Correlates of Overweight and Obesity in 644 Patients With Bipolar Disorder

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Objective: Overweight and obesity are common clinical problems encountered in the treatment of bipolar disorder. We therefore assessed the prevalence and clinical correlates of overweight, obesity, and extreme obesity in 644 bipolar patients.

Method: 644 outpatients with DSM-IV bipolar disorder in the Stanley Foundation Bipolar Treatment Outcomes Network were evaluated with structured diagnostic interviews and clinician- and self-administered questionnaires to determine bipolar disorder diagnoses, demographic and historical illness characteristics, comorbid Axis I diagnoses, medical histories, health habits, and body mass indices (BMIs).

Results: Fifty-eight percent of the patients with bipolar disorder were overweight, 21% were obese, and 5% were extremely obese. American patients had significantly higher mean ($p < .0001$) BMIs and significantly higher rates of obesity ($p < .001$) and extreme obesity ($p < .001$) than European patients. Significant associations ($p \leq .001$) were found between overweight, obesity, and extreme obesity and gender, age, income level, comorbid binge-eating disorder, hypertension, arthritis, diabetes mellitus, exercise habits, and coffee consumption. Current BMI and weight were each correlated with the number of weight gain–associated psychotropics to which patients had been exposed. Multinomial logistic regression (adjusted for site and eating disorder diagnosis and corrected for multiple comparisons) showed that (1) overweight was significantly associated with male gender and hypertension ($p < .001$), (2) obesity was significantly associated with hypertension ($p < .001$), and (3) extreme obesity was significantly associated with hypertension and arthritis ($p < .001$).

Conclusion: Overweight, obesity, and extreme obesity were common in this group of bipolar patients, although it was unclear that their prevalence rates were truly elevated, because overweight and obesity are increasingly common public health problems among the general population. Correlates of overweight and obesity in bipolar disorder include patient and treatment variables such as gender, geographical location, comorbid binge-eating disorder, age, income level, degree of exposure to weight gain–associated psychotropics, medical disorders associated with obesity, and health habits.

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It has been increasingly recognized that depression in general,[1–6] and bipolar disorder in particular,[7–11] may be associated with clinically significant weight gain. For example, Elmslie et al.[10,11] recently reported that overweight, obesity, and central obesity were significantly more common in 89 euthymic patients with DSM-IV bipolar disorder from New Zealand than in age- and sex-matched reference subjects.

Relatively little is known, however, about the factors associated with weight gain, overweight, and obesity in bipolar disorder. Indeed, overweight and obesity are increasingly common public health problems in their own right, with overweight affecting approximately 55% and obesity affecting approximately 27% of the general population of the United States from 1988 to 1994.[12,13] Moreover, preliminary epidemiologic data suggest that overweight and obesity may be associated with depression[14–17] and that some factors associated with overweight and obesity in general[13,18] are also associated with bipolar disorder. These include overeating and inactivity,[11,19,20] treatment with drugs that induce weight gain,[7–11,21–25] and comorbidity with binge eating.[5,26–28] However, of the factors potentially associated with weight gain in bipolar disorder, it is unknown which are specifically related to overweight and obesity in general or to bipolar disorder itself

and which are common to both disorders (e.g., treatment with weight-gaining medications, comorbidity with binge eating). By contrast, other factors associated with bipolar disorder, such as smoking and alcohol abuse, have been negatively associated with obesity.[29]

It may therefore not be surprising that available data regarding the clinical correlates of weight gain, overweight, and obesity in bipolar disorder are inconsistent. For example, in a prospective study of 471 Danish patients with broadly defined manic-depressive illness treated with prophylactic lithium for up to 7 years, Vestergaard et al.[7] found that weight gain was significantly associated with female sex, higher body weight before the start of treatment, the use of antidepressants, higher fasting blood glucose, and a diagnosis of bipolar rather than unipolar illness. Weight gain was not associated with age, lithium serum concentration or dosage, use of antipsychotics, or serum concentration of thyroxine or thyroid-stimulating hormone. In the Elmslie et al. reports,[10,11] female patients were more often overweight and obese than female reference subjects, whereas male patients were similarly overweight but more often obese than male reference subjects. Hypothyroidism was significantly more common in men, but not women, who were overweight or obese. Moreover, obesity was significantly associated with treatment with antipsychotic drugs, but not with lithium.

The Stanley Foundation Bipolar Treatment Outcome Network (SFBN) was established to advance the understanding of the long-term course and treatment of bipolar disorder.[30] To further evaluate the relationship between weight and bipolar disorder, we assessed the prevalence and clinical correlates of overweight, obesity, and extreme obesity in the first 644 patients with DSM-IV bipolar disorder and complete baseline data entered into the SFBN (from 1995 to 2001). We also compared the rates of overweight, obesity, and extreme obesity obtained in the American SFBN patients with the most current rates available for the general American population, namely, those from the National Health and Nutrition Examination Survey III (NHANES III), conducted from 1988 to 1994.[12]

METHOD

The methods of the SFBN,[30] along with the demographic and clinical features of the first 261 patients[31] and the Axis I comorbidity of the first 288 patients,[32] are described in greater detail elsewhere. Patients with bipolar disorder were recruited from private, academic, and community mental health clinic outpatient settings by referral and advertisement and entered into the SFBN if they met the following inclusion criteria: (1) age of at least 18 years; (2) DSM-IV diagnosis of bipolar I disorder, bipolar II disorder, bipolar disorder not otherwise specified, or schizoaffective disorder, bipolar type; (3) absence of an active substance use disorder requiring additional treatment in another setting; (4) willingness and ability to perform prospective daily mood charting and to attend monthly evaluation appointments; (5) willingness to be in ongoing treatment and to consider possible entry into future clinical trials; and (6) provision of written informed consent after the study procedures had been fully explained. Patients were not paid for their participation.

The SFBN baseline evaluation included the Structured Clinical Interview for DSM-IV, Patient Version (SCID-P),[33] performed to establish the diagnosis of bipolar disorder, illness characteristics (e.g., bipolar disorder subtype and age at onset), and comorbid Axis I disorder diagnoses. Excellent interrater reliability was achieved in using the SCID-P for the diagnosis of bipolar disorder, with an overall kappa score of .917.[32] The baseline evaluation also included completion of structured clinician- and patient-administered questionnaires to determine demographic factors, psychiatric historical illness variables (e.g., age at onset of affective symptoms, history of dysphoric mania, psychosis, rapid cycling, and suicide attempts), family history of psychiatric illness, psychotropic drug exposure, medical history, health habits (use of nicotine and caffeine, frequency of exercise), and height and weight (by self-report).

Overweight and obesity, including extreme obesity, were defined according to the clinical guidelines recently developed by the National Heart, Lung, and Blood Institute.[12,13] Specifically, overweight was defined as a body mass index (BMI; weight in kilograms divided by height in meters squared) of 25.0 to 29.9; obesity, as a BMI of 30.0 to 39.9; and extreme, or class III, obesity, as a BMI of 40.0 or greater.

Psychotropic treatment history was categorized as lifetime exposure to no weight-gaining medications, to 1 weight-gaining medication, and to ≥ 1 weight-gaining medication. Lithium, valproate, all typical antipsychotics, and all atypical antipsychotics (with the exception of ziprasidone) were classified as medications that could induce weight gain.[21–23,25]

All statistical analyses were performed with the Statistical Products for Service Solutions, version 10.1 (SPSS, Inc., Chicago, Ill.). Variables selected for analysis were chosen a priori, based on previous research (Appendix 1). Categorical variables were compared using chi-square analysis. Continuous variables were compared using analysis of variance. Hochberg's correction was used to adjust for multiple comparisons.[34] Variables significant at the .1 level were selected for inclusion in multinomial logistic regressions, controlling for site and comorbid eating disorder diagnoses. These multinomial regressions were also corrected for multiple comparisons.

RESULTS

Six hundred forty-four SFBN patients with bipolar disorder completed a SCID-P interview and the patient and

Table 1. Body Mass Index (BMI) in 644 Bipolar Patients in the Stanley Foundation Bipolar Treatment Outcomes Network by Site Location and Gender

Value	Network Total	American Women	American Men	European Women	European Men	Americans	Europeans
N	644	280	198	85	81	478	166
Mean (SD) BMI	27.3 (6.4)	27.9 (7.6)[a]	28.5 (5.8)[b]	24.2 (4.5)	25.8 (3.4)	28.1 (6.9)[c]	24.9 (4.0)
Median BMI	25.9	25.8	27.2	23.6	25.4	26.6	24.5
BMI range	10.7–53.8	16.8–53.6	10.7–53.8	11.7–36.5	19–35.8	10.7–53.8	11.7–36.5

[a]The difference between mean BMIs of American and European women is significant; t = 29.39, df = 241.4, p < .0001.
[b]The difference between mean BMIs of American and European men is significant; t = 11.16, df = 242.8, p < .0001.
[c]The difference between mean BMIs of Americans and Europeans is significant; t = 5.53, df = 642.0, p < .0001.

Table 2. Body Mass Index (BMI) Categories of 644 Bipolar Patients by Site Location and Gender

	Total Network (N = 644)		Women (N = 365)		Men (N = 279)		Total Network Men vs Women		Americans (N = 478)		Europeans (N = 166)		Americans vs Europeans	
BMI Category	N	%	N	%	N	%	χ^2	p	N	%	N	%	χ^2	p
Normal weight	273	42.4	188	51.5	85	30.5	28.67	< .001	182	38.1	91	54.8	14.15	< .001
Overweight	201	31.2	76	20.8	125	44.8	79.71	< .001	144	30.1	57	34.3	1.02	1
Obese	138	21.4	76	20.8	62	22.2	0.18	1	120	25.1	18	10.8	14.88	< .001
Extreme obesity	32	5.0	25	6.9	7	2.5	6.31	.016	32	6.7	0	0	11.69	< .001

Table 3. Body Mass Index (BMI) Categories of American SFBN Bipolar Patients and an American General Population Group (NHANES III)[a]

Group	N	Normal (%)	Overweight (%)	Obese (%)	Extreme Obesity (%)	Age (y) Mean (SD)	Years
SFBN women	280	47.50	20.00	23.60	8.90	39.7 (10)	1995–2001
SFBN men	198	24.70	44.40	27.30	3.50	43.4 (12.9)	1995–2001
NHANES III women	…	40.50	39.90	17.80	1.80	…	1988–1994
NHANES III men	…	49.40	25.70	21.10	3.80	…	1988–1994

[a]NHANES III data from Flegal et al.[12] Significance in BMI distribution differences between genders is as follows: SFBN women vs. SFBN men have a significantly different BMI distribution (χ^2 = 18.34, p < .001), NHANES III women vs. NHANES III men do not have a significantly different BMI distribution (χ^2 = 4.57, p = .206), NHANES III women vs. SFBN women have a significantly different BMI distribution, (χ^2 = 12.53, p = .006), and NHANES III men vs. SFBN men have a significantly different BMI distribution (χ^2 = 13.16, p = .004). Abbreviations: NHANES III = National Health and Nutrition Examination Survey III, SFBN = Stanley Foundation Bipolar Treatment Outcome Network.

clinician questionnaires and had their BMI calculated. Two hundred seventy-nine patients (43.3%) in the group were male. The mean ± SD current age was 41.2 ± 11.3 years (range, 18–82 years), the mean age at onset of illness was 21.0 ± 9.7 years (range, 2–57 years), and the mean duration of illness was 20.8 ± 12.0 years (range, 5–70 years). Two hundred fifty-nine patients (40.2%) reported limitation of occupational functioning by their bipolar illness, 407 (63.2%) reported 1 or more psychiatric hospitalizations, and 428 (66.5%) had a first-degree relative with a mood disorder. These features were very similar to those of the first 261 SFBN patients described elsewhere.[32]

Table 1 shows the mean (SD) and median BMIs for all 644 bipolar patients by American versus European site and gender, and Table 2 shows the distribution of BMI categories for all patients, also by site and gender. The rates of overweight and obesity in this group of bipolar patients were high, with 58% being overweight (31% overweight but not obese); 21%, obese; and 5%, extremely obese. There were significant site and gender differences. Regarding site differences, both the female and male American patients had significantly higher mean BMIs, as well as significantly higher rates of obesity and extreme obesity, than the female and male European patients. Regarding gender differences, male patients had significantly higher rates of overweight, whereas female patients had significantly higher rates of extreme obesity.

Table 3 compares BMI category prevalence rates from the American SFBN bipolar patients with those from the American NHANES III[12] general population sample (to our knowledge, the most recent estimates of overweight, obesity, and extreme obesity in the general American population). Both the female (p = .006) and male (p = .004) bipolar patient groups had significantly different BMI distributions compared with the female and male general population groups, respectively. Specifically, female bipolar patients appeared to have higher rates of obesity and extreme obesity, but lower rates of overweight, than reference women. Male bipolar patients appeared to have higher rates of overweight and possibly obesity, but not extreme obesity, than reference men.

Table 4 shows that in the 644 bipolar patients significant associations were found between overweight, obesity, or extreme obesity and geographical site, gender, age, income level, lifetime and current comorbid binge-eating

Table 4. Variables Significantly Associated With Body Mass Index (BMI) Categories in 644 Bipolar Patients by Chi-Square, Analysis of Variance, or Correlation

Variable	Normal	Overweight	Obese	Extreme Obesity	Statistic	p
Site, N (%)	(N = 273)	(N = 201)	(N = 138)	(N = 32)		
Los Angeles, Calif	51 (18.7)	30 (15)	24 (25.45)	7 (21.8)	$\chi^2 = 62.62$	< .001
Dallas, Tex	78 (28.6)	59 (29.4)	47 (34.1)	10 (31.3)		
Cincinnati, Ohio	33 (12.1)	29 (14.4)	37 (26.8)	14 (43.8)		
Bethesda, Md	20 (7.3)	26 (12.9)	12 (8.7)	1 (3.1)		
Utrecht, the Netherlands	80 (29.3)	44 (21.9)	13 (9.4)	0 (0)		
Munich, Germany	7 (2.6)	11 (5.5)	3 (2.2)	0 (0)		
Freiburg, Germany	4 (1.5)	2 (1)	2 (1.4)	0 (0)		
All American sites	182 (66.7)	144 (71.6)	120 (87.0)	32 (100.0)	$\chi^2 = 31.656$	< .001
Demographic information						
Male, N (%)	85 (31.1)	125 (62.2)	62 (44.9)	7 (21.9)	$\chi^2 = 51.79$	< .001
Current age, mean (SD), y	38.2 (10.7)	44.4 (12.5)	42.2 (9.6)	42 (9.9)	F = 12.563, df = 3,643	< .001
Income ≥ $20,000, N/N (%)	174/267 (65.2)	147/198 (74.2)	75/137 (54.7)	16/32 (50.0)	$\chi^2 = 16.933$	.001
Eating disorders, N/N (%)						
Lifetime binge-eating disorder	8/162 (4.9)	3/140 (2.1)	12/89 (13.5)	10/20 (50.0)	$\chi^2 = 58.567$	< .001
Current binge-eating disorder	2/162 (1.2)	3/140 (2.1)	8/89 (9.0)	8/20 (40.0)	$\chi^2 = 54.696$	< .001
Lifetime eating disorder	24/273 (8.8)	5/201 (2.5)	14/138 (10.1)	11/32 (34.4)	$\chi^2 = 41.991$	< .001
Current eating disorder	6/273 (2.2)	4/201 (2.0)	9/138 (6.5)	8/32 (25.0)	$\chi^2 = 38.853$	< .001
Weight gain–associated psychotropics						
Correlation between exposure and BMI					r = 0.244	< .001
Correlation between exposure and current weight					r = 0.2	< .001
Medical conditions, N/N (%)						
Hypertension	15/269 (5.6)	32/192 (16.7)	36/132 (27.3)	11/32 (34.4)	$\chi^2 = 44.073$	< .001
Diabetes mellitus	4/268 (1.5)	4/189 (2.1)	6/133 (4.5)	6/32 (18.8)	$\chi^2 = 28.822$	< .001
Arthritis	25/268 (9.3)	28/190 (14.7)	21/133 (15.8)	16/31 (51.6)	$\chi^2 = 40.48$	< .001
Health habits, N/N (%)						
> 3 cups of coffee/day	86/268 (32.1)	68/193 (35.2)	29/134 (21.6)	1/32 (3.1)	$\chi^2 = 18.646$	< .001
Exercise, N (%)	(N = 270)	(N = 193)	(N = 134)	(N = 32)		
No exercise	22 (8.1)	21 (10.9)	21 (15.7)	8 (25.0)	$\chi^2 = 42.939$	< .001
1 or 2 times a month	26 (9.6)	34 (17.6)	30 (22.4)	6 (18.8)		
Occasionally	51 (18.9)	39 (20.2)	28 (20.9)	10 (31.3)		
1 or 2 times a week	58 (21.5)	35 (18.1)	26 (19.4)	4 (12.5)		
3 or 4 times a week	55 (20.4)	32 (16.6)	18 (13.4)	4 (12.5)		
Daily	58 (21.5)	32 (16.6)	11 (8.2)	0 (0)		
Correlation between BMI category and amount of exercise					r = –0.242	< .001

disorder, hypertension, arthritis, diabetes mellitus, infrequent or no exercise, and drinking > 3 cups of coffee/day. (Appendix 1 shows the variables that were tested for association with the different BMI categories.) Current BMI ($r = 0.24$, $p < .001$) and weight ($r = 0.20$, $p < .001$) were correlated with the number of weight-gaining psychotropic drugs (range, 0–9) to which patients had been exposed. There was a negative correlation between BMI category and amount of exercise ($r = –0.24$, $p < .001$).

Table 5 shows the variables that were significantly associated with overweight, obesity, and extreme obesity for the 644 bipolar patients by multinomial logistic regression adjusted for site and comorbid eating disorder diagnosis. (Appendix 2 shows the variables included in the regression.) Variables that remained significant after correction for multiple comparisons for each weight category were male gender ($p < .001$) and hypertension ($p < .001$) for overweight, hypertension ($p < .001$) for obesity, and hypertension ($p < .001$) and arthritis ($p < .001$) for extreme obesity.

DISCUSSION

Our findings of high rates of overweight, obesity, and extreme obesity in a large group of outpatients with bipolar disorder are consistent with existing data from other clinical samples.[7–11] Compared with the most recent (1988–1994) estimates from the U.S. general population,[12] the female American SFBN patients were more frequently obese and extremely obese, and the male patients were more frequently overweight and obese. However, it is unknown whether overweight and obesity were truly increased in prevalence in this group of bipolar patients, because overweight and obesity are increasingly common public health problems in their own right and the comparison group used was not similarly obtained or evaluated.[12]

Overweight, obesity, or extreme obesity in these bipolar patients were significantly associated with gender; age; geographical location; income level; a lifetime and current diagnosis of binge-eating disorder, history of hypertension, diabetes mellitus, and arthritis; and exercise and coffee-drinking habits. In the multinomial logistic regression,

Table 5. Variables Significantly Associated With Overweight, Obesity, and Extreme Obesity as Compared With Normal Weight in 644 Bipolar Patients by Multinomial Logistic Regression[a]

Variable	Group	p Value
Male	Overweight	< .001
	Obese	.008
Hypertension	Overweight	< .001
	Obese	< .001
	Extreme obesity	< .001
Arthritis	Extreme obesity	< .001
Little or no exercise	Overweight	.026
	Obese	.005
	Extreme obesity	.006
Diabetes mellitus	Extreme obesity	.002
Income ≥ $20,000	Overweight	.016
> 4 Manic episodes	Obese	.019
Limited occupational functioning	Obese	.011
	Extreme obesity	.023
≥ 1 Suicide attempt	Extreme obesity	.037
Hypothyroidism	Obese	.003
Cancer	Extreme obesity	.033
Smoker	Extreme obesity	.039
≥ 1 Exposure to weight gain–associated psychotropics	Obese	.007
No lifetime alcohol use disorder	Obese	.005

[a]Adjusted for site and eating disorder diagnoses.

which was adjusted for site and eating disorder diagnosis and corrected for multiple comparisons, overweight was significantly associated with male gender and hypertension; obesity, with hypertension; and extreme obesity, with hypertension and arthritis.

Some of these factors have been associated with obesity in general (e.g., little or no exercise),[12] and some are shared by bipolar disorder and obesity (e.g., exposure to weight gain–associated medications,[7–11,13,18,21–25] comorbidity with binge eating[13,18,28]). As in community samples of obese persons and clinical samples of patients seeking weight loss treatment,[12,17,28] overweight and obesity in this group of bipolar patients were associated with hypertension, diabetes, and arthritis.

Consistent with findings from other studies,[7,10] overweight and obesity were not associated with many of the historical illness or psychiatric comorbidity variables assessed. Overweight, obesity, and extreme obesity were not associated with bipolar I versus bipolar II diagnostic subtype, age at onset of bipolar symptoms or disorder, number of prior depressive episodes, history of rapid cycling or dysphoric mania, lifetime history of a substance use or anxiety disorder, history of abuse, or family history of psychiatric illness.

Our findings must be considered in view of several methodological limitations. First, this study included only patients with bipolar disorder and lacked direct comparisons with a healthy control group, another psychiatrically ill group, or an epidemiologic sample. Second, weight, height, and some historical illness variables reported here were obtained by self-report. Specifically, this may have provided conservative estimates of weight, since people in general (and females in particular) tend to underestimate their actual weight.[35] Of note, we reviewed our database and found 111 patients for whom weight measurements had been obtained within 1 month of the self-report measures. The correlation between self-reported weight and measured weight was $r = 0.99$, $p < .0001$, suggesting that patients' self-reports of their weights were fairly accurate.

A third limitation is that several important variables associated with overweight and obesity were not assessed, such as family history of obesity, dietary habits, and exposure to weight gain–associated medications other than psychotropics (e.g., steroids).[13,18] A fourth limitation is that our group of bipolar patients may not be representative of the general population with the disorder due to the SFBN inclusion criteria. Specifically, only outpatients willing to be compliant with treatment and to participate in research were included. Our results, therefore, might not be generalizable to other bipolar populations, such as those drawn from an initially hospitalized cohort or those in the community who are not in treatment. However, comparison of many demographic variables in the SFBN bipolar patients with those in other clinical populations, including those of Winokur,[36] the National Institute of Mental Health Collaborative Study,[37] and the National Depressive and Manic-Depressive Association,[38] suggests that the SFBN population is not widely divergent or atypical.

Despite these limitations, our study has several strengths. To our knowledge, this is the largest cohort of patients with bipolar disorder to have their weight and clinical correlates systematically assessed. This is also the first study to examine the relationship between weight and certain factors in bipolar disorder, such as binge-eating disorder and degree of exposure to psychotropics associated with weight gain.

Our findings of high rates of overweight and obesity and their complications in patients with bipolar disorder have important clinical implications. Comprehensive evaluations of patients with bipolar disorder should include assessment of weight and BMI, as well as medical, metabolic, and behavioral factors associated with overweight and obesity. Such factors should include vital signs, medical history, family history of obesity and obesity-related diseases, blood lipid and glucose profiles, and eating and activity patterns. Patients should be specifically asked about a current or past history of binge eating, as well as disorders characterized by binge eating, such as binge-eating disorder and bulimia nervosa. Interventions to prevent or minimize weight gain and optimize metabolic health should be instituted as early as is feasible. Psychological strategies could include counseling about nutrition and exercise as well as cognitive-behavioral therapy.[11,39–42] Medical strategies could include use of thymoleptics associated with minimal or no weight gain (e.g., ziprasidone, carbamazepine, and/or lamotrigine), use of thymoleptics

or potential thymoleptics with weight loss or anti–binge-eating properties (e.g., topiramate, zonisamide, bupropion, serotonin-norepinephrine reuptake inhibitors, and/or selective serotonin reuptake inhibitors), or the adjunctive use of antiobesity agents (e.g., orlistat, sibutramine, and/or histamine-2 antagonists).[42,43]

In sum, our findings are consistent with others suggesting that bipolar disorder is often accompanied by overweight and obesity. Moreover, overweight and obesity in bipolar disorder appear to be associated with both patient and treatment variables that may interact in complex ways. In subsequent work, we will be extending these observations by prospectively evaluating the relationships among course of illness, treatment, and weight in bipolar disorder.

Drug names: bupropion (Wellbutrin and others), carbamazepine (Tegretol and others), lamotrigine (Lamictal), orlistat (Xensical), sibutramine (Meridia), topiramate (Topamax), ziprasidone (Geodon), zonisamide (Zonegran).

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Appendix 1. Demographic and Historical Illness Variables Tested for Association With Different Body Mass Index Categories

- Weight and Site
  - Site location (Los Angeles, Calif; Dallas, Tex; Cincinnati, Ohio; Bethesda, Md; Utrecht, the Netherlands; Munich, Germany; Freiburg, Germany)
  - Site location (America or Europe)
- Weight and Demographic Information
  - Gender
  - Current age
  - Income ≥ $20,000
  - Limited occupational functioning
- Weight and Course of Illness
  - Bipolar diagnosis (I vs II)
  - Age at onset:
    - Bipolar disorder
    - 1st symptoms
    - 1st treatment
    - 1st hospitalization
  - > 4 Episodes of mania
  - > 20 Episodes of mania
  - > 4 Episodes of depression
  - > 20 Episodes of depression
  - Rapid cycling
  - Dysphoric mania
  - ≥ 1 Suicide attempt
- Weight and Axis I Comorbidity
  - Lifetime Axis I disorder
  - Current Axis I disorder
- Weight and Anxiety Disorders
  - Lifetime anxiety disorder
  - Current anxiety disorder
- Weight and Substance Use Disorders
  - Lifetime alcohol use disorder
  - Current alcohol use disorder
  - Lifetime drug use disorder
  - Current drug use disorder
  - Lifetime substance use disorder
  - Current substance use disorder
- Weight and Eating Disorders
  - Lifetime anorexia nervosa
  - Current anorexia nervosa
  - Lifetime bulimia nervosa
  - Current bulimia nervosa
  - Lifetime binge-eating disorder
  - Current binge-eating disorder
  - Lifetime eating disorder
  - Current eating disorder
- Weight and Abuse
  - Lifetime verbal abuse
  - Lifetime physical abuse
  - Lifetime sexual abuse
- Weight and Family History
  - Any psychiatric disorder
  - Any mood disorder
  - Any substance use disorder
- Weight and Medication
  - Exposure to psychotropics with weight-gaining side effects (no exposure, 1 exposure, or ≥ 1 exposure)
- Weight and Medical Conditions
  - Hypothyroidism
  - Hypertension
  - Diabetes mellitus
  - Cancer
  - Arthritis
  - ≥ 4 Medical conditions
- Weight and Health Habits
  - Smoking status
  - Coffee intake
  - Amount of exercise

Appendix 2. Demographic and Historical Illness Variables Tested for Association With Different Body Mass Index Categories by Multinomial Logistic Regression[a]

Gender	Lifetime anxiety disorder
Age	Sexual abuse
Income ≥ $20,000	Physical abuse
Limited occupational functioning	Hypertension
≥ 1 Suicide attempt	Arthritis
Age at onset of bipolar disorder	Diabetes mellitus
> 4 Manic episodes	Hypothyroidism
> 4 Depressive episodes	Cancer
Dysphoric mania	Little or no exercise
Exposure to weight gain–associated psychotropics[b]	Coffee intake (> 3 cups per day)
Lifetime alcohol use disorder	Smoker

[a]Chi-square or analysis of variance tests were completed on each variable, as appropriate. An alpha level of .1 was chosen as the cutoff for inclusion in the regression.
[b]This variable consists of no exposure, 1 exposure, and ≥ 1 exposure.