The Effect of Parental and Young Adult's Own Education on Weight Status Trajectories During the Transition to Adulthood

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Abstract

This study examines the effect of own and parental education on body mass index (BMI) trajectories by gender during the transition to adulthood using a life course perspective. Education likely influences health through both more advantaged origins and cumulatively through better outcomes during each stage in the life course. Using growth curve models I am able to examine the extent that advantaged family origins, measured as parental education, influences both adolescent BMI and change in BMI during the transition to adulthood. This time period is also marked by many other transitions that may impact weight status including own education and family formation. I use growth curve models and the National Longitudinal Study of Youth, 1997 to 2010 cohort, which surveyed youths in the U.S. I find that parent‟s education is associated with lower adolescent BMI and slower growth in BMI during the transition to adulthood for both men and women. However, this slower growth in BMI is accounted for by own education and lower and delayed fertility and partnering. Young adults‟ own education is associated with slower growth in BMI, but only among women. I situate these findings using a life course perspective on health and theories concerning the educational gradient in health.
KEY WORDS: Education; Obesity; Weight Status; Transition to adulthood; Life course; U.S.

Introduction

Past research has consistently found an inverse relationship between education and health. This has been demonstrated for general health, chronic conditions, and health behaviors, including smoking, diet, and obesity. Explanations for this disparity include increased access to resources, healthier peer groups, greater cognitive development, and better problem solving skills (Adler and Ostrove, 2006). However, the nature and the direction between the influence of education and health have recently been called into question. An additional line of research suggests that educational health disparities are due to the better socioeconomic status of parents, including parental education, resulting in both better childhood health and adult educational attainment (Haas, 2008; Crosnoe and Muller, 2004; Glass et al., 2010). The cumulative nature and early life origins of both health and socioeconomic status suggest that a life course perspective may shed light on the relationship between education and health. In this study I examine how own education and parental education influences health trajectories as adolescents enter adulthood and their socioeconomic status becomes increasingly defined by their own pursuits.

I focus on one important indicator of young adult health, weight status. Obesity and overweight are serious health concerns in the United States, as two thirds of adults are overweight or obese and a third of adults are obese (Ogden et al., 2010). Achieving long term weight loss among adults is difficult; as such, research has focused on critical time periods during childhood and adolescence where obesity and obesity promoting behaviors (diet and exercise) are formed (Lawlor and Chaturvedu, 2006) in an effort to reduce obesity among adults. Adolescence and the transition to adulthood represents one of these key time periods as many health behaviors including diet and physical activity change markedly during this time period and these patterns persist into adulthood (Gordon-Larsen et al., 2004; Lawlor and Chaturvedu, 2006; Mokdad et al., 1999; Nelson et al., 2008; Tucker et al., 2005).

Using the life course perspective I examine how weight status trajectories of young adults vary due to differences in early life circumstances, focusing on parental education, and also by the timing and sequencing of important young adult transitions including education, marriage, and childrearing. Parental education influences young adults weight status through two avenues, first influencing weight status upon entering adulthood and through tastes and preferences that individuals carry into adulthood (Fiorito et al., 2010; Oken and Gillman, 2012; Davison and Birch, 2002). Additionally, early life circumstances may influence the timing and sequencing of other important life events such as college, union formation, and childrearing, which in turn influence early life health. College attendance may be especially influential on health during young adulthood, as it represents an important socializing institution during young adulthood, may encourage maintenance and uptake of healthier behaviors, and provide the economic means necessary to purchase a healthier lifestyle.

In this study I employ growth curve models using thirteen waves of the National Longitudinal Survey of Youth, 1997-2010 cohort. I add to past research examining the health of young adults during the transition to adulthood by employing a life course perspective and examining the interconnected relationship between parental education and important young adult transitions. Past research indicates that disparities in weight status by parental education widen from adolescence to adulthood. Parental education may influence both adolescent BMI and growth in BMI and also own education; these effects may obscure the extent that own education is associated with change in BMI. Growth curve models allow me to examine the separate influence of family of origin characteristics on adolescent BMI and growth in BMI as well as accommodate time varying characteristics of education and family formation. Additionally, I examine the extent that parenthood and union formation differences account for differences in weight trajectories by education. Past research on middle aged adults has found that little of the gap between family of origin characteristics and own education are explained by relationship or parenthood status (Baum and Ruhm, 2009). However, these behaviors are relatively common among older adults and less common among young adults. These transitions likely influence not only health but the likelihood of pursing higher education (Stange, 2011). These behaviors may represent key pathways that family of origin characteristics and own education influence weight status. Lastly, I examine differences in the effect of education by gender.

Life course perspective on health

Maternal Education and weight status

Past research has demonstrated the importance of examining health disparities from a life course perspective. Early disparities in health set the stage for adult disparities. Family of origin characteristics, especially parental education, influences health even prior to birth. Maternal education is associated with pre-pregnancy weight status and the in utero environment including substance abuse, diet, gestational age, and birth weight (Semmler et al., 2009; Power et al., 2003; Burdette et al., 2006). These disparities in turn influence health at every other stage of the life course and compound to produce disparities in adult health (Gillman, 2002; Gluckman et al., 2008). Additionally, family of origin characteristics, especially maternal education, continues to influence health and health behaviors during infancy, childhood, and adolescence (Brisbois et al., 2012). In regards to weight status, family of origin characteristics may influence adult obesity through three primary avenues; influencing weight status upon entry into adulthood, influencing the timing and sequencing of other important transitions that in turn influence health, and through influencing health behaviors that continue into adulthood. In this study we focus on parental education as the primary indicator of family of origin characteristics, given its strong association with child, adolescent, and even adult health (Lee et al., 2009; Yang et al., 2008).

Individuals whose parents have lower educational attainment enter adulthood with an already elevated BMI due to the inverse relationship between parental education and childhood or adolescent weight status (Powers et al, 2007; Lee et al., 2009; Shrewsbury and Wardle, 2008). Weight status at earlier ages, even among young children, highly predicts weight status at older ages (Brisbois et al., 2012). A longitudinal study of children in Louisiana found that children who were obese when they were between the ages of two to five were over four times more likely to be obese adults. Additionally, even children with a slightly elevated BMI percentile (>50th) are at increased odds of obesity and overweight as adults compared to those with a lower BMI percentile during childhood (Freedman et al., 2005). Parental education then influences adult obesity by influencing the likelihood that children will enter adulthood obese.

In addition to influencing weight status upon entering adulthood, parental education may shape and influence long lasting preferences and behaviors that continue to influence weight status through adulthood (Van De Mheen, et al., 1997; Powers and Parsons, 2000; Larson et al., 2007). Past research has found that family meals, soda consumption and exposure to vegetables early in childhood predicts consumption of not only these items later on, but also the intake of other items such as milk and fruits (Lee et al, 2009; Fiorito et al., 2010). Additionally, the family environment that parents create through their own physical activity and diet influences their child"s current risk of obesity and diet as well as their future risk and diet (Larson et al., 2007; Davison et al., 2010; Davison and Birch, 2002). Indeed, past research suggests that parental education influences young adult BMI through both adolescent BMI and growth in BMI from adolescence to young adulthood (Jackson, 2011). This leads to widening obesity disparities by parental education. Baum and Ruhm (2009) found that the difference in BMI by high and low maternal education was relatively small at age 20 (0.8 BMI), but the difference had doubled by age 40 (1.9 BMI).

Lastly, parental education may influence young adult BMI indirectly through better young adult outcomes, including educational attainment and delayed family formation. Research examining both parental and own education from young adulthood to age 40 finds that about 30% of the effect of parental education on adult body weight is accounted for by own education (Baum and Ruhm, 2009), though both factors remain significant predictors of adult weight status (Baum and Ruhm, 2009; Braddon et al., 1986, Power et al., 2003). However, research examining younger adults, age 18 to 27, finds only childhood socioeconomic factors are important for predicting young adult obesity (Yang et al., 2008).

Own education and weight status

While socialization during childhood has important consequences on lifelong tastes and preferences, socialization is an ongoing process and continues to influence individuals‟ behaviors throughout life. I focus on one potentially important socializing institution during young adulthood, education and college attendance (Hogan and Astone, 1986). College represents an important socializing institution during young adulthood, and may encourage maintenance and uptake of healthier behaviors as well as provide the economic means necessary to purchase a healthier lifestyle (McLaren, 2007; Ross and Mirowsky, 2003). Social networks are often stratified by education (McPherson et al., 2001). Thus, education provides a healthier reference group, as educated individuals tend to be healthier, which shapes behaviors and may shape ideas concerning appropriate body size (Singh-Manoux and Marmot, 2005; Christakis and Fowler, 2007). Additionally, college attendance may influence health through greater cognitive development, better problem solving skills, and greater motivation and effort to solve problems (Ross and Mirowsky, 2010). In essence, more educated individuals are better at identifying health risks and shaping their behavior to pursue better health.

Education may mediate the negative effect of early disadvantage on health (Mirowsky and Ross, 2005). In fact, research examining self-rated health and mortality found that those from lower status backgrounds experience the largest health benefit from education (Ross and Mirowsky, 2010; Mirowsky and Ross, 2005). However, research examining weight status among young adults suggests that the healthier weight status of educated young adults is due primarily to their better family of origin characteristics and lower weight status during adolescence. Yang and colleagues (2008) find that among women age 18-26 those who received a bachelor degree or are enrolled in bachelor program have lower odds of obesity compared to those with lower educational attainment even after controls for mother‟s education. However, after controlling for adolescent BMI, only family of origin characteristics, including parental education, are associated with young adult obesity, suggesting that the main avenue that young adult‟s education influences weight status is through better social origins. However, this research may have been hindered by the relatively few waves available, especially after college attendance began, and the young age of the respondents in the study.

Lastly, research examining academic achievement and educational attainment suggests that rather than education influencing weight status, weight status influences education. For example, obese or heavier adolescents, especially girls, are more likely to drop out or be held back a grade in high school, have a lower grade point average and obtain less post-secondary education than their thinner or non-obese peers (Crosnoe and Muller, 2004; Glass et al., 2010). Though past research has demonstrated that these effects are relatively small, discrimination and underperformance of obese adolescents may help explain educational disparities in adulthood. Examining weight trajectories prior to and after college attendance allows me to examine whether weight trajectories change as a result of college attendance *or* whether those who attend college had different weight trajectories prior to enrolling in college.

Parenthood and Union Formation: Mechanisms Linking Young Adult and Parental Education to Weight Status

The life course perspective emphasizes cumulative disadvantage and the sequencing of events as potential explanations for adult disparities on many outcomes including health (Elder, 1998). Parenthood and union formation represent two key transitions that young adults make during this time period and may represent an important avenue through which family of origin characteristics and education influence disparities in BMI trajectories. Parental education and own education strongly influence the timing and probability of union formation and parenthood for young adults (Cheng and Landale, 2011; Schoen et al., 2009; Stange, 2011) and parenthood and union formation influences weight status and weight gain among adults (The and Gordon-Larson, 2009; Sobal et al., 2009; Berge et al., 2011). A closer examination of how parenthood and union formation influence weight status during young adulthood, may shed light on the mechanisms through which young adult‟s own education and parental education influence disparities in young adult‟s weight status trajectories.

Entry into unions, either cohabiting or marriage, are often delayed by more educated young adults or those from households with more educated parents (Cavanagh, 2011; Goldstein and Kenney, 2001). For example, women with at least one college educated parent are 44% less likely to be in a cohabitation or marital union at age 24 compared to women with less educated parents (Cavanagh, 2011). Entry into unions is positively associated with obesity and weight gain for women and entry into marriage is positively associated with obesity and weight gain for men (The and Gordon-Larsen, 2009).

Additionally, patterns of parenthood in young adulthood are also strongly associated with own and parental education for both women (Stange, 2011; Schoen et al., 2009) and men (Goldsheider et al., 2008) and may also represent a pathway through which education influences weight status trajectories (Davis et al., 2009; Gunderson, 2009). Among young women, those who gave birth are 3.5 times as likely to become obese during a five year follow up period compared to women who never gave birth (Davis et., 2009) and while this has been more thoroughly studied for women, research on men indicates that parenthood is also positively associated with weight status (Berge et al., 2011).

Does Gender matter?

Though parental education has been demonstrated to be an important predictor of weight status for both boys and girls (Powers et al., 2007; Lee et al., 2009; Shrewsbury and Wardle, 2008), among adults, own education tends to be a better predictor of weight status for women compared to men (Yang et al., 2008; Schroun-Lee et al., 2009; 2008; McLaren, 2007; Roberts and Reither, 2004). In fact, past researches on young men demonstrates that economically inactive men with a high school degree or less have lower odds of obesity compared to men currently enrolled or have completed a four year degree (Yang et al., 2008). This research suggests that the effects of own education are likely to differ between men and women.

Gender differences in the influence of parenthood and union formation on weight status may help explain the greater importance of own education on weight for women compared to men. Marital status appears to be a stronger predictor of weight status for adult women compared to adult men (Sobal et al., 2002), though union formation is positively associated with weight gain for both men and women (The and Gordon-Larson, 2010). Also, due to the physical toll of pregnancy, parenthood has a larger impact on weight status for women compared to men. However, parenthood does appear to increase the probability of obesity for young men as well

(Berge et al., 2011). If own education influences young adults weight status trajectories through their influence on union formation and parenthood then these effects are likely to differ by gender.

PRESENT STUDY

This study uses growth curve models to examine disparities in weight status trajectories as adolescents transition into adulthood. Using a life course perspective we focus on three main related research questions. First, in light of past research demonstrating the importance of parental education on adult health, I hypothesize that:

> H1: Those with higher parental education have a lower adolescent BMI and growth in BMI compared to those with less educated parents.

Second, I examine the extent that own education influences BMI trajectories net of the association between parental education and weight status. I hypothesize that:

> H2: Those with more education have a slower growth in BMI compared to those with less education and young adults‟ own education accounts for the relationship between parental education and growth in weight status.

Third, I examine the extent that parenthood and union formation mediates disparities in weight status trajectories from adolescence to adulthood. Parental education may continue to influence young adult health by influencing the timing of union formation and parenthood. Those with more highly educated parents may delay union formation and parenthood which in turn, results in lower body weight in adulthood and distinct weight status trajectories. Additionally, those who attend college tend to delay union formation and parenthood until after schooling is completed.

> H3: Parenthood and union formation mediate the effect of parental education and own

education on BMI trajectories.

Lastly, I examine gender differences in the relationship between parental and own education and BMI trajectories. Past research indicates that own education is less predicative on weight status for men compared to women, but parental education influences both men and women‟s adult weight (Power et al., 2007). Additionally, the effects of union formation and parenthood tend to have a greater effect on female‟s weight status compared to males

Data and Methods

The data for this project come from the *National Longitudinal Study of Youth* (*NLSY*), 1997 cohort. The NLSY is a nationally representative random sample of approximately 9,000 youths who are followed annually for 14 years. This sample is a stratified random sample of households selected from 147 primary sampling units (metropolitan statistical areas, counties, or groups of counties). Any household containing a youth between the ages of 12 and 16 as of December 31, 1996 was considered eligible to participate in the study. Attrition varied by waves, with roughly, 11% of the respondents absent at each wave, though many were followed up at later waves. An additional 15% of respondents are dropped due to invalid responses on the analytic variables for that wave. Finally, all respondents must begin the study in high school and girls are coded missing in waves they are pregnant (5%). The data are organized into a person period file (N = 92,837 records) with one record contributed by respondents for each year they were interviewed. Grow curve models are well suited to handle this type of missing data across waves as it does not require all data points to be present; rather it uses a maximum likelihood indicator to account for missing data.

Dependent variable.

BMI. Weight status is measured as BMI, which is a commonly used measure to examine adiposity among individuals and is calculated as weight(kg)/height(m)^2. This study relies on self-reported height and weight. Measured height and weight are ideal, but reported and measured height and weight are highly predictive of each other. I use BMI in its raw form as opposed to transforming it into percentile BMI or BMI z-scores. Research that examines adolescents and children converts BMI into percentiles and z-scores to reduce bias due to differences in developmental phase (based on age in months) and gender. However, the BMI percentile and z-score measures created by the Center of Disease Control were created using cross-sectional samples of children and adolescents. As such it masks normal changes in weight related to peaks in height and non-linear peaks in BMI (Cole et al., 2003; Berkey and Colditz, 2006). The variability within this transformed measures of BMI are large and represents a wide range of actual change in adiposity. Additionally, BMI is used to define weight status among adults (those age 20 and over). Using BMI allows for some consistency in how adiposity is measured as adolescence move towards adult definitions of obesity.

Independent variables.

Age. Age is measured in months (though annual coefficients are presented in the multivariate tables) and is centered at the first observation. Doing so allows for easier interpretation of the coefficients and represents the influence of a variable at baseline (e.g. 1997). Preliminary analyses indicate that the effect of time on BMI was not linear. Additionally, model fit statistics indicates that a linear spline at age 19 produces better model fit.

Parental education in 1997. Parent‟s education come from the parent‟s reports of the residential mother‟s highest grade completed. For 7% of the cases there was either no residential mother or the mother‟s education is not known. For these cases father‟s education is used. This is then measured using four dummy variables; less than high school (less than 12 years of education completed), high school (12 years of education completed), some college (13-15 years of education completed), and college (16 or more years of education completed).

Own Education. Own education is a time varying variable and is defined as time since completed high school, but did not attend college (four year institution), attend college (four year institution), and did not complete high school (reference). All respondents begin the study with less than a high school education. A linear discontinuity is introduced at the age that the respondent first reports attending college or reports finishing high school among those who do not attend college. Those who finish high school, but only attend a two year college are classified as high school graduates. Additionally, respondents who only complete a GED are classified as not finishing high school. These trajectories are mutually exclusive. Less than a high school education is chosen as the reference group, since all respondents begin with less than a high school education.

Controls.

I control for several time vary and non-varying factors. The time varying factors smoking behaviors (non-smoker, light smoker 1 to 10 cigarettes a day on the days the respondent smokes,, and heavy smoker more than 10 cigarettes a day on the days the respondent smokes), binge drinking behavior (number of days the respondent drank five or more alcoholic drinks at one time over the last 30 days dummy coded as never, 1-4 times, and 4 times or more), has children (none=0 and 1 or more=1), and marital status (married, cohabiting and single). The non-time varying controls include race/ethnicity, (non-Hispanic white, non-Hispanic black, non-Hispanic mixed race, and Hispanic), and family status in 1997 (two parent family, single parent family, step-parent family, and other family type). Table 1 reports the descriptive statistics for the analytic sample in 1997 (wave 1) and 2010 (wave 14) for the analytic sample and by gender.

[Table 1 about here]

Analyses

To examine BMI trajectories I use un-weighted growth curve modeling techniques. Growth curve models are well suited for modeling baseline levels and the direction and magnitude of change in developmental outcome measures such as BMI (Heo et al., 2003). The models simultaneously estimate effects for Level-1 units (the multiple observations for each respondent across age) and Level-2 units (the respondent). The Level-1 model fits BMI as a function of age, relationship status, and parenthood status across the observations for each respondent and the Level-2 model fits the Level-1 intercepts and coefficients across all individuals as a function of respondents' fixed characteristics.

The Level-1 model is:

$$Y_{ij} = \pi_{0i} + \pi_{1i} \text{Age}_{ij} + \pi_{2i} \text{Age 19}_{ij} + \pi_{3i} \text{Married/Cohabiting}_{ij} + \pi_{4i} \text{Parenthood}_{ij} + \varepsilon_{ij}$$

I included fixed effects in two different level- 2 equations to determine their influence on the level- 1 coefficients, where:

$$\pi_{0i} = \gamma_{00} + \gamma_{01} \text{Parent's Edu.}_{i} + \mathbf{Z}_{0i} + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11} \text{Parent's Edu}_{i} + \gamma_{12} \text{Own Edu.}_{ij} + \mathbf{Z}_{1i} + \zeta_{1i}$$

The level 1 coefficients π_{3i} and π_{4i} include their own intercept and error term, but for simplicity variation in these effects by the fixed effects was not explored. Several interactions between the fixed effects of parental education, race and ethnicity, and family status on growth and growth after age 19 were examined. Model fit statistics indicate that the growth rates differ by parental education, race/ethnicity, and family status. Growth in BMI decreases after age 19 and interactions between parental education, race/ethnicity, and family status were not significant indicating the amount of the decrease in BMI after age 19 was relatively similar for all groups.

I examine the relationship between parental education and young adult‟s own education and family formation using nested growth curve models. The first model includes the effect of parental education on adolescent BMI and growth net of controls, to examine whether parental education is associated with both adolescent BMI and growth in BMI from adolescence to young adulthood. The second model includes the effect of own education on growth in BMI. If the effect of parental education on growth in BMI is fully mediated by own education then this suggests that parental education influences growth in BMI through the greater educational attainment of those with highly educated parents. The last model (Model 3) includes the time varying controls of parenthood and relationship status. This allows me to examine whether the beneficial influence of own and parental education on weight trajectories is accounted for by their influence on parenthood and union formation. Lastly, these models are run separately for males and females. Fit statistics on a gender pooled model using Model 3 and a gender fully interacted Model 3 supports running the analyses separately by gender (BIC for base model is 424,053.9 and BIC for fully interacted model is 423,970.4, where smaller BIC indicates better model fit). Wald equvilancey test statistics are employed to examine whether there are significant differences in the effects of the analytical variables by gender.

Results

Growth curve models predicting BMI trajectories from adolescence to young adulthood are presented in Table 2 for females and Table 3 for males. In order to test the first hypothesis, that parental education is negatively associated with adolescent BMI and growth, Model 1 includes parental education and the controls. Confirming Hypothesis 1, I find parental education is inversely associated with adolescent BMI and annual growth in BMI. Among girls, those who had a parent graduate from college had an adolescent BMI and annual growth in BMI that was lower than girls whose parent only received a high school degree. Among boys, those who had a parent graduate from college had an adolescent BMI and annual growth in BMI that was lower than boys whose parent only received a high school degree. Additionally, girls whose parent had less than a high school degree had a faster growth in BMI and boys whose parent had some college had a slower growth in BMI than those whose parent had a high school education.

[Table 2 about here]

[Table 3 about here]

Model 2 includes own education and tests Hypothesis 2, that own education is negatively associated with growth in BMI. I find this to be the case for girls; those who attend college have a slower growth in BMI compared to those who did not finish high school. Including own education in the model reduces the association between parental education and growth in BMI for both girls and boys and accounts for the differences in growth in BMI by parental education. This suggests that the beneficial impact of parental education on growth in BMI is partially accounted for by the better educational outcomes of those whose parents also attended college.

The last model includes the time varying variables representing relationship and parenthood status. Consistent with past research, I find that marriage and cohabitation are positively associated with BMI compared to those who are single for both men and women. Additionally, parenthood is positively associated with BMI for both women and men. Among women, parenthood and union formation suppress differences between women who only graduated from high school and those who did not graduate high school, resulting in slower growth in BMI among high school graduates compared to non-graduates. Additional analyses (not shown) indicated that this suppression effect is attributable to the greater likelihood of those who only received a high school degree to marry compared to those who went on to college or did not graduate high school. For girls, the different BMI trajectories are illustrated in Figure 1 (based off the Model 3). This graph indicates that the difference in BMI by education widens as the respondent ages. By age 28, a woman who first attended college after high school (age 19) has a BMI that is 0.88 lower and a woman who only graduated high school has a BMI that is 0.36 lower than women who never graduated high school.

[Figure 1 about here]

Lastly, I examine gender differences in BMI trajectories. This is done by pooling boys and girls and including interaction effects between gender and all study variables. Gender differences are considered significant if $p < 0.05$ and are indicated by a 1 for gender differences in baseline and 2 for gender differences in growth on Tables 2 and 3. I find that the association between parental education and adolescent BMI is similar for girls and boys. However, the effect of low parental education on growth in BMI differs by gender, but the effect is not significant for either gender. College attendance is a stronger predictor of BMI growth for women compared to men. Additionally, parenthood and marital status are stronger predictors of BMI for women compared to men. Lastly, I also find significant gender differences in BMI trajectories by race/ethnicity. Black women and Hispanic men have the greatest risk for high BMI trajectories.

Discussion

This study examines the effect of socioeconomic status, focusing on education, on BMI trajectories from a life course perspective by including both parental and young adult‛s own education and by observing adolescents as they age into adulthood. I find that higher parental education is associated with lower adolescent BMI and slower growth in BMI for both girls and boys. Accounting for own education reduces the impact of parental education on growth in BMI for both genders, though own education is only a significant predictor for girls. Parenthood and relationship status account for the rest of the effect of parental education on growth in BMI for women.

Past research suggests that parental education may influence adult health by influencing weight upon entering adulthood and by shaping behaviors that carry into adulthood that influence adult weight, such as diet and physical activity (Powers et al., 2007; Larson et al., 2007; Davison et al., 2009; Davison and Birch, 2002). I find that parental education influences young adult‟s weight status through two avenues; first, through adolescent BMI; and second, through the greater tendency of those with highly educated parents to attend college themselves and delay childbearing and union formation.

Own education appears to be an important factor influencing BMI trajectories during the transition to adulthood among women. Women who attend college or finish high school experience slower growth in BMI than women who do not complete high school. Greater education may promote better health through, greater economic resources and peer groups with better health habits (McLaren, 2007; Yu, 2012; Singh-Manoux and Marmot, 2005; Christakis and Fowler, 2007). Additionally, greater education may promote better health through the development of non-cognitive skills, or learned effectiveness (Ross and Mirowsky, 2003). Greater education may foster better problem solving skills, and greater motivation and effort to solve problems (Ross and Mirowsky, 2010). Thus, more highly educated people are healthier in part because they are better at identifying health risks and shaping their behavior to pursue better health. While testing the exact mechanisms that college attendance promotes healthier weight trajectories is beyond the scope of this paper, I provide evidence that own education influences young adult‟s weight status net of parental education and family formation.

Similar to other research on adults (Hanson et al., 2007; McLaren, 2007; Yu, 2012), I find that education has a stronger effect on women‟s weight status compared to men and this appears to arise primarily from the stronger impact of college attendance for young women. I examined parenthood and union formation as potential mechanisms linking own education to weight status. Additionally, these factors may account for the greater importance of own education on weight status for women compared to men, given that parenthood and union formation have a stronger effect on women‟s weight. Indeed, I find that marriage and having a child has a stronger impact on women‟s weight status compared to men, but these effects do little to explain the effect of own education. In fact, these factors suppress differences in own education for women. Specifically, differences between high school graduate and non-graduate women‟s weight status increase after I account for these factors. This suppression effect appears to be attributable to controlling for marriage. Marriage is less common among less educated women, but delayed among young women who attend college (Goldstein and Kenney, 2001). Thus, young women who graduate from high school, but do not attend college are the most likely to marry. Accounting for the positive association between union formation and weight status among young women results in significant differences in BMI growth between high school graduates and non-graduates.

Although this study makes significant contributions to the understanding of education on weight, the findings should be considered within study limitations. First, these results are largely descriptive. Future research should examine the different pathways that own education influences growth in BMI during young adulthood. For example, is college attendance associated with healthier diets or are college educated people more likely to maintain a lower body weight due to peer influence? Second, this study relies on reported height and weight instead of measured height and weight. Measured height and weight are the most optimal measures to examine BMI, though past research has documented that reported height and weight are a good approximation of measured height and weight (Goodman et al., 2000; Kuczmarski et al., 2001). Third, future research would benefit by examining differences in race/ethnicity as well as gender. Past research has documented that the association between education and health varies by race/ethnicity (Kimbro et al., 2008) examining young adults‟ own education may provide insight into these different patterns.

Lastly, past research has documented that thinner and non-obese girls complete more education and are more likely to attend college than their obese peers (Crosnoe and Muller, 2004; Glass et al., 2010). This potential relationship was examined by including a non-time varying variable that indicates whether the adolescent will ever attended college or will graduate from high school, compared to non-graduates (analyses not shown). In line with this research I find that adolescent girls who will eventually attend college are significantly thinner during adolescence than girls who will not complete high school ($b=-0.76$, $p<0.001$). However, the effect of college attendance on growth in BMI remains virtually unchanged after accounting for future college attendees‟ lower weight status during adolescents. Accounting for this effect, does reduce the impact of parental education on adolescent weight, but remains a significant predictor ($b=0.38$, $p<0.05$). This provides further evidence that one of the main avenue that parent‟s education influences their daughter‟s BMI trajectories is through the greater likelihood for their daughters to attend college themselves. Among boys, I find that those who will eventually graduate high school are significantly *heavier* than their peers who do not finish high school (b=0.52, $p<0.001$). This curvilinear relationship between young adult men‟s education and weight status has been documented in other research (Yang et al., 2008).

Overall, this study finds that parent‟s and own education has important effects on health in young adulthood above and beyond their reciprocal influences on each other. Attending a four-year college or graduating from high school is associated with slower growth in BMI during the transition into adulthood for women. However, mother‟s education is only important for adolescent BMI, though this effect is present for both men and women. College may be an important socializing institution for healthier eating and physical activity habits and provide the means necessary to purchase healthier lifestyles. Among young women, this results in a healthier BMI trajectory during the transition to adulthood.

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Table 1. Means and Percentage for the Study Variables in 1997 and 2010 by Gender, NLSY 1997

	Female		Male		**Total**	
	1997	2010	1997	2010	1997	2010
BMI	21.7	26.4	22.0	27.1	21.9	26.8
Own Education						
Months since HS graduation	0.0	34.1	0.0	37.0	0.0	32.4
Months since first attended college	0.0	36.6	0.0	28.7	0.0	35.6
Parental Education						
Less than HS	22.4	22.8	21.8	21.2	22.1	22.0
HS	35.5	34.8	36.3	35.9	35.9	35.4
Some college	24.3	24.3	23.0	22.9	23.6	23.6
College	17.8	18.1	18.9	20.0	18.4	19.1
Binge drinking (day/month)						
None	91.5	69.8	89.2	54.3	90.3	61.6
1 to 3	5.6	21.4	6.6	24.9	6.1	23.3
4 or more	2.9	8.8	4.1	20.8	3.5	15.2
Cigarette Use						
Non-Smoker	89.5	73.4	88.9	66.8	89.2	69.9
Moderate	7.3	13.9	7.6	14.6	7.5	14.3
Heavy	3.2	12.7	3.5	18.6	3.4	15.8
Race/Ethnicity						
White	53.8	52.6	54.6	54.5	54.2	53.6
Black	19.3	20.7	19.8	20.2	19.6	20.4
Hispanic	26.1	25.9	24.9	24.6	25.5	25.2
Other	0.8	0.8	0.7	0.8	0.8	0.8
Family status, 1997						
Two Parent						
Single parent	32.4	32.8	30.0	29.4	31.2	31.0
Other	3.6	3.4	3.5	3.5	3.6	3.4
Has children	1.4	50.5	0.2	37.8	0.7	43.8
Relationship status						
Single	99.9	48.0	100.0	55.4	100.0	51.9
Married	0.1	29.1	0.0	24.5	0.0	26.7
Cohabiting	0.0	22.9	0.0	20.1	0.0	21.4
Male	---	---	---	---	52.2	53.1
Age (months)	178.0	339.7	178.0	339.7	178.0	339.7
N	3,791	3,052	4,148	3,371	7,939	6,423

Table 2. BMI Trajectories from Adolescence to Young Adulthood for Females, NLSY 1997 to 2010

	Model 1		Model 2		Model 3	
	Baseline	Change	Baseline	Change	Baseline	Change
Intercept[1, 2]	21.3 ***	0.50 ***	21.3 ***	0.50 ***	21.3 ***	0.45 ***
11 Age 19 spline[2]		-0.12 ***		-0.08 ***		-0.09 ***
Own Education				-0.01		-0.04 *
(Less than HS)				-0.11 ***		-0.11 ***
HS						
Attend college[2]	0.08	0.04 **	0.09	0.03 +	0.08	0.02
Parental Education						
Less than HS	-0.14	-0.01	-0.14	0.00	-0.14	0.00
(HS)	-0.62 **	-0.05 **	-0.65 ***	-0.02	-0.64 ***	-0.01
Some college						
College						
Binge drinking behavior	0.02		0.02		0.06	
(None)	0.00		0.00		0.08	
1 (day/month)						
2+ (day/month)						
Cigarette Use	-0.15 ***		-0.15 ***		-0.11 **	
(Non-smoker)	-0.52 ***		-0.52 ***		-0.45 ***	
Moderate						
Heavy						
Race/Ethnicity	0.82 ***	0.02 ***	0.82 ***	0.01	0.87 ***	0.01
37 (White)	1.65 ***	0.06 ***	1.66 ***	0.06 ***	1.66 ***	0.07 ***
Black	0.71	-0.02	0.71	-0.02	0.56	-0.04
Hispanic[1, 2]						
Other						
Family status, 1997	0.55 ***	0.02	0.55 ***	0.01	0.52 ***	0.00
(Two parent)	0.61 +	-0.03	0.61 +	-0.04	0.58 +	-0.04
Single parent					0.79 ***	
Other						
48 Has children[1]						
Relationship status						
(Single)						
Married[1]					0.69 ***	
Cohabiting					0.32 ***	

N=44,383
+p<0.1, *p<0.05, **p<0.01, ***p <0.001
[1]Indicates significant gender difference on baseline.
[2]Indicates significant gender difference in change.

Table 3. BMI Trajectories from Adolescence to Young Adulthood by for Males, NLSY 1997 to 2010

	Model 1				Model 2				Model 3			
	Baseline		Change		Baseline		Change		Baseline		Change	
Intercept[1, 2]	22.0	***	0.59	***	22.0	***	0.59	***	22.0	***	0.59	***
Age 19 spline[2]							-0.24	***			-0.24	***
Own Education												
(Less than HS)												
HS							-0.01				-0.01	
Attend college[2]							-0.01				-0.01	
Parental Education												
Less than HS	0.04		-0.02		0.03		-0.02		0.03		-0.02	
(HS)												
Some college	-0.11		-0.02		-0.10		-0.02		-0.10		-0.02	
College	-0.49	**	-0.03	*	-0.50	**	-0.02		-0.50	**	-0.02	
Binge drinking behavior												
(None)												
1 (day/month)	0.08	**			0.09	**			0.09	**		
2+ (day/month)	0.12	***			0.13	***			0.13	***		
Cigarette Use												
(Non-smoker)												
Moderate	-0.10	**			-0.10	**			-0.10	**		
Heavy	-0.39	***			-0.38	***			-0.38	***		
Race/Ethnicity												
(White)												
Black	0.68	***	0.06	***	0.67	***	0.05	**	0.67	***	0.05	**
Hispanic[1, 2]	0.59	***	-0.04	*	0.60	***	-0.03	*	0.60	***	-0.03	*
Other	1.97	**	-0.04		2.04	**	-0.03		2.04	**	-0.03	
Family status, 1997												
(Two parent)												
Single parent	0.26	+	0.00		0.27	+	0.00		0.27	+	0.00	
Other	-0.38		-0.06	+	-0.33		-0.06	+	-0.34		-0.06	+
Has children[1]									0.18	***		
Relationship status												
(Single)												
Married[1]									0.46	***		
Cohabiting									0.25	***		

N=48,454

+p<0.1, *p<0.05, **p<0.01, ***p <0.001

[1]Indicates significant gender difference on baseline.

[2]Indicates significant gender difference in change.

Figures

Figure 1. BMI Trajectory from Age 20 to 27 by Education for Women, NLSY 97