College and Weight Gain: Is There A Freshman Five?

by
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Structured abstract (218 words)

Objectives: Education is generally associated with superior health, yet it is widely believed that attending college causes excessive weight gain (the "freshman five"). This study tries to ascertain whether college attendance increases or decreases obesity risk by comparing the weight and weight gain of youth who do and do not attend college.

Methods. Using data came from the National Longitudinal Survey of Youth, 1997 cohort (NLSY97), we compared the weight and weight gain of 16-to-23-year-olds who did and did not attend college. We conducted separate analyses for black, white, and Hispanic males and females. Each analysis controlled for confounders including prior weight and measures of family background.

Results: College attenders do gain weight during their college years, but college-age non-attenders gain about the same amount. There are some weight differences between college attenders and non-attenders—female attenders are lighter than female non-attenders, and black male attenders are heavier—but for the most part these weight differences are established well before college begins.

Conclusions: College attendance appears to have little effect, positive or negative, on body weight, at least in the short run. To the degree that college students gain weight, they do so no faster than non-college students. To the degree that college graduates have healthier weights than non-graduates, the difference is one that exists before college begins.

Introduction

More educated adults enjoy better health. At every age, adults with more education have greater happiness, less stress, and lower morbidity[2]. The health advantage of the educated extends all the way to the grave; on average, college graduates live more than seven years longer than adults who only graduated from high school.[3]

Where does the association between health and education come from? One possibility is that education changes behavior and opportunities in ways that enhance health. The educated have fuller and more accurate information about the health implications of their lifestyle choices. When the educated lack information about a health issue, they are better able to inform themselves. The educated have higher-paying, more stable jobs, and as a result they live in safer neighborhoods and they are more likely to have private health insurance. The educated have higher-quality doctor's visits, and as patients they are more likely to seek out second opinions and auxiliary information.[3,4]

But the association between health and education does not necessarily mean that education improves health. It could also be that youths are more likely to complete their education if they are healthy to begin with. Good health in itself makes it easier to pursue education, and good health may also be a sign of other advantages that predict high educational attainment. Very early signs of poor health, such as low birth weight, predict low test scores and low educational attainment later on.[3–5]

It is hard to figure out whether health affects educational attainment or vice versa, because most serious health problems arise many years after education is complete. Yet some predictors of future health can be observed while youths are still young enough to pursue an education.

An important example is overweight and obesity. About 30% of youth are overweight during their school years, and 15% are obese.[6] Obesity during the school years is predictive of later morbidity and illness, especially diabetes, metabolic syndrome, and cardiovascular disease.[7,8]

Like other health risks, obesity is associated with educational attainment, at least among women. Women with a college degree are less likely to be obese than women with a high school degree, and women with a high school degree are less likely to be obese than women without one.[3] Again, this association could mean that education reduces obesity risk, or it could mean that women who attend college are lighter to begin with; in fact, girls who are obese in high school are less likely than other girls to enroll in college.[9] The association between college attendance and reduced obesity risk is limited to females; obese boys are as likely to attend college as are other boys,[9] and college-educated men are not much lighter than men with less education.[3]

Despite the lower obesity risk of college-educated women, there is a popular notion that the college environment encourages unhealthy weight gain—popularly known as the "freshman five." Twenty-four studies have tracked the weight of college students, usually women on a single campus. All but two of these studies showed significant gains during freshman year, with an average gain of 3.86 pounds (1.75 kg) over an average study period of 6 months.[10] Some studies emphasized fattening aspects of the college environment, such as all-you-can-eat meal plans and easy access to high-calorie snacks.[11] Few studies have explored aspects of college culture that might be slimming, such as easy access to exercise facilities and the desire to stay fit and attractive to classmates.

A weakness of past freshman-five studies is that they have focused on the weight gain college students, rarely asking whether youth who are not enrolled in college experience similar

gains. Without a control group of non-college youth, it is impossible to attribute freshman weight gain to the college environment. If a control group were used, the relevant question would not be whether college attenders gain weight. Instead, we would ask whether college attenders gain weight faster or slower than similar non-attenders. The answer to this question would shed light not just on the origins of the freshman five, but on the broader question of whether higher education enhances, maintains, or harms students' health.

What does college do to women's weight? Does college increase or reduce obesity risk, or do college-educated women enjoy lower obesity risk because of preexisting advantages that they brought to college with them? And what, if anything, does college do to the weight of men?

A simple way to address these question is to ask whether college attenders gain weight faster or slower than non-attenders, and to ask whether the weight gaps between college attenders and non-attenders are larger or smaller at the beginning of college or at the end.

In this paper, we ask these questions in a large national probability sample of college-age youth representing both genders and three racial/ethnic groups (blacks, whites, and Hispanics). Within this sample, we compare the weight gain of college attenders to the weight gain of a control group of young adults who did not attend college (non-attenders). We compare weight not just during college, but before college, and we make an effort to control for preexisting differences between college attenders and non-attenders.

Data

We analyze data from the National Longitudinal Survey of Youth, 1997 cohort (NLSY97). The NSLY97 is an ongoing nationally representative sample of 8,984 youths born between January 1, 1980 and December 31, 1984 who were first interviewed in 1997 and most

recently interviewed in 2007. Participants were 12 to 16 years old at the date of the first interview and 23 to 27 years old at the date of the most recent interview—so information on all participants is available from ages 16 to 23. The NLSY97 interviews most participants in November, December, and January—that is, between the fall and spring semesters of a typical academic year.

The NLSY97 is well suited to study college weight gain because it recorded youths' height and weight on an annual basis before and during the years when attenders are typically in college. A limitation of the NLSY97 is that is has not, so far, followed all participants beyond age 23 (and it has not followed any participants past age 27). The NLSY97 is therefore well-suited to studying the short-term effects of education on health. Studies of long-term effects will have to wait until the NLSY97 participants are older.

A weakness of the NLSY97 is that heights and weights are self-reported by survey participants instead of being measured on calibrated equipment by trained personnel. Self-reported height and weight can be inaccurate, and some of the inaccuracies can be self-serving, although the average size of self-serving biases is rather small. A recent review of 64 studies found that respondents tend to over-report their height, on average by less than an inch (2 cm), and they tend to under-report their weight, on average by less than 3 pounds (1.5 kg).[12] Despite the potential for self-serving bias, past studies of freshman weight gain have produced very similar results whether they used self-reported weights (average gain 3.88 lb [1.76 kg]) or weights measured by study personnel (average gain 3.83 lb [1.75 kg]).[10] Perhaps one reason that studies of freshman weight gain have escaped bias is that they focus on not on weight but on weight gain. Although self-reported weight may be biased, estimated gains will only be biased if the bias in self-reported weight changes from one measurement occasion to the next.

For the purpose of this study we divide the NLSY97 sample into college attenders and

non-attenders. College attenders are defined as youth who enrolled in a two-year or four-year college after the age of 15, and non-attenders are youth who never report enrolling in a college course. We make use of three dependent variables: weight in pounds and dummy variables representing overweight and obesity. Until age 18 overweight and obesity are defined using US thresholds for body mass index (BMI) that are specific to each age and gender[13]. After age 18 overweight and obesity are defined using conventional adult BMI thresholds of 25 for overweight and 30 for obesity.[14] The thresholds for adults and children nearly coincide at age 18.

In preparing data for analysis, we deleted weights and heights that were "biologically implausible" by standard definitions.[15] We also deleted measurements that formed implausible growth patterns, for example when a participant reported that they were three inches shorter at age 18 than they were at age 17. Only .009% (1523 of 169,665) measurements were deleted for these reasons, and deletion did not materially change the results. We also deleted 71 respondents who did not identify as white, black, or Hispanic, and we deleted 1294 respondents who had missing values on any of our dependent variables, namely height and weight at age 17, 18, 19, and 23.

After these deletions, the analytic sample consisted of 7,619 black, white, and Hispanic respondents. Since college attenders are more likely to be white and female than non-attenders, we divided our sample into six subgroups of gender and race/ethnicity. white males (n=2104), white females (n=1898), black males (n=1015), black females (n=984), Hispanic males (n=830), and Hispanic females (n=788).

Methods and Results

From age 16 to age 23, Figure 1 compares the average weight of college attenders and

non-attenders, and Figure 2 compares the percentage of attenders and non-attenders who are obese. Table 1 compares college attenders and non-attenders with respect to average weight at age 17, a baseline age when only 9% of college attenders are enrolled in college. Table 1 also compares average weight gain from age 18 to age 19, when 80% of college attenders are enrolled in college and 75% are in their freshman year. Finally, Table 1 compares average weight gain from age 18 to age 23, a five-year period which for 71% of college attenders includes at least two years of college, and for 65% of college attenders includes the whole college career. Table 1 reports simple means, while Table 2 adjusts the means for regressors including weight and height at age 16, age in months at the time of the interview, parents' weight status (obese, overweight, normal, underweight), mother's education level, and a variety of sociodemographic characteristics. All regressors are centered around the mean for each respondent's gender and ethnicity, so that the regression intercept represents the mean for a respondent with average characteristics for their gender and ethnicity. Likewise, the coefficient for college attendance represents the average difference between a college attender and a non-attender with average characteristics for their gender and ethnicity. Note that regression adjustment successfully eliminated the age 17 weight gaps between attenders and non-attenders; this is primarily due to the regression's adjusting for weight at age 16.

←*Figures 1-2 and Tables 1-2 near here*→

Is there a freshman five? Yes and no. Although the results show that college attenders gain an average of 2 to 5 pounds between ages 18 and 19, there are very similar gains among non-attenders of the same age. Similarly, between age 18 to age 23, college attenders gain an average of 12 to 19 pounds, and the gains of non-attenders are very similar. The differences

between the gains of college attenders and non-attenders are mostly nonsignificant (Table 1). When gains are adjusted for confounding variables, all of the differences between college attenders and non-attenders are nonsignificant—with the exception of Hispanic females, among whom college attenders gain 7 pounds *less*, after adjustments, than non-attenders (Table 2). That is, the association between college and weight gain, in the one group where it exists, is actually beneficial.

If we switch our attention from average weight to obesity, the details of the picture change slightly (Figure 2). From ages 18 to 23 the probability of being obese rises, but again there is no indication that college attendance contributes to the rise. Among males, and among black females, the probability of obesity rises at about the same rate for college attenders and for non-attenders. Among white and Hispanic females, the probability of obesity actually rises more quickly for non-attenders than it does for college attenders—again suggesting that college is associated with reduced obesity risk.

On balance, it appears that college attendance has little association with average weight gain between ages 18 and 23, and for some groups, college attendance is associated with a reduced risk of becoming obese. While some aspects of the college environment may be fattening or slimming, on balance college attenders gain weight no faster, and in some cases gain weight more slowly, than do non-attenders of the same age.

The results are consistent with past findings that women who attend college are thinner than women who do not. However, most of the weight advantage of college-attending women is established before college begins. Among white females, for example, college attenders are already 5 pounds lighter than non-attenders at age 17, and only 6½ pounds lighter at age 23 (not a significant change). If we focus on obesity risk, it appears that during the college years the risk of obesity grows a little more slowly for female college attenders than for non-attenders.

However, this growth in obesity risk among non-attenders could simply be a continuation of trajectories that were established before college began, or a result of non-attenders being closer to the obesity threshold at the start of the study.

Among males, the results are largely consistent with past findings that college attendance has little association with weight—but black males are an exception. Among black males, college attenders are actually heavier than non-attenders, but the difference between attenders and non-attenders is established by age 16 and does not grow during the college years. Among white and Hispanic males, college attenders and non-attenders show little difference in weight or obesity risk, either before or after college begins.

Conclusions

Our results contradict the popular notion that college causes unhealthy weight gain. Instead the results fit a broader pattern of findings suggesting that higher education is associated with superior health, including reduced obesity risk.

The association between college attendance and reduced obesity risk is subject to varying interpretations. Some scholars emphasize the health benefits of college attendance[3], while others emphasize selection effects whereby healthier youths are more likely to attend college in the first place.[9] Our results tend to favor the selection-effect interpretation since we find that most of the weight differences between college attenders and non-attenders predate the beginning of college.

A limitation of the NLSY97 data is that they end at age 23, before many hypothesized health benefits of college have had a chance to materialize. As the NLSY97 respondents mature into their thirties and forties, the college attenders, at least those who graduated, will start to reap the benefits of a college education. These benefits include lower stress, more accurate

understanding of health risks and benefits, and neighborhoods with healthier food choices and opportunities for safe and active recreation. It is possible that these benefits will further reduce the relative obesity risk of college attenders. On the other hand, it is possible that the superior risk profile of college attenders will continue to have little to do with the benefits of college, and a great deal to do with health advantages that were established well before college began. Future research can try to distinguish these two possibilities.

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Table 1. Gains in Body Weight (pounds) over College Ages Comparing Attenders and Non-Attenders by Gender and Race/Ethnicity.

	Weight and weight gain at select age intervals		
	Age 17	change age 18 to 19	change age 18 to 23
Panel A: White Male			
College attenders (mean)	164.6	3.5	15.2
Non-attenders (mean)	167.6	2.4	15.3
Difference	-3.0^{+}	1.1^{+}	-0.1
	(-6.3, .2)	(-.2, 2.4)	(-3.2,2.0)
Panel B: White Female			
College attenders (mean)	132.8	2.4	12.7
Non-attenders (mean)	137.8	2.1	14.3
Difference	-5.0***	0.3	-1.6
	(-8.0, -2.0)	(-1.2, 1.8)	(-4.2, .9)
Panel C: Black Male			
College attenders (mean)	175.0	2.9	12.8
Non-attenders (mean)	165.0	3.1	14.3
Difference	10.0***	-0.2	-1.5
	(4.7, 15.3)	(-2.4, 2.1)	(-4.9, 1.8)
Panel D: Black Female			
College attenders (mean)	142.5	3.2	15.9
Non-attenders (mean)	149.4	4.0	16.5
Difference	-6.9*	-0.8	-0.6
	(-12.3, -1.6)	(-3.1, 1.4)	(-4.1, 2.9)
Panel E: Hispanic Male			
College attenders (mean)	162.2	4.7	19.0
Non-attenders (mean)	168.7	2.2	17.8
Difference	-6.5*	2.5*	1.1
	(-12.6, -.3)	(.0, 5.0)	(-2.7, 4.9)
Panel F: Hispanic Female			
College attenders (mean)	130.6	2.1	12.1
Non-attenders (mean)	140.1	4.6	17.0
Difference	-9.5***	-2.5*	-5.0*
	(-14.1, -4.8)	(-4.6, -.3.0)	(-9.1, -.9.0)

$^{+}p<.10$, $^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$. Parentheses enclose 95% confidence intervals

Note: all means are weighted

Table 2. Gains in Body Weight (pounds) over College Ages Comparing Attenders and Non-Attenders by Gender and Race/Ethnicity adjusted for height and weight at age 16 and sociodemographic characteristics

	Weight and weight gain at select age intervals		
	Age 17	Weight change age 18 to 19	Weight change age 18 to 23
Panel A: White Male			
College attenders (mean)	167.4	3.3	15.0
Non-attenders (mean)	168.1	2.0	15.1
Difference	-0.7	1.3	0.0
	(-2.5, 1.1)	(-0.4, 3.0)	(-2.9, 2.8)
Panel B: White Female			
College attenders (mean)	134.1	2.6	13.3
Non-attenders (mean)	134.0	2.1	13.8
Difference	0.1	0.5	-0.5
	(-1.6, 1.8)	(-1.7, 2.7)	(-3.8, 2.8)
Panel C: Black Male			
College attenders (mean)	171.0	2.0	12.1
Non-attenders (mean)	169.4	3.4	15.3
Difference	1.6	-1.4	-3.2
	(-1.1, 4.3)	(-4.0, 1.3)	(-7.7, 1.3)
Panel D: Black Female			
College attenders (mean)	147.1	3.5	18.5
Non-attenders (mean)	149.3	2.4	17.9
Difference	-2.2	2.3	0.6
	(-5.4, 1.0)	(-1.3, 5.9)	(-4.7, 5.9)
Panel E: Hispanic Male			
College attenders (mean)	164.4	4.7	18.4
Non-attenders (mean)	167.6	2.4	21.0
Difference	-3.2^{+}	2.3	-2.6
	(-6.7, 0.4)	(-1.3, 5.9)	(-8.0, 2.7)
Panel F: Hispanic Female			
College attenders (mean)	133.3	1.9	10.5
Non-attenders (mean)	137.5	3.6	17.3
Difference	-4.2*	-1.7	-6.8^{+}
	(-7.5, -0.9)	(-4.6, 1.2)	(-14.5, 1.0)

$^{+}p<.10$, $^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$. Parentheses enclose 95% confidence intervals

Note: all models adjust for parental BMI, Mother's education in years, respondent height and age at the start of the measurement interval, and weight at age 16.

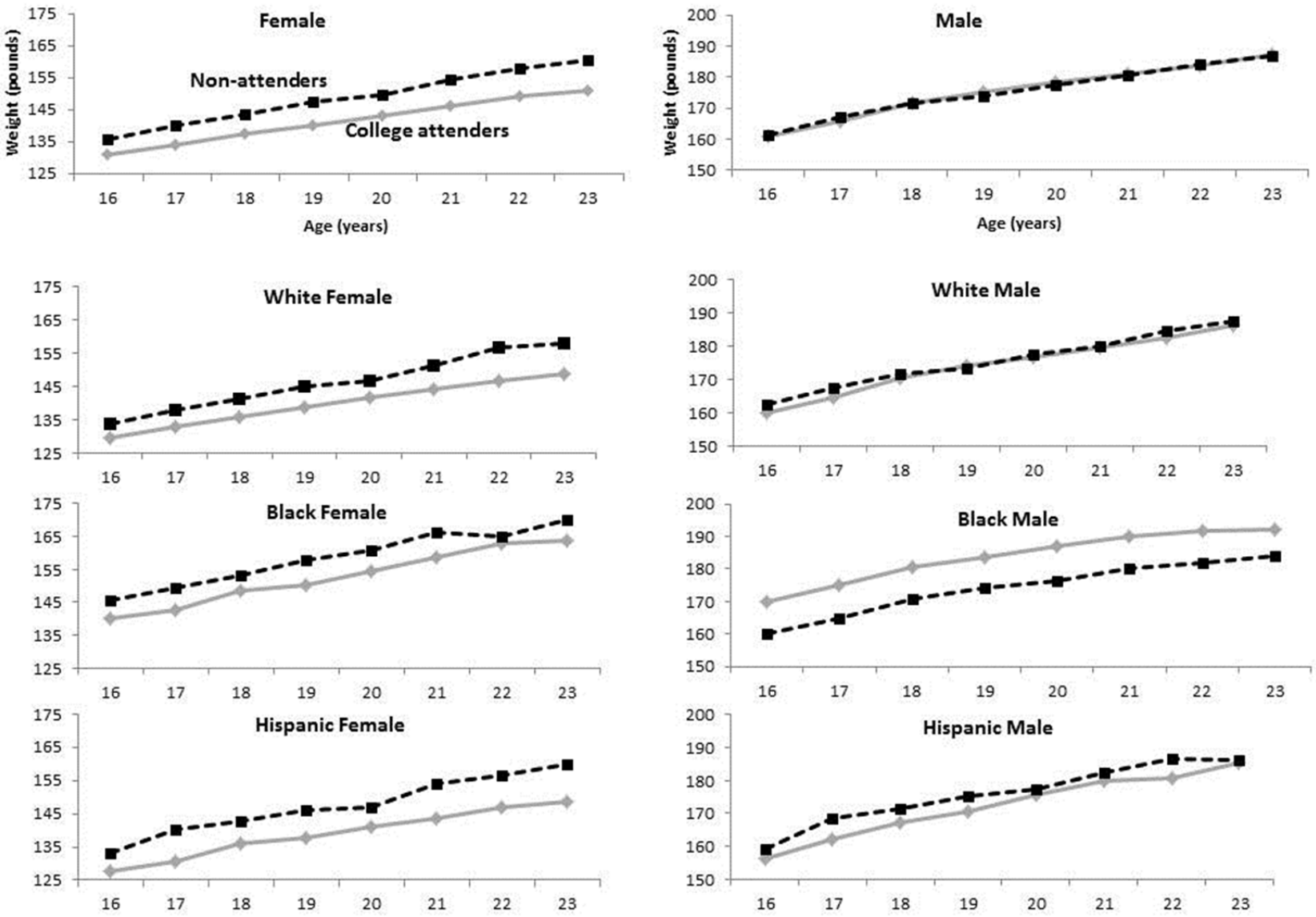

Figure 1. Average Weight by Gender between College Attenders and non-Attenders by Age National Longitudinal Survey of Youth (NLSY97).

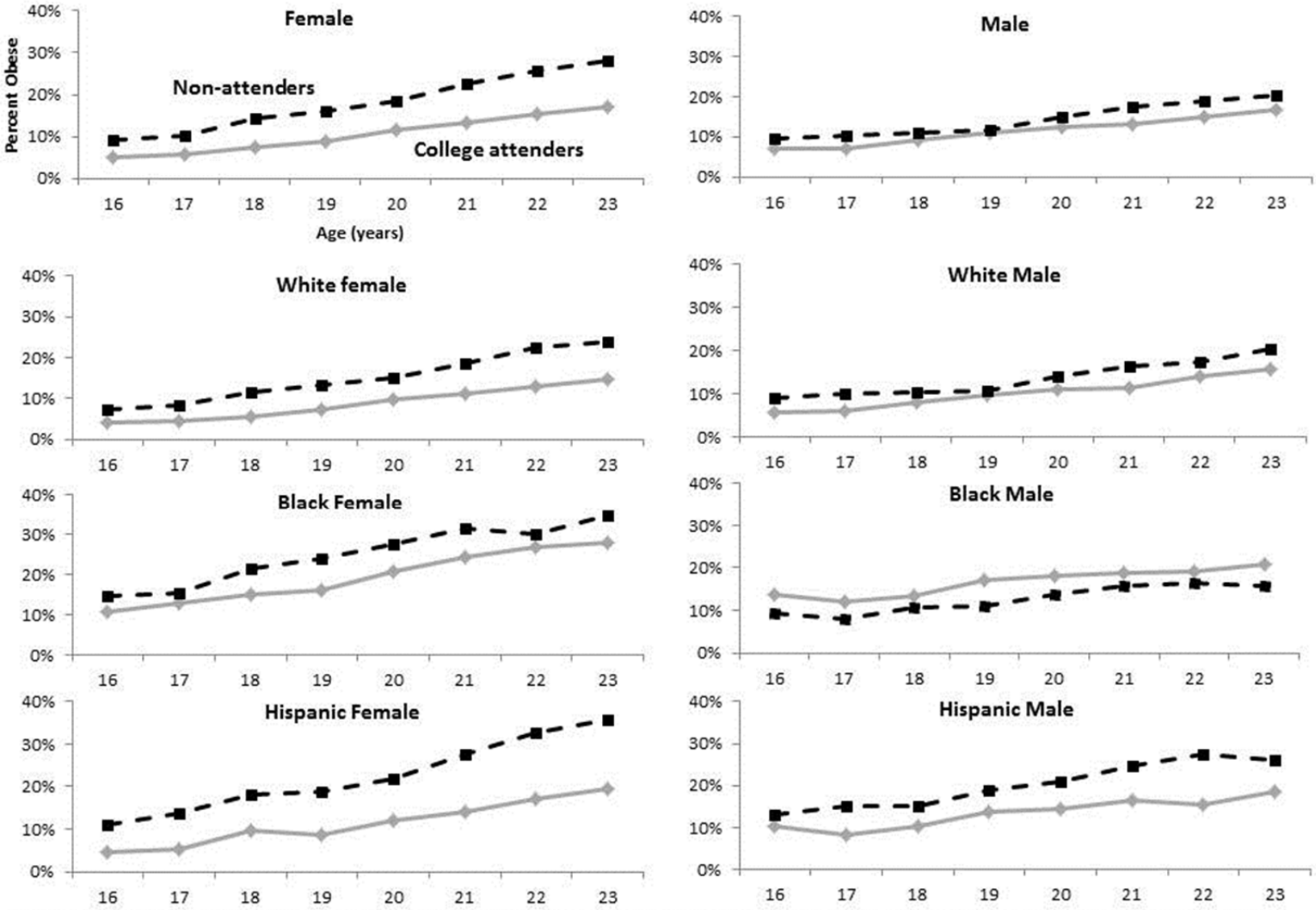

Figure 2. Percent Obese by Gender between College Attenders and non-Attenders by Age National Longitudinal Survey of Youth (NLSY97).