Sex Differences in Adult Outcomes by Changes in Weight Status From Adolescence to Adulthood: Results From Add Health

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Received for publication October 14, 2013; accepted March 31, 2014.

ABSTRACT

OBJECTIVE: Changes in weight status from adolescence to adulthood may be associated with varying social, vocational, economic, and educational outcomes, which may differ by sex. We studied whether there are differences in adult outcomes by sex for different weight status changes in the transition to adulthood.

METHODS: Using data from the National Longitudinal Study of Adolescent Health, participants were categorized by weight status from adolescence into adulthood. We examined self-reported outcomes in adulthood for living with parents, being married, being a parent, employment, receipt of public assistance, income, and college graduation by weight groupings (healthy–healthy, healthy–overweight/obese, overweight/obese–overweight/obese, overweight/obese–healthy). The effect of changes in weight status on the adult outcomes was modeled, controlling for sex, age, parental education, and race/ethnicity.

RESULTS: There were differences by sex for many of the self-reported outcomes, especially educational and economic outcomes. Female subjects who became overweight/obese between adolescence and adulthood or remained so had worse economic and educational findings as adults compared to male subjects.

CONCLUSIONS: Overall, for female subjects, becoming and remaining overweight/obese was associated with worse outcomes, while for male subjects, adolescent obesity was more important than isolated adult obesity. The relationship between obesity and life situations may be more negative for female subjects in the transition to adulthood. The findings emphasize that adolescent obesity, and not just obesity isolated in adulthood, is important for characteristics achieved in adulthood.

KEYWORDS: adolescent obesity; adult outcomes; obesity/overweight; population-based studies; transition to adulthood; weight changes

ACADEMIC PEDIATRICS 2014;14:448–455

WHAT'S NEW

There are sex-based differences in adult outcomes, particularly economic and educational, that differ depending on weight status stability or changes in the transition to adulthood. Female subjects who had persistent obesity or became obese from adolescence to adulthood were particularly vulnerable.

OBESITY IS ONE of the most important health issues facing adolescents today. Although the health and psychological outcomes of obese children and adolescents are well known, few recent studies using objectively measured weight have focused on the relationship between obesity and adult social, vocational, economic, and educational (SVEE) outcomes. Obesity tracks strongly from adolescence into adulthood,[1–3] and the transition to adulthood is a time period when many adolescents also develop obesity.[4,5] The transition from adolescence to adulthood is also marked by many important developmental milestones such as leaving home, completing college, getting married, becoming a parent, and starting one's career. Maintaining weight or gaining weight during this critical developmental period may be associated with different adult SVEE outcomes. As they age into adulthood, adolescents may have different weight changes or stability which can be classified into following groups for the purposes of this study: 1) adolescents who were healthy weight and remained healthy into adulthood (healthy–healthy), 2) adolescents who were healthy then

became overweight/obese as adults (healthy–OW/OB), 3) those who were overweight/obese and remained so into adulthood (OW/OB–OW/OB), and 4) adolescents who were overweight/obese and reversed their obesity and became healthy weight (OW/OB–healthy). Previous studies have demonstrated that obesity, whether isolated to a single period of development such as adolescence or continuous into adulthood, increases risk for chronic health problems.[6,7] However, less is known about the relationships of weight status changes to SVEE status across the transition to adulthood and especially how these relationships may differ by sex.

Previous studies of the association between changes in weight from adolescence to adulthood and adult SVEE outcomes have yielded mixed results.[8–11] Some studies have shown that young adults who were obese adolescents were less likely to marry, had lower incomes, had higher poverty rates, and completed fewer years of education, and that these outcomes were generally worse for women than men.[8–12]

A British study, which used measured height and weight in childhood and self-reported data in adulthood, found that female subjects with persistent obesity had higher risk of unemployment and of not having a current partner, but did not have lower incomes.[12] Persistent obesity in male subjects was not significantly associated with adverse outcomes in adulthood.[12] Another study found that obese adolescents were less likely to attain college graduation than healthy-weight peers.[9] Additionally, many of the studies examining adult correlates of obesity relied on self-reported height and weight at some time point, which can misclassify participants into body mass index (BMI) categories, particularly at the extremes of weight distributions.[13–17] Reliance on self-report is a particularly important limitation when examining SVEE outcomes because the accuracy of self-report might be related to the outcomes and covariates of interest, including marital status, income, and race/ethnicity.[18]

To our knowledge, no recent US longitudinal studies have been conducted after the substantial rise in obesity rates seen over the last 10 years, and none has used measured height and weight in both adolescence and adulthood to comprehensively examine by sex how adult SVEE status is associated with different in weight status changes from adolescence into adulthood. There has also been an increase in obesity-related stigma over the years that could also influence SVEE outcomes.[19] The goal of this study was to determine whether weight status from adolescence to adulthood is associated with a variety of SVEE statuses in a racially/ethnically diverse, US national longitudinal sample, and whether these associations vary by sex. We hypothesized that both those who remain OW/OB or become OW/OB in early adulthood may have different adult SVEE outcomes than those who remained healthy weight, and that those who persistently remain OW/OB may not meet the traditional transitional milestones of adulthood compared to those who become OW/OB in the transition period. We also hypothesized that female subjects may be more vulnerable than male subjects to not meeting the same SVEE milestones, on the basis of findings from prior studies.[8–10,12,20]

METHODS

Data examined in this study came from the National Longitudinal Study of Adolescent Health (Add Health), which is an ongoing nationally representative study of adolescents who were in grades 7 to 12 in the 1994–1995 school year (wave 1) when the study began. Respondents have been followed into adulthood with 3 subsequent in-home interviews. Details of the Add Health study design and sampling procedures are described elsewhere.[21] Specific groups were oversampled in the original design to enhance representation of non-Hispanic blacks with a college-educated parent, Chinese, Cubans, and Puerto Ricans.[21] This study was exempted by the institutional review board at the University of North Carolina at Chapel Hill (IRB 12-2511).

We examined individuals who were followed since wave 1 and interviewed at both waves 2 (1996; 12 to 21 years old with average age of 16.2 years; N = 14,738) and 4 (2008, ages 24 to 32 years with average age 29.1 years old; N = 15,701), and were either healthy weight or OW/OB at waves 2 and 4 and who self-reported on SVEE information at wave 4. A total of 20,747 participants were included in one of the waves; 2171 were excluded because they did not have data in wave 2 or wave 4. Respondents with missing height or weight (wave 2 = 3950; wave 4 = 2998; both = 107), or who were pregnant (wave 2 = 258; wave 4 = 385; both = 16) were excluded from the analysis. An additional 739 participants were excluded as a result of missing sample weights. Finally, 447 individuals were excluded because they were underweight at one of the waves, and an additional 454 were missing values on one of the outcomes of interest. Thus, the final analytic sample consisted of 9222 participants.

MEASURES

WEIGHT STATUS

Measured height and weight at waves 2 and 4 were collected using standardized procedures described elsewhere.[21] Individuals were categorized as OW/OB or healthy weight on the basis of age-based US Centers for Disease Control and Prevention definitions at the time of measurement at waves 2 and 4, as we were focused on any changes in weight status from adolescence to adulthood. For those younger than 20 years, age- and sex-specific BMI percentiles were used with overweight/obese defined as ≥85th percentile and healthy weight as ≥5th to <85th percentile.[22,23] For those 20 years and older, standard BMI was used, with overweight/obese defined as ≥25 kg/m^2 and healthy weight defined as ≥18.5 to <25 kg/m^2. From these categories, we created 4 categories of weight status from adolescence to adulthood.

We compared outcomes on the basis of the following 4 categories from waves 2 to 4: 1) healthy weight adolescents who remained healthy weight in adulthood (healthy–healthy), 2) healthy weight adolescents who became OW/OB as adults (healthy–OW/OB), 3) OW/OB adolescents who remained overweight/obese (OW/OB–OW/OB), and