Body Weight Trajectories and College Completion:
The role of non-cognitive trait and mother-child relationship as sources of resilience

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As adolescent obesity has become more prevalent in the U.S. (NCHS 2010) and that prejudice toward the obese has worsened over the past few decades (Latner and Stunkard 2003), increasingly more health research has begun to explore the causes and consequences of adolescent obesity. Prior research has shown the association between obesity and negative education, income, and marital prospects in adulthood. Given that adolescent obesity often persists into adulthood, one might think that differential weight trajectories during this life phase can potentially diverge individuals into various developmental pathways.

Most studies on adolescent obesity often use weight status at one time point as a predictor of later adjustments. Longitudinal studies that track the developmental trajectory of body weight using repeated BMI measures were non-existent until less than 5 years ago. Of the six such studies that can be found, four focus on early to late childhood (Balistreri and Van Hook 2011; Danner 2008b; Li, Goran, Kaur, Nollen, and Ahluwalia 2007b; Seegers, Petit, Falissard, Vitaro, Tremblay, Montplaisir, and Touchette 2011) and two focus on adulthood (Østbye, Malhotra, and Landerman 2011; Wills, Hardy, Black, and Kuh 2010). No studies have sought to examine the development of weight trajectory across the critical period of adolescence to emerging adulthood (the early twenties). Given that most of the negative consequences of being overweight are often due to social stigmatization (Puhl and Latner 2007) and that peer relationships occupies center stage during adolescence, one would expect that the timing of obesity onset and the duration of being obese make a difference on individuals. For instance, it would be reasonable to hypothesize that being chronically obese throughout adolescence and young adulthood has stronger impact on unfavorable adulthood outcomes than becoming obese during late adolescence or early adulthood.

On the other hand, the majority of studies that have investigated the consequences of adolescent obesity focus on negative developmental outcomes. While being overweight is often conceptualized as a risk factor for unfavorable adjustments, research that examines resilient overweight youths is almost non-existent. Granted that overweight individuals have lower likelihood of getting married (Gortmaker et al. 1993; Mukhopadhyay 2008), entering college (Crosnoe 2007) or having higher income in adulthood (Gortmaker et al. 1993), there are certainly many overweight adults who attain favorable adulthood statuses as their normal weight counterparts. Yet, we have very little understanding of these resilient individuals. In particular, what are the characteristics of these successful overweight adults? What are the protective factors that shield them through the social stigmatization of obesity to achieve in

adulthood? More research is needed to gain further insights into these processes. This study aims to examine non-cognitive traits and interpersonal connectedness (i.e., relationships with parents) that serve as sources of resilience among youths of different weight trajectories in the process of completing college education.

Conceptual Framework: The Life Course Perspectives

Adolescence and early adulthood is a "demographically dense" phase in the life course, for it is characterized by critical transitions such as puberty, completion of schooling, entry into labor market, and family formation. Relevant studies on transition to adulthood have increased dramatically over the past couple of decades, revealing the significance of this life stage in understanding the processes of human development and subsequent life course adjustments (Arnett 2000; Shanahan 2000). Research has generally found that behaviors and attitudes formed during adolescence have long term impact on later outcomes (Clausen 1991; Hogan and Astone 1986; Shanahan 2000).

Body weight during adolescence is an indicator of life style and health behaviors formed earlier in life and has implications for adulthood social relationships and socioeconomic attainment. As the period of adolescence is critical for identity formation and sets the stage for individuals' development in later phases of the life course, the current study draws on three main theses of the Life Course Perspectives as the overarching theoretical framework to approach the issues raised in the previous section. First of all, the life course perspective argues that the timing and sequence of critical life events matters. Second, the life course perspectives posits that human lives are lived interdependently and human behaviors are affected by shared relationships with others. Third, the life course perspective maintains that individuals are active and creative agents in their environment.

Past Research and Analytical Plan

To start out, this project aims to explore the different developmental pathways of body weight from adolescence to adulthood, using multiple waves of data and with the technique of growth mixture modeling. In addition, this project also aims to investigate the role of non-cognitive traits as well as parent-child relationships in moderating the negative impact of unfavorable weight trajectories (e.g., adolescence onset obesity or chronic obesity) on the likelihood of obtaining a college degree.

Østbye and colleagues showed that weight trajectories matter for health in mid-life. Among a group of adults in their early to late forties, there is a clear graded difference in self-rated health and prevalence of hypertension, diabetes, and back problems for individuals in four different weight trajectory groups. (Østbye, Malhotra, and Landerman 2011). Thus, we can expect youths who are chronically overweight would be exposed to more negative interpersonal interactions, which can further limit their socio-developmental opportunities in adulthood, when compared to those who become overweight during late adolescence or have never become overweight. The significance of identifying weight trajectories lies in its

predictive power of later life and health pathways.

In the risk and resilience literature, research has shown that resilience resides both in the social context as much as within the individual (Rutter 1993). Masten and Garmezy clearly pointed out three broad sources of resilience: (1) personality characteristics such as autonomy, self-esteem, and a positive social orientation; (2) family cohesiveness, warmth and lack of discord; (3) the availability of external support system that enhances a child's coping ability. These factors have been found to be associated with more beneficial outcomes for children exposed to adverse circumstances (Masten and Garmezy 1985).

Earlier research has pointed out the importance of non-cognitive traits in determining individual socioeconomic and health outcomes several decades ago (Mueser 1979), interests in further exploring its critical role in the social stratification processes did not re-emerged till about a decade ago. Formation of non-cognitive human capital during the early phases of life has been identified as one key factor that explains differential attainments and behavioral patterns in adulthood (Heckman, Stixrud, and Urzua 2006). However, health research on the consequences of obesity has not moved beyond examining negative outcomes to exploring the characteristics of resilient overweight individuals who succeed despite experiencing the obesity stigma. On the other hand, although interpersonal relationships in the social domain can bring about unpleasant feelings for overweight adolescents, a close and supportive relationship with parents and other family members serves as an important buffer that protects discriminated teens from poor adjustments (Masten and Coatsworth 1998; Masten, Burt, Roisman, Obradovic, Long, and Tellegen 2004; Meadows, Brown, and Elder 2006). Past studies often showed that the presence of a close relationship with at least one parent figure is highly protective for children. In particular, having a supportive and responsive mother contributes to resilient adaptation in the face of stressful life events (Ge, Lorenz, Conger, Elder, and Simons 1994), and it has a long-lasting influence on later life adjustments by benefiting youth in interpersonal skills and interactions with peers (Furman, Simon, Shaffer, and Bouchey 2002).

The current project plans to answer three main research questions. First, what are the different developmental trajectories of body weight between early adolescence and young adulthood? Several trajectories such as normal weight throughout adolescence and young adulthood, adolescence onset obesity, adulthood onset obesity, and chronic obesity are expected to be derived from the multi-year BMI reports. Second, what are the associations between weight trajectories and the odds of college completion in adulthood? I expect that there will be a graded relationship between weight trajectories and the likelihood of these outcomes, with those who experienced chronic obesity fare the worst. Those in the trajectory of normal weight throughout adolescence and adulthood fare the best, with the outcomes of those in adolescence onset obesity and adulthood onset obesity groups in between these two extreme trajectories. Finally, this study will explore the protective factors that characterize

resilient overweight youths who graduated from college. The analyses will focus on investigating protective mechanisms embedded within the family and the youth's own non-cognitive traits as sources of resilience.

Data

The data used for the current project come from the National Longitudinal Study of Adolescent Health (Add Health). Add Health was designed to study health behaviors of a cohort of adolescents in grades 7-12 during the 1994-1995 academic year.

The data were collected mainly through adolescent in-home interviews. The first wave of Add Health data was collected between September 1994 and December 1995. A follow-up Wave 2 in-home interview was done between April 1995 and August 1996. The Wave 3 in-home interview was conducted with respondents in young adulthood between 2001 and 2002. Finally, the Wave 4 interview was done between 2007 and 2008.

Study Sample

The adolescents selected for this study are those who participated in all four waves of Add Health data collection and those who have valid longitudinal sample weights. To avoid the situation in which college completion occurs before wave 3 interview and to maximize the pool of respondents to be included in this study, adolescents in the ages of 12 to 14 were selected as the analytical sample. The final sample size is 3068 youths surveyed in the academic year of 1995-1996. They became 18- to 21-year-olds at wave 3.

Variables and Measures

The outcome variable for this study is whether a respondent has obtained a college degree, as reported at Wave 4. For the predictors, this study utilizes subjective (self-reported) height and weight collected in Waves 1 to 3 to construct weight statuses for the weight trajectory analyses. The results of growth mixture modeling show that the optimal number of groups describing the sample is five weight trajectories. The non-cognitive trait examined is a scale for conscientiousness, which is constructed by adding three items measured at Wave 1: (1) You usually go out of your way to avoid having to deal with problems in your life (2) difficult problems make you very upset (3) when making decisions, you usually go with your "gut feelings" without thinking too much about the consequences of each alternative. This study also explores the effect of another protective factor, mother-child relationship, measured at Wave 1. The scale is composed of four items: (1) Most of the time, your mother is warm and loving toward you; (2) When you do something wrong that is important, your mother talks about it with you and help you understand why it is wrong; (3) You are satisfied with the way your mother and you communicate with each other; (4) Overall, you're satisfied with your relationship with your mother.

Preliminary Findings

As shown in Figure 1, there are five optimal trajectories for adolescents between ages 12 and 14, based on the mixture modeling analyses. The characteristics of respondents in each

trajectory are presented in Table 1. Youths who were already overweight or obese (chronic overweight/obesity trajectories) in early adulthood have the lowest rates of college completion among all trajectory groups. They are more likely to come from single-parent families and to have lower maternal education than those in the normal weight trajectory. Minority youths, except Asian Americans, are more likely to be members of all non-normal-weight trajectories. Those in chronic obesity group also score lower on the conscientiousness scale than the other groups.

The findings from Model 1 of the logistic regression analyses (Table 2) show that being in the chronic obesity, chronic overweight and adult onset obesity trajectories significantly lower a respondent's likelihood of having a college degree by Wave 4. Socio-demographic characteristics explain part of the lower odds of college completion, as can be seen in changes of odds ratios in Model 2. Although addition of conscientiousness and mother-child relationship in Model 3 does not further close the gap in college completion between normal weight trajectory and the other overweight trajectories, they have significant positive effect on the likelihood of getting a college credential. Finally, in Model 4 and 5, we see that scoring higher on conscientiousness increases the odds of graduating from college for those in adult onset obesity groups, and that having a better mother-child relationship also raises the chances of college completion among those in adult-onset overweight trajectory.

Future Analyses

As shown in the preliminary findings, the young adolescents analyzed in this study have very diverse developmental pathways in body weight. While the majority of them never became overweight or obese, more than 40% of them experienced excessive weight gain earlier or later in their life course. Being conscientious and having a close mother-child relationship can serve as sources of resilience for youths in adult onset overweight/obesity trajectories. These findings shed light on the importance of investigating factors that are protective to overweight youths, so that interventions can be provided earlier on to improve developmental outcomes among them. Several additional analyses have been planned to expand this study in the future. Other socioeconomic outcomes such as personal earnings and type of first full-time job in adulthood will be examined as additional dependent variables. Furthermore, additional protective factors such as closeness with peers, received friendship nominations, and other non-cognitive trait such as self- efficacy will also be included in future analyses.

Figure 1. Growth Mixture Modeling Results
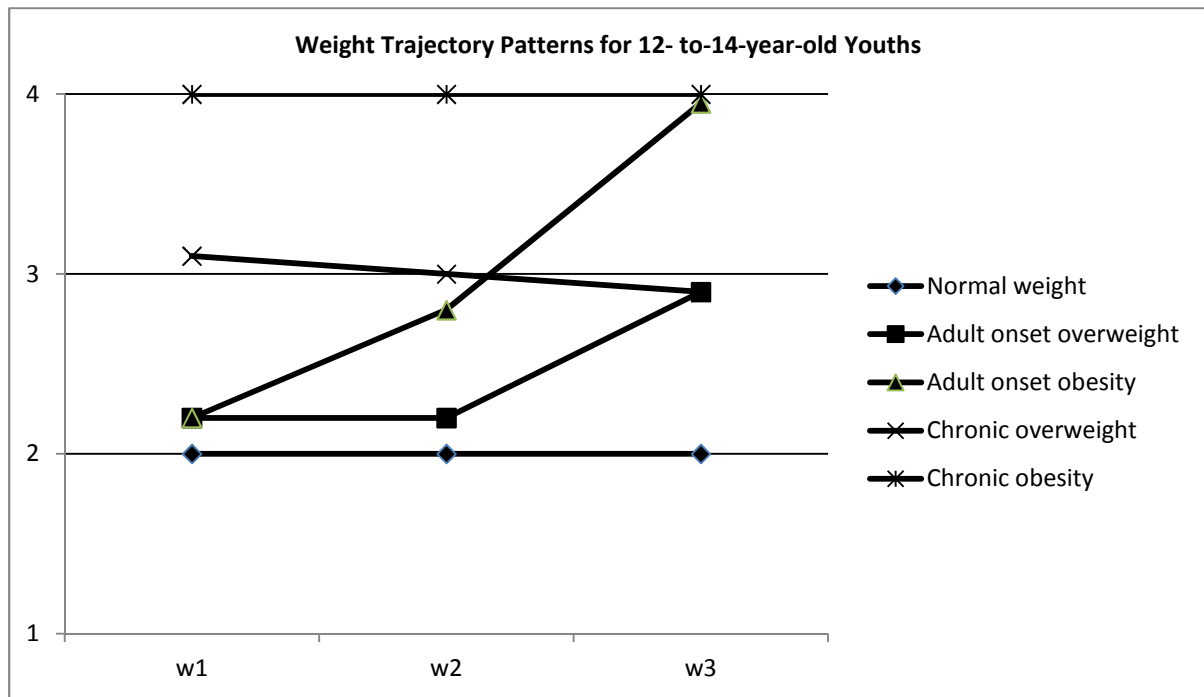
Table 1. Sample characteristics of 12- to 14-year-old youths (weighted data)

	Normal weight	Chronic overweight	Chronic obesity	Adult onset overweight	Adult onset obesity
Sample (n)	1777	358	356	181	396
Age at W1	13.39	13.24	13.45	13.52	13.49
Male	46.79%	54.36%	54.91%	39.33%	48.57%
Family Structure					
Two-parent family	62.78%	64.39%	57.24%	51.87%	
Single-parent family	19.26%	25.28%	26.87%	24.43%	24.49%
Stepfamily	15.90%	7.79%	12.88%	22.95%	13.77%
Other family	2.06%	2.54%	3.01%	0.75%	1.88%
Race					
White	74.68%	-1486.07%	65.03%	61.49%	
Black	10.69%	16.60%	20.22%	19.03%	15.76%
Hispanics	9.63%	15.66	12.48%	14.04%	12.83%
Asian	4.15%	1.82%	1.57%	1.83%	2.76%
Other race	0.85%	1.65%	0.70%	3.61%	0.94%
Maternal Education					
Less than high school	12.18%	17.86%	22.99%	20.00%	
High school	42.22%	45.50%	43.88%	47.56%	40.24%
Some college	19.16%	17.66%	15.10%	15.57%	18.60%
College and above	26.44%	18.98%	18.03%	16.87%	25.12%
Conscientiousness	8.18	8.14	7.93	8.14	8.15
Positive mother-child relationship	17.49	17.79	17.33	17.1	17.32
College Completion	36.77%	19.77%	20.63%	22.63%	31.98%

Table 2. Logistic regressions predicting college completion by Wave 4 for 12- to 14-years-olds (weighted data)

	Model 1	Model 2	Model 3	Model 4	Model 5
Normal weight (ref.)					
Chronic obesity	0.46***	0.58***	0.57***	0.56	1.94
Chronic overweight	0.42***	0.46***	0.45***	0.47	0.08*
Adult onset obesity	0.50***	0.62**	0.61**	0.16*	2.47
Adult onset overweight	0.82+	0.87	0.87	0.73	0.13*
Age at W1	0.87*	0.89+	0.91	0.91	0.89
Male	0.74***	0.64***	0.64***	0.64***	0.64***
Family Structure					
Two-parent family (ref.)					
Single-parent family		0.54***	0.54***	0.54***	0.54***
Stepfamily		0.51***	0.53***	0.53***	0.53***
Other family		0.05***	0.05***	0.05***	0.05***
Race					
White (ref.)					
Black		0.80+	0.93	0.93	0.92**
Hispanics		1.04	1.11	1.12	1.09
Asian		2.00**	1.98**	1.99**	1.99**
Other race		0.95	0.92	0.88	0.89
Maternal Education					
Less than high school (ref.)					
High school		2.73***	2.44***	2.45***	2.52***
Some college		3.79***	3.29***	3.31***	3.34***
College and above		13.86***	11.42***	11.50***	11.87***
Conscientiousness			1.18***	1.17***	1.17***
Positive mother-child relationship			1.04*	1.04*	1.03
Conscientiousness x weight traj.					
conscientiousness x normal weight (ref.)					
x cons_cob				1.01	
x cons_cov				0.99	
x cons_aob				1.17*	
x cons_aov				1.02	
MCR x weight traj.					
mother-child rel. x normal weight (ref.)					
mcr_cob					0.93
mcr_cov					1.11
mcr_aob					0.92
mcr_aov					1.12*