

Outcomes of Eating Disorders: A Systematic Review of the Literature

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ABSTRACT

Objective: The RTI International-University of North Carolina at Chapel Hill Evidence-based Practice Center systematically reviewed evidence on factors associated with outcomes among individuals with anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED) and whether outcomes differed by sociodemographic characteristics.

Method: We searched electronic databases including MEDLINE and reviewed studies published from 1980 to September, 2005, in all languages against *a priori* inclusion/exclusion criteria and focused on eating, psychiatric or psychological, or biomarker outcomes.

Results: At followup, individuals with AN were more likely than comparisons to be depressed, have Asperger's syndrome and autism spectrum disorders, and suffer from anxiety disorders including obsessive-compulsive disorders. Mortality risk was significantly higher than what would be expected in the population and the risk

of suicide was particularly pronounced. The only consistent factor across studies relating to worse BN outcomes was depression. A substantial proportion of individuals continue to suffer from eating disorders over time but BN was not associated with increased mortality risk. Data were insufficient to draw conclusions concerning factors associated with BED outcomes. Across disorders, little to no data were available to compare results based on sociodemographic characteristics.

Conclusion: The strength of the bodies of literature was moderate for factors associated with AN and BN outcomes and weak for BED. © 2007 by Wiley Periodicals, Inc.

Keywords: outcomes; systematic review; anorexia nervosa; bulimia nervosa; binge eating disorder; eating disorders; binge; purge; cohort study; obsessive-compulsive disorder

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Introduction

Anorexia nervosa (AN) is a serious psychiatric illness marked by an inability to maintain a normal healthy body weight, often dropping below 85% of ideal body weight (IBW). Bulimia nervosa (BN)

is characterized by recurrent episodes of binge eating in combination with some form of inappropriate compensatory behavior. Individuals with binge eating disorder (BED) regularly engage in binge eating in the absence of compensatory behaviors.

In young females in Western Europe and the United States, the mean prevalence estimates are 0.3% for AN and 1.0% for BN; subthreshold conditions of clinical concern are more prevalent.¹ Population-based studies suggest that between 0.7 and 3% of individuals in community samples meet criteria for BED^{2,3}; community studies of obese individuals have found the prevalence of BED to be between 5 and 8%.^{4,5}

Risk factors and correlates of disorders include sex, race or ethnicity, childhood eating and gastrointestinal problems, elevated shape and weight concerns, negative self-evaluation, sexual abuse, and general psychiatric comorbidity.⁶ Prematurity, smallness for gestational age, and cephalohematoma have been identified as specific risk factors for AN.⁷

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TABLE 1. Criteria for searches on outcomes of anorexia nervosa, bulimia nervosa, or binge eating disorder

Category	Criteria
Study population	Humans All races, ethnicities, and cultural groups 10 years of age or older.
Study settings and geography	All nations
Time period	Published from 1980 through September 2005
Publication criteria	Included: • All languages • Articles in print Excluded: • Articles in gray literature or nonpeer-reviewed journals or unobtainable during the review period.
Admissible evidence (study design and other criteria)	Original research studies that provide sufficient detail regarding methods and results to enable use and adjustment of the data and results. AN must be diagnosed according to DSM III, DSM III-R, DSM IV, ICD-10, Feighner, or Russell criteria. BN must be diagnosed according to DSM III-R, DSM IV, or ICD-10 criteria. Eating disorders not otherwise specified (binge eating disorder) must be diagnosed according to DSM IV criteria. Relevant outcomes: eating related, psychiatric or psychological, and biomarker measures; must be able to be abstracted from data presented in the papers. Eligible study designs include outcomes studies: Observational studies including prospective and retrospective cohort studies and case series studies, with or without comparison groups. Disease populations must be followed for a minimum of 1 year and must include 50 or more participants at the time of analysis.

The RTI International-University of North Carolina Evidence-based Practice Center (RTI-UNC EPC) conducted a systematic review of literature on the treatment and disease-related outcomes for these three significant eating disorders; it was commissioned by the Agency for Healthcare Research and Quality (AHRQ) on behalf of the National Institutes of Health (NIH) Office of Research on Women's Health, the National Institute on Mental Health, and the Health Resources and Services Administration. We reported more detail elsewhere on pharmaceutical, behavioral, and novel interventions for treating patients with these conditions.⁸⁻¹⁰ Our review of the outcomes literature was guided by two key questions:

1. What factors are associated with (i.e., predictive of) outcomes among individuals with AN, BN and BED?

2. Do outcomes for AN, BN and BED differ by certain sociodemographic variables (e.g., sex, gender, age, race, ethnicity, or cultural group).

Here we present our findings about how individuals with these diseases fare over time, irrespective of specific treatments, and the factors that influence those outcomes. We also recommend future research to overcome substantial gaps and limitations in the evidence base.

Method

Methods for our entire review appear in Bulik et al.,⁸ and at www.ahcpr.gov/clinic/tp/eatdistp.htm. We developed *a priori* article inclusion and exclusion criteria, limiting our review to human studies of participants diagnosed with AN, BN, or BED, ages 10 years and older, and published from 1980 to the present (Table 1). We excluded data that combined eating disorders and those from study populations without a primary diagnosis of AN, BN, or BED.

Results

We identified 62 articles (on 32 separate studies) presenting outcomes for individuals with these disorders; some investigators conducted multiple analyses that they reported in separate articles. We rated the quality of six articles (six reports of separate analyses) as "poor" and do not discuss them further.¹¹ Because many¹²⁻¹⁶ studies were conducted outside the United States (Germany, England, Scotland, Sweden, China, Japan, New Zealand, and Australia), we note the setting of the remaining 56 articles (28 studies) to emphasize the extent to which this literature drew from international samples. We discuss findings for AN, BN, and BED separately. Outcomes of interest (summarized in tables) are eating-related factors, psychiatric or psychological factors, biomarker measures, and death. Predictive factors are discussed in the text for each disease and outcome. Results on sociodemographic characteristics associated with outcomes are presented at the end of the disease-specific findings.

Anorexia Nervosa Outcomes and Predictive Factors

For AN (Table 2), we present data from 46 articles (22 studies).¹⁷⁻⁵⁶ Study designs include

TABLE 2. Outcomes: anorexia nervosa

Authors, Year	Characteristics	AN Group Outcomes
Prospective Cohort Studies, Comparison Groups		
Gillberg et al. ²⁷ Gillberg et al. ²⁸ Råstam et al. ³⁹ Gillberg et al. ²⁹ Ivarsson et al. ⁴³ Cases: 51 Comparisons: 51	Sweden community sample Female: 94% Years followed: 5	Eating-related Diagnostic: AN: 6%, BN: 22%, EDNOS: 14%, None: 59% M-R general ^a : Good: 41%, Inter: 35%, Poor: 24% Psychiatric/Psychological OCD [*] : 30%; Any cluster C [*] : 37% Any SCID personality disorder [*] : 41% Asperger syndrome [*] : 12%, Any autistic like condition [*] : 20% Empathy disorder [*] : 30% Biomarker measured Near average body weight [*] : 53% Extremely underweight [*] : 8% Regular menses [*] : 50%, Dysdiadochokinesis [*] : 20%
Nilsson et al. ⁴⁵ Råstam et al. ³² Wentz et al. ³⁵ Ivarsson et al. ⁴³ Wentz et al. ⁴⁴ Cases: 51 Comparisons: 51	Sweden community sample Female: 94% Years followed: 10	Eating-related Diagnostic: AN: 6%, BN: 4%, EDNOS: 18% No ED symptoms for 6 month: 39%, NR: 33% M-R general ^a : Good: 49%, Inter: 41%, Poor: 10% Psychiatric/Psychological OCD [*] : 16%, Autism spectrum disorder [*] : 18% Lifetime: Any effective disorder [*] : 96%, OCD [*] : 35%, OCPD [*] : 55% Any anxiety disorder [*] : 57%, Depressive disorder [*] : 84% Autism spectrum disorder [*] : 24% Biomarker measured Regular menses [*] : 65%, Dysdiadochokinesis [*] : 22%
Case Series Comparison Groups		
Bulik et al. ²⁵ Sullivan et al. ³³ Cases: 70 Comparisons: 98	New Zealand inpatient, outpatient, or assessment Years followed: 12	Eating-related Diagnostic: AN: 10%, BN or EDNOS: 11% Recovery scale 1 ^b : Fully: 30%, Partially: 49%, Chronically ill: 10% Psychiatric/Psychological Lifetime diagnosis (controlling for age) [*] : Major depression: 51%, Any mood disorder: 60%, Alcohol or other drug dependence: 30%, OCD: 16%, Separation anxiety disorder: 17%, overanxious disorder: 37%, Any anxiety disorder: 60% Biomarker measured BMI [*] : 20.1 kg/m ² Mortality Deaths: N = 1 (suicide)
Halmi et al. ¹⁸ Cases: 62 Comparison: 62	US inpatient Years followed: 10	Eating-related Diagnostic: AN: 3%, BN: 26%, EDNOS: 39%, No ED: 27% Unknown: 5% Psychiatric/Psychological Lifetime diagnosis: Major depression: 68%, Dysthymia: 32%, OCD: 25%, Agoraphobia: 14%, Social phobia: 32% Current diagnoses [*] : Major depression: 29%, OCD: 11%
Case Series, No Comparison Groups		
Ben-Tovim et al. ⁵⁰ Cases: 92	Australia secondary or tertiary services Years followed: 5	Eating-related Diagnostic: AN: 21%, BN: 5%, EDNOS: 9%, No ED: 59% Unknown: 2%, Deceased: 3% M-R-H ^c : Good: 34%, Inter: 54%, Poor: 13%
Birmingham et al. ¹⁷ Cases: 326	Canada adult tertiary care Females: 97% Years followed: 7	Mortality Deaths: N = 17 (Suicide: N = 7, Pneumonia: N = 2, Hypoglycemia: N = 2, Liver disease: N = 2, Cancer: N = 2, Alcohol poisoning: N = 1, Subdural hemorrhage: N = 1), SMR: 10.5
Crisp et al. ⁴⁰ Cases: 168	England and Scotland Mean years followed: 22	Mortality England: Deceased: N = 4 (Anorexia: N = 2, Suicide: N = 1; Cancer: N = 1) (SMR: 1.36 times more likely than women of same age, 1973–1989) Scotland: Deceased: N = 8 (Anorexia: N = 3; Suicide: N = 4; Cancer: N = 1) (SMR: 4.71 times more likely than women of same age, 1973–1979)

TABLE 2. Continued

Authors, Year	Characteristics	AN Group Outcomes
Dancyger et al. ³⁶ Cases: 52	US inpatient Years followed: 10	Eating-related Dancyger dehned scale ^d : Recovered: 31%, Good: 13%, Inter: 21%, Poor: 35% (5 died during followup)
Deter et al. ⁵⁷ Herzog, Schellberg, and Deter ⁴² Deter et al. ⁴⁸ Cases: 75	Germany inpatient Mean years followed: 12 (9–19)	Eating-related Diagnostic: AN: 17%, BN: 14% M-R general ^a : Good: 54%, Inter: 25%, Poor: 11%. Average time to first recovery (M-R outcome of good) ^a : 6 years Mortality Deceased: 11% (AN complications: <i>N</i> = 7; Suicide: <i>N</i> = 2)
Eckert et al. ²¹ Cases: 76	US inpatient Mean years followed: 10 (8.5–10.5)	Eating-related Diagnostic: AN: 9%, BN: 22%, AN/BN: 3%, EDNOS: 36%, No ED: 24%, Deceased: 6% Recovery scale 1 for 1 year ^d : 24%, Good: 26%, Inter: 32%, Poor: 12% Biomarker measured ABW: < 85%; 23%, 85%–115%; 73%, > 115%; 3% Regular menses: 48% Mortality Deceased: 6% (all complications of AN: no suicides): SMR: 12.8
Eddy et al. ¹⁹ Cases: 136	US inpatient and outpatient Median years followed: 8 (8–12)	Eating-related Recovery scale 2 ^c : Full Recovery: ANR Pure: 46%, ANR not pure: 22%, ANBP: 39%, Partial recovery: ANR Pure: 88%, ANR not pure: 86% ANBP: 87%, Relapse: ANR Pure: 31%, ANR not pure: 47%, ANBP: 68% Psychiatric/Psychological History of drug abuse at intake: AN restricting pure: 0% AN restricting not pure: 13%, AN binge purge: 16% Mortality Deceased: ANR Pure: 8%, ANR not pure: 7%, ANBP: 6% History of suicidality by subtype: Restricting pure: 4%; Restricting not pure: 29%; Binge/purge: 27%
Fichter and Quadflieg ²² Cases: 101	Germany inpatient Years followed: 6	Eating-related Diagnostic: AN: 24%, BN: 16%, EDNOS: 2%, No ED: 52% M-R general ^a : Good: 27%, Inter: 25%, Poor: 42% Mortality Deceased: 6% (Traffic accident during exercise: <i>N</i> = 1; Cardiac and renal failure: <i>N</i> = 2; Hypocalcemia: <i>N</i> = 2; Cardiac failure and cachexia; <i>N</i> = 1)
Franko et al. ⁵¹ Cases: 136	US inpatient and outpatient Mean years followed: 9	Mortality Suicide attempts during study period: 22%
Halvorsen et al. ⁴⁹ Cases: 51	Norway inpatient Mean years followed: 9 (4–15)	Eating-related Diagnostic: AN: 2%, BN: 2%, EDNOS: 14%, No ED: 82% Deceased: 0% M-R general ^a : Good: 80%, Inter: 16%, Poor: 4% Psychiatric/Psychological Depression: 22%, Anxiety (not OCD): 27%, OCD: 2%
Hebebrand et al. ³⁷ Cases: 272	Germany Mean years followed: 10, (0–34)	Mortality Deceased: <i>N</i> = 12 (Emaciation: <i>N</i> = 10, Suicide: <i>N</i> = 2) Mortality rate by patient weight at referral: > 13 kg/m ² : 11%, ≥ 13 kg/m ² : 0.6%
Herzog et al. ⁵³ Cases: 136	US, assessment for ED Mean years followed: 4	Eating-related Recovery scale 2 ^c : Full recovery: ANR 8%, ANBP: 17%; Partial recovery: ANR: 54%, ANBP: 81%
Herzog et al. ⁵² Cases: 136	US, assessment for ED Median years followed: 8 (up to 11)	Eating-related Recovery scale 2 ^c at some point over 90 months: Full recovery: 34%, Partial recovery: 84%, Relapse after first recovery: 40%, No remission: 18%
Herzog et al. ⁵⁴ Cases: 110	US, assessment for ED Years followed: 11	Mortality Deceased: <i>N</i> = 7 (Suicide: <i>N</i> = 3; Acute alcohol intoxication: <i>N</i> = 1; Cardiorespiratory failure, hepatic failure, and cirrhosis: <i>N</i> = 1; Cardiac arrhythmia and seizure disorder: <i>N</i> = 1; Fungal pneumonia: <i>N</i> = 1), SMR (all deaths): 9.6: SMR (suicide): 58.1

TABLE 2. Continued

Authors, Year	Characteristics	AN Group Outcomes
Isager et al. ²³ Cases: 142	Denmark, inpatient and outpatient Female: 93% Mean years followed: 13 (4–22)	Eating-related Remission: 80% Average annual hazard of first relapse ^f : 3%; 14% in first year Mortality Deceased: <i>N</i> = 9 (Suicide: <i>N</i> = 6, Malnutrition: <i>N</i> = 2, Unknown: <i>N</i> = 1)
Keel et al. ⁵⁵ Cases: 136	US, inpatient and outpatient Mean years followed: 9	Mortality Deaths: <i>N</i> = 11; SMR: 11.6 Suicide: <i>N</i> = 4; Suicide SMR: 56.9
Lee et al. ³⁰ Lee et al. ⁴⁶ Cases: 74	Hong Kong, inpatient and outpatient Years followed: 9	Eating-related Diagnostic: AN: 15%, BN: 20% (typical 25%, atypical 5%), EDNOS: 19% (typical 15%, atypical: 29%), No ED: 46% (typical: 41%, atypical: 57%) M-R component ^g : Good: 62% (typical 53%, atypical: 89%), Inter: 33% (typical: 42%, atypical: 5%, Poor: 5% (typical and atypical: 5%) Mortality Deaths: <i>N</i> = 3 (Suicide: <i>N</i> = 2, Emaciation: <i>N</i> = 1); SMR: 10.5
Löwe et al. ³¹ Cases 63	Germany, inpatient Mean years followed: 21	Eating-related PSR scale ¹⁴ : Good: 51%, Inter: 21%, Poor: 26%, Unknown: 2% Psychiatric/Psychological Mood disorders by PSR Scale outcomes: Good: 8%, Inter: 31%, Poor: 38% Substance use disorders by PSR Scale outcomes: Good: 5%, Inter: 6%, Poor: 50% Biomarker measured BMI by PSR scale outcomes: Good: 21.6, Inter: 19.7, Poor: 15.3 Mortality Deaths: <i>N</i> = 14 (12 directly due to AN)
Møller-Madsen et al. ⁴⁷ Cases: 853	Denmark, inpatient Female: 93% Mean years followed: 8	Mortality Deceased: <i>N</i> = 50 (AN complications: <i>N</i> = 13, Natural causes: <i>N</i> = 11, Suicide: <i>N</i> = 18, Accidents: <i>N</i> = 2, Unknown causes or could not be determined: <i>N</i> = 4) SMR: Females: 9.2; SMR: Males: 8.2 Females only < 1 year following treatment admission, SMR = 30.5
Morgan et al. ³⁸ Cases: 78	UK, outpatient Female: 94% Mean years followed: 6(4–9)	Eating-related M-R general ^a as of last 6 months: Good: 58%, Inter: 19%, Poor: 19%, Deceased: 1%, Unknown: 3%
Patton ⁵⁶ Cases: 332	UK, assessed for ED Female: 96% Mean years followed: 8	Mortality Deaths: <i>N</i> = 11 (Suicide: <i>N</i> = 6; low weight: <i>N</i> = 5) Overall SMR: 6.01; Higher than expected SMR at 4-year FU: 5.76. Higher than expected SMR at 8-year FU: 2.70 Normal level
Strober et al. ⁴¹ Cases: 95	US, inpatient Female: 94% Years followed: 10	Psychiatric/Psychological Substance abuse: 12%, Dependence: 7%
Strober et al. ²⁴ Cases: 95	US, inpatient Female: 90% Years followed: 10–15	Eating related Diagnostic: AN restricting: 3%, AN binge eating: 1%, BN: 10% Recovery, scale 2 ^c : Full recovery: 76%, Partial recovery: 86%
Tanaka et al. ³⁴ Cases: 68	Japan, inpatient Mean years followed: 8 (4–18)	Eating-related M-R general ^a : Good: 51%; Inter: 13%, Poor: 25% Mortality Deceased: 11% (Emaciation: <i>N</i> = 3; Suicide: <i>N</i> = 2; Murder: <i>N</i> = 1; Burn: <i>N</i> = 1)

Note: Population followed is all female unless otherwise specified. *Outcome significantly different from comparison group (*p* < 0.05). ABW, average body weight; AN, anorexia nervosa; ANBP, anorexia nervosa binge eating and/or purging subtype; ANR, anorexia nervosa restricting subtype; BMI, body mass index; BN, bulimia nervosa; ED, eating disorder; EDNOS, eating disorder-not otherwise specified; inter, intermediate; M-R scores: Morgan and Russell Scale; M-R-H Scale, Morgan-Russell-Hayward Scale; OCD, obsessive-compulsive disorder; OCPD, obsessive-compulsive personality disorder; PSR, psychiatric status rating scale; SMR, standardized mortality ratio; UK, United Kingdom; US, United States.

^aM-R general scale: Good: normal body wt (100% ± 15% avg body wt.); Inter: normal or near normal wt and/or menstrual abnormalities; Poor: low wt and absent or scanty menstruation (BMI and % wt details not provided).

^bRecovery scale 1: Fully: No current ED dx, >85% IBW, no current bingeing or purging; Partial: No current ED dx but reported current bingeing or purging or maintained body wt < 85% IBW. Chronically ill: met criteria for ED at time of interview.

prospective cohort studies with comparison groups (one study with two follow-up periods), case series with a comparison group (two studies), and case series with no comparison group (19 studies). Seventeen studies reported eating-related outcomes, 16 reported mortality, 7 reported psychiatric or psychological measures, and 4 reported biomarker outcomes.^{17–19,21–56} Only eight outcome studies included males.

Results from one prospective cohort study of individuals with AN (individuals identified through community screening) reflect follow-up measurements at five^{27,28,39} and 10 years.^{32,35,45} AN participants were 51 residents of Göteborg, Sweden (including three males), born in 1970, who had been diagnosed with AN as adolescents. Comparisons were Göteborg residents matched by age, sex, and school attended. Data from various articles discussing this study did not match exactly; therefore, we caution readers about ostensible trends across time based on data from different articles. All other evidence was obtained from case series (individuals identified during treatment) with and without a nondisease comparison group.

Eating-Related Outcomes

Eating-related outcomes across studies were measured using one or more of the following: (a) diagnostic criteria, i.e., whether the individual had AN, BN, or eating disorders not otherwise specified (EDNOS, which are eating disorders such as BED that do not meet criteria for AN or BN); (b) scales, such as the Morgan-Russell (M-R) General scale, or some modification of the scale measuring a combination of weight and menstrual functioning; and (c) measures of recovery accounting for weight and symptomatology over varying periods of time.

Prospective Cohort Study with a Comparison Group. At 5-year followup,^{27,28,39} approximately one-half of individuals in the Göteborg cohort with AN were considered recovered: 59% had no eating disorder diagnosis and 41% had a good outcome according

to M-R General scale criteria. However, 6% still had AN, 22% had BN, and 14% had EDNOS. The AN group was significantly less likely than the nondisease comparison group to be at normal body weight during the past 6 months. They also remained significantly more symptomatic on several measures such as dietary restriction, concern about body weight, worry about appearance, and Eating Attitudes Test (EAT) scores.

By 10 years,^{32,35,45} the M-R General scale outcomes had improved in the AN cohort. One-half had a good M-R scale outcome; the percentage with a poor outcome had declined from 24% at 5 years to 10% at 10 years. Still, 27% had an eating disorder diagnosis at followup. The AN group was significantly more likely than comparisons to have eating disorder symptoms in the past 6 months even though the groups did not differ significantly in weight. The AN group was also more likely to be worried about body weight and appearance.

Case Series Studies with Comparison Groups. The New Zealand study with a nondisease comparison group (residents of the same city matched on age) re-contacted female patients 12 years after referral for treatment for AN (inpatient, outpatient, or assessment at one facility).^{25,33} Of the AN patients, 30% were fully recovered at followup; 21% continued to have an eating disorder, including 10% who continued to meet diagnostic criteria for AN. All AN groups continued to exhibit worse eating-related outcomes than the comparison women, including lower actual and desired body mass index (BMI). Controlling for age and current AN status, individuals in the AN group reported worse scores on the Eating Disorder Inventory (EDI) drive for thinness and perfectionism subscales, and the Three Factor Eating Questionnaire Scale (TFEQ) cognitive restraint and hunger subscales.

A US study similarly found that approximately 27% of the AN group had no ED diagnosis at 10-year followup.¹⁸

TABLE 2. Footnote continued

^c M-R-H (Morgan-Russell-Hayward) scale: modification of Morgan-Russell scale, Good: 8–12; Inter (4–<8); Poor (0–<4).

^d Recovery scale 2: Recovered: above the 85% IBW cutoff, had no menstrual disturbances, reported no bingeing or purging behavior, and free from any other eating or body image disturbance: Good: > 85% IBW, normal menses but binged and purged < once/mo; Intermediate: intermittently at < 85% IBW, had some disturbed menses or some bingeing and purging behavior; Poor: < 85% of IBW with amenorrhea or frequent bingeing and purging (i.e., met criteria for BN, AN, or both).

^e Recovery scale 3: Full recovery: absence of symptomatology or the presence of minimal symptomatology for at least 8 consecutive weeks. Partial recovery: reductions of symptomatology to less than full criteria for at least 8 consecutive weeks. Relapse: return of full criteria symptomatology for at least 1 week following a period of full recovery.

^f Isager defined scale: loses 15% or more of weight acquired during the course of treatment.

^g M-R composite score: (average outcome score) of M-R Outcome Assessment Schedule derived from nutritional status, menstrual function, mental status, sexual adjustment, and socioeconomic status. Higher score is better recovery. On the basis of outcome score, created 3 outcome categories: poor, intermediate, and good.

^h PSR rating: Good (full recovery): 1; Inter (partial recovery): 2–4; Poor: 5–6 (full criteria for AN or deceased).

Case Series Studies with no Comparison Groups. Various case series indicating the persistence of eating disorders reported data from 5 to 15 years following treatment.^{21,22,24,30,36,42,46,49,50,57} The percentages of individuals with a given eating disorder diagnosis at followup were as follows: AN, 1–24%; BN, 2–25%; EDNOS, 2–36%. Between 24 and 82% of patients across studies had no eating disorder diagnoses at followup.

A common outcome measure across studies was the M-R General score. In four studies measuring M-R General scores at 6–12 years following treatment,⁵⁷ 27–58% of participants had a good outcome, 13–25% had an intermediate outcome, 11–42% had a poor outcome, and 1–11% were deceased.^{22,34,38,57} Another team used the Morgan-Russell-Hayward (M-R-H) scale, a modification of the M-R scales after adding items related to binge eating and vomiting to a subscale concerning dietary and eating patterns, body concern, and body weight.⁵⁰ After 5 years, outcomes were as follows: 34%, good; 54%, intermediate, and 13%, poor. A study conducted in Hong Kong measured outcomes using the M-R Composite score derived from nutritional status, menstrual function, mental status, sexual adjustment, and socioeconomic status; in a population of inpatient and outpatient participants, after an average of 9 years, outcomes were good for 62%, intermediate for 33%, and poor for 5%.^{30,46} Another common outcome measure was recovery, although recovery definitions varied appreciably across studies. For example, after following patients for approximately 12 years, one group reported that the average patient had a first recovery (first rating of M-R General outcome of good) in 5.8 years, with a greater likelihood of recovering in the first 6 years than later.⁴² Across two other studies, recovery ranged from 24 to 31% after 10 years.^{21,36}

Relapse is an important outcome. One Danish study assessed relapse rates as loss of 15% or more of the weight gained during treatment in a year's time.²³ In this study, after followup of 4–22 years, patients were experiencing a 3% average annual hazard rate of relapse.²³ In a US study that defined relapse as a return to full criteria symptomatology for at least 1 week following a period of full recovery, 40% of patients relapsed after a median of 8 years.⁵²

Factors Predictive of Eating-Related Outcomes

We report here on factors that, according to analytic models, were statistically significantly related to outcomes in at least one study. Other studies may have examined the same or similar factors and

not found them to be significant; because of the complexity of commenting on literally dozens of different models, explanatory variables, and definitions of outcomes, we generally do not report non-significant results. Age is an important predictive factor for AN; we discuss it later in the section related to sociodemographic characteristics.

Mental Health and Related Factors. A good M-R Composite score outcome was associated with a better overall general sense of control, a greater positive sense of control, and a lower negative sense of control.^{30,46} For inpatients, a good (vs. poor) M-R General score was associated with better mental state and psychosocial measures.³⁴ Poorer average M-R outcome scores in one UK study were associated with greater family hostility toward the patient, a disturbed relationship between the patient and family, and personality difficulties.³⁸

In one study, which did not control for length of followup, patients who no longer had an eating disorder were significantly less likely to be depressed or suffer from an anxiety disorder (except for obsessive compulsive disorder [OCD], which did not differ between groups).⁴⁹ Significant predictors of chronic AN (intermediate or poor outcome) included an extreme compulsive drive to exercise,²⁴ a history of poor social relationships preceding onset of illness,²⁴ worse evaluation scores concerning hypochondriasis, paranoia, and psychopathic deviance.³⁶ Higher scores on a global prognosis scale developed from the Anorexia Nervosa Symptom Score (ANSS) predicted persistence of AN symptoms.²⁶

Significant predictors of first recovery included less purging behavior⁴⁸ and the interaction of less purging and fewer social disturbances as measured by the ANSS.²⁶ In a descriptive analysis, recovered patients were less likely to have major affective disorder, anxiety disorders, and phobias.²¹

Predictors of a longer time to recovery included a more hostile attitude towards one's family and extreme compulsivity in daily routines.²⁴ Recovery measured using the Psychiatric Status Rating (PSR) scale indicated that poor long-term outcomes (after 21 years) were related to severe psychological symptoms and social problems and higher EDI perfectionism and interpersonal distrust scores.³¹ Factors associated with poor PSR scores included other psychiatric illness diagnoses before treatment.²² A compulsive drive to exercise at hospital discharge also predicted shorter time to relapse.⁵⁸

Duration of Illness and Symptomatology. Shorter duration of AN episode significantly predicted recovery after 4 years⁵³ and 8 years.⁵² Baseline factors asso-

ciated with relapsing versus persisting AN included shorter disease duration before first presentation and less frequent vomiting.²⁶

Earlier time to relapse (adjusted for duration of the hospitalization) included having a chronic disease outcome rather than partial or full recovery.⁵⁸ Worse M-R outcomes were associated with longer duration of food difficulties and longer duration of amenorrhea.³⁸ Binge eating in the month before treatment was related to poorer PSR outcomes.²²

Duration of Treatment. In one study, relapse was greater among those whose duration of therapeutic contact was less than 1 year.²³

Body Weight or Body Mass and Other Physiologic Measures. A higher percentage of average body weight (ABW) at intake predicted both a shorter time to both full and partial recovery.⁵² Higher BMI at followup, higher minimum BMI, and normalized menstrual functioning were associated with a good versus poor M-R General score among patients receiving inpatient treatment.³⁴ Significant predictors of first recovery included lower serum creatinine levels at baseline.^{26,48}

Poor long-term outcomes (after 21 years measured with the PSR) were related to low BMI and lower hemoglobin and alkaline phosphatase levels (at 12 years since inpatient admission)³¹ and lower body weight at the end of treatment.²² Low albumin levels,²⁶ more somatic symptoms, and more laxative use predicted persistence of AN symptoms.

Subtypes of Illness. Defining recovery as a lack of symptoms for at least 8 consecutive weeks, one study compared outcomes for restricting and binge/purge subtypes of AN. At 4-year followup, full recovery was achieved in 17% of individuals with the AN binge/purge subtype and in 8% of individuals with the AN restricting subtype. Rates for partial recovery were 81% in the binge/purge subtype and 54% in the restricting subtype.⁵³ After 8 years, significant differences in recovery rates between subtypes were no longer observed.¹⁹ Those with longer duration of illness and higher percent IBW were more likely to have the binge/purge subtype.¹⁹

Through 8-year followup, diagnostic crossover between the restricting and binge/purge subtypes was high. Of those with the restricting subtype, 52% developed the binge/purge subtype, with most of the crossover occurring in the first 5 years of followup.¹⁹ In contrast, other researchers found a lower rate of crossover (29%) after 10 years. The median time to onset of binge eating was 24 months from baseline admission.⁵⁸

In another study, better outcomes on the EAT-26 and the Eating Disorders Evaluation Questionnaire

were associated with an initial diagnosis of atypical AN (no fat phobia).³⁰ As measured by the Shapiro Control Inventory, typical versus atypical AN patients at followup had a lower sense of control in the domains of body and mind and a stronger desire for control.

Psychiatric/Psychological Outcomes

Prospective Cohort Study with a Comparison Group. Results from the Göteborg study found that, at 5 years, the AN group was significantly more likely to have personality disorders especially Cluster C personality disorders (avoidant, dependent, obsessive-compulsive, or passive-aggressive) as measured by the Structured Clinical Interview II for the DSM-IV (SCID II). In addition, individuals in the AN group had significantly greater rates than the comparison group of OCD, Asperger's syndrome, any autistic-like condition, and empathy disorder.²⁹

At 10 years,^{32,35,44} the AN group continued to be significantly more likely than the comparison group to have a personality disorder, OCD, and Asperger's syndrome or autism-spectrum disorder but not other anxiety disorders.^{32,35,44,45} Finally, The AN group had a higher lifetime prevalence of depression.⁴³

Case Series Studies with Comparison Groups. In two studies, the AN groups had higher rates of lifetime major depression and OCD.^{18,25,33} The New Zealand study found, after controlling for age, significant differences in the lifetime prevalence of major depression, mood disorders, OCD, anxiety disorders, and drug dependence.^{25,33} A US study also identified significantly greater rates of lifetime major depression and OCD in AN patients than in the comparison group.¹⁸

Case Series Studies with No Comparison Groups. AN subgroups differed in history of drug abuse, which was more likely among those with the binge/purge subtype (16%).¹⁹

Factors Predictive of Psychiatric/Psychological Outcomes

In the Göteborg study, being in the AN group was the only significant predictor of depressive disorder at 5-year followup (odds ratio [OR], 7.7; 95% CI, 1.15–19.6). At 10 years, being in the AN group (OR, 4.03; 95% CI, 1.15–14.19) and having a depressive disorder at 5 years were significant predictors of current depressive disorder. Absence of a mood disorder was significantly associated with resolution of the eating disorder. In another study, binge eating at treatment intake was the only significant predictor of the onset of a substance use disorder.⁴¹

Using stepwise regression, one team determined that higher scores on three Minnesota Multiphasic Personality Inventory (MMPI) subscales (hypochondriasis, paranoia, and psychopathic deviate) predicted poorer outcomes at 10-year followup.³⁶

Biomarker-Measured Outcomes

This category has very few studies primarily because many studies present measurement of weight and menstrual status through M-R General scale outcomes (discussed under eating-related outcomes).

Prospective Cohort Studies with Comparison Groups. At 5 years, the Göteborg study found that the AN group still weighed significantly less than the comparison group; a greater proportion of the AN group were appreciably underweight (lowest weight ≤ 45 kg); only half of the AN group in contrast to all of the comparison group were around average body weight.^{27,28} Regular or cyclical menstruation was significantly less likely in the AN group, and a larger percentage of the AN group (20%) had dysdiadochokinesis (inability to execute rapidly alternating movements).

At 10 years, various measures of weight (direct measures in kilograms, ABW, and mean BMI) did not differ significantly between groups.^{32,35,44} However, a significantly larger percentage of the AN group still did not have normal menstrual function and continued to demonstrate dysdiadochokinesis.

Case series Studies with Comparison Groups. The AN cohort in the New Zealand study had significantly lower BMI than comparison participants at 12 years (controlling for age and current AN status).^{25,33} Desired BMI was also lower in the chronically ill AN group than in recovered individuals or the comparison group.

Case series Studies with No Comparison Groups. A BMI of less than 17.5 at followup (criterion cutoff for AN diagnosis) was related to lower BMI at referral, older age at referral, and younger age at followup.³⁷ A higher BMI was significantly related to a better PSR scores at followup.³¹ At 10 years, lower weight was associated with greater food faddishness, laxative abuse, body image disturbance, fear of getting fat, disturbance in sexual adjustment, worse psychological adjustment, disturbed menses, and other weight loss behavior.²¹

Mortality Outcomes

The Göteborg study (through the 10-year followup) reported no deaths, so all mortality data came from case series studies. Several studies calculated standardized mortality ratios (SMR), allow-

ing for comparison to the population based on age, sex, and time when the patient population was drawn; other studies reported only the number of deaths during the followup period.

The SMRs were elevated in the AN groups and ranged from 1.36 among females 20 years following treatment to 30.5 among females at <1 year following treatment.^{17,21,30,47,54,55} In one study, SMRs were significantly elevated in a female patient population through 14 years of followup but not beyond that point.⁴⁷ Among mostly female AN patients (96%) who had received hospital treatment in the United Kingdom between 1971 and 1981, the SMR was significantly elevated at 4 years but not at 8 years.⁵⁶

Factors Predictive of Mortality Outcomes

In the UK study, predictors of death included weight less than 35 kg at presentation and more than one inpatient admission.⁵⁶ In another study that followed patients for approximately 9 years, significant predictors of mortality (controlling for age and duration of illness before intake) included greater severity of alcohol use disorders, greater severity of substance use disorders, worse social adjustment, and worse Global Assessment of Functioning (GAF) scores. Predictors of shorter time to death included longer duration of illness at treatment intake, history of hospitalization for an affective disorder, suicidality associated with mental illness other than an ED, substance abuse, and worse severity of alcohol use over the course of the illness.⁵⁵ A third study found that deceased patients were significantly more likely to have had a psychiatric hospitalization for AN.²³

Suicide was a common cause of death. Among a group of US females with adolescent AN onset, the suicide-related SMR was 58.1, significantly higher than that for the population as a whole.⁵⁴ Thirty percent of the patients had a history of suicide attempts before they entered the study; during the study, 22% attempted suicide. A history of a suicide attempt at intake significantly predicted time to a future attempt. A history of suicide attempts at intake, greater drug use, participation in individual therapy, use of neuroleptic medications, and older age at disease onset all predicted a first suicide attempt during the course of the study.⁵¹

A history of suicide attempts was significantly different among patient subtypes in one study—lower in the pure restricting group than other groups.¹⁹ However, the groups did not differ in rates of death by all causes at 8-year (median) followup.

TABLE 3. Outcomes: bulimia nervosa

Authors, Year	Characteristics	BN Group Outcomes
Case Series, Comparison Groups		
Fichter and Quadflieg. ⁶² Cases: 163 Comparisons: 202	Germany, inpatient Years followed: 12	<p>Eating related Diagnostic (at 6 years): AN: 4%, BN purge: 21%, BN nonpurge: 1%, BED: 1%, EDNOS: 1%, No ED: 71%, Diagnostic (at 12 years): AN: 2%, BN purge: 10%, BN nonpurge: 1%, BED: 2%, EDNOS: 14%, No ED: 71% Bingeing (at 12 years): at least twice per week: 22%, less than twice per week: 18%, none in preceding 3 months: 60%</p> <p>Psychiatric/Psychological At 12 years: Mood disorder: 17%, Major depression: 11% Anxiety: 22%, Substance use: 15%, Borderline personality disorder: 10%; Lifetime: Mood disorders: 69%, Major depression: 58%, Anxiety: 36%, Substance use: 36%</p> <p>Mortality Deceased (at 6 years): 1%, Deceased (at 12 years): 3% SMR: 2.36</p>
Case Series, No Comparison Groups		
Ben-Tovim et al. ⁵⁰ Cases: 86	Australia, specialist services Years followed: 5	<p>Eating related Diagnosis at FU: AN: 1%; BN: 8%; EDNOS: 13%; No ED: 74%; Unknown: 5%; Deceased: 0% M-R-H³ Outcomes: Good: 76%; Intermediate: 19%; Poor: 2%; Unknown: 2%</p>
Fairburn et al. ⁵⁹ Fairburn et al. ⁶¹ Stice and Fairburn, ⁷¹ Cases: 92	UK, outpatient Years followed: 5	<p>Eating related Diagnosis at FU: BN: 15%; BED: 7%; AN: 1%; EDNOS: 32% Any DSM-IV ED: 49%; Remission^b: 35%; Relapse^c: 26%</p> <p>Psychiatric/Psychological Substance use overall: 3% Major depression: Overall: 9%; Dietary: 61%; Dietary-depressive: 81% ($p < 0.05$) Panic disorder: Dietary: 75%; Dietary-depressive: 33% ($p < 0.05$) Obsessive-compulsive disorder: Dietary: 2%; Dietary-depressive: 25% ($p < 0.05$) Generalized anxiety disorder: Overall: 17%; Dietary: 11%; Dietary-depressive: 47% ($p < 0.05$) Agoraphobia: Dietary: 4%; Dietary-depressive: 36% ($p < 0.05$)</p> <p>Biomarker measured Weight: 69.8 kg, BMI: 25.5</p>
Fichter and Quadflieg ⁶³ Cases: 185	Germany, inpatient Years followed: 6	<p>Eating related Diagnostic: AN: 4%, BN: 21%, BED: 1%, EDNOS: 2%, No ED: 71% Global Outcome^d: Good: 60%, Inter: 29%, Poor: 10%</p> <p>Psychiatric/Psychological Borderline personality disorder: 4%, Substance abuse 21%, Mood disorders: 46%, Anxiety: 32%</p> <p>Mortality Deceased: 1%</p>
Franko et al. ⁵¹ Cases: 110	US, ED assessment Years followed: 9	<p>Mortality Suicide attempts: 11%</p>
Gendall, Bulik et al. ⁶⁴ Cases: 82	New Zealand, outpatient Years followed: 1	<p>Biomarker measured Irregular menses: 30.5%</p>
Herzog et al. ⁶⁵ Cases: 96	US, ED assessment Years followed: 1	<p>Eating related First shift to subclinical BN diagnosis (loss of full criteria without considering duration): 86% Recovery^e: Full: 56%, Partial: 71%</p>
Herzog et al. ⁵³ Cases: 150	US, ED assessment Years followed: 4	<p>Eating related Recovery^e: Full: 62%; Partial: 91%</p>
Herzog et al. ⁵² Cases: 110	US, ED assessment Median years followed: 8	<p>Eating related Recovery^e: Full: 74%; Partial recovery: 99% Relapse after full recovery: 35%</p>

TABLE 3. Continued

Authors, Year	Characteristics	BN Group Outcomes
Jäger et al. ⁶⁶ Cases: 80	Germany, inpatient and outpatient Years followed: 8	Eating related Diagnostic: BN: 29%; EDNOS (bulimic): 9%; EDNOS (anorexic): 1%; None: 61% No binges per week: 63%
Keel et al. ⁶⁹ Keel, Mitchell, Davis et al. ⁶⁸ Keel, Mitchell, Miller et al. ⁷⁰ Cases: 173	US, outpatient Mean years followed: 12	Eating related Diagnostic: At followup: BN: 11%; AN: 1%; BED: 1%; EDNOS: 19%; Lifetime history of AN: 36%; lifetime history of BED: 11% Narrow definition of remission ^f : Full: 42%, Partial ^g : 28% Broad definition of remission ^h : Full: 47%, Partial ^g : 23% Biomarker measured BMI: 22.1, Weight: 60.7 kg
Keel et al. ⁵⁵ Cases: 110	US, outpatient Mean years followed: 9	Mortality Deaths: 1, SMR: 1.3, CI (0.0, 7.2)
Patton et al. ⁵⁶ Cases: 96	US, ED assessment Female: 96% Mean years followed: 6 (4–15)	Mortality Deaths: 3 (2 car accidents, 1 low weight) Crude mortality rate: 3.3, SMR: 9.38 ($P = NS$)

Note: Population followed is all female unless otherwise specified, AN, anorexia nervosa; BMI, body mass index; BN, bulimia nervosa; ED, eating disorder; EDNOS, eating disorder-not otherwise specified; SMR, standardized mortality ratio; UK, United Kingdom; US, United States.

^aM-R-H (Morgan-Russell-Hayward) scale: modification of Morgan-Russell scale, Good: 8–12; Inter (4–<8); Poor (0–<4).

^bRemission: No DSM IV eating disorder diagnosis

^cRelapse: Recurrence of any DSM IV eating disorder diagnosis.

^dGlobal outcomes: SIAB supplemented by PSR, aggregating 10 outcome categories including over-concern with eating and weight, binge attacks, counterregulatory measures, body weight, depression, obsession etc. with Good: 1 or 2, Inter: 3–4, Poor: 5–6.

^eRecovery: Full: at least 8 consecutive weeks at a PSR level of 1 or 2, Partial: at least 8 consecutive weeks of a PSR level of 3 or 4 or < 8 consecutive weeks at a PSR of 1 or 2.

^fNarrow definition of remission: Freedom from disordered eating for at least 6 months, weight and shape concern could not unduly influence how subject felt about or evaluated herself.

^gPartial remission: Not meeting criteria for full remission and not meeting DSM IV criteria for any eating disorder.

^hBroad definition of remission: Absence from disordered eating for at least 8 weeks with no restrictions based on influence of weight or shape on self-evaluation.

Bulimia Nervosa Outcomes and Predictive Factors

Our discussion of BN outcomes includes 8 studies reported in 20 articles (Table 3).^{50–56,59–71} The BN literature that met our inclusion criteria included only case series studies. One study had a nondisease comparison group; all other studies had no comparison group.

Eating-Related Outcomes

In the Fichter and Quadflieg case series study with a comparison group, patients who had received inpatient treatment for BN were followed for 12 years and compared with individuals who had never received treatment for an eating disorder on the Structured Inventory for Anorexic and Bulimic Syndromes, Expert-Rating version (SIAB-EX).⁶² On this measure, at 12-year followup the BN group as a whole was significantly more symptomatic than the comparison group, including individuals with BN who were considered to be recovered. Among just the BN group, total EDI scores were worse at 2 year than at discharge but no different from discharge at 6 years.⁶³ Still, by 12-year followup, 67% of the group were recovered and had no eating disorder diagnosis.⁶²

Case series studies with no comparison groups yielded mixed outcomes. At 5 years in one study, BN patients across the age span recruited through general practitioners and psychiatrists had improved since baseline on a variety of measures including a significant reduction in recent mean number of objective bulimic episodes, self-induced vomiting episodes, and laxative misuse.^{59–61,71} Eating Disorder Examination (EDE) interview measures that significantly improved included those measuring restraint, shape concern, weight concern, and eating concerns.

In a US study of women who had sought treatment in Boston eating disorder programs, the percentage of the group that fully recovered increased over time. By 7 years, 73% had achieved a full recovery (no symptoms or only residual symptoms for at least 8 consecutive weeks) at some point during followup.⁵² The trend was similar for partial recovery at some point during followup and included 98% of participants after 7 years.⁵² By 7 years, however, 35% of women who had previously met criteria for being fully recovered had relapsed.

Exploring the impact of six different definitions of full recovery on outcome reporting in a US case series of females with a mean of 11.5 years of fol-

lowup, investigators reported full recovery in 38–47% of participants.⁶⁸ These percentages were linearly related to the duration of abstinence required by the definition of recovery⁶⁸; for every additional month of abstinence required for full recovery, approximately 1% of women were reclassified from fully to partially remitted.⁶⁹

One German study compared women who received conflict-oriented inpatient therapy with those who had received systemic outpatient treatment. At 8-year followup, binge eating episodes, severity of bulimia, food restriction, and EAT measures of bulimia and dieting significantly decreased in those who had received inpatient or outpatient treatment; in addition, the number of normal meals consumed increased.⁶⁶ Still, the inpatient group had a greater decline than the outpatient group, on two measures developed by the author, a severity index and a score of restrictive intake comprising 14 possible behaviors.

Factors Predictive Of Eating-Related Outcomes

In the Fichter and Quadflieg study, lifetime psychiatric comorbidity predicted a significantly higher probability of having any eating disorder at 2 and 6 years but not at 12 years. In contrast, after 12 years, greater lifetime psychiatric comorbidity significantly predicted a higher probability of having a poorer PSR score (OR, 3.71; 95% CI, 1.16–11.91); a lifetime history of AN and older age at disease onset also predicted a worse PSR at 12 years.⁶²

Significant predictors of continued BN (or AN) status at 6 years (adjusted for type of treatment and duration of followup) included paternal obesity (OR, 5.73; 95% CI, 1.56–21.1) and premorbid obesity (OR, 4.31; 95% CI, 1.35–13.7).⁶⁰

The Boston study, investigating recovery at 1, 4, and 7 years, tested numerous predictors; none was significant (including IBW, duration of the current disorder episode, age at onset of the current eating disorder, age at onset of the first eating disorder, weight, binge and purge frequency, and the co-occurrence of various other disorders including those involving a lack of impulse control, depression, personality and any Axis I disorder).^{52,53,65}

Patients in family practices in Oxfordshire, England, with persistent disease (at least two episodes of behavior at one or both of last two assessments) and remitted disease (not engaged in any relevant behavior over past 3 months) were compared with respect to binge eating and compensatory behavior.⁶¹ Baseline duration of disturbed eating, overvaluation of shape and weight were related to being

in both groups; worse social adjustment was related to persistence of binge eating behavior but not to compensatory behavior. Binge eating and compensatory behaviors were significant predictors of each other.

Prognostic factors significantly related to both categorical outcomes (full or partial remission vs. not in remission) and continuous outcomes (log of the number of months since last binge/purge episode) in a US study included mood disorder, substance use, and impulse control disorders.⁷⁰ In the same population, comparisons of factors associated with six specifications of recovery from BN found numerous factors significantly related to recovery in at least four specifications: depression, body image disturbance, impulse control, and social adjustment; affective disorder, substance use, current medications, BMI, and not currently being in therapy. Age at presentation was significant in three models.⁶⁸

Baseline depression was both independent of and superior to bulimic symptoms in predicting body dissatisfaction at followup,⁶⁷ demonstrating a direct association between depression and body dissatisfaction, independent of bulimic symptoms.

A study using cluster analysis to group BN patients into dietary and dietary-depressive subtypes based on baseline restraint, depression, and self-esteem scale scores found that those in the dietary-depressive subtype were significantly more likely to have lifetime psychiatric treatment for eating disorders at baseline and during followup, greater persistence of binge eating and compensatory behaviors, and diagnoses of major depression, OCD, panic disorder, social phobia, generalized anxiety disorder, and agoraphobia.⁷¹

Psychiatric/Psychological Outcomes

The one case series study with healthy comparisons recorded psychiatric comorbidities only in the BN group.^{62,63} General psychopathology, as measured by the global severity index of the Symptom Checklist 90-Revised (SCL-90), showed that symptoms deteriorated between end of treatment and 2-year followup but had improved by 6-year followup from status at the end of treatment.⁶³ At 12 years, 41% had a psychiatric disorder in the month before assessment. Half of the patients had suffered from a lifetime mood disorder or major depression; 36% had suffered from an anxiety or substance use disorder.⁶²

In the German case series with no comparison group that compared conflict-oriented inpatient

TABLE 4. Outcomes: binge eating disorder

Authors, Year	Characteristics	BED Group Outcomes
Case Series, Comparison Groups		
Busetto et al. ⁷⁴ Cases: 130 Comparisons: 249	Italy, obese Female: 73% Years followed: 5	Eating related Excess weight loss > 50%: 23% Percent excess weight loss < 20%: 24% Weight regain: 21% Stoma stenosis: 26%; pouch dilatation: 25%; esophageal dilatation: 10%; stomach slippage: 9%; postoperative band adjustments: 2%
Case Series No Comparison Groups		
Fichter et al. ⁷² Cases: 62	Germany, inpatient Years followed: 6	Eating related Diagnosis at FU: AN: 0%; BN: 7%; BED: 6%; EDNOS: 7%; No ED: 78%
Wilfley et al., ⁷³ Cases: 92	US, outpatient Female: 83% Years followed: 1	Psychiatric/Psychological Mood disorder: current: 22%, lifetime: 61% Anxiety disorder: current: 13%, lifetime: 29% Substance abuse disorder: current: 4%, lifetime: 33%

Note: Population followed is all female unless otherwise specified. AN, anorexia nervosa; BMI, body mass index; BN, bulimia nervosa; ED, eating disorder; EDNOS, eating disorder-not otherwise specified; SMR, standardized mortality ratio; US, United States.

therapy with systemic outpatient treatment, at 8 years follow-up depression had declined in both groups; the decline was greater in those who received inpatient treatment.⁶⁶

Biomarker Outcomes

One case series with no comparison group reported menstruation outcomes among females who had participated in outpatient treatment trials in New Zealand. Approximately 31% had irregular menses at 1-year followup.⁶⁴

Several studies reported improvements over time in weight measures. After 5 years, Fairburn and colleagues found that participants' mean weight and BMI had increased.⁵⁹ At 6-year followup, Fichter and Quadflieg found that 74% of their participants were in the good weight range ($19 < \text{BMI} < 30$).⁶³ Similarly, Keel et al. measured differences in weight variables in females followed for approximately 11 years.⁶⁹ BMI, actual weight, desired weight, and highest weight all significantly increased over time.

Factors Predictive of Biomarker Outcomes

In multivariate analyses, irregular menses at 1-year followup were significantly related to a greater lifetime maximum-minimum weight difference and current smoking.⁶⁴

Mortality Outcomes

Across BN studies, either no participants were deceased or the SMR was not significantly different from the rate expected in the population matched by age and sex.^{54-56,62}

Factors Predictive of Mortality Outcomes

Significant predictors of shorter time to first suicide attempt in a group of women with BN who

had sought treatment at Boston area clinics at approximately 9-year followup included receiving group therapy, receiving individual therapy, younger age at onset, a history of drug use disorder, paranoid personality disorder at intake, and greater severity of laxative use.⁵¹

Binge Eating Disorder Outcomes and Predictive Factors

Outcomes. Three studies met our inclusion criteria for this section (Table 4). All were case series; one included a comparison group.⁷²⁻⁷⁴ The case series with a comparison group explored a special population of individuals undergoing laparoscopic adjustable gastric banding.⁷⁴ Those with BED experienced more band adjustments and more pouch and esophageal dilatations than those without BED. At 5 years, the groups did not differ on measures of either weight loss or weight regain.

In one German study, at 6-year followup, 78% had no ED diagnosis, 6% continued to have a BED diagnosis, and a minority had developed BN or EDNOS over the followup interval.⁷² Over the follow-up interval, depression, anxiety, and obsessiveness measures improved.

Predictive Factors. The second case series examined the impact of comorbid psychopathology and personality disorders on treatment outcome for BED.⁷³ Individuals with cluster B personality disorders reported a greater number of binge days at 1-year followup.

Outcomes by Sociodemographic Characteristics

Age was the most commonly examined sociodemographic factor, and it appeared chiefly in AN studies. No study that we reviewed presented outcomes based on participant age at followup. Some

studies limited participants to those whose AN onset was during adolescence, but none specifically compared outcomes of those with adolescent onset to those with older onset.

Some AN investigators used age as a covariate and found younger age at onset to be related to better outcomes. In various studies, younger age at referral was related to a good M-R scale rating³⁴; earlier onset of disease was a significant predictor of recovery versus persistent or relapsing disease AN at 12-year followup²⁶; and suicide attempts were more likely among those whose disease began at an older age.⁵¹ Younger age at referral and at admission were associated with better M-R General scores among patients treated on an inpatient basis.³⁴ Baseline factors associated with relapsing versus persisting AN included being younger at first presentation.²⁶

In contrast, in other AN studies, age at onset was not a significant factor in predicting chronic AN²⁴ or time to recovery.⁵³ Lastly, one study found that although age at onset was not significantly related to lower BMI at followup,³⁷ older age at referral and younger age at followup predicted a worse outcome.

In BN studies, one researcher found that age at disease presentation significantly predicted BN in three of six outcome specifications.⁶⁸

Looking across all three diseases, no studies yielded information on gender (the social role of being a man or a woman). Very few studies included males and even if they did, males were never more than 10% of the analysis sample; thus, essentially no information is available on the influence of sex (male versus female) on eating disorder outcomes. Only a handful of studies reported the race, ethnicity, or cultural background of participants,^{17,24,41,51,73} again, no studies compared groups or reported outcome differences by these characteristics.

CONCLUSION

Strength of the Body of Literature

We evaluated the strength of the bodies of evidence available to address these issues for each disorder. Considerable evidence speaks to factors related to outcomes among individuals with AN and BN. We rated the evidence for both these disorders as moderate (i.e., studies of strong design, but some uncertainty because of inconsistencies or concern about generalizability, bias, research design flaws,

or adequate sample size). In contrast, the evidence available to address factors related to BED outcomes was much more limited and, thus, weak (i.e., a limited number of studies of weaker design or studies with strong design are inconclusive).

The AN outcomes literature included one prospective cohort study and two case series with comparison group designs. The remaining literature follows case series of patients without comparisons. Some studies applied strong methodological designs that controlled for length of followup and the effect of independent predictors. Factors associated with worse outcomes included other psychological symptoms including depression, mood and anxiety disorders, social functioning, longer duration of disease, and substance abuse.

The BN outcomes literature included no prospective cohort studies but did include several studies with strong designs, including one case series study with a comparison group. Factors clearly associated with worse outcomes across studies included depression, substance use, and worse impulse control; the importance of other predictive variables remains uncertain.

The BED literature comprised only three studies. Much of the data from these studies was descriptive and offered very limited information concerning factors related to outcomes.

We used these bodies of literature to examine differences in outcomes by sex, gender, age, race, ethnicity, or cultural group. For these questions, we graded the AN literature as weak and the BN and BED literature as nonexistent. For AN, evidence suggested that younger age at onset may be associated with better outcomes. The AN literature yielded no evidence to evaluate differences in outcomes by any other of the selected demographic characteristics.

Issues in the Literature and Directions for Future Research

Gaps in the Evidence Base. Over time, many former AN and BN patients no longer had these disorders. Nevertheless, many continued to suffer for long periods of time from some lesser forms of the conditions, typically described as EDNOS. Virtually nothing is known about the persistence and factors associated with this latter condition.

Nearly all the outcome results and relationships that we identified came from case series studies, limiting generalizability beyond the treatment population being studied. Only one prospective cohort study has been conducted with individuals identified with AN and none among persons with either

BN or BED. Therefore, little evidence exists as to whether outcomes differ across treatment populations, in individuals in the general population who suffer from these disorders, and in those who may not meet threshold diagnostic criteria yet report symptoms or features of the disorders.

Information about factors that predict outcomes was drawn from only a handful of studies and was occasionally conflicting. All these variables can generate hypotheses about potential future studies that, ideally, would include comparison or control groups. In addition, conducting longitudinal investigations outside populations identified solely through treatment centers could inform both epidemiology and knowledge about natural course of these diseases (especially in non treatment-seeking individuals).

Virtually nothing is known concerning disparities in outcomes based on sex, gender, age, race, or ethnicity. Future research should strive to include a varied population in studies, report these characteristics, and analyze differences between groups.

Although the facilitating nature of sociocultural forces such as emphasis on thinness and unhealthy dieting have long been acknowledged, few outcome studies have attempted to measure the impact of these pernicious contextual factors. Although these variables are less tractable (for study design and conduct) than more readily measured factors such as eating-disordered behaviors, depression, anxiety, or biomarkers, greater attention to developing effective methods to measure these contextual factors may reveal important and often overlooked factors that influence recovery. This in turn may open new avenues for prevention, community education, and policy.

Measurement Problems. Investigators used a large number of diagnostic and outcome assessment measures; these reflected numerous definitions of stage of illness, remission, recovery, and relapse. The lack of consistency of measures makes comparisons across studies very difficult. Consolidation of measures and standardized definitions and reporting guidelines fielder critical to the further advancement of the field.

For AN, BN, and BED, investigators did not apply consensus definitions of stage of illness, remission, recovery, and relapse. Developing standardized definitions of these terms for each disorder and devising ways to evaluate them are high priorities for future research. Accomplishing this will require a concerted and orchestrated effort to bring researchers together to develop such definitions and reporting guidelines.

Researchers commonly reported outcomes such as percentage reduction in binge days, percentage reduction in binge episodes, or amount of time spent binge eating. Although these are potential indicators of therapeutic change, when used alone they can be misleading because individuals with high weekly binge episode counts can reduce this behavior by even as much as 50% but still be highly symptomatic. Depending on the disorder and core behaviors being targeted, future studies should report either abstinence from binge eating, vomiting, and other compensatory behaviors or absence of binge days for a specified duration of time (at least 1 month but preferably longer).

Incomplete reporting of results derived from multivariate models makes evaluation of results difficult. Authors should take care to report clearly the methods used and all variables included in analyses.

One serious gap in the evidence base about eating disorders is the absence of “cross talk” between the outcomes and the treatment literatures. Outcomes literature reveals intriguing problems that persist years after the onset of AN. One example is the presence of autism spectrum disorders reported in the Göteborg cohort.^{27–29,32,39} Such observations could provide critical information to individuals designing new interventions for AN. Targeting social information processing deficits, for example, could be one way to enhance AN treatment delivery. Paying greater attention to premorbid traits and traits that persist after recovery or through persistent illness may help to enhance treatment efficacy by identifying new treatment targets.

In addition, greater attention to demographic patterns in outcome studies such as typical age of recovery from AN may assist with better appraising where an individual entering treatment is in the course of her or his illness. This could assist with enhancing engagement in treatment and reducing the number of dropouts.

Little in this literature provides definitive guidance for clinicians about factors that may facilitate (or hinder) therapeutic success. Generally, we conclude that clinicians need to pay close attention to comorbid psychiatric disorders (including substance abuse), disease subtype, and age of onset or duration of disease.

Outcome studies, especially for BN and BED, should emphasize population-based cohort studies with comparison groups and plan for adequate length of followup. Ongoing psychiatric epidemiology studies should routinely assess eating disorders. Epidemiologic studies of BMI and obesity trends should examine eating-disordered behavior to help understand the role of disordered eating in

obesity. Population-based studies should measure disability and impairment associated with eating disorders. For both future treatment and outcome studies, researchers must carefully attend to issues of statistical power, research design, and sophistication and appropriateness of statistical analyses.

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