Supplementary Digital Content

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Supplementary Methods. Assessment of covariates

Longitudinal Assessment of Bariatric Surgery-2 (LABS-2) data collection, including hyperlinks to study-specific forms, has been previously reported. Briefly, participant characteristics were assessed with standard forms, LABS-2 forms and laboratory measures. The names of data forms and definitions of variables used in this report (not described in the main text) are provided below.

Sociodemographics. Sex (male/female), date of birth, race (white/Caucasian, black/African-American, Asian, American Indian/Alaska Native, Native Hawaiian/other Pacific Islander), ethnicity (Hispanic/non-Hispanic), education (high school or less, some college/post high school education, and college degree or higher), employed for pay (yes/no), and annual household income (<\$25,000, \$25,000-\$49,999, \$50,000-\$74,999, \$75,000-\$99,999, ≥\$100,000) were self-reported on the LABS-2 Demographic Information form. Age was calculated from date of birth. Race was set to missing for participants who did not self-report their race as one or more of the investigator-defined categories. Due to low frequencies, race and ethnicity categories were combined and collapsed (Non-Hispanic White, Non-Hispanic black, Hispanic and other).

Health. Following a standard protocol, research staff queried participants about their history of cigarette smoking, which was used to determine past-year smoking status², and measured their weight and height. Body mass index was calculated as weight in kilograms divided by height in meters squared. History of cardiovascular disease was defined as history of percutaneous coronary intervention, coronary artery bypass surgery, angina, myocardial infarction or coronary heart failure or stroke. These conditions were assessed via medical records, physical exam, and patient interview and recorded on the LABS-2 Surgeons Medical Assessment and LABS-2 Pre-operative forms. Diabetes was defined as currently taking diabetes medication as recorded on the LABS-2 Medication form, or having a glycated hemoglobin (HbA1c) measure of 6.5% or greater or, if HbA1c level was not available, then fasting plasma glucose value of 126 mg/dL or greater as measured by a central laboratory used for all the study sites. (To convert glucose to mmol/L, multiply by 0.0555.) Severe walking limitation was determined with self-report of current inability to walk 200 feet without assistance, as assessed on the LABS-2 Medical Assessment form.

The Medical Outcomes Study 36-item Short-Form Health Survey (SF-36) is a generic measure of functional health and well-being with proven validity, reliability and sensitivity to change³. Questions assess current status or status in the past 4 weeks. The Physical Component Summary (PCS) score and Mental Component Summary (MCS) score were examined. Norm-based methods were used to transform the scores to a mean of 50 and standard deviations of 10 in the general U.S. population; higher score (range 0-100) indicates better functioning⁴. Symptoms of depression over the past week were assessed using the Beck Depression Inventory, version 1 (BDI-1)⁵. The BDI score ranges from 0 to 63, with higher score indicating greater severity of depression^{6,7}.

The Alcohol Use Disorder Identification Test (AUDIT)⁸ was used to classify participants as having an alcohol problem (indication of 'alcohol-related harm,' 'alcohol dependence symptoms,' or AUDIT score ≥8) in the past year⁹. Several items on the LABS-2 Behavior Baseline and Follow-up questionnaires were used to determine the five criteria of binge eating disorder defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM).¹⁰ The questionnaire was formulated before finalizing the 5th Edition of the DSM (DSM-5) so per the DSM-IV¹¹, days in the prior 6 months was assessed rather than episodes in the prior 3 months. However, the DSM-5 threshold of once a week to classify someone as having binge eating (BE) was used. Loss of control eating (LOC) was identified by endorsement of the following two items, "During the past 6 months, have you had times when you eat continuously during the day or parts of the day without planning what and how much you would eat?" and, "Did you experience a loss of control; you felt like you could not control your eating?" BE and LOC eating were combined 1) into a three-level variable: BE (with or without LOC), LOC only, and neither BE, and 2) into a binary variable (yes/no to BE or LOC). Current medication use for psychiatric or emotional problems was self-reported on the LABS-2 Psychiatric and Emotional Test Survey.

Current perceived social support was measured using the 12-item Interpersonal Support Evaluation List (ISEL-12); the belonging scale score was utilized; a higher score (range 0-12) indicates greater support availability¹². Sexual function was assessed using a self-administered, structured-item questionnaire that participants were given regardless of history of sexual activity. Select questionnaire items were drawn from three existing measures -- the Sexual Function Questionnaire (SFQ)¹³, the PRIDE sexual function. questionnaire¹⁴, and the Female Sexual Function Index¹⁵ -- and standardized to evaluate sexual functioning in the past month. Frequency of sexual desire (3 levels), any sexual activity in the past month (alone or with a partner) (yes/no) and satisfaction with sexual life (3 levels) were evaluated.

Change variables. Change in binary variables (employed for pay, smoking, diabetes, severe walking limitation, alcohol problem, eating disorder [binge eating or loss of control eating versus neither], psychiatric medication use, and past month sexual activity) were evaluated with categorical variables that took pre- and postoperative status into account (e.g., stopped working for pay, continued working for pay, starting working for pay, continued not working for pay). Change in ordinal variables (household income, frequency of sexual desire and satisfaction with sex life) were categorized as increase, decrease or no change. Change in scores (SF-36 PCS, SF-36 MCS, BDI, and ISEL belonging) were evaluated as postoperative value minus preoperative value. Weight change was evaluated as percentage of preoperative weight. Change in education and change in CVD history were too rare to evaluate.

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Supplementary Table 1. Preoperative characteristics of LABS-2 participants who underwent RYGB or SG, by report inclusion status.

	Included n=1441	Excluded n=388	n-value
Sex	11=1441	11=300	p-value 0.89
Male	298 (20.7%)	79 (20.4%)	0.09
Female	1143 (79.3%)	309 (79.6%)	
Age, years	1143 (13.376)	303 (13.070)	< 0.001
Median (25th:75th)	47 (38 : 55)	41 (34 : 49.5)	40.001
Range	19:75	19 : 70	
Race/ethnicity	n=1424	n=384	0.02
Non-Hispanic White	1184 (83.1%)	293 (76.3%)	0.02
Non-Hispanic Black	143 (10.0%)	56 (14.6%)	
Hispanic	53 (3.7%)	22 (5.7%)	
Other	44 (3.1%)	13 (3.4%)	
Education	n=1440	n=249	0.25
High school or less	340 (23.6%)	56 (22.5%)	0.20
Some college/post high school education	604 (41.9%)	118 (47.4%)	
College degree or higher	496 (34.4%)	75 (30.1%)	
Employed for pay	n=1433	n=247	0.12
No	454 (31.7%)	66 (26.7%)	0.12
Yes	979 (68.3%)	181 (73.3%)	
Household income	n=1403	n=239	0.12
<\$25,000	281 (20.0%)	51 (21.3%)	0.12
\$25,000	392 (27.9%)	66 (27.6%)	
\$50,000-\$49,999	392 (27.9%)	68 (28.5%)	
\$75,000-\$74,999 \$75,000-\$99,999	` '	ì í	
\$\frac{1}{2}\frac{1}{	214 (15.3%) 199 (14.2%)	32 (13.4%) 22 (9.2%)	
Smoked in past year	n=1438	n=387	< 0.001
No	1257 (87.4%)	304 (78.6%)	<0.001
Yes		` ,	
Body mass index (kg/m²)	181 (12.6%)	83 (21.4%)	0.18
Median (25th:75th)	46 F (42 F : F2 1)	47 F (42 4 : F2 2)	0.10
_ ,	46.5 (42.5 : 52.1) 33.7 : 94.3	47.5 (42.4 : 53.2) 34.3 : 76.8	
Range	33.7 : 94.3 n=1427	04.3 . 70.6 n=362	0.87
History of cardiovascular disease No			0.07
Yes	1309 (91.7%)	333 (92.0%)	
Diabetes	118 (8.3%)	29 (8.0%)	0.10
No	n=1428	n=364	0.19
	935 (65.5%)	225 (61.8%)	
Yes Severe walking limitation	493 (34.5%) n=1323	139 (38.2%) n=329	0.72
No	1227 (92.7%)	307 (93.3%)	0.72
Yes		1	
SF-36 PCS score	96 (7.3%)	22 (6.7%)	0.30
	n=1410	n=248	0.38
Median (25th:75th)	35.2 (27.0 : 44.1) 8.9 : 65.7	36.6 (27.4 : 44.9)	
Range SF-36 MCS score	0.9 . 65.7 n=1410	8.5 : 61.0 n=248	0.84
			0.04
Median (25th:75th)	51.5 (42.6 : 57.1) 17.7 : 75.9	52.0 (42.9 : 57.6)	
Range	n=1352	16.8 : 70.7	0.39
Beck Depression Inventory score		n=348	0.39
Median (25th:75th)	6 (3 : 11)	6 (3 : 12) 0 : 44	
Range	0:37		0.26
Alcohol problem	n=1430	n=251	0.36
No Yes	1334 (93.3%)	238 (94.8%)	
Yes	96 (6.7%)	13 (5.2%)	0.15
Eating disorder	n=1429	n=254	0.15
Binge eating	214 (15.0%)	31 (12.2%)	
Loss of control without binge	327 (22.9%)	49 (19.3%)	
Neither	888 (62.1%)	174 (68.5%)	0.70
Psychiatric medication use, current	n=1428	n=253	0.78
No	905 (63.4%)	158 (62.5%)	
Yes	523 (36.6%)	95 (37.5%)	2.5-
ISEL belonging score	n=1431	n=251	0.25
Median (25th:75th)	14 (12 : 16)	14 (12 : 16)	
Range	4 : 16	5 : 16	

	Included	Excluded	•
	n=1441	n=388	p-value
Frequency of sexual desire	n=1383	n=246	0.12
Never	316 (22.8%)	55 (22.4%)	
Once a month/week	571 (41.3%)	87 (35.4%)	
Few times a week or more	496 (35.9%)	104 (42.3%)	
Any sexual activity in past month	n=1413	n=250	0.15
No	455 (32.2%)	69 (27.6%)	
Yes	958 (67.8%)	181 (72.4%)	
Satisfaction with sexual life	n=1314	n=233	0.61
Satisfied	395 (30.1%)	73 (31.3%)	
Equal	268 (20.4%)	41 (17.6%)	
Dissatisfied	651 (49.5%)	119 (51.1%)	

Abbreviations: ISEL, Interpersonal Support Evaluation List; MCS, Mental Health Summary; PCS, Physical Component Summary; RYGB, Roux-en-Y Gastric Bypass; SG, Sleeve Gastrectomy; SF-36, 36-Item.

Supplementary Table 2. Health status at time of RYGB or SG, overall and by marital status.

	Total	Married	Cohabitating	Separated	Divorced	Widowed	Always single
	N=1441	n=827	n=68	n=57	n=213	n=33	n=243
Smoked in past year	181/1438 (12.6%)	77/825 (9.3%)	18 (26.5%)	12 (21.1%)	27 (12.7%)	1/32 (3.1%)	46 (18.9%)
Body mass index (kg/m²)							
Median (25th:75th)	46.5 (42.5:52.1)	45.7 (41.9:50.8)	46.8 (42.7:53.2)	48.7 (44.0:56.4)	46.9 (42.7:53.2)	45.0 (41.2:53.6)	49.7 (44.2:55.2)
Range	33.7:94.3	33.7:76.0	35.7:65.6	34.7:76.8	34.1:81.0	37.0:70.8	35.5:94.3
History of cardiovascular disease	118/1427 (8.3%)	76/823 (9.2%)	6/67 (9.0%)	6/56 (10.7%)	15/208 (7.2%)	4 (12.1%)	11/240 (4.6%)
Diabetes	493/1428 (34.5%)	290/822 (35.3%)	23/67 (34.3%)	20/55 (36.4%)	84/211 (39.8%)	9 (27.3%)	67/240 (27.9%)
Severe walking limitation	96/1323 (7.3%)	43/759 (5.7%)	3/62 (4.8%)	6/53 (11.3%)	31/201 (15.4%)	4/28 (14.3%)	9/220 (4.1%)
SF-36 PCS score	n=1410	n=811	n=64	n=56	n=207		n=239
Median (25th:75th)	35.2 (27.0:44.1)	35.3 (27.5:44.5)	33.8 (24.6:41.9)	32.4 (26.9:38.4)	32.2 (25.1:41.1)	32.8 (21.9:38.3)	40.1 (29.3:47.3)
Range	8.9:65.7	8.9:65.7	15.9:54.5	16.1:57.8	13.3:61.7	13.4:55.7	13.2:62.2
SF-36 MCS score	n=1410	n=811	n=64	n=56	n=207		n=239
Median (25th:75th)	51.5 (42.6:57.1)	51.9 (43.5:57.5)	52.5 (37.8:58.0)	49.9 (38.0:58.0)	49.8 (38.4:56.7)	52.6 (40.3:58.7)	51.5 (43.5:56.6)
Range	17.7:75.9	17.7:75.9	20.8:67.8	23.8:68.1	21.5:69.3	20.8:66.7	17.9:69.4
Beck Depression Inventory score	n=1352	n=783	n=64	n=53	n=193	n=29	n=230
Median (25th:75th)	6 (3:11)	6 (3:10)	8 (4:13)	9 (4:13)	7 (4:14)	7 (4:9)	5 (2:11)
Range	0:37	0:33	0:23	0:37	0:36	0:23	0:36
Alcohol problem	96/1430 (6.7%)	43/820 (5.2%)	5/67 (7.5%)	5/55 (9.1%)	13/212 (6.1%)	1 (3.0%)	29 (11.9%)
Eating disorder	n=1429	n=819	n=67	n=57	n=212	n=32	n=242
Binge eating	214 (15.0%)	103 (12.6%)	9 (13.4%)	7 (12.3%)	41 (19.3%)	7 (21.9%)	47 (19.4%)
Loss of control without binge	327 (22.9%)	182 (22.2%)	15 (22.4%)	11 (19.3%)	58 (27.4%)	9 (28.1%)	52 (21.5%)
Neither	888 (62.1%)	534 (65.2%)	43 (64.2%)	39 (68.4%)	113 (53.3%)	16 (50.0%)	143 (59.1%)
Psychiatric medication use	523/1428 (36.6%)	289/821 (35.2%)	22/66 (33.3%)	23/56 (41.1%)	105/210 (50.0%)	11 (33.3%)	73/242 (30.2%)
ISEL belonging score	n=1431	n=822	n=66	n=56	n=211	n=33	n=243
Median (25th:75th)	14 (12:16)	14 (13:16)	14 (12:16)	14 (10.5:16)	13 (10:15)	13 (11:15)	14 (12:15)
Range	4:16	4:16	7:16	5:16	4:16	7:16	4:16
Frequency of sexual desire	n=1383	n=806	n=67	n=56	n=203	n=27	n=224
Never	316 (22.8%)	168 (20.8%)	11 (16.4%)	11 (19.6%)	73 (36.0%)	15 (55.6%)	38 (17.0%)
Once a week or less	571 (41.3%)	355 (44.0%)	29 (43.3%)	25 (44.6%)	72 (35.5%)	6 (22.2%)	84 (37.5%)
Few times a week or more	496 (35.9%)	283 (35.1%)	27 (40.3%)	20 (35.7%)	58 (28.6%)	6 (22.2%)	102 (45.5%)

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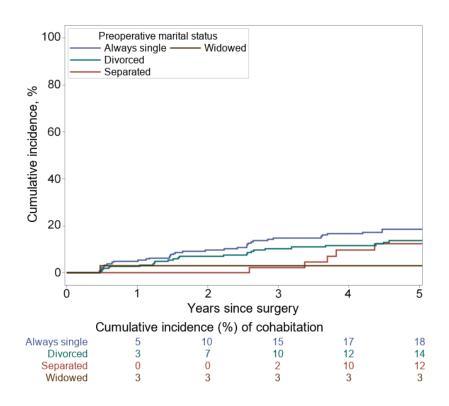
	Total	Married	Cohabitating	Separated	Divorced	Widowed	Always single
	n=1441	n=827	n=68	n=57	n=213	n=33	n=243
Any sexual activity in past month	958/1413 (67.8%)	605/815 (74.2%)	51/67 (76.1%)	38/56 (67.9%)	103/208 (49.5%)	11/32 (34.4%)	150/235 (63.8%)
Satisfaction with sexual life	n=1314	n=782	n=66	n=52	n=185	n=22	n=207
Satisfied	395 (30.1%)	232 (29.7%)	21 (31.8%)	13 (25.0%)	56 (30.3%)	8 (36.4%)	65 (31.4%)
Equally satisfied/dissatisfied	268 (20.4%)	155 (19.8%)	13 (19.7%)	8 (15.4%)	36 (19.5%)	2 (9.1%)	54 (26.1%)
Dissatisfied	651 (49.5%)	395 (50.5%)	32 (48.5%)	31 (59.6%)	93 (50.3%)	12 (54.5%)	88 (42.5%)

Abbreviations: ISEL, Interpersonal Support Evaluation List; MCS, Mental Health Summary; PCS, Physical Component Summary; RYGB, Roux-en-Y Gastric Bypass; SG, Sleeve Gastrectomy; SF-36, 36-Item Short Form Survey.

Supplementary Figure 1. Cumulative incidence of cohabitation after RYGB or SG.

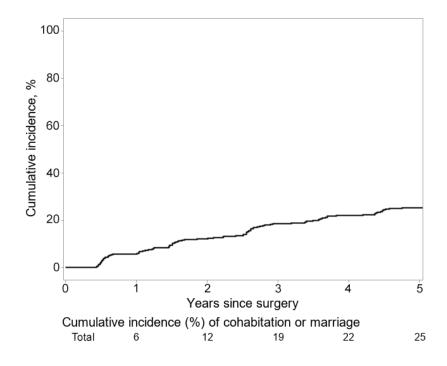
- A. Among participants who were not married or cohabitating preoperative
- 100 80 Cumulative incidence, % 20 0 2 3 Ó 5 Years since surgery Cumulative incidence (%) of cohabitation Total 3 11 13 15

B. Stratified by preoperative marital status

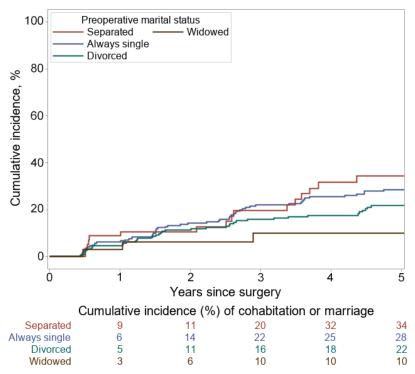


Supplementary Figure 2. Cumulative incidence of cohabitation or marriage after RYGB or SG.

A. Among participants who were not cohabitating or married preoperative



B. Stratified by preoperative marital status



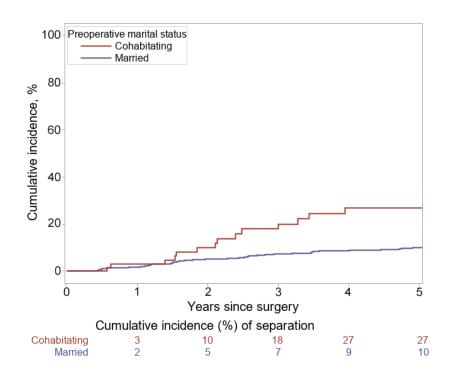
Supplementary Figure 3. Cumulative incidence of separation after RYGB or SG.

- A. Among participants who were cohabitating or married preoperative
- 100808060200 1 2 3 4 5

 Years since surgery

 Cumulative incidence (%) of separation

 Total 2 5 8 10 11
- B. Stratified by preoperative marital status



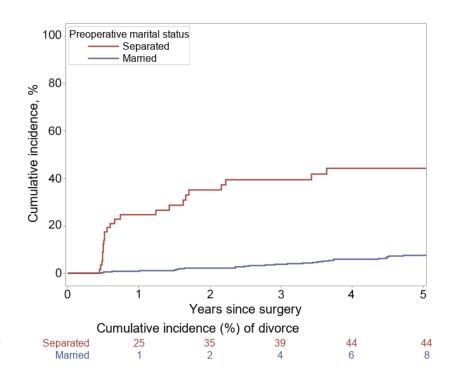
Supplementary Figure 4. Cumulative incidence of divorce after RYGB or SG.

- A. Among participants who were separated or married preoperative
- 100 80 60 60 40 20 7 Years since surgery

 Cumulative incidence (%) of divorce

 Total 2 4 6 8 10

B. Stratified by preoperative marital status



Supplementary Table 3. Number at risk and number of events (cohabitation, cohabitation or marriage, separation and divorce) by time in relation to RYGB or SG among US adults by applicable preoperative marital status.

	Year in relation to RYGB or SG surgery									
Preoperative status	0		1		2		3		4	5
	Incide	nt cohabit	ation							
	At risk	Event	At risk	Event	At risk	Event	At risk	Event	At risk	Event
Not married or cohabitating	546	19	506	18	435	17	379	8	339	7
Separated	57	0	56	0	47	1	43	3	35	1
Divorced	213	6	199	8	176	6	152	2	137	3
Widowed	33	1	31	0	28	0	26	0	24	0
Always single	243	12	220	10	184	10	158	3	143	3
	Incident marriage or cohabitation									
	At									
Not married or	risk	Event	At risk	Event	At risk	Event	At risk	Event	At risk	Event
cohabitating	546	31	495	32	412	28	349	14	307	12
Separated	57	5	51	1	42	4	35	5	26	1
Divorced	213	10	196	13	169	8	144	3	128	6
Widowed	33	1	31	1	27	1	24	0	24	0
Always single	243	15	217	17	174	15	146	6	129	5
-	Incident separation									
	At risk	Event	At risk	Event	At risk	Event	At risk	Event	At risk	Event
Cohabitating or married	895	15	854	30	741	19	659	14	601	7
Cohabitating	68	2	63	4	50	4	39	4	30	0
Married	827	13	791	26	691	15	620	10	571	7
	Incide	nt divorce								
	At									
	risk	Event	At risk	Event	At risk	Event	At risk	Event	At risk	Event
Separated or married	884	22	836	14	740	13	664	15	603	10
Separated	57	14	43	5	31	2	26	2	21	0
Married	827	8	793	9	709	11	638	13	582	10

Supplementary Table 4. Unadjusted hazard ratios of either incident postoperative marriage or separation/divorce among US adults who underwent RYGB or SG by preoperative demographics and health characteristics.

	HR (95% CI) of	HR (95% CI) of
	marriage among unmarried N=614ª	separation or divorce among married N=827 ^a
Marital status (Ref=Always single)	P<.001	
Cohabitating	3.66 (2.13, 6.29)	
Separated	1.82 (0.93, 3.54)	NA
Divorced	0.78 (0.45, 1.34)	
Widowed	0.44 (0.11, 1.83)	_
Sex (Ref=Male)	P=0.69	P=0.04
Female	1.13 (0.63 2.03)	1.81 (1.03, 3.20)
Age	P<.001	P<.001
per 10 years younger	1.45 (1.22, 1.73)	1.99 (1.62, 2.46)
Race/ethnicity (Ref=Non-Hispanic White)	N=607; P=0.45 1.22 (0.71, 2.11)	N=817; P=0.003 2.72 (1.51, 4.90)
Non-Hispanic Black Hispanic	0.28 (0.04, 1.98)	2.12 (1.31, 4.90)
Other	1.34 (0.54, 3.32)	0.44 (0.06, 3.13)
Education (Ref=high school or less)	N=613; P=0.16	P=0.07
Some college/post high school education	1.50 (0.82, 2.77)	1.23 (0.75, 2.01)
College degree or higher	1.83 (0.99, 3.38)	0.69 (0.39, 1.22)
Employed for pay (Ref=No)	N=609; P=0.21	N=824; P=0.30
Yes	1.34 (0.85, 2.10)	1.29 (0.80, 2.07)
Household income (Ref= ≥\$100,000)	N=598; P=0.39	N=805; P=0.008
<\$25,000	0.71 (0.29, 1.71)	2.52 (1.14, 5.55)
\$25,000-\$49,999	0.83 (0.34, 1.98)	1.94 (1.03, 3.63)
\$50,000-\$74,999	1.23 (0.49, 3.07)	1.36 (0.71, 2.61)
\$75,000-\$99,999	0.67 (0.19, 2.36)	0.71 (0.32, 1.55)
Smoked in past year (Ref=No)	N=613; P= 0.96	N=825; P=0.01
Yes	0.98 (0.56, 1.74)	2.07 (1.19, 3.59)
Body mass index kg/m ²	P=0.02	P=0.13
Per 10 units lower	1.41 (1.06, 1.85)	0.81 (0.62, 1.06)
History of cardiovascular disease (Ref=No)	N=604; P=0.74	N=823; P=0.16
Yes	1.14 (0.53, 2.46)	0.52 (0.21, 1.28)
Diabetes (Ref=No)	N=606; P=0.06	N=822; P=0.16
Yes	0.63 (0.39, 1.03)	0.73 (0.47, 1.13)
Severe walking limitation (Ref=No) Yes	N=564; P=0.17	N=759; P=0.53
SF-36 Physical Component Summary score	0.53 (0.22, 1.32) N=599; P=0.83	1.31 (0.57, 3.00) N=811; P=0.56
Per 10 units higher	1.02 (0.85, 1.24)	1.06 (0.88, 1.28)
SF-36 Mental Component Summary score	N=599; P=0.59	N=811; P=0.48
Per 5 units higher	1.05 (0.87, 1.28)	0.93 (0.76, 1.14)
Beck Depression Inventory score	N=569; P=0.03	N=783; P=0.41
Per 10 units lower	1.45 (1.03, 2.04)	1.16 (0.82, 1.64)
Alcohol problem (Ref=No)	N=610; P= 0.96	N=820; P=0.13
Yes	0.98 (0.45, 2.12)	1.74 (0.84, 3.60)
Eating disorder (Ref=Neither)	N=610; P=0.97	N=819; P=0.56
Binge eating	1.07 (0.62, 1.85)	1.27 (0.70, 2.33)
Loss of control	1.01 (0.61, 1.67)	1.25 (0.77, 2.04)
Psychiatric medication use (Ref= No)	N=607; P= 0.10	N=821; P=0.27
Yes	0.69 (0.44, 1.07)	0.78 (0.50, 1.22)
ISEL belonging score	N=609; P=0.055	N=822; P=0.44
Per 10 units higher	2.19 (0.98, 4.89)	0.73 (0.32, 1.64)
Frequency of sexual desire (Ref=Never)	N=577; P=0.02	N=806; P=0.003
Once a week or less	1.77 (0.93, 3.37)	1.53 (0.76, 3.02)
Few times a week or more	2.45 (1.32, 4.57)	2.70 (1.40, 5.22)
Any sexual activity in the past month (Ref=No)	N=598; P=0.003	N=815; P=0.02
Yes Satisfaction with say life (Pof—Satisfied)	2.06 (1.29, 3.29)	1.91 (1.10, 3.32)
Satisfaction with sex life (Ref=Satisfied) Equal	N=532; P=0.56 1.16 (0.65, 2.05)	N=782; P=0.56 0.98 (0.55, 1.74)
Dissatisfied	0.87 (0.53, 1.42)	0.98 (0.35, 1.74)
Abbraviations IID beyond ratio ICCI Internary and cumps		

Abbreviations: HR, hazard ratio; ISEL, Interpersonal support evaluation list; NA; not applicable; RYGB, Roux-en-Y Gastric Bypass; SF-36, 36-Item Short Form Survey; SG, sleeve gastrectomy.

aNumber of participants in each model unless otherwise indicated due to missing data.