=17
Yes	52 (19.2)	81 (17.3)	1 (4.8)	46 (21.3)	86 (18.7)	1 (5.9)
No	217 (80.1)	385 (82.3)	20 (95.2)	169 (78.2)	372 (81.1)	16 (94.1)
Unknown	2 (0.7)	2 (0.4)	0 (0.0)	1 (0.5)	1 (0.2)	0 (0.0)
Mental disorder	n=267	n=480	n=21	n=211	n=458	n=17
Yes	44 (16.5)	70 (14.6)	1 (4.8)	38 (18.0)	65 (14.2)	0 (0.0)
No	222 (83.1)	409 (85.2)	20 (95.2)	173 (82.0)	392 (85.6)	17 (100)
Unknown	1 (0.4)	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)
GERD	n=269	n=479	n=21	n=212	n=457	n=17
Yes	31 (11.5)	43 (9.0)	5 (23.8)	23 (10.8)	45 (9.9)	6 (35.3)
No	234 (87.0)	430 (89.8)	16 (76.2)	186 (87.7)	406 (88.8)	11 (64.7)
Unknown	4 (1.5)	6 (1.2)	0 (0.0)	3 (1.4)	6 (1.3)	0 (0.0)
Bronchial asthma	n=267	n=479	n=20	n=211	n=458	n=17
Yes	27 (10.1)	45 (9.4)	4 (20.0)	19 (9.0)	43 (9.4)	4 (23.5)
No	240 (89.9)	434 (90.6)	16 (80.0)	192 (91.0)	415 (90.6)	13 (76.5)
Cholelithiasis	n=270	n=482	n=21	n=212	n=460	n=17
Yes	24 (8.9)	50 (10.4)	3 (14.3)	18 (8.5)	48 (10.4)	4 (23.5)
No	246 (91.1)	432 (89.6)	18 (85.7)	194 (91.5)	412 (89.6)	13 (76.5)
Skin disorders	n=269	n=476	n=21	n=211	n=454	n=17
Yes	20 (7.4)	25 (5.3)	3 (14.3)	19 (9.0)	23 (5.1)	3 (17.6)
No	246 (91.5)	449 (94.3)	18 (85.7)	191 (90.5)	429 (94.5)	14 (82.4)
Unknown	3 (1.1)	2 (0.4)	0 (0.0)	1 (0.5)	2 (0.4)	0 (0.0)
Venous thrombosis or pulmonary embolism	n=267	n=460	n=21	n=210	n=441	n=17
Yes	6 (2.2)	8 (1.7)	0 (0.0)	4 (1.9)	8 (1.8)	0 (0.0)
No	261 (97.8)	452 (98.3)	21 (100)	206 (98.1)	433 (98.2)	17 (100)
Male infertility	n=103	n=234	n=5	n=85	n=222	n=4

Yes	0 (0.0)	2 (0.8)	0 (0.0)	0 (0.0)	2 (0.9)	0 (0.0)
No	85 (82.5)	204 (87.2)	1 (20.0)	72 (84.7)	191 (86.0)	0 (0.0)
Unknown	18 (17.5)	28 (12.0)	4 (80.0)	13 (15.3)	29 (13.1)	4 (100)

Abbreviations: GERD - gastroesophageal reflux disease, lwOD – individuals with obesity disease, n – number of lwOD, NAFLD – non-alcoholic fatty liver disease, OHS – obesity hypoventilation syndrome, ORC – obesity-related complication, ORHD – obesity-related health disorder, OSAS – obstructive sleep apnea syndrome, TIA – transient ischemic attack

Supplementary table 3: Laboratory data of responders and non-responders at baseline and the latest follow-up, categorized by degree of weight reduction

Non-responders				Responders								
Parameter	<3%			≥3%			≥5%			≥7%		
	Baseline	Follow-up	Mean change (%)	Baseline	Follow-up	Mean change (%)	Baseline	Follow-up	Mean change (%)	Baseline	Follow-up	Mean change (%)
SBP in mmHg	n=276	n=180		n=220	n=180		n=165	n=138		n=116	n=97	
Mean (SD)	128.2 (13.1)	127.6 (12.5)	-0.5	127.3 (14.5)	124.9 (14.8)	-1.9	126.8 (14.7)	124.1 (14.5)	-2.1	127.7 (15.1)	124.0 (14.7)	-2.9
DBP in mmHg	n=276	n=180		n=220	n=180		n=165	n=138		n=116	n=97	
Mean (SD)	75.0 (11.5)	73.2 (10.6)	-2.4	72.7 (11.6)	72.3 (10.7)	-0.6	72.0 (10.9)	71.4 (10.5)	-0.8	71.5 (11.5)	71.9 (11.1)	0.6
TG in mg/dL	n=350	n=336		n=261	n=259		n=198	n=196		n=135	n=134	
Mean (SD)	181.7 (130.4)	170.7 (132.0)	-6.1	194.4 (141.9)	141.2 (75.8)	-27.4	190.2 (144.2)	136.9 (69.0)	-28.0	197.7 (150.6)	133.0 (67.8)	-32.7
HDL-C in mg/dL	n=345	n=330		n=261	n=259		n=198	n=196		n=135	n=134	
Mean (SD)	56.7 (16.5)	56.3 (15.6)	-0.7	54.8 (14.2)	56.4 (15.2)	2.9	54.7 (13.6)	56.9 (15.4)	4.0	54.2 (13.4)	57.4 (15.2)	5.9
LDL-C in mg/dL	n=343	n=327		n=259	n=258		n=197	n=196		n=134	n=134	
Mean (SD)	113.7 (34.6)	102.6 (30.2)	-9.8	112.9 (37.2)	98.7 (29.7)	-12.6	113.1 (34.9)	100.1 (29.0)	-11.5	111.5 (34.1)	96.6 (27.7)	-13.4
Blood glucose in mg/dL	n=355	n=345		n=262	n=261		n=199	n=198		n=136	n=136	
Mean (SD)	153.9 (71.5)	140.5 (54.5)	-8.7	148.7 (68.2)	132.1 (46.1)	-11.2	146.6 (66.6)	131.1 (46.8)	-10.6	149.9 (75.2)	129.1 (44.0)	-13.9
HbA1c in %	n=351	n=339		n=262	n=259		n=199	n=196		n=136	n=135	
Mean (SD)	7.4 (1.6)	7.0 (1.2)	-5.4	7.3 (1.3)	6.7 (1.1)	-8.2	7.3 (1.3)	6.7 (1.1)	-8.2	7.3 (1.3)	6.6 (1.1)	-9.6
AST in U/L	n=355	n=345		n=262	n=261		n=199	n=198		n=136	n=136	
Mean (SD)	27.7 (18.0)	25.9 (15.5)	-6.5	26.7 (13.8)	24.2 (12.5)	-9.4	26.6 (14.8)	24.0 (12.8)	-9.8	26.1 (14.6)	24.8 (14.0)	-5.0
ALT in U/L	n=355	n=345		n=262	n=261		n=199	n=198		n=136	n=136	
Mean (SD)	34.7 (35.9)	29.7 (23.3)	-14.4	31.7 (23.1)	24.9 (16.0)	-21.5	30.6 (23.1)	23.5 (15.2)	-23.2	27.9 (17.0)	23.0 (14.4)	-17.6
γ-GTP in U/L	n=351	n=340		n=261	n=259		n=198	n=196		n=135	n=135	
Mean (SD)	47.5 (66.9)	42.4 (51.7)	-10.7	49.8 (51.0)	41.8 (54.1)	-16.1	50.5 (52.2)	42.3 (58.3)	-16.2	50.2 (53.8)	42.9 (58.5)	-14.5
Uric acid in mg/dL	n=349	n=335		n=261	n=259		n=199	n=197		n=136	n=136	
Mean (SD)	5.6 (1.4)	5.5 (1.4)	-1.8	5.4 (1.4)	5.2 (1.5)	-3.7	5.3 (1.4)	5.0 (1.5)	-5.7	5.3 (1.4)	4.9 (1.4)	-7.5
eGFR in ml/min/1.73m²	n=355	n=344		n=262	n=261		n=199	n=198		n=136	n=136	
Mean (SD)	73.5 (28.4)	69.9 (28.3)	-4.9	70.1 (27.2)	68.8 (29.2)	-1.9	70.7 (28.1)	69.0 (29.5)	-2.4	70.4 (26.9)	68.1 (27.6)	-3.3
Responders												
≥10%				≥15%			≥20%			-		

	Baseline (n=80)	Follow-up (n=80)	Mean change (%)	Baseline (n=38)	Follow-up (n=38)	Mean change (%)	Baseline (n=22)	Follow-up (n=22)	Mean change (%)	
SBP in mmHg	n=71	n=63		n=34	n=31		n=20	n=18		
Mean (SD)	125.7 (13.5)	123.7 (15.5)	-1.6	124.6 (12.9)	121.9 (14.8)	-2.2	124.0 (13.3)	119.6 (17.5)	-3.5	
DBP in mmHg	n=71	n=63		n=34	n=31		n=20	n=18		
Mean (SD)	70.0 (10.0)	71.4 (12.0)	2.0	69.6 (8.3)	68.7 (8.3)	-1.3	69.4 (7.9)	68.6 (8.5)	-1.2	
TG in mg/dL	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	202.3 (142.4)	121.0 (58.7)	-40.2	184.9 (150.3)	114.5 (70.5)	-38.1	201.5 (161.6)	111.5 (63.2)	-44.7	
HDL-C in mg/dL	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	53.1 (13.0)	56.9 (15.6)	7.2	53.4 (12.8)	60.1 (14.3)	12.5	50.5 (10.0)	58.0 (12.6)	14.9	
LDL-C in mg/dL	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	114.0 (33.4)	96.9 (24.7)	-15.0	111.1 (34.9)	98.0 (26.2)	-11.8	110.9 (32.8)	94.3 (19.5)	-15.0	
Blood glucose in mg/dL	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	141.1 (54.8)	118.7 (30.6)	-15.9	133.8 (49.2)	112.5 (32.7)	-15.9	125.6 (32.7)	110.8 (34.7)	-11.8	
HbA1c in %	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	7.2 (1.2)	6.4 (1.0)	-11.1	7.1 (1.1)	6.3 (1.1)	-11.3	7.1 (1.2)	5.9 (0.8)	-16.9	
AST in U/L	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	27.2 (16.3)	25.2 (15.7)	-7.4	23.3 (11.0)	23.3 (14.1)	0.0	23.0 (10.5)	22.7 (10.4)	-1.3	
ALT in U/L	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	29.2 (18.6)	22.8 (14.1)	-21.9	25.4 (14.8)	21.6 (15.8)	-15.0	25.6 (14.3)	22.1 (12.9)	-13.7	
γ-GTP in U/L	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	51.3 (50.6)	43.5 (60.2)	-15.2	35.4 (24.5)	33.1 (35.6)	-6.5	39.2 (26.3)	38.6 (41.3)	-1.5	
Uric acid in mg/dL	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	5.4 (1.4)	4.9 (1.4)	-9.3	5.3 (1.4)	4.7 (1.5)	-11.3	5.0 (1.1)	4.8 (1.6)	-4.0	
eGFR in ml/min/1.73m²	n=80	n=80		n=38	n=38		n=22	n=22		
Mean (SD)	73.3 (30.4)	71.1 (29.5)	-3.0	72.5 (31.5)	70.1 (29.3)	-3.3	84.7 (31.2)	81.9 (25.0)	-3.3	

Abbreviations: ALT – alanine aminotransferase, AST – aspartate aminotransferase, DBP – diastolic blood pressure, eGFR – estimated glomerular filtration rate, HDL-C – high-density lipoprotein cholesterol, HbA1c – glycated hemoglobin, lwOD – individuals with obesity disease, LDL-C – low-density lipoprotein cholesterol, n – number of lwOD, SBP – systolic blood pressure, TG – triglycerides, SD – standard deviation, γ-GTP – gamma glutamyl transferase.

Supplementary Table 4. Change in body weight among individuals with obesity who received the most advanced treatment (bariatric surgery) after the index date

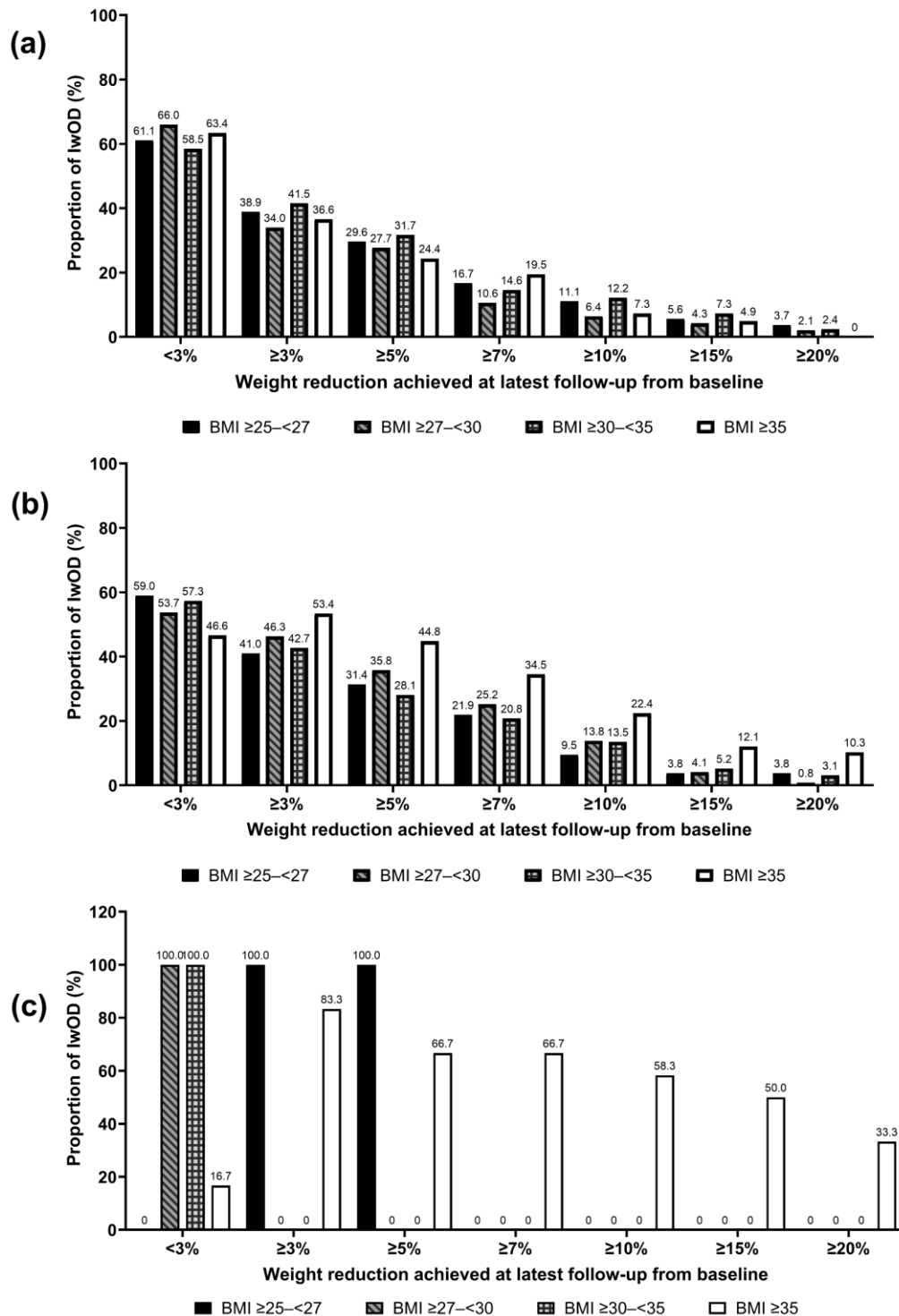
Parameter	Bariatric surgery (n=8)*
Body weight measurement interval (days before and after surgery)^	
Mean (SD)	451.9 (523.4)
Median (Q1, Q3)	265.5 (110.5 - 537.0)
Change in body weight (kg)	
Mean (SD)	-21.2 (9.6)
Median (Q1, Q3)	-19.3 (-23.1, -16.0)
Change in body weight (%)	
Mean (SD)	-19.0 (8.6)
Median (Q1, Q3)	-18.0 (-23.9, -12.2)

*Eight individuals with obesity disease received bariatric surgery after J-ORBIT registration.

^Body weight was measured using the interval from the date of the preoperative weight measurement closest to the day of surgery to the final date on which body weight was recorded in the J-ORBIT database.

Abbreviation: lwOD – individuals with obesity disease, n – number of lwOD, SD – standard deviation

Supplementary figure 1: Degree of weight reduction achieved at the latest follow-up among individuals with obesity disease, categorized by the most advanced treatment received during the study period including index date and BMI



Panels A, B, and C represent the treatments lifestyle intervention (n=183), pharmacotherapy (n=382), and bariatric surgery (n=17), respectively. **Abbreviation:** BMI – body mass index in kg/m², lwOD – individuals with obesity disease, n – number of lwOD.