Eating Disorders During Adolescence and the Risk for Physical and Mental Disorders During Early Adulthood

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Background: Data from a community-based longitudinal investigation were used to investigate whether adolescents with eating disorders are at an elevated risk for physical and mental disorders during early adulthood.

Methods: Psychosocial and psychiatric interviews were administered to a representative community sample of 717 adolescents and their mothers from 2 counties in the state of New York in 1983, 1985 to 1986, and 1991 to 1993. In 1983, the mean age of the youths was 13.8 years.

Results: Adolescents with eating disorders were at a substantially elevated risk for anxiety disorders, cardiovascular symptoms, chronic fatigue, chronic pain, depressive disorders, limitations in activities due to poor health, infectious diseases, insomnia, neurological symptoms, and suicide attempts during early adulthood after age, sex, socioeconomic status, co-occurring psychiatric disorders, adolescent health problems, body mass index, and worries about health during adulthood were controlled statistically. Problems with eating or weight during adolescence predicted poor health outcomes during adulthood, regardless of whether an eating disorder had been present. Only 22% of the adolescents with current eating disorders had received psychiatric treatment within the past year.

Conclusion: Eating disorders during adolescence may be associated with an elevated risk for a broad range of physical and mental health problems during early adulthood.

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P ATIENTS WITH severe eating disorders have elevated rates of physical illness,[1-9] psychiatric disorder,[10-16] suicide,[17] and mortality.[18-20] However, relatively little is known about the association between eating disorders and subsequent health problems among individuals in the general population.[21] Nearly all of the population-based epidemiological studies of eating disorders and associated health problems have been cross-sectional investigations. Directional inferences cannot be made from cross-sectional data, and longitudinal research is needed to investigate whether individuals with eating disorders in the community are at an elevated risk for subsequent health problems. Because eating disorders often develop during adolescence,[22] it is of particular interest to examine the long-term health outcomes associated with adolescent eating disorders.

Most of the information available regarding the course and sequelae of eating disorders has been provided by treatment outcome studies. Most of these studies have investigated the outcome of treatment for anorexia nervosa, although the outcome of adolescent-onset anorexia nervosa has not been extensively investigated.[23] A few recent studies have examined outcomes associated with bulimia nervosa, but little information is available regarding the long-term outcome of patients with bulimia nervosa.[24] Most treatment outcome studies have investigated the course of eating disorder symptoms, and relatively little information has been obtained regarding other outcomes, including physical and mental disorders.[25] The available findings indicate that, while many patients who are treated for eating disorders have fair or satisfactory outcomes, patients with poor treatment outcomes are at risk for physical illnesses,[26-28] psychiatric disorders,[29-31] suicide attempts,[28] and mortality.[32,33]

Yet, because participants in treatment outcome studies tend to have severe eating disorders and co-occurring health problems, the findings may not be applicable to adolescents with eating disorders in the community. Most eating disorders are not detected by primary care physicians,[34] and most individuals with

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PARTICIPANTS AND METHODS

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The participants in the present study were 717 youths (51% females) and their mothers, who completed research interviews conducted in 1983, 1985 to 1986, and 1991 to 1993.[38] The participating families were a subset of 976 randomly sampled families from 2 upstate New York counties, with children ranging in age from 1 to 10 years, with whom maternal interviews had been conducted in 1975.[39] During the 3 follow-up interviews, which were administered by extensively trained and supervised lay interviewers, the youths and their mothers were interviewed to assess Axis I and II psychiatric disorders and demographic and other psychosocial variables. The mean age of the youths was 13.8 (SD, 2.6; range, 9-19) years in 1983, 16.1 (SD, 2.7; range, 11-23) years in 1985 to 1986, and 22.0 (SD, 2.7; range, 17-28) years in 1991 to 1993. The families in this study generally represented families in the northeastern United States for socioeconomic status and most demographic variables (38%), but they reflected the sampled region, with high proportions of those taking the survey being Roman Catholic (54%) and white (91%). Study procedures were approved according to appropriate institutional guidelines. Written informed consent was obtained after the interview procedures were fully explained. Youths and their mothers were interviewed separately, and both interviewers were blind to the responses of the other informant. Additional information regarding the study methods is available from previous reports.[38,39]

ASSESSMENT OF PSYCHIATRIC DISORDERS, TREATMENT, AND PHYSICAL HEALTH PROBLEMS

The parent and youth versions of the Diagnostic Interview Schedule for Children (DISC-I)[40] were administered in 1983, 1985 to 1986, and 1991 to 1993 to assess anxiety (obsessive-compulsive disorder, overanxious disorder, panic disorder, separation anxiety disorder, and social phobia), disruptive (attention-deficit disorder, conduct disorder, and oppositional defiant disorder), eating (anorexia nervosa, binge-eating disorder, bulimia nervosa, and eating disorder not otherwise specified), depressive (dysthymic disorder and major depressive disorder), and substance use (alcohol and other drug abuse or dependence) disorders. The eating disorders module of the DISC-I assessed height, weight, and specific eating and weight problems. The height and weight data were used to compute the youths' body mass index (BMI) (calculated as weight in kilograms divided by the square of height in meters). Following the publication of *DSM-IV*, computerized diagnostic algorithms were developed to determine whether the diagnostic criteria for *DSM-IV* eating disorders were met. Eating disorder not otherwise specified was diagnosed, in accordance with *DSM-IV* guidelines, if there were clinically significant eating problems (eg, anorexia without amenorrhea or self-induced vomiting), but these symptoms did not meet the criteria for a specific eating disorder. Parents and youths were interviewed because research has demonstrated that the use of multiple informants tends to increase the reliability and validity of psychiatric diagnoses.[41,42] Symptoms were considered present if reported by either informant. Diagnostic findings were not provided to either informant. Parental and youth reports of psychiatric symptoms were positively correlated in the entire sample ($r=0.38$, $P<.001$) and in the subsample of youths with eating disorders ($r=0.40$, $P=.01$).

eating disorders in the community do not receive treatment.[35] Although some epidemiological studies[35-37] have examined the course or development of eating disorders, to our knowledge, no population-based prospective longitudinal study has investigated the association between adolescent eating disorders and a broad range of physical and mental health problems during adulthood.

We report such epidemiological findings from the Children in the Community Study. Statistical procedures are used to control for age, sex, and parental income, which are associated with many physical and psychiatric symptoms. Preexisting health problems during adolescence are also controlled, permitting investigation of the hypothesis that adolescent eating disorders contribute to an increased risk for the development of mental and physical health problems.

RESULTS

DESCRIPTIVE STATISTICS

Thirty-six female subjects (10%) and 4 male subjects (1%) had eating disorders during early or middle adolescence (**Table 1**). Of the 40 adolescents with current eating disorders, 9 (22%) had received treatment from a mental health professional during the past year. Of these 9 youths, 8 (89%) had co-occurring psychiatric disorders. In comparison, 17 (55%) of the 31 youths who were not treated by a mental health professional had co-occurring psychiatric disorders ($\chi^2=3.45$, $P=.06$). Four individuals had eating disorders during adolescence and early adulthood. Youths with eating disorders had a mean of 6 problems with eating or weight during adolescence, regardless of treatment status.

The BMI scores of adolescents with eating disorders were not significantly ($t_{715}=1.60$, $P=.12$) different from those of adolescents without eating disorders. However, the adolescents who reported strict dieting ($t_{715}=6.38$, $P<.001$), eating alone to conceal unusual eating behavior ($t_{715}=3.03$, $P=.004$), frequent exercise to lose weight ($t_{715}=9.27$, $P<.001$), fasting for at least 24 hours ($t_{715}=3.45$, $P=.001$), recurrent fluctuations in weight ($t_{715}=4.36$, $P<.001$), self-induced vomiting ($t_{715}=2.32$, $P=.02$), and the use of medication to lose weight ($t_{715}=3.48$, $P=.001$) had significantly higher BMI scores at a mean age of 16.1 years than those who did not have these eating or weight problems.

Previous research[43] has indicated that the reliability and validity of the DISC-I as used in the present study are comparable to those of other structured interviews.[43]

Personality disorders were assessed with items from the Personality Diagnostic Questionnaire,[44] the DISC-I, and other measures.[38] Items were selected based on correspondence with *DSM-III-R*[45] diagnostic criteria, combined using algorithms developed by a psychiatrist and 2 clinical psychologists,[46] and subsequently modified to correspond with revisions in the *DSM-IV*[22] diagnostic criteria. Adolescent personality disorder diagnoses were assigned only if youths met the *DSM-IV* diagnostic criteria in 1983 and 1985 to 1986 or if they met the *DSM-IV* diagnostic criteria at one assessment and were within one criterion of the diagnosis at the other assessment. Research[47-49] has supported the reliability and validity of the items and algorithms used to assess personality disorders.

The version of the DISC-I administered in the present study was expanded to assess the following physical health problems during adolescence and early adulthood: cardiovascular illness, chronic allergies, chronic fatigue, chronic orthopedic problems, chronic or frequent insomnia, chronic or frequent pain, chronic respiratory illnesses, limitations in activities due to poor health, migraine or other chronic headaches, neurological symptoms (eg, epilepsy), other chronic illnesses (eg, diabetes), worries about health problems, and fair or poor overall health. Susceptibility to infectious diseases (eg, influenza) was assessed during early adulthood with an item assessing whether the participant tended to become "sick more easily than other people." These health problems were considered present if reported by either informant. Parental and youth reports of physical health problems were positively correlated in the entire sample ($r=0.42$, $P<.01$) and in the subsample of youths with eating disorders ($r=0.61$, $P<.01$). Additional questions regarding psychiatric treatment were asked during the maternal interviews and during the youth interview in 1991 to 1993. The respondents were asked if the youth had received treatment from a mental health professional and if such treatment had been provided in the past year. Data were not obtained regarding specific treatment for eating disorders.

DATA ANALYSIS

Descriptive statistics were computed to determine the prevalence of all of the study variables. Analyses of contingency tables were conducted to investigate whether eating disorders, weight loss behaviors, and behaviors associated with weight gain during adolescence were associated with risk for the development of mental and physical health problems during early adulthood. Logistic regression analyses were conducted to investigate whether these associations were significant after age; sex; anxiety; depressive, disruptive, personality, and substance use disorders; corresponding health problems during adolescence; parental income; co-occurring problems with eating or weight; and worries about health during early adulthood were controlled statistically. To reduce the likelihood of type II errors, these covariates were controlled sequentially in a series of analyses, rather than simultaneously in a single analysis, and bivariate odds ratios (ORs) are reported. To reduce the likelihood of type I errors, $\alpha=.01$ was used to determine whether the ORs were statistically significant.

Analyses of contingency tables and logistic regression analyses were conducted to investigate whether low body weight (defined as a BMI of ≤16.60, identifying individuals whose BMI was at least 2 SDs below the sample mean) or obesity (defined as a BMI of ≥28.25, identifying individuals whose BMI was at least 2 SDs above the sample mean) during adolescence was associated with an elevated risk for health problems during early adulthood.

HEALTH PROBLEMS ASSOCIATED WITH EATING DISORDERS DURING ADOLESCENCE

Eating disorders during adolescence were significantly associated with co-occurring chronic fatigue (OR, 3.81; 95% confidence interval [CI], 1.48-9.76), chronic or frequent insomnia (OR, 2.88; 95% CI, 1.44-5.76), chronic or frequent pain (OR, 3.26; 95% CI, 1.71-6.21), migraine or other chronic headaches (OR, 3.38; 95% CI, 1.72-6.64), and any chronic health problems (OR, 2.33; 95% CI, 1.22-4.44). Adolescent eating disorders were also associated with co-occurring anxiety (OR, 3.49; 95% CI, 1.73-7.04), depressive disorders (OR, 5.20; 95% CI, 2.44-11.08), disruptive disorders (OR, 3.78; 95% CI, 1.84-7.76), personality disorders (OR, 3.64; 95% CI, 1.73-7.66), substance use disorders (OR, 4.50; 95% CI, 2.01-10.09), and suicide attempts (OR, 5.02; 95% CI, 1.92-13.14) during adolescence.

ADOLESCENT EATING DISORDERS AND PHYSICAL HEALTH OUTCOMES DURING EARLY ADULTHOOD

Eating disorders during adolescence were associated with an increased risk for cardiovascular symptoms, chronic fatigue, chronic or frequent insomnia, chronic or frequent pain, neurological symptoms, frequent sickness, many activities limited due to poor health, fair or poor overall health, and any chronic health problems during early adulthood (**Table 2**). These associations remained significant after age, sex, co-occurring psychiatric disorders, corresponding health problems during adolescence, parental income, BMI, and worries about health during early adulthood were controlled statistically. Eating disorders were not associated with risk for diabetes, which was present in 3 individuals.

ADOLESCENT EATING DISORDERS AND MENTAL HEALTH OUTCOMES DURING EARLY ADULTHOOD

Eating disorders during adolescence were associated with an increased risk for anxiety disorders, depressive disorders, and suicide attempts during early adulthood (**Table 3**). These associations remained significant after age, sex, co-occurring psychiatric disorders, corresponding psychiatric conditions during adolescence, parental income, BMI, and worries about health during early adulthood were controlled statistically. Twenty-five (62%)

Table 1. Eating and Weight Problems During Adolescence and Early Adulthood*

Variable	Adolescence			Early Adulthood		
	Females (n = 366)	Males (n = 351)	Total Sample (N = 717)	Females (n = 366)	Males (n = 351)	Total Sample (N = 717)
Weight loss behaviors						
Strict dieting	82 (22)	21 (6)	103 (14)	58 (16)	14 (4)	72 (10)
Fasting for ≥24 h†	45 (12)	11 (3)	56 (8)	40 (11)	13 (4)	53 (7)
Frequent exercise to lose weight	208 (57)	97 (28)	305 (43)	142 (39)	64 (18)	206 (29)
Self-induced vomiting	16 (4)	2 (<1)	18 (3)	8 (2)	3 (<1)	11 (2)
Use of medication to lose weight	40 (11)	9 (3)	49 (7)	34 (9)	2 (<1)	36 (5)
Behaviors associated with weight problems						
Eating alone to conceal unusual eating behavior	27 (7)	12 (3)	39 (5)	12 (3)	2 (<1)	14 (2)
Recurrent binge eating	27 (7)	23 (7)	50 (7)	11 (3)	11 (3)	22 (3)
Recurrent fluctuations in weight	52 (14)	44 (13)	96 (13)	48 (13)	42 (12)	90 (13)
Easting disorders						
Anorexia nervosa	0	1 (<1)	1 (<1)	0	0	0
Bulimia nervosa	13 (4)	1 (<1)	14 (2)	1 (<1)	1 (<1)	2 (<1)
Binge-eating disorder	2 (<1)	0	2 (<1)	6 (2)	1 (<1)	7 (1)
Eating disorder not otherwise specified‡	21 (6)	2 (<1)	23 (3)	13 (4)	3 (<1)	16 (2)

*Data are given as number (percentage) of subjects. The mean age during adolescence was 13.8 years in 1983 and 16.1 years in 1985 to 1986; during early adulthood, 22.0 years in 1991 to 1993.
†Only includes fasting for the purpose of losing weight.
‡Includes anorexia nervosa without amenorrhea and clinically significant eating disorder symptoms (eg, self-induced vomiting).

Table 2. Eating Disorders During Adolescence and Chronic Health Problems During Early Adulthood[a]

Chronic Health Problem During Early Adulthood	Prevalence of a Health Problem During Early Adulthood Among Individuals[b]		Odds Ratio (95% Confidence Interval)
	Without an Eating Disorder During Adolescence (n = 677)	With an Eating Disorder During Adolescence (n = 40)	
Cardiovascular symptoms (eg, hypertension)	11 (2)	3 (8)	4.91 (1.31-18.36)[c,d,e,f,g]
Chronic allergies	159 (23)	11 (28)	1.24 (0.60-2.53)
Chronic fatigue	10 (1)	3 (8)	5.41 (1.43-20.49)[c,d,e,f,g]
Chronic or frequent insomnia	184 (27)	19 (48)	2.42 (1.27-4.61)[c,d,e,f,g]
Chronic or frequent pain	119 (18)	18 (45)	3.84 (2.00-7.38)[c,d,e,f,g]
Chronic orthopedic condition (eg, arthritis)	88 (13)	9 (22)	1.94 (0.90-4.22)
Chronic respiratory illness (eg, asthma)	22 (3)	4 (10)	3.31 (1.08-10.11)
Frequent sickness (eg, influenza)	41 (6)	7 (18)	3.29 (1.37-7.89)[c,d,e,f,g]
Many activities limited due to poor health	19 (3)	4 (10)	3.85 (1.24-11.90)[c,d,e,f,g]
Migraine or other chronic headache	69 (10)	9 (22)	2.56 (1.17-5.60)
Neurological symptoms (eg, seizures)	5 (<1)	2 (5)	7.07 (1.33-37.65)[c,d,e,f,g]
Overall health rated as "fair" or "poor"	72 (11)	11 (28)	3.18 (1.53-6.65)[c,d,e,f,g]
Any chronic health problem	183 (27)	23 (58)	3.65 (1.91-6.99)

[a]Eating disorders included anorexia nervosa, bulimia nervosa, binge-eating disorder, and eating disorder not otherwise specified. The mean age during adolescence was 13.8 years in 1983 and 16.1 years in 1985 to 1986; during early adulthood, 22.0 years in 1991 to 1993.
[b]Data are given as number (percentage) of subjects.
[c]Significant ($P<.01$) association after controlling for age, sex, and parental income.
[d]Significant ($P<.01$) association after controlling for corresponding health problem during adolescence.
[e]Significant ($P<.01$) association after controlling for co-occurring psychiatric disorders.
[f]Significant ($P<.01$) association after controlling for body mass index during adolescence.
[g]Significant ($P<.01$) association after controlling for worries about health during early adulthood.

of the adolescents with eating disorders had 2 or more chronic physical health problems during early adulthood. In comparison, 22% of the adolescents without psychiatric disorders and 32% of the adolescents without eating disorders who had other psychiatric disorders had multiple chronic physical health problems during early adulthood ($\chi^2_2=34.34$, $P<.001$).

ADOLESCENT WEIGHT LOSS BEHAVIORS AND HEALTH PROBLEMS DURING EARLY ADULTHOOD

Fasting, frequently exercising to lose weight, self-induced vomiting, and strict dieting during adolescence were associated with health problems during early adult-

Table 3. Eating Disorders During Adolescence and Psychiatric Conditions During Early Adulthood[a]

Psychiatric Condition During Early Adulthood	Prevalence of a Psychiatric Disorder During Early Adulthood Among Individuals[b]		Odds Ratio (95% Confidence Interval)
	Without an Eating Disorder During Adolescence (n = 677)	With an Eating Disorder During Adolescence (n = 40)	
Anxiety disorder	57 (8)	11 (28)	4.13 (1.96-8.69)[c,d,e,f,g]
Depressive disorder	37 (5)	8 (20)	4.32 (1.86-10.04)[c,d,e,f,g]
Disruptive disorder	23 (3)	2 (5)	1.50 (0.34-6.58)
Personality disorder	90 (13)	10 (25)	2.17 (1.02-4.60)
Substance use disorder	53 (8)	5 (12)	1.68 (0.63-4.47)
Suicide attempt	19 (3)	5 (12)	4.95 (1.31-18.36)[c,d,e,f,g]

[a]Eating disorders included anorexia nervosa, bulimia nervosa, binge-eating disorder, and eating disorder not otherwise specified. The mean age during adolescence was 13.8 years in 1983 and 16.1 years in 1985 to 1986; during early adulthood, 22.0 years in 1991 to 1993.
[b]Data are given as number (percentage) of subjects.
[c]Significant ($P<.01$) association after controlling for age, sex, and parental income.
[d]Significant ($P<.01$) association after controlling for corresponding psychiatric condition during adolescence.
[e]Significant ($P<.01$) association after controlling for co-occurring psychiatric disorders.
[f]Significant ($P<.01$) association after controlling for body mass index during adolescence.
[g]Significant ($P<.01$) association after controlling for worries about health during early adulthood.

Table 4. Significant Associations Between Weight Loss Behaviors During Adolescence and Health Problems During Early Adulthood[a]

Health Problem During Early Adulthood	Weight Loss Behavior During Adolescence			
	Fasting for ≥24 h	Frequent Exercise to Lose Weight	Self-Induced Vomiting	Strict Dieting
Cardiovascular symptoms (eg, hypertension)	. . .	12.51 (3.16-49.48)[b,c,d,e,f,g]	. . .	. . .
Chronic orthopedic condition (eg, arthritis)	. . .	. . .	. . .	. . .
Chronic respiratory illnesses (eg, asthma)	. . .	. . .	5.88 (1.59-21.73)[b,c,d,e,g]	. . .
Chronic fatigue	. . .	. . .	. . .	. . .
Chronic or frequent insomnia	. . .	. . .	. . .	. . .
Chronic or frequent pain	3.07 (1.73-5.45)[b,c,d,e,f,g]	2.13 (1.46-3.11)[b,c,d,e,f,g]	5.63 (2.18-14.55)[b,c,d,g]	2.18 (1.37-3.49)[b,c,d,e,f,g]
Migraine or other chronic headache	2.46 (1.24-4.89)[b,c,d,e,f,g]	1.99 (1.23-3.20)[c,d,e,f,g]	4.35 (1.59-11.95)[b,c,d,g]	. . .
Neurological symptoms (eg, seizures)	. . .	. . .	17.35 (3.13-96.22)[b,c,d,e,g]	. . .
Frequent sickness (eg, influenza)	3.05 (1.40-6.68)[b,c,d,e,f,g]	. . .	. . .	. . .
Many activities limited due to poor health	. . .	. . .	6.79 (1.82-25.34)[b,c,d,e,g]	. . .
Overall health rated as "fair" or "poor"	. . .	3.02 (1.86-4.89)[b,c,d,e,f,g]	4.04 (1.47-11.07)[b,c,d,g]	2.28 (1.32-3.94)[b,c,d,e,f,g]
Any chronic health problem	. . .	1.81 (1.30-2.50)[b,c,d,e,f,g]	4.06 (1.55-10.63)[b,c,d,g]	. . .
Anxiety disorder	3.33 (1.69-6.57)[b,c,d,e,f,g]	. . .	3.88 (1.34-11.25)[b,c,d,g]	4.26 (2.46-7.35)[b,c,d,e,f,g]
Depressive disorder	. . .	. . .	4.59 (1.44-14.56)[b,c,d,g]	2.63 (1.33-5.20)[b,c,d,e,f,g]
Suicide attempt	4.29 (1.63-11.28)[b,c,d,e,f,g]	. . .	6.46 (1.74-24.01)[b,c,d,g]	. . .

[a]Data are given as odds ratio (95% confidence interval). The mean age during adolescence was 13.8 years in 1983 and 16.1 years in 1985 to 1986; during early adulthood, 22.0 years in 1991 to 1993. Ellipses indicate nonsignificant associations.
[b]Significant ($P<.01$) after controlling for age, sex, and parental income.
[c]Significant ($P<.01$) after controlling for corresponding health problem during adolescence.
[d]Significant ($P<.01$) after controlling for co-occurring psychiatric disorders.
[e]Significant ($P<.01$) after controlling for body mass index and co-occurring eating or weight problems.
[f]Significant ($P<.01$) after controlling for eating disorders during adolescence.
[g]Significant ($P<.01$) after controlling for worries about health during early adulthood.

hood after age, sex, co-occurring psychiatric disorders, corresponding health problems during adolescence, parental income, and worries about health during early adulthood were controlled statistically (**Table 4**). Several of the associations between weight loss behaviors and subsequent health problems remained significant after adolescent eating disorders, co-occurring eating or weight problems, and BMI were controlled statistically. Because all of the adolescents who reported self-induced vomiting met the criteria for bulimia nervosa or eating disorder not otherwise specified, co-occurring eating disorders could not be controlled in the analyses involving self-induced vomiting. The use of medications to lose weight was not significantly associated with any subsequent physical or mental health problems. A low body weight during adolescence was associated with an elevated risk for respiratory illnesses during adulthood (OR, 4.44; 95% CI, 2.07-9.62). This association remained significant after age, sex, co-occurring psychiatric disorders, corresponding health problems during adolescence, parental income, adolescent eating disorders, and worries about health during early adulthood were controlled statistically. A low body weight during adolescence was not independently associated with any other adult health problems after these covariates were controlled.

Table 5. Significant Associations Between Behaviors Associated With Weight Problems During Adolescence and Health Problems During Early Adulthood[a]

Health Problems During Early Adulthood	Behavior Associated With Weight Problems During Adolescence		
	Eating Alone to Conceal Unusual Eating Behavior	Recurrent Binge Eating	Frequent Weight Fluctuations
Cardiovascular symptoms (eg, hypertension)	5.05 (1.35-18.91)[b,c,d,e,g]	...	...
Chronic orthopedic condition (eg, arthritis)	...	...	2.16 (1.27-3.69)[b,c,d,e,g]
Chronic respiratory illnesses (eg, asthma)	...	...	3.05 (1.29-7.21)[b,c,d,e,f,g]
Chronic fatigue	5.57 (1.47-21.11)[b,c,d,e,g]	...	...
Chronic or frequent insomnia	...	...	...
Chronic or frequent pain	2.85 (1.45-5.59)[b,c,d,e,g]	3.13 (1.72-3.51)[b,c,d,e,f,g]	2.18 (1.35-3.53)[b,c,d,e,f,g]
Migraine or other chronic headache	...	...	...
Neurological symptoms (eg, seizures)	...	...	...
Frequent sickness (eg, influenza)	4.12 (1.78-9.54)[b,c,d,e,f,g]	3.53 (1.60-7.79)[b,c,d,e,f,g]	...
Many activities limited due to poor health	...	...	...
Overall health rated as "fair" or "poor"	2.86 (1.34-6.10)[b,c,d,e,g]	...	2.52 (1.46-4.38)[b,c,d,e,f,g]
Any chronic health problem	...	...	2.17 (1.39-3.37)[b,c,d,e,f,g]
Anxiety disorder	...	3.02 (1.47-6.21)[b,c,d,e,f,g]	3.72 (2.12-6.52)[b,c,d,e,f,g]
Depressive disorder	...	...	2.55 (1.27-5.12)[b,c,d,e,f,g]
Suicide attempt	...	...	...

[a]Data are given as odds ratio (95% confidence interval). The mean age during adolescence was 13.8 years in 1983 and 16.1 years in 1985 to 1986; during early adulthood, 22.0 years in 1991 to 1993. Ellipses indicate nonsignificant associations.
[b]Significant ($P<.01$) after controlling for age, sex, and parental income.
[c]Significant ($P<.01$) after controlling for corresponding health problem during adolescence.
[d]Significant ($P<.01$) after controlling for co-occurring psychiatric disorders.
[e]Significant ($P<.01$) after controlling for body mass index (calculated as the weight in kilograms divided by the square of height in meters) and co-occurring eating or weight problems.
[f]Significant ($P<.01$) after controlling for eating disorders during adolescence.
[g]Significant ($P<.01$) after controlling for worries about health during early adulthood.

ADOLESCENT BEHAVIORS ASSOCIATED WITH WEIGHT PROBLEMS AND ADULT HEALTH PROBLEMS

Eating alone to conceal unusual eating behavior, eating a large amount of food, and frequent fluctuations in weight during adolescence were associated with early adulthood health problems after age, sex, co-occurring psychiatric disorders, corresponding health problems during adolescence, parental income, and worries about health during early adulthood were controlled statistically (**Table 5**). Several of the associations between these behaviors and subsequent health problems remained significant after adolescent eating disorders, co-occurring eating or weight problems, and BMI were controlled. Adolescent obesity was associated with an elevated risk for fair or poor health during adulthood (OR, 4.31; 95% CI, 1.39-13.33). This association remained significant after age, sex, co-occurring psychiatric disorders, corresponding health problems during adolescence, parental income, adolescent eating disorders, and worries about health during early adulthood were controlled. Adolescent obesity was not independently associated with any other adult health problems after these covariates were controlled.

COMMENT

The present findings indicate that adolescents with eating disorders are at an elevated risk for a broad range of physical and mental health problems during early adulthood. Our findings are consistent with the findings of cross-sectional and treatment outcome studies[26-33,50,51] indicating that eating disorders tend to be associated with poor physical and mental health outcomes. However, to our knowledge, these are the first systematic findings from a community-based longitudinal investigation to demonstrate that adolescent eating disorders are associated with the risk for the development of physical and mental disorders after preexisting health problems are controlled statistically. Because most individuals with eating disorders are not appropriately diagnosed or treated,[34,35] it seems that greater effort should be devoted to the recognition and treatment of eating disorders among adolescents in the community. The administration of screening questionnaires to patients with eating or weight problems may help primary care physicians, pediatricians, and other practitioners to increase the recognition of eating disorders.[52] Referring adolescents with eating disorders to appropriate treatment specialists may help to prevent the development of potentially serious health problems.

The present findings also indicate that specific problems with eating or weight during adolescence are associated with an increased risk for physical and mental disorders during early adulthood. Our findings are of particular interest because they indicate that youths with eating or weight problems may be at an elevated risk for health problems during adulthood, even if their problems with eating or weight are not severe enough to warrant an eating disorder diagnosis. Because problems with eating and weight are so common among adolescents in the general population, it would seem important to develop and implement educational and public health in-

terventions that inform parents and youths about the potentially harmful long-term consequences of eating and weight problems during adolescence.[53]

The present findings also indicate that problematic behaviors associated with eating and weight tend to be more strongly associated with risk for subsequent health problems than body weight itself. Particularly noteworthy are our findings indicating that self-induced vomiting is strongly associated with various adverse health outcomes. Future research should investigate the biological and psychological processes that may mediate the associations between specific problems with eating and weight and the development of physical and mental disorders. Numerous factors, including disruptions in hormonal, neurotransmitter, cytokine, peptide, immunologic, and metabolic functioning, may underlie these associations.[50,51,54-58] An increased understanding of the mechanisms that govern the association between eating or weight problems and adverse health outcomes may facilitate the development of more effective treatment interventions.

Although effective treatments are available for youths with eating disorders,[23-33] the present findings from this upstate New York sample are consistent with previous findings[35] indicating that relatively few adolescents with eating disorders receive these kinds of specialized treatment services. Because eating and weight problems are associated with a wide range of adverse health outcomes, the present findings suggest that greater effort should be made to promote increased recognition and treatment of eating and weight problems by pediatricians, primary care physicians, and other health professionals. Our findings also suggest that specialized treatment programs should be made more widely available to adolescents with eating disorders.

Limitations of the present study merit consideration. There were not enough cases to permit analyses regarding associations between specific types of adolescent eating disorders and adult health problems. Therefore, we investigated associations between specific eating or weight problems and health problems during early adulthood. In this respect, the present findings provide a uniquely detailed and systematic contribution to the scientific literature. Health outcomes were assessed by interview and could not be independently verified. However, adolescent problems with eating or weight were associated with poor adult health outcomes after worries about health during early adulthood were controlled statistically. Because sufficiently detailed data regarding treatment were not available, treatment outcomes could not be systematically investigated. Few male subjects had eating disorders; however, many male subjects had eating or weight problems, and it was of interest to investigate the health problems that were associated with these problems. There were relatively few subjects with certain health outcomes, such as cardiovascular symptoms, chronic fatigue, and neurological symptoms. This would have been a concern if adolescent problems with eating or weight did not predict these health outcomes. However, problems with eating or weight during adolescence did predict several of the health outcomes that were low in prevalence.

The present study also has numerous methodological strengths, including the use of a large representative sample, the use of a longitudinal design, the systematic assessment of a wide range of psychiatric disorders and health problems from adolescence through early adulthood based on data that were obtained from the youths and their mothers, and the use of statistical procedures to control for the effects of age, sex, socioeconomic status, co-occurring psychiatric disorders, preexisting health problems, and worries about health during early adulthood. For these reasons, the present findings promise to increase our understanding of the association between eating disorders and health problems during early adulthood.

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