Time Trends in Age at Onset of Anorexia Nervosa and Bulimia Nervosa

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Objective: This study aims to explore the time trends in age at onset of anorexia nervosa and bulimia nervosa.

Method: The sample was composed of 1,666 anorexia nervosa subjects and 793 bulimia nervosa subjects (according to *DSM-IV* criteria) without previous anorexia nervosa consecutively referred to our outpatient unit in the period between 1985 and 2008. Time trends in illness onset were analyzed according to the year of birth of subjects.

Results: In both anorexia nervosa and bulimia nervosa, age at onset showed a significant decrease according to year of birth. A regression model showed a significant independent effect of socioeconomic status, age at menarche, and number of siblings in predicting age at onset lower than 16 years.

Conclusion: Age at onset of anorexia nervosa and bulimia nervosa is decreasing in younger generations. The implications of our findings in terms of long-term outcome remain to be understood. Biologic and sociocultural factors explaining this phenomenon need to be explored in future studies.

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Few data are available in the literature concerning how the characteristics of eating disorders are changing with time. For example, it is a common belief among clinicians that early-onset cases of anorexia nervosa are increasing, but no data in the literature are available, to our knowledge, to demonstrate this. A study by Hindler et al[1] examining a sample of 827 anorexia nervosa patients analyzed the pattern of presentation of patients referred from 1960 to 1990 and found no change in the age at onset according to year of presentation. In this study, the average age at onset of anorexia nervosa was 17.4 years in female patients and 18.1 years in male patients.

Epidemiologic studies have revealed that the highest incidence rates for anorexia nervosa are among females aged 15 to 19 years, and, for bulimia nervosa, are among females aged 20 to 24 years.[2,3] In a sample of 105 subjects with anorexia nervosa, Halmi et al[4] observed 2 peaks of incidence: one around 14.5 years and the other around 18 years of age. In bulimia nervosa, the typical age at onset is considered to occur during young adulthood, with few cases starting during adolescence.[5,6] On the contrary, in anorexia nervosa, an onset after the age of 25 years is usually considered atypical.[4]

Both extremes of age at onset seem to be associated with negative outcome in anorexia nervosa.[7] Several outcome studies have found that early age at onset is a favorable prognostic factor in adult anorexia nervosa samples.[5] However, the onset of anorexia nervosa before puberty is reported to be a very poor outcome condition.[8,9]

The aim of the present study was to analyze the distribution and time trends of age at onset in a large sample of subjects with eating disorders referred to our outpatient Eating Disorder Unit between 1985 and 2008.

METHOD

Between July 1985 and December 2008, three thousand thirty-one different subjects (2,944 females and 87 males) with a clinically significant eating disorder completed the baseline assessment that collects information for present and lifetime diagnosis according to *DSM-III-R* and, from 1995, *DSM-IV*.[7] Of these, 1,486 (49%) fulfilled all the diagnostic criteria for lifetime anorexia nervosa and 1,305 (43%), for lifetime bulimia nervosa (512 with a previous anorexia nervosa diagnosis and 793 without). One hundred eighty other subjects (6%) fulfilled all the diagnostic criteria for lifetime anorexia nervosa after the amenorrhea criterion was waived. For the purposes of the present study, the sample of anorexia nervosa subjects is composed of all patients who fulfilled the criteria for anorexia nervosa in their lifetime, including those subjects for whom the amenorrhea criterion was waived (n = 1,666); the sample of bulimia nervosa subjects is composed of all patients who fulfilled the criteria of bulimia nervosa without a previous anorexia nervosa diagnosis (n = 793).

Our Eating Disorder Unit is the only public facility in the area that receives adult and adolescent patients with all types of severity, providing outpatient treatment, urgent general psychiatric admissions, and brief medical admissions for severe complications. In this study, the age range was

Table 1. Descriptive Data About Patients Diagnosed With Either Anorexia Nervosa or Bulimia Nervosa

Variable	Subjects, n	Anorexia Nervosa	Bulimia Nervosa
Age at presentation, mean (SD), y	2,459	23.7 (7.1)	25.7 (7.5)
Lifetime lowest body mass index, mean (SD)	2,459	15.2 (1.7)	19.6 (2.0)
Menarche age, mean (SD), y	1,928	12.7 (1.5)	12.5 (1.5)
Primary amenorrhea at presentation, n/n (%)	1,950	19/1,296 (1.5)	3/654 (0.5)
Medium-low and low socioeconomic status, n/n (%)	2,219	711/1,494 (48)	379/725 (52)
Maternal eating disorder, n/n (%)	1,904	66/1,289 (5.1)	36/615 (5.9)
Maternal age at birth, mean (SD), y	1,680	28.4 (5.5)	27.8 (5.5)
No. of siblings, mean (SD)	1,894	1.3 (1.1)	1.4 (1.1)
Childhood abuse, n/n (%)	1,673	119/1,089 (10.9)	77/584 (13.2)

12 to 66 years for anorexia nervosa cases and 14 to 61 years for bulimia nervosa cases. However, a presentation by patients younger than 15 years of age was not common (n = 46; 1.5% of the considered sample), since children usually were referred to specific psychiatric units. Patients with all levels of severity are represented in our sample. The range of body mass index at presentation in subjects with current anorexia nervosa was 9.4 to 17.4. Table 1 shows demographic data and availability of the main variables used in the study.

All subjects underwent a routine baseline assessment. Clinical interviews were performed using the eating disorders section of the Structured Clinical Interview for *DSM*[10,11] and a semistructured interview to gather sociodemographic and clinical variables. All diagnoses made before 1994, using the Structured Interview for *DSM-III-R*,[10] were then converted into those described by *DSM-IV*. All interviews were administered by trained medical doctors or psychologists with at least 2 years of experience in the field of eating disorders. The diagnostic process was constantly supervised by the first author (A.F.) who also personally updated the case register. Social class was determined using an Italian adaptation of Havighurst's formula.[12] This formula calculates social class using paternal and maternal professional status and degree of education. The formula results in a score that ranges from 1 (very high social class) to 6 (very low social class). We considered subjects who scored 3 or less to be high and medium-high social class.

Age at onset was defined as the first occurrence of an eating disorder diagnosis (anorexia nervosa, bulimia nervosa, or eating disorder not otherwise specified) and not simply as the beginning of strict dieting as reported in previous studies.[1] All subjects gave informed written consent for the use of data in an anonymous form. The procedures followed were in accordance with the Helsinki Declaration of 1975 as revised in 1983.

Statistical Analyses

We analyzed data about age at onset of eating disorders using 2 perspectives: according to the year of presentation and according to the year of birth.[13] The first reflects the pattern of presentation of subjects with eating disorders, but it is not suitable to test if a change in the age at onset is occurring. The 2 perspectives give similar findings for disorders whose presentation takes place at the same time of onset—such as, for example, juvenile diabetes[14]—but not for disorders whose pattern of presentation is variable, like psychiatric disorders. In this case, the most reliable method to observe a change in the age at onset is to analyze the trend according to the year of birth of the subjects. The analyses according to the year of birth, however, are subject to possible biases because (1) patients with a late age at onset have less time to be referred for treatment than those with an early age at onset and (2) we started our recruitment in 1985; therefore, patients born before 1968–1970 with an early age at onset were less likely to be represented in the sample. For these reasons, we performed part of the analyses excluding all subjects with an age at onset greater than 24 years (90th percentile of the age at onset in our sample) and those born before 1970 or after 1981. In this way, (1) subjects with an age at onset of 24 years who were also born in 1981 would have had more than 4 years to ask for treatment, and (2) subjects with an early age at onset who were born after 1970 would have had the possibility to ask for treatment in our Eating Disorder Unit.

The subsample of patients with anorexia nervosa born between 1970 and 1981 with an age at onset less than 25 years was composed of 934 subjects, whereas the sample of patients with bulimia nervosa with the same characteristics was composed of 472 subjects.

RESULTS

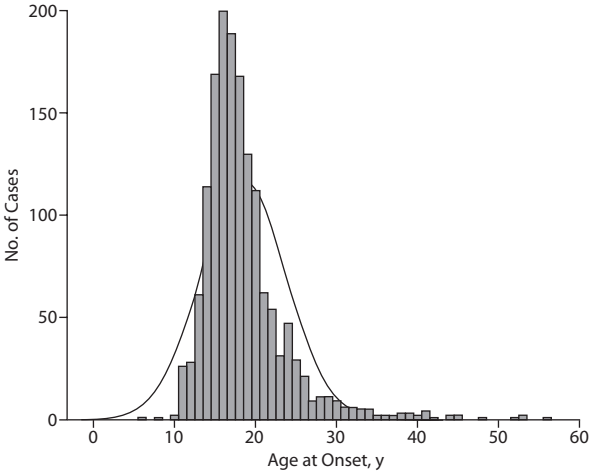
Anorexia Nervosa

In the whole sample (n = 1,666), the mean age at onset was 18.5 years (SD = 5.1; range, 8–56; mode = 16), with a unique peak, as shown in Figure 1. No statistically significant difference emerged in the comparison between females and males (mean ± SD, 18.4 ± 5.1 vs 18.9 ± 5.6 years; $z = 0.93$; $P = .35$)

In anorexia nervosa cases, age at onset and age at presentation tended to increase according to year of presentation (Table 2). Year of presentation showed a significant positive correlation with age at presentation ($\rho = 0.14$; $P < .001$) and age at onset ($\rho = 0.05$; $P < .03$).

When data were analyzed according to year of birth (Figure 2), a progressive decrease in the age at presentation and age at onset was evident. In Table 3, we reported the analyses performed in those subjects born between

Figure 1. Distribution of Age at Onset in Anorexia Nervosa



1970 and 1981, excluding those with an age at onset greater than 24 years. In this subsample (n = 934), the year of birth showed a significant negative correlation with age at onset (ρ = −0.23; $P < .001$) and age at presentation (ρ = −0.34; $P < .001$). The mean age at onset decreased from 18.6 years in the period 1970–1972 to 16.8 years in the period 1979–1981. Performing the same correlations while excluding subjects with an age at onset greater than 19 years (n = 701), we found that the year of birth still showed a significant negative correlation with age at onset (ρ = −0.17; $P < .001$) and age at presentation (ρ = −0.31; $P < .001$).

Bulimia Nervosa

In the whole sample (n = 793), the mean age at onset was 19.3 years (SD = 5.5; range, 6–51; mode = 17), with a unique peak, as shown in Figure 3. On average, the age at onset of subjects with bulimia nervosa is significantly higher than that of subjects with anorexia nervosa ($z = 4.09$; $P < .001$). Male subjects showed a nonsignificant trend toward an older age at onset in comparison to females (21.9 ± 6.9 vs 19.3 ± 5.5 years; $z = 1.58$; $P = .11$).

In bulimia nervosa, age at presentation, but not age at onset, tended to increase according to year of presentation (Table 2). The year of presentation showed a significant positive correlation with age at presentation (ρ = 0.23; $P < .001$; n = 793), but the correlation with age at onset was not significant (ρ = 0.03; $P = .42$).

When data were analyzed according to year of birth (Figure 4), a progressive decrease of the age at presentation and age at onset was evident, even when considering only subjects born from 1970 through 1981 and excluding those with an age at onset greater than 24 years (n = 472; Table 3). The year of birth showed a significant negative correlation with age at onset (ρ = −0.19; $P < .001$) and age at presentation (ρ = −0.38; $P < .001$). The age at onset decreased from 18.5 years in the period 1970–1972 to 17.1 years in the period 1979–1981. When subjects with an age at onset greater than 19 years were excluded (n = 347), year of birth still showed a significant negative correlation with age at onset (ρ = −0.13; $P < .02$) and age at presentation (ρ = −0.40; $P < .001$).

Table 2. Pattern of Presentation of Anorexia Nervosa and Bulimia Nervosa Cases According to Year of Presentation

Years	n	Age at Presentation, Mean (SD), y	Age at Onset, Mean (SD), y	Age at Onset < 16 Years, n (%)
Anorexia nervosa				
1988–1992	136	21.6 (5.6)	17.7 (3.6)	40 (29)
1993–1997	478	22.7 (5.7)	18.0 (4.2)	123 (26)
1998–2002	516	23.4 (6.4)	18.2 (5.0)	147 (28)
2003–2008	521	25.4 (8.6)	19.3 (6.2)	123 (24)
All	1651	23.7 (7.1)	18.5 (5.1)	433 (26)
Bulimia nervosa				
1988–1992	43	23.1 (4.7)	18.7 (4.1)	8 (19)
1993–1997	231	23.7 (5.6)	18.9 (4.6)	45 (20)
1998–2002	259	25.8 (7.3)	19.6 (6.0)	57 (22)
2003–2008	259	27.9 (8.6)	19.5 (5.9)	58 (22)
All	792	25.7 (7.4)	19.3 (5.5)	168 (21)

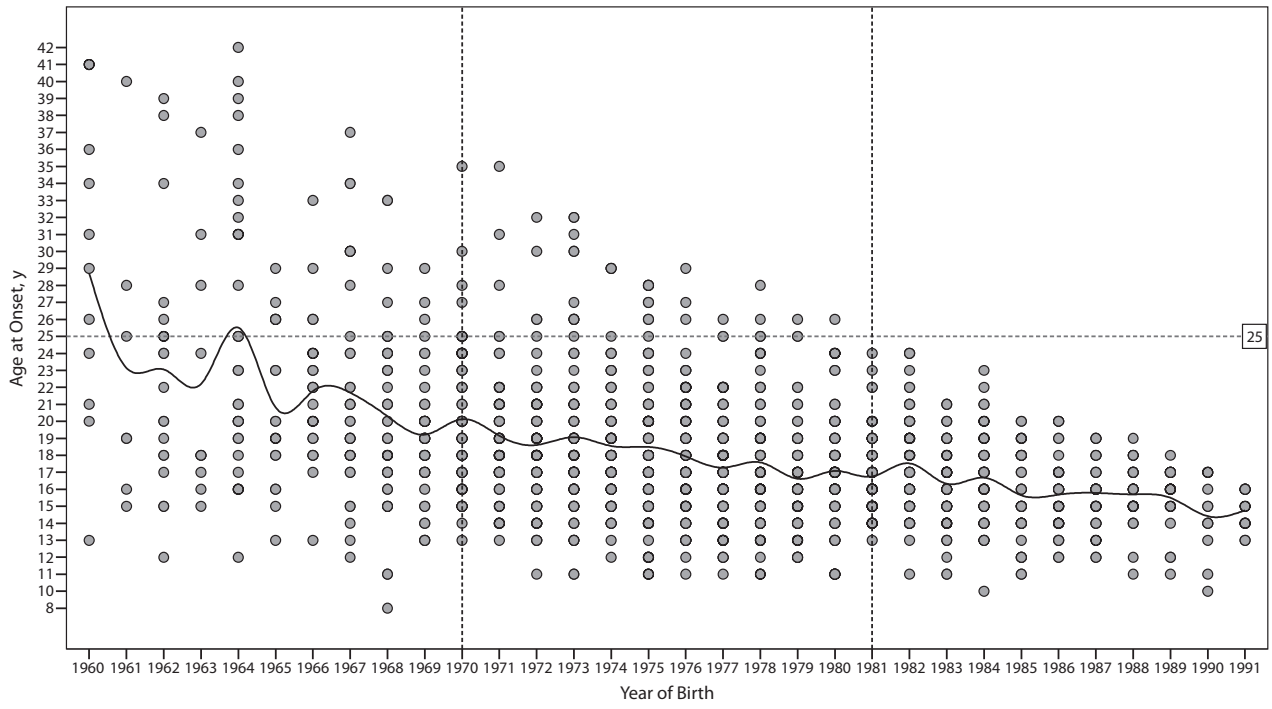
Correlates of Age at Onset

We performed all the correlations on the whole sample of anorexia nervosa and bulimia nervosa subjects, excluding those subjects with an age at onset greater than 24 years (n = 2,196). Age at onset significantly correlated with age at menarche (n = 1,731; ρ = 0.15; $P < .001$), socioeconomic status (n = 2,006; ρ = 0.12; $P < .001$), number of siblings (n = 1,698; ρ = 0.07; $P < .005$), and number of sisters (n = 1,698; ρ = 0.07; $P < .01$). However, all these variables also showed a significant change according to year of birth. Their correlations with year of birth were age at menarche (n = 1,731; ρ = −0.09; $P < .001$), socioeconomic status (n = 2,006; ρ = −0.20; $P < .001$), number of siblings (n = 1,698; ρ = −0.13; $P < .001$), and number of sisters (n = 1,698; ρ = −0.09; $P < .001$).

The correlation between age at onset and birth order was not significant (n = 1,698; ρ = 0.04; $P = .09$). Having a mother with an eating disorder did not seem to have an impact on the mean ± SD age at onset (17.5 ± 3.1 vs 17.3 ± 3.0 years; $z = 0.10$; $P = .92$), nor did having a mother with a psychiatric disorder (17.5 ± 3.1 vs 17.3 ± 2.9 years; $z = 1.14$; $P = .25$). A history of childhood abuse was not associated with an earlier mean ± SD age at onset (17.2 ± 3.2 vs 17.4 ± 2.9 years; $z = 0.81$; $P = .42$).

A conditional logistic regression model was used to identify which factors were independently associated with an increased risk of developing anorexia nervosa or bulimia nervosa before the age of 16 years. The model that best fitted the data included age at menarche, number of siblings, and socioeconomic status (Table 4). All factors maintained their significant effect when year of birth was included among the independent variables (Table 4). No effect of gender, diagnosis, maternal psychiatric history, maternal age at birth, and childhood abuse was observed in the multivariate model.

Figure 2. Age at Onset According to the Year of Birth in Anorexia Nervosa[a]



[a]The horizontal and vertical lines delimitate the cases included in Table 3.

Table 3. Pattern of Presentation in Anorexia Nervosa and Bulimia Nervosa Cases According to Year of Birth

				Age at Onset < 16 Years		
Years	n	Age at Presentation, Mean (SD), y	Age at Onset, Mean (SD), y	n (%)	Odds Ratio (95% CI)	*P*
Anorexia nervosa						
1970–1972	195	24.7 (4.7)	18.6 (3.1)	33 (17)	1.0	…
1973–1975	252	23.1 (4.1)	17.9 (3.0)	51 (20)	1.2 (0.8–2.0)	.374
1976–1978	265	21.5 (3.7)	17.3 (3.1)	75 (28)	1.9 (1.2–3.1)	.005
1979–1981	222	20.7 (3.3)	16.8 (2.7)	71 (32)	2.3 (1.4–3.7)	<.001
All[a]	934	22.1 (4.0)	17.6 (3.0)	230 (25)		
Bulimia nervosa						
1970–1972	108	25.9 (4.3)	18.5 (3.1)	17 (16)	1.0	…
1973–1975	144	24.4 (3.9)	18.2 (3.2)	32 (22)	1.5 (0.8–2.9)	.200
1976–1978	136	22.6 (3.5)	17.4 (2.9)	32 (23)	1.6 (0.9–3.2)	.134
1979–1981	84	21.4 (3.4)	17.1 (3.0)	26 (31)	2.4 (1.2–4.8)	.013
All[a]	472	23.7 (4.1)	17.9 (3.1)	107 (23)		

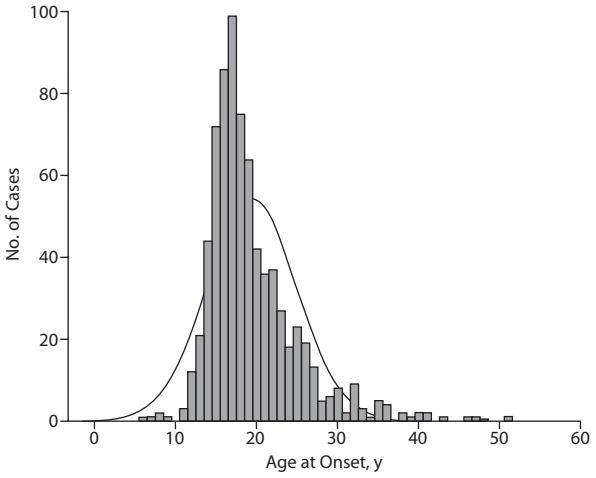
[a]Subjects with an age at onset greater than 25 years; those born before 1970 and after 1981 were excluded.

DISCUSSION

Few studies to date have reported evidence of a cohort effect for age at onset in psychiatric disorders.[13] The present study provided a large dataset to explore the distribution and cohort effects in the age at onset of anorexia nervosa and bulimia nervosa. The distribution of age at onset in patients with anorexia nervosa and those with bulimia nervosa without previous anorexia nervosa were very similar, with a unique peak in both cases (16 years in anorexia nervosa and 17 years in bulimia nervosa). Both disorders seem to display their typical onset during adolescence, since 71% of anorexia nervosa and 65% of subjects with bulimia nervosa were already affected before the age of 20 years. These findings are in line with those of previous epidemiologic and clinical studies[1,6,12,15] but are, however, in contradiction with those epidemiologic studies that found a peak incidence of bulimia nervosa between 20 and 24 years of age.[2]

Our study, which analyzed data according to year of birth, is the first to explore the possibility of a change in the age at onset of eating disorders. The data in our study revealed that an analysis according to year of presentation, such as that used in the previous study by Hindler et al,[1] can give divergent results in comparison to the analysis according to

Figure 3. Distribution of Age at Onset in Bulimia Nervosa



year of birth. The reason is that the pattern of presentation across the cases can vary considerably, with patients asking for treatment at very different points of the illness.

The most important finding in our study is the observation of a trend toward a progressively decreasing age at onset in both anorexia nervosa and bulimia nervosa cases. Although a decrease in the age at onset is observable and evident in the whole sample (Figures 2 and 4), by restricting our analyses to only subjects born between 1970 and 1981 and to those with an onset before 25 years, we have the possibility to measure a reliable trend. It is necessary to exclude late-onset cases because their decrease is due to the fact that our time frame of observation is relatively short. However, in both anorexia nervosa and bulimia nervosa, the decrease in the age at onset was a finding strong enough to be evident even when restricting our analyses not only to subjects who had an age at onset before 25 years but also to those who developed their illness in their teen years.

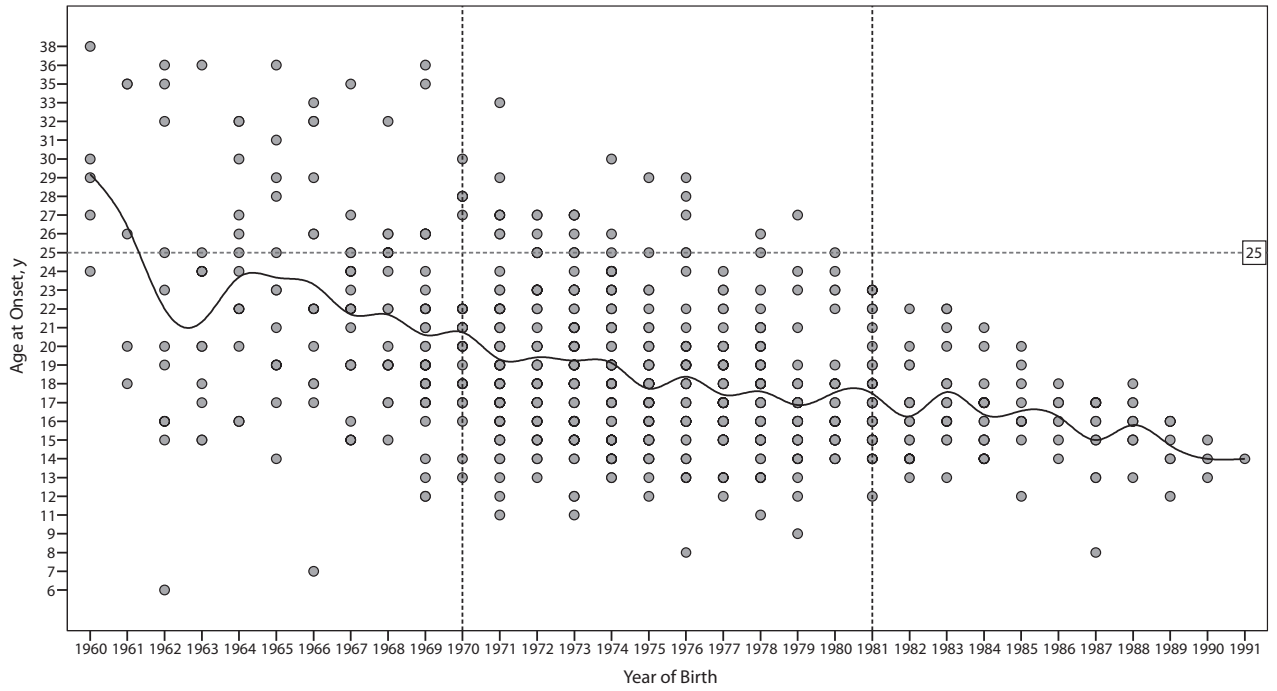
The correlation between age at onset and year of birth seemed to show that the decrease could be dependent on something with which subjects were exposed to at a similar age or at an early stage in their life. In the present study, we explored different factors that have been implicated in the anticipation of age at onset in other diseases. For example, in anxiety disorders,[16] in bipolar disorders,[17] as well as in some type of cancers,[18] an anticipation of the age at onset is observable when the individual has an affected parent. Unfortunately, we did not have the age at onset of the affected mothers and cannot exclude the phenomenon of genetic anticipation in eating disorders. In any case, the presence of a mother with an eating disorder did not explain the decrease in the age at onset observed in our sample. Most of the mothers were born between 1940 and 1960 and so were adolescent or young adults in a period when the incidence of eating disorders was increasing.[2] For this reason, it was reasonable to believe that an anticipation of the age at onset was due to an increasing frequency of eating disorders among mothers. However, our data did not support this hypothesis. Although the presence of a full eating disorder did not significantly contribute to the observed decrease in the age at onset, it is possible that other maternal characteristics could explain our data. For example, it is possible that in the period when the incidence of eating disorders was increasing, there was a growing use of hypocaloric diets and a greater attention to body size. It is possible that these factors could have had some influence on maternal weight and health during pregnancy as well as on the family "culture" about food and body.[19] However, unfortunately no data about these maternal characteristics are available in our sample.

The risk of developing an eating disorder before 16 years of age increased from 16% to 17% during the period 1970–1972 to 31% to 32% during the period 1979–1981. This increase could be due, at least in part, to the decrease of the age at menarche described in our sample, since age at menarche emerged as an independent predictor of the age at onset in the regression model. Puberty and sexual hormones exposure are considered risk or precipitating factors for eating disorders.[20] Puberty represents a series of hormonally driven changes that occur under neuroendocrine control, involving a number of hormonal messengers, including leptin, insulin, and melatonin. Early puberty is usually associated with greater adiposity that can be considered a risk factor for dieting behavior and, as a consequence, for eating disorders. In the literature, early menarche has been associated with an increased risk for bulimia nervosa but not for anorexia nervosa.[5] However, the role of pubertal changes, and not only menarche, as precipitating factors for both types of eating disorders is well known.[20]

In Europe and in Italy,[21] a secular decrease in the age at menarche has been described, which explains the significant correlation we observed between year of birth and age at menarche in our sample. In the literature, early menarche was found to be associated with higher socioeconomic status and a lower number of siblings.[22] We found that these factors both seem to be associated with the age at onset of anorexia nervosa and bulimia nervosa, even after controlling for the effects of year of birth and age at menarche. Moreover, an earlier age at menarche has been observed with greater psychosocial stress, such as parental divorce, but the findings of the studies are not consistent.[23] In any case, no effect of childhood abuse on age at onset emerged in our sample.

The protective effect of having siblings against early onset of eating disorders is an interesting finding, although explanations can only be speculative. Parity may be related to hormonal factors, with higher estrogen levels observed in primiparous women or first versus subsequent pregnancies.[24] Prenatal and perinatal factors seem to be important predictors of age at menarche and hormonal levels in adolescents[25,26] and can be considered among the risk factors

Figure 4. Age at Onset According to the Year of Birth in Bulimia Nervosa[a]



[a]The horizontal and vertical lines delimitate the cases included in Table 3.

Table 4. Adjusted Odds Ratios and 95% CIs for the Prediction of Early Age at Onset (below 16 years) in Anorexia Nervosa and Bulimia Nervosa

Factor	Odds Ratio (95% CI)	Wald χ^2	*P*
Model 1[a]			
Age at menarche < 12 years	1.8 (1.4–2.4)	18.05	< .001
High or medium social class	1.5 (1.2–1.9)	9.42	.002
Having 1–2 siblings	1.5 (0.9–2.3)	2.64	.104
Having no siblings	2.2 (1.3–3.7)	8.76	.003
Model 2[b]			
Year of birth	1.1 (1.0–1.1)	25.00	< .001
Age at menarche < 12 years	1.8 (1.4–2.4)	17.49	< .001
High or medium social class	1.3 (1.0–1.7)	4.12	.042
Having 1–2 siblings[c]	1.4 (0.9–2.3)	2.15	.143
Having no siblings[c]	2.0 (1.2–3.3)	6.48	.011

[a]Likelihood ratio statistic: 39.87_4; $P < .001$.
[b]Likelihood ratio statistic: 66.40_5; $P < .001$.
[c]Odds ratio is calculated versus having more than 2 siblings.

for the development of eating disorders.[27,28] In addition, the number of perinatal complications seems to be associated with a lower age at onset in anorexia nervosa.[28] However, we observed a stronger correlation between age at onset and the number of siblings than between age at onset and parity. This would lead to the hypothesis that growing up with more siblings is more important for moderating the risk of early onset than the perinatal factors associated with multiparity. It is possible that the presence of more siblings exerts a protective effect against psychosocial stressors and, in particular, against the perceived pressures to lose weight from the media.[29,30]

The present study has several methodological advantages as well as important limitations that should be taken into consideration. First, it is the first study to analyze trends in the age at illness onset according to year of birth. In addition, the sample is very large, and patients of all levels of severity are represented. The fact that the data come from 1 treatment center can be considered both a point of strength, because of the homogeneous collection of data, and a limitation, because other local or specific factors, the impact of which is difficult to account for, can be implicated in the explanation of our findings. In addition, for some variables, such as maternal eating disorder and childhood abuse in bulimia nervosa, the sample size allows the detection of small-medium effects with a statistical power of 90%, but is unable to detect very small effects (less than 0.3 of effect size).

In conclusion, this study is the first to provide evidence in support of a decreasing age at onset in anorexia nervosa and bulimia nervosa. Since our dataset comes from 1 treatment center, our observations need to be replicated. The implications of our findings in terms of long-term outcome[7–9] remain to be understood, although we know that an earlier age at onset has a more deleterious impact on specific aspects of general health, such as stature and bone density.[31,32] While a trend toward a decreasing age at menarche can partially explain this phenomenon, the sociocultural and biologic factors that are causing these changes remain to be adequately explored by future studies.

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Editor's Note: We encourage authors to submit papers for consideration as a part of our Focus on Women's Mental Health section. Please contact Marlene P. Freeman, MD, at mfreeman@psychiatrist.com.