ARTICLE

Obesity and Stature in Adolescence and Earnings in Young Adulthood

Analysis of a British Birth Cohort

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Objective: To examine the association between obesity and stature at various ages and earnings in young men and women at age 23 years.

Design: We estimated the effect of obesity on earnings by constructing a series of ordinary least-squares regression equations in which the dependent variable was the natural logarithm of hourly earnings at age 23 years. We report the coefficients for obese subjects compared with those for the nonobese subjects and for height while controlling for a number of other factors that are known to affect pay.

Setting: A birth cohort of 12 537 respondents at age 23 years from the National Child Development Study, which consists of all children born in England, Scotland, and Wales between March 3 and 9, 1958.

Outcome Measure: Hourly earnings at age 23 years as it relates to obesity, as determined by the body mass index and stature measured as a continuous variable.

Results: Men and women who had been obese at age 16 years had significantly fewer years of schooling than did their nonobese peers. Obese women performed poorly on math and reading tests at ages 7, 11, and 16 years when compared with their nonobese peers. Regression analyses indicated no relationship between obesity at any age and earnings at age 23 years in *males*. In contrast, there was a statistically significant inverse relation between obesity and earnings in *females*, independent of parental social class and ability test scores of the child. Female adolescents who were in the top 10% of the body mass index at age 16 years earned 7.4% less (95% confidence interval, −11% to −3.8%) than their nonobese peers; those in the top 1% earned 11.4% less (−21% to −1.5%). The inverse relationship between obesity at 16 years of age and earnings persisted whether the adolescent female remained obese (−6.4% [−12.3% to −4.7%]) or moved into the nonobese category by age 23 years (−7.5% [−12.5% to −2.4%]). A positive relationship was found between height at age 16 years and earnings at age 23 years for men (but not for women) after controlling for social class and IQ.

Conclusions: This study demonstrates an inverse relationship between obesity at 16 years and earnings at age 23 years for British women; the magnitude of the relation is similar to that of other factors that predict earnings, such as gender, job training, and union membership. In the case of men, we found a positive relationship between height and subsequent earnings but no obesity effects.

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Editor's Note: It seems that it's over for the "fat lady" long before she sings. Obese teenage girls can look forward to a double whammy in earning power because of two physical features, size and gender. Does anyone doubt that the same is true in America?

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THE RELATION between obesity and adverse medical outcomes, such as diabetes, cardiovascular disease, hypertension, gallbladder disease, and cancer, is well described.[1] Similarly, the relation between obesity and socioeconomic status

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SUBJECTS AND METHODS

The NCDS is a birth cohort consisting of all children born in England, Scotland, and Wales between March 3 and 9, 1958. The study began as an investigation of perinatal mortality, covering 98% of estimated births in the reference week. This birth cohort was subsequently contacted at ages 7, 11, 16, and 23 years, and information was obtained by structured questionnaire administered by trained interviewers from the respondent and his or her parents and teacher. A school physician performed a complete physical examination of the child at ages 7, 11, and 16 years, during which height and weight were measured.

Contact has been maintained with a large number of the original cohort. In addition to those born during the first week of March 1958, all immigrants who arrived in Britain after 1958 and before 1974 who had been born during that week were added to the sample. High response rates to the first three sweeps of the survey were achieved through the cooperation of the state school system. However, it proved more difficult to obtain responses when the cohort reached the age of 23 years, when many had left their original family homes and started families of their own. In 1958, the initial birth sample (known as the Perinatal Mortality Study) contained 18 559 subjects, including 388 stillbirths and 228 neonatal deaths; there were 15 468 responses at age 7 years (NCDS1), 15 503 at age 11 years (NCDS2), and 14 761 at age 16 years (NCDS3). The 1981 survey (NCDS4), which took place between August 1981 and March 1982 when the respondents were 23 years of age, contained a total of 12 537 interviewees, or approximately 68% of the original sample of 18 559. Elias and Blanchflower[7] provided evidence of response bias; individuals with the lowest levels of attainment on the early ability tests were most likely not to respond to subsequent sweeps of the survey.

Some comments about differences between the British population and the American population are warranted. Since compulsory education ends at 16 years of age in Britain, that population enters the labor market some 2 years earlier than their American counterparts. Also, in contrast to the United States, formal education after 16 years of age is relatively uncommon in Britain; roughly 20% of the NCDS subjects at age 16 years went on to college. By age 23 years, only 250 of the adults interviewed were still receiving higher education.

We use the body mass index (BMI), which is defined as weight in kilograms divided by height squared in meters, as an anthropometric measure of obesity. Measured weight and height data are available at ages 7, 11, and 16 years and from self-report at age 23 years. We defined as obese all subjects whose BMI was at the 90th percentile or greater (the BMI values used are reported in **Table 1**), and as grossly obese those whose BMI was above the 99th percentile. This standard defines obesity at a level of BMI similar to that commonly used to define obesity in the US population.[8] In the United States, this level of BMI occurs at the 85th percentile, indicating that the US population is more obese than the British population. We distinguished changes in obesity through time by means of the BMI definition, by dividing the subjects into four groups: those nonobese at 16

has been examined many times. For developed nations, the literature is unclear in regard to the direction of this relation in men; however, there is a consistent inverse relation between obesity and socioeconomic status in women.[2] This relation in women could be a result of obesity affecting socioeconomic status, socioeconomic status affecting obesity, or a common factor that influences both obesity and socioeconomic status, and there are data to support each of these possibilities.[3] Recent studies indicate that other physical attributes, such as height,[4] beauty,[5] and handicapping conditions,[6] are also associated with earnings.

In this study, we used data from a British birth cohort, the National Child Development Study (NCDS), to explore the relation between obesity and height in adolescence and earnings at a later time. The results indicate that (1) obese female adolescents will earn significantly less than their nonobese peers 7 years later and (2) short male adolescents will earn significantly less than their taller counterparts.

RESULTS

Using the BMI definition of obesity and height in centimeters, **Table 2** reports the means and SDs in addition to *P* values for differences between the means of a number of sample characteristics for individuals who were not obese and those who were obese at age 16 years. For both men and women, the individuals who had been classified as obese at age 16 years had significantly higher mean BMIs at all the other sweeps ($P<.0001$) and higher birth weights ($P<.0003$) than did the nonobese group. We could find no significant differences between the unadjusted earnings of obese and nonobese men, whereas for obese women unadjusted earnings were nearly 10% lower than for nonobese women. Obese men and women had significantly fewer years of schooling than did their nonobese peers but had similar rates of college completion. Obese women performed poorly on all of the other attainment measures ($P<.0001$) when compared with their nonobese peers. We could find no significant differences between the nonobese and the obese, for both men and women, in the proportions who worked part-time, were black, were union members, or worked in large plants with at least 500 employees.

In the multiple regression analysis for *men*, we could find no significant relation between any measure of obesity and earnings at 23 years of age (**Table 3**). In contrast, for *women*, even when we included a full and 23 years of age, those obese at 16 and 23 years of age, those nonobese at 16 years but obese at 23 years of age, and those obese at 16 years but nonobese at 23 years of age.

The NCDS has two other measures of obesity when the respondent was aged 16 years. The physicians who collected the height and weight data were asked to report whether they considered the children to be obese or overweight (alternatives offered were 1 [grossly obese], 2 [moderately obese], 3 [normal], 4 [thin], and 5 [very thin]). At the same time, their teachers were asked to report on whether the children were obese or overweight (alternatives offered were 1 [certainly], 2 [somewhat], and 3 [not at all]). We use the responses to each of these measures in turn to classify individuals as obese if they received a score of 1 or 2, with the remainder (excluding missing values) classified as nonobese.

To model the relation between obesity, height, and earnings, we estimated a number of ordinary least squares regression equations with the natural logarithm of net hourly earnings as the dependent variable. The initial sample consisted of individuals who were employed at the time of interview, in 1981. We performed a series of ordinary least squares regressions by gender with the use of measures of obesity and height that corresponded to the same date as the obesity measure, controlling for a number of other factors related to hourly earnings (including the local unemployment rate, part-time status, union membership, industry type, plant size, educational qualifications, race, and marital status).[9] In these equations, 1 minus the natural antilogarithm of the regression coefficient represents the impact on earnings of a change in the variable for the obese compared with the nonobese group. For values of less than 0.1, the regression coefficient times 100 approximates this difference as a percentage; all coefficients are therefore presented as percentage changes in hourly earnings for the obese vs the nonobese group.

Obesity in these subjects has been shown to be related to parental socioeconomic status.[10] To assess the role of this variable in confounding the relation between obesity and earnings, we included controls for parental social class (seven dichotomous variables describing the father's occupation when the respondent was 11 years old or the mother's occupation when the father was not present—reported in 1969 by the parents when the child was aged 11 years). We also assessed the possibility of a confounding influence of ability test scores in math and reading taken by the children at ages 7, 11, and 16 years by performing regressions with and without these controls. To test the possibility that obesity and/or height effects might vary across parental social class groups or by ability test scores, we estimated separate regression equations for a variety of subgroups and included interaction terms between the obesity variable and various categories for parental social class and ability test scores (results not reported).

Finally, we modeled the effect of persistence of the obese state or changes in the obese state on hourly earnings in a regression that compared adolescents who were not obese at 16 and 23 years of age with those who were obese at 16 and 23 years of age, those who went from being obese at 16 years old to nonobese at 23 years old, and those who went from being nonobese at 16 years old to obese at 23 years old.

set of personal and workplace controls, we found a strongly significant inverse relation between obesity and earnings. Women who were obese at 23 years of age earned 5.3% less than women who were not obese at that age. Women who had been in the top decile for BMI at age 16 years had hourly earnings at age 23 years that were 7.4% lower than those of their nonobese peers. Remarkably, we also found a significant inverse relation between obesity in middle childhood and earnings at 23 years of age, with women who had been obese at age 11 years earning 3.5% less at 23 years of age than those who had not been obese at that time. The inverse relation between female obesity and earnings increased with the degree of obesity. Women who had been in the top 1% of BMI at age 16 years earned 11.4% less at 23 years of age, with everything else constant. Obesity in the top percentile of the BMI at 23 years of age was associated with a 14% decrease in hourly earnings.

Among the other measures of obesity at age 16 years reported in Table 3, physicians classified 6.4% of boys and 15.4% of girls as obese in NCDS2, compared with 6.1% and 10.3%, respectively, who were classified as obese by teachers. Although each method of determining obesity at age 16 years defined somewhat different populations, each group of girls defined as obese was associated with significantly lower earnings at age 23 years compared with their nonobese counterparts (Table 3), corroborating the earlier results obtained with the BMI as a measure of obesity. Despite the somewhat greater propensity of physicians to report girls as obese, the two reports produced similar results for women and no significant relation for men.

Table 3 also shows the relation between height and earnings. In every case, the height variable was the same used to construct the BMI. For example, where the top 10% of the BMI at 16 years of age was used, height in centimeters at age 16 years was included as an additional control variable. For both men and women, there was evidence of a significant positive relation between height and earnings. The size of the effect changed little between the rows, apart from when height at 11 years was used, when the coefficient was insignificant. An increase in height by 10 cm at age 16 years for boys, which was equivalent to moving from the 10th percentile to the median (10th percentile, 160 cm; median, 170 cm; 90th percentile, 180 cm), resulted in an increase in hourly earnings of 2.7%. In the case of girls (10th percentile, 153 cm; median, 161 cm; 90th percentile, 169 cm), a similar increase in height of 10 cm resulted in a 2% increase in pay.

Table 1. Distribution of BMI in the United Kingdom and the United States*

	British Subjects (90th Percentile of BMI)†		US Subjects (85th Percentile of BMI)	
Age, y	Males	Females	Males	Females
16	24.7 (29.8)	23.4 (30.7)	24.5	24.7
23	26.7 (32.4)	26.1 (33.3)	26.9	26.1

*Body mass index (BMI)=weight (kilograms)/height squared (meters). Data for British subjects in the National Child Development Study were collected in 1974 at age 16 years and in 1981 at age 23 years. Data for the American subjects in the National Health and Nutrition Examination Survey I were collected between 1970 and 1974.
†The 99th percentiles are given in parentheses.

Table 2. Sample Characteristics According to Obesity Status* at Age 16 Years

	Males			Females		
Characteristics	Obese	Nonobese	P	Obese	Nonobese	P
Hourly earnings at age 23 y, 1981 British pounds	2.55±0.014	2.53±0.014	.67	1.99±0.014	2.19±0.014	.0001
Birth weight, g	3688±576	3592±574	.0003	3537±573	3444±537	.0003
BMI at age 7 y	17.6±2.3	15.8±1.4	.0001	17.8±2.6	15.6±1.6	.0001
BMI at age 11 y	21.4±3.3	17.0±1.8	.0001	21.8±3.2	17.3±2.2	.0001
BMI at age 23 y	26.9±3.9	22.5±2.4	.0001	26.5±4.2	21.6±2.7	.0001
Height at age 11 y, cm	146±8.3	142±6.9	.0001	147±8.5	144±7.4	.0001
Height at age 16 y, cm	172±8.1	170±7.9	.0001	160±6.4	161±6.3	.0002
Height at age 23 y, cm	176±8.2	177±6.9	.0001	160±8.8	162±6.7	.0001
Math/reading scores at age 7 y	27.0±9.3	28.4±8.8	.0009	28.8±8.4	29.8±8.0	.0077
Math/reading scores at age 11 y	33.0±15.9	33.9±16.1	.21	30.6±14.5	33.7±15.1	.0001
Math/reading scores at age 16 y	39.4±13.1	39.6±13.1	.73	35.6±11.9	38.4±12.1	.0001
Months of schooling after age 16 y	14.2±21.9	17.3±24.2	.008	13.5±19.6	17.6±22.7	.0002
College educated, %	17.1	20.8	.065	17.8	19.6	.36
Working in plant with >500 employees, %	22.3	23.5	.62	22.2	18.7	.10
Part-time employees, %	0.66	1.44	.17	6.3	7.3	.43
Union members, %	42.0	38.5	.15	29.4	29.8	.85
Black, %	3.3	3.9	.47	3.6	3.5	.91

*Body mass index (BMI)=weight (kilograms)/height squared (meters). Those with a BMI in the 90th percentile or greater for the population when the respondents were aged 16 years were defined as obese. Data are given as mean±SD except as noted.
†P values represent the level of significance of the t value on the difference between the values for the obese and the lean by gender for means and with the χ^2 test for proportions.

Table 4 reports the results of two separate regressions by sex with and without controls for parental social class (when the child was 11 years old) and ability test scores (taken when the child was aged 7, 11, and 16 years). The first part of the table models obesity and height at age 16 years; the first column excludes controls for social class and ability, while the second includes them. Their addition has little effect on the relation between obesity and earnings at 23 years of age for either men or women, indicating that the effect of obesity on earnings was independent of these factors. Similarly, the relation between height and earnings in men was not greatly affected by the addition of these controls, whereas the height effect for women lost significance. These results remained unchanged when controls for the height of the father and mother (obtained from interviews with the parents in NCDS2 when the respondents were 11 years old) were entered into the analysis.

Comparison of the BMI measure of obesity at 16 years of age with the same measure at age 23 years indicated a large transition between the nonobese and the obese states. The patterns of these transitions were remarkably similar for males and females for whom data (n=4370 and n=4373, respectively) on weight and height were available at both ages. Approximately 5% of both men and women went from being (1) obese at 16 years of age to nonobese at 23 years of age; (2) nonobese at 16 years of age to obese at 23 years of age; and (3) obese at 16 years of age to obese at 23 years of age. Transitions in and out of the obese state are modeled for males and females in the regression analysis presented in the second part of Table 4. Young women who had been obese at 16 years of age had significantly lower hourly earnings at 23 years of age regardless of whether they maintained their obesity (−8.9% without social controls and −6.4% with them) or became nonobese at 23 years old (−6.7% without social controls and −7.5% with them). Nonobese female adolescents who became obese by 23 years of age

Table 3. Relationship Between Obesity and Height at Various Ages and Hourly Earnings at Age 23 Years*

Obesity Measure†	% Change in Hourly Earnings at 23 y for Obese Group	T Statistics	% Change in Hourly Earnings for Each 10-cm Change in Height at Same Time Obesity Is Measured	T Statistics	N	$\bar{R}^2$
		Males				
Top 10% BMI at age 23 y	0.05 (−3.2, 3.3)	0.1	3.3 (1.9, 4.7)‡	4.6	3778	.21
Top 10% BMI at age 16 y	0.9 (−2.7, 4.5)	0.5	2.7 (1.2, 4.1)‡	3.6	3007	.22
Top 10% BMI at age 11 y	−1.8 (−5.4, 1.7)	−1.0	1.6 (0.1, 3.1)‡	2.0	3266	.20
Top 1% BMI at age 23 y	2.7 (−7.3, 12.6)	0.5	3.3 (1.9, 4.7)‡	4.6	3778	.21
Top 1% BMI at age 16 y	−6.7 (−11.1, 9.7)	−0.1	2.7 (1.3, 4.1)‡	3.7	3007	.22
Physician reports obesity at age 16 y	−3.7 (−4.9, 4.2)	−0.2	3.3 (1.9, 4.8)‡	4.5	3005	.21
Teacher reports obesity at age 16 y	−3.0 (−8.1, 2.1)	−1.2	3.2 (1.6, 4.8)‡	4.0	2568	.22
		Females				
Top 10% BMI at age 23 y	−5.3 (−8.9, −1.6)‡	−2.8	2.1 (0.6, 3.6)‡	2.8	3165	.29
Top 10% BMI at age 16 y	−7.4 (−11.0, −3.8)‡	−4.1	2.0 (0.3, 3.7)‡	2.3	2545	.30
Top 10% BMI at age 11 y	−3.5 (−6.8, −0.1)‡	−2.0	1.0 (−0.3, 2.4)	1.4	2772	.28
Top 1% BMI at age 23 y	−14.0 (−26.0, −2)‡	−2.3	2.2 (0.7, 3.7)‡	3.0	3165	.29
Top 1% BMI at age 16 y	−11.4 (−21.4, −1.5)‡	2.3	2.1 (0.3, 3.8)‡	2.3	2545	.29
Physician reports obesity at age 16 y	−5.3 (−8.3, −2.3)‡	−3.5	2.4 (0.6, 4.1)‡	3.5	2530	.30
Teacher reports obesity at age 16 y	−5.9 (−9.8, −1.9)‡	−2.9	2.4 (0.5, 4.2)‡	2.5	2185	.30

**In these regressions, the dependent variable is the natural logarithm (ln) of hourly earnings at age 23 years. All equations also include the following controls: (1) ln of the county unemployment rate, (2) nine dummies describing type of industry, (3) four marital status dummies, (4) three dummies describing highest educational qualifications, (5) four plant size dummies, (6) part-time dummy, (7) union membership dummy, (8) nonwhite dummy, and (9) a constant. The 95% confidence limits are given in parentheses.*

†Body mass index (BMI)=weight (kilograms)/height squared (meters).

‡Significant at $P<.05$.

also had significantly lower earnings in the first column of the table (−9.6% [confidence interval, −16.0% to −3.2%]). However, this coefficient (−3.0% [confidence interval, −9.6% to +3.5%]) lost significance with the addition of controls for social status and ability.

As can be seen from **Table 5**, a considerably smaller proportion of women than men were employed at age 23 years (64.3% and 82.7%, respectively). This raises the possibility that our results are biased by sample selection. We examined the possibility of selection bias in a number of ways. First, we assessed the impact of excluding from the analysis those individuals who were not working at age 23 years (they were either unemployed or out of the labor force) by means of the earnings from their last job. Because this job could have occurred at any time between the ages of 16 and 23 years, we expressed these earnings in constant 1981 British pounds. In a series of regressions (results not reported), we added these individuals along with the employed; a variable indicating their presence was always significantly negatively associated with the dependent variable but had no effect on the coefficients for any of the obesity measures. Second, we looked at the proportion of those employed at age 23 years who had BMIs available at age 16 years (Table 5); there was no significant difference between males and females (27.8% and 27%, respectively). Third, we estimated a series of logistic regression equations to model the probability of being unemployed at age 23 years—with the dependent variable set to zero if employed and one if unemployed—and that included controls for race, social class, location, and ability along with obesity at age 16 years. Obese individuals had no higher likelihood of unemployment. Finally, because of the importance of nonparticipation in the labor force by women during childbearing years (5.1% of men in the sample were out of the labor force, compared with 28.1% of women) and the fact that a married woman who was looking for work in Great Britain at this time would frequently not register as unemployed because of the unavailability of unemployment benefits, we repeated the exercise but set the dependent variable to 0 if the individual was employed at age 23 years and to 1 if not employed (ie, unemployed *or* out of the labor force), and the results were the same. Thus, it does not appear to us that our results are accounted for either by sample attrition or by dissimilar work experiences of the obese vs the nonobese.

COMMENT

It has been three decades since the relation between obesity and socioeconomic status was first described.[11] A re-

Table 4. Obesity, Height, and Hourly Earnings Controlling for Social Class and Ability*

	No Controls for Social Class or IQ	With Controls for Social Class and IQ
	Obesity and Height at Age 16 y†	
Males		
Obese at 16 y	+0.9 (0.5)	+0.7 (0.4)
Height at 16 y, cm	+2.7 (3.6)‡	+2.3 (2.7)‡
Females		
Obese at 16 y	−7.4 (4.1)‡	−6.6 (3.3)‡
Height at 16 y, cm	+2.0 (2.3)‡	+0.9 (0.9)
	Transitions§	
Males		
Obese at 16 y but not at 23 y	+3.0 (1.3)	+3.0 (1.1)
Obese at 23 y but not at 16 y	−1.6 (0.6)	−0.6 (0.2)
Obese at 16 and 23 y	−1.8 (0.7)	−2.8 (1.0)
Height at 16 y, cm	+3.0 (4.2)‡	+2.5 (3.1)‡
Females		
Obese at 16 y but not at 23 y	−6.7 (2.7)‡	−7.5 (2.9)‡
Obese at 23 y but not at 16 y	−9.6 (2.9)‡	−3.0 (0.9)
Obese at 16 and 23 y	−8.9 (3.0)‡	−6.4 (2.1)‡
Height at 16 y, cm	+3.2 (3.4)‡	+1.0 (1.0)

**In all cases the dependent variable is the natural logarithm (ln) of hourly earnings at age 23 y. All equations also include the following controls: (1) ln of the county unemployment rate, (2) nine dummies describing type of industry, (3) four marital status dummies, (4) three dummies describing highest educational qualifications, (5) four plant size dummies, (6) part-time dummy, (7) union membership dummy, (8) nonwhite dummy, and (9) a constant.*

†Obesity was defined as a body mass index in the 90th percentile or higher for the population. Body mass index=weight (kilgorams)/height squared (meters). The obesity coefficient represents the percentage change in hourly earnings for respondents who were obese at age 16 years compared with the nonobese. The height coefficient represents the percentage change in hourly earnings for each 10-cm change in height at age 16 years. T statistics are given in parentheses.

‡Significant at $P \leq .05$.

§The numbers for the three obese categories represent the percentage change in hourly earnings for each transition group when compared with those who were nonobese at both ages 16 and 23 years.

Table 5. Employment Status at Age 23 Years, Sample Attrition, and Obesity at Age 16 Years*

Status at Age 23 y	No. With BMI Present	No. With No BMI	% With No BMI	% Obese at 16 y
Males				
Employed	3743	1440	27.8	10.2
Unemployed	490	273	35.8	10.4
Out of labor force†	236	85	26.5	9.3
Absent from assesment	1237	2089	62.8	9.5
Total	**5706**	**3887**	40.5	10.0
Females				
Employed	2940	1090	27.0	9.7
Unemployed	310	150	32.6	12.1
Out of labor force†	1190	588	33.1	11.5
Absent from assessment	917	1770	65.9	8.3
Total	**5357**	**3598**	40.2	10.0

**Obesity was defined as a body mass index (BMI) in the 90th percentile or higher for the population. BMI=weight (kilograms)/height squared (meters).*
†The labor force consists of the unemployed plus the employed. "Not employed" consists of the unemployed plus those who are out of the labor force.

cent review of 144 published studies since that time[12] indicated a consistent finding of an inverse relation between obesity and socioeconomic status in women, but mixed patterns for other age and gender groups. The possible mechanisms for this relation in women were explored by Sobal[2] and more recently by Stunkard and Sorensen.[3] Social class as a determiner of obesity is best demonstrated in longitudinal studies (including one that used NCDS data)[13] in which girls of low socioeconomic status have been found to be systematically more obese than their peers,[14] or in which adult obesity is significantly predicted by social class in childhood.[15] However, the alternative possibility exists, that obesity is a determiner of social class in women. There are a number of mechanisms by which obesity might determine social class. In a study of 1917 husband-wife pairs, Garn et al[16] concluded that assortive mating with respect to educational level was responsible for some of the socioeconomic effect of obesity in women, with women who married men of greater education being systematically leaner and women who married men of lesser education being more obese than women who married men of equivalent education. However, in women, childbearing may be correlated with both obesity and socioeconomic status; Oken et al[17] provided evidence in a Scandinavian sample of women that childbearing confounds the relation between socioeconomic status and obesity.

The relation between earnings and obesity has received little attention. Two cross-sectional studies of employed American men have shown no relation between obesity and earnings.[18,19] More recently, Gortmaker et al[4] and Averett and Korenman[20] reported a negative association between obesity in an American cohort of youths (the National Longitudinal Survey of Youth) and earnings 7 years later. These data indicate a statistically significant negative relation between obesity and household income for *women* and higher rates of poverty for short *men*.

We also found an inverse relation for women between obesity at age 16 years and hourly earnings 7 years later, which rose with increasing degrees of obesity. This effect was large, being of the same magnitude as other factors that predict earnings, such as gender, job training,[21] and union membership.[22] This finding adds to the long list of adverse consequences of obesity and underlines the importance of efforts aimed at preventing this condition. We also find a statistically significant relation for men between height and earnings. Since these relations were not affected by the addition of controls for parental social class and ability test scores of the child, we conclude that they are unlikely to result from differences in social background, school achievement, or educational attainment. Finally, teen pregnancy was uncommon in Britain in the 1970s, so it is also unlikely that the inverse relation between teen obesity and later earnings was confounded by parity.

The longitudinal design of this study provides evidence that height and weight influence earnings. Indeed, the negative effect on earnings for women was as strong for those who were obese at 16 years of age but became nonobese by age 23 years as for those who were still obese at 23 years of age, suggesting that events that occur around entry into the job market may mediate this effect. We cannot determine whether the effect on earnings of adolescent obesity in girls and shortness in boys is the result of external factors, such as job discrimination, or internal or psychological factors. Young adults enter a phase of intensive evaluation during the initial period of their entry into the labor market, and our results are consistent with the idea that physical appearance can influence the transition from school to work.

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